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The Financial and Monetary Crisis
Rethinking Economic Policies and Redefining the architecture and governance of international finance

Financial crisis and Confidence in a Post-Keynesian Stock Flow Consistent model

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Edwin Le Heron

University of Bordeaux, Sciences Po Bordeaux, SPIRIT, CNRS UMR 5116, Pessac, F-33607, FRANCE

President of the ADEK (*Association pour le Dévelopement des Études Keynésiennes*)

e.le.heron@sciencespobordeaux.fr

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While there was only a U.S. subprime mortgage crisis in 2007, economic growth and employment are now deteriorating sharply all around the world. The aim of this paper is to understand how this financial crisis located in the U.S. had became a real global economic crisis, especially in a country like France.

Indeed, France had no specific reasons to suffer its deepest depression since WW2. There was no bubble on housing market, banks were moderately engaged in the U.S. speculative markets and their profitability remained good. French households were unlikely to suffer a negative wealth effect, since their incomes or pensions are not very sensitive to stocks markets. Certainly we are living in a globalize world, but the U.S. market is not an important demand for France. Moreover, the U.S. crisis involved a great moderation in the prices of raw materials, and particularly a strong and quick fall in oil price. It was good news for the French production and we could have been expected lower inflation and lower interest rates. Euro has allowed us to maintain stability of exchange rates with our major economic partner. Except in the cases of Great Britain and Spain, other European countries knew the same situation as France.

Our thesis is that the most important channel of transmission of the U.S. financial crisis to the French growth crisis is confidence. Of course, we do not say it is the only one. But 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. With the framework of radical uncertainty, agents' expectations can become self-fulfilling prophecies. As Keynes said, in economics, when the people go out with umbrellas, it rains. Group expectations are the strongest predictor of future events.

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 complete private banks sector. We introduce the borrower and the lender's risks from the Minskian approach and the state of confidence of the private sector. In the second part, we simulate the model to study the effects of the current financial crisis that involves a confidence crisis. The aim is to analyze the channel of transmission to the real world of changes in the state of confidence of private sectors in France from 2005 to 2009.

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

We resume only the most specific features of our model[1] with five sectors: government, firms, households, private banks and central bank. SFC modelling is based on two tables. You can find the transactions matrix (flows) in appendix 3 and the balance sheet matrix (stocks) in appendix 4. The complete model (Appendix 2) contains 63 equations.

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 a fall in the state of confidence of banks, firms and households 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). ΔF determines monetary creation in the period.

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.

Fiscal policy of the Government

Government expenditures are only final sales of consumption goods. The government collects only taxes from households on wages. 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 (i_l).

To analyze the consequences of a supply shock, we assume a stabilizing effect of the fiscal policy. Public expenditure (G) is always growing at the same rate (gr_y) as the national income (Y) with a lag of one year. Tax revenue is proportional to income and hence varies in line with the public expenditure. With the State debt, 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.

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[1] For more explanations, you can read Le Heron and Mouakil (2008) and Le Heron (2009) for the Post Keynesian model and Le Heron (2008) for the Keynesian stock-flow consistent model.

The final effect of the fiscal policy is measured by the government deficit (GD). Our economy has a self-stabilizing tendency due to the fiscal policy.

(1) $G = G_{-1}. (1 + gr_{y\,-1})$

(2) $GD = G + (i_{b-1} . B_{-1}) – T – P_{cb}$

Investment of Firms

The investment function is the most important one in a growth model. The stock of capital (K) 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). Firms issue equities (E), bonds with fixed rates of interest (OF) and commercial papers (CP), and borrow money from banks (variable rate) (L) to finance investments. Amortization concerns only the debt: loans, bonds and commercial papers.

(3) $I \equiv \varphi + IF$

(4) $IF = P^u – amort$

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

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 15, 16, 18). A rationing in investment financing 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 level of indebtedness, 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 Minsky.

(6) $I_D = gr_{kD} . K\text{-}1$

(7) $\varphi^d = I^d – IF$

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

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

(9) $r_{cf} = P^u /K_{-1}$

(10) $u = Y /Y_{fc}$

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

(11) $Y_{fc} = K_{-1} \cdot \sigma$ With σ: constant

(12) $FCI = (\mu_1 \cdot i_l \cdot L/K) + (\mu_2 \cdot i_{cb} \cdot CP/K) – (\mu_3 \cdot E/Y)$ With μ_i: constants

We measure the output gap in ratio, with Y_{fc} the output of full capacity and not of the capacity that corresponds to the potential output. Distributed dividends (P^d) are a fraction (25%) of profits realized in the previous period. This part can be higher in a 'financiarized' economy:

(13) $P^d = (1 - s_f) . P_{-1}$ With s_f: constant

Consumption of Households

We assume that households determine their consumption expenditure on the basis of their expected disposable income and their wealth of the previous period that consist entirely of bank deposits. Following the Kaleckian tradition, wages are mostly consumed while financial income is largely devoted to saving. The consumption decision depends on the state of confidence of households and determines the amount that they will save out of their disposable income. The financial behaviour of households is simplified: they hold only banking deposit account.

We assume that the state of confidence of Households (γ_6) influences only the workers, *i.e.* the propensity to consume ($\alpha_1 = \alpha'_1.\gamma_6$). The consumption decision determines the amount (ΔD) that households will save out of their disposable income (Y_h). We integrate a wealth effect that influences the consumption share ($\alpha_3 = \alpha'_3.\ (i_{d-1} - \Pi_{-1})$) of the stock of saving (D). The wealth effect depends on the spread of the previous period between the rate of yield of saving (i_d) and the rate of inflation (Π).

(14) $$C = (\alpha'_1.\gamma_6 .Y_w^a) + (\alpha_2 .\ Y_v^a) + (\alpha'_3.\ (i_{d-1} - \Pi_{-1}) .D_{-1})$$ With α_i: constant

Financing by Private banks
Private banks

Banks don't make loans to households, but 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, bankers can refuse to finance. The state of confidence of banks summarizes these factors.

Banks know a lender's risk (LR) when underwriting finance and creating money. Lender's risk is the sum of three fundamental risks: risk of default, risk of liquidity and market risk. 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 (15, 18, 21, 22), 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}).

(15) $\varphi = \varphi^d .(1 - LR)$ With $0 \leq LR \leq 1$

(16) $\Delta F = \varphi - amort + CG$

(17) $CG = CG_e + CG_{of}$

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.

(18) $LR = -\gamma_4 + a_1 \cdot (lev_{-1} - lev_c) - (b_1 \cdot V_C) + (c_1 \cdot i_{cb})$ With γ_4, a_1, b_1, c_1 et lev_c: constant

(19) $lev = (CP + OF + L) / K$

(20) $V_C = E / E_{-1}$

We follow the methodology developed by Godley and Lavoie (2007) and inspired by Tobin (1958) to define the portfolio behaviour of banks. Banks can hold four different assets: bonds (with fixed rate of interest) $OF = of . p_{of}$, equities $E = e . p_e$, loans at variable long-term interest rate (L) and commercial paper (CP) at short-term interest rate:

Monetary authorities determine endogenously the key rate on the money market (i_{cb}) following 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 and budget; expected inflation; the level of future short-term rates of interest; financial markets' evolution and capital assets' prices; foreign long-term rates. In the model, we use the same lender's risk as the one seen previously (equation

18), 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.

(21) $i_l = i_{cb} + lr + \chi_1$ With χ_1: constant $\chi_1 > \chi_2$

(22) $lr = - \gamma_5 + a_2 . (lev_{-1} - lev_c) – (b_2 . V_C)$

With γ_5, a_2, b_2, lev_c constant and c = convention on the 'normal' debt ratio

(23) $i_{cp} = i_{cb} + \chi_2$ With χ_2: constant $\chi_1 > \chi_2$

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

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

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:

(25) $P_b \equiv i_{b-1} . B_{-1} + i_{l-1} . L_{-1} + i_{cp-1} . CP_{-1} + i_{of} . of_{-1} + P^d – i_{d-1} . D_{-1} – i_{cb-1} . REF_{-1}$

Monetary policy of central bank

The central bank has neither operating costs nor net worth and pays all its profits to the government. Following the theory of endogenous money, we assume that the central bank is fully accommodating. We use a Taylor rule for the modelling of its behaviour. 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 instrument rule in 1993, modelling the dual mandate of the Fed. It was founded on the output gap and on the inflation gap. 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.

We assume that central bank uses a flexible Taylor rule. 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 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.

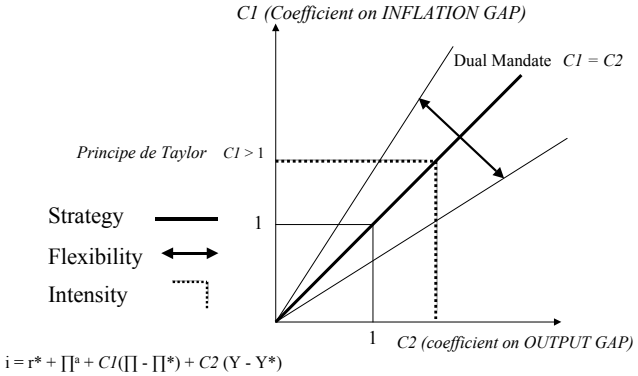


Figure 1 Monetary policy of central bank

Our monetary rule is:

(26) $i_{cb} = i^* + \Pi - \alpha_4 .OG_R + \alpha_6 (\Pi - \Pi^*)$

We have some flexibility in the instrument function of the central bank. As with the risk management of Alan Greenspan (balance of risks), the central bank prefers to fight against the greatest danger and focuses on the most important variable in the current period.

(27) $\alpha_4 = \alpha_{4(-1)} + (al_4 .(OG_R - OG_{R(-1)}))$

(28) $\alpha_6 = \alpha_{6(-1)} + (al_6 .(\Pi - \Pi_{(-1)}))$

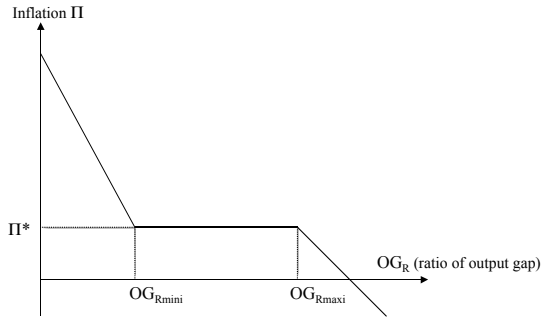


Figure 2 Inflation curve

A special kind of Phillips Curve models inflation. 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}. Leijonhufvud (1981:112n) coined in the notion of a 'corridor' the idea that for small disturbances the inflation rate is stable while for large disturbances it is unstable. 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:

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

(29) $\Pi = \Pi^* + d_1 .(OG_{Rmini} + OG_R) + d_2 .(OG_{Rmaxi} + OG_R)$

EXPERIMENTS ABOUT CONFIDENCE AND FINANCIAL CRISIS IN FRANCE

Our model is a mathematical model of a closed modern economy but it is not calibrated on the French economy. Therefore these experiments are only an attempt to simulate the state of confidence with some established figures of confidence index in order to know if we can find the stylized facts of the current period. Our thesis is that an important channel of transmission of the U.S. financial crisis to the French growth crisis is confidence. But of course, it is not the only channel of transmission.

As we have seen in the introduction, France had no specific reasons to suffer its deepest depression since WW2: no bubble on housing market, banks moderately engaged in the U.S. speculative markets, no wealth effect for the households, low demand for the U.S. market, stability of exchange rates with our major economic partner. The strong fall in oil price allows lower inflation and lower interest rates. Except in the cases of Great Britain and Spain, other European countries knew the same situation as France. However, the rate of growth in France has dramatically fallen to -3.5% in the first quarter of 2009. And the unemployment rate rose from 7.6% in May 2008 to 10% today.

Crisis in the state of confidence

We make simulations[2] by imposing changes in the state of confidence corresponding to the period April 2005 – October 2009. To take into account the end of the speculative boom and the current crisis, we experiment the period from May of 2005 (INDEX = 100) until October of 2009. We use the different monthly indicators elaborate by the French National Institute of Statistics and Economic Studies (INSEE). These indexes are calculated from monthly polls on a representative population. These calculated index of confidence drive our model and impact the GDP and the real economy. We do not try to explain these changes in the state of confidence. We assume that these changes impact the real economy and we have no loop from the real economy (GDP for instance) to the state of confidence of the private sectors. Then the state of confidence of the private sectors moves exogenously with the calculated expectations of the private agents.

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 fall in the state of confidence of the economic agents, which have then depressed the real economy. The aim is to deal with the channels of transmission of these psychological variables. We want to show that

[2] We use the E-views 5.5 software.

psychological reactions (lower confidence) are sufficient to explain the spread of financial crisis to the real sector. We develop four processes for the crisis: changes in the state of confidence of firms, banks, and households and then in all the private sectors.

Although our economy is closed, taking into account the international dimension of the crisis in polls conducted among private agents, justifies our integration of the global dimension of our economic world today.

The state of confidence of firms: F

For the firms, we use an indicator of the state of confidence of firms (SCF) that summarizes more than 18 issues: turning point indicator, recent changes in output, personal production expectations, inventory levels of finished goods, demand and total order books, demand and total export books, personal price expectations, general production expectations, etc.. We are taking into account the expectations about the international demand. The changes in the state of confidence of firms (γ_0) impact the desired rate of accumulation. It is a good proxy for the effective demand. Pessimistic expectations of firms depress effective demand and involve a supply shock and then a demand shock.

$$gr_{kD} = \gamma_0 + \gamma_1 \, . \, r_{cf\text{-}1} + \gamma_2 \, . \, u_{\text{-}1} - \gamma_3 \cdot FCI_{-1}$$

$$\gamma_0 = a_5 \, . \, SCF$$

The state of confidence of households: H

For the households, we use the consumer confidence indicator (CCI) to measure their state of confidence (γ_6). This summary indicator of confidence analyzes five major components derived from monthly poll: the financial situation of households (past and next), the feeling on general economic situation (past and next) including international perspectives, the major purchases intentions (12 months). In our model, the consumer confidence indicator influences only the propensity to consume (α_1) of the expected disposable income of workers (Y_w^a). It involves a demand shock.

$$C = (\alpha_1 \, . Y_w^a) + (\alpha_2 \, . \, Y_v^a) + (\alpha'_3 . \, (i_{d\text{-}1} - \Pi_{\text{-}1}) \, . D_{\text{-}1})$$

$$\alpha_1 = \alpha'_1 . \gamma_6 \qquad \text{or} \qquad \alpha_1 = \alpha'_1 . CCI$$

The state of confidence of commercial banks: B

For banks, there is not a specific index on the state of confidence of this sector. We use the expectations about the credit (more hard or easy conditions) calculated by the French central bank. This indicator influences the conventional level of the leverage ratio and the lender's risk. The index changes (γ_4) and (γ_5) in equations (35) and (53) of lender's risk. Moreover, it changes the level of the conventional leverage ratio (quantity of firms indebtedness considered as normal (lev_c)).

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

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

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

We put the three processes together for a generalized analyze of the state of confidence of the private sectors. In the experiments, the respective importance of the different economic sectors on the economic situation is not relevant. The changes in the state of confidence of banks and firms involve supply shocks. In contrast the changes in the state of confidence of household involve shock of demand.

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 in place of the Tobins's *q*.

Experiments with the state of confidence of French private sectors

Following the approaches of Minsky and Keynes, confidence is an important channel of transmission of the U.S. financial crisis to the French real economy. If we compare the observed rate of growth (Figure 3bis) and our simulation (Figure 3), there is a strong convergence but with a little delay. As we would expect, the expectations (state of confidence) seem to precede changes in the observed economic growth of France.

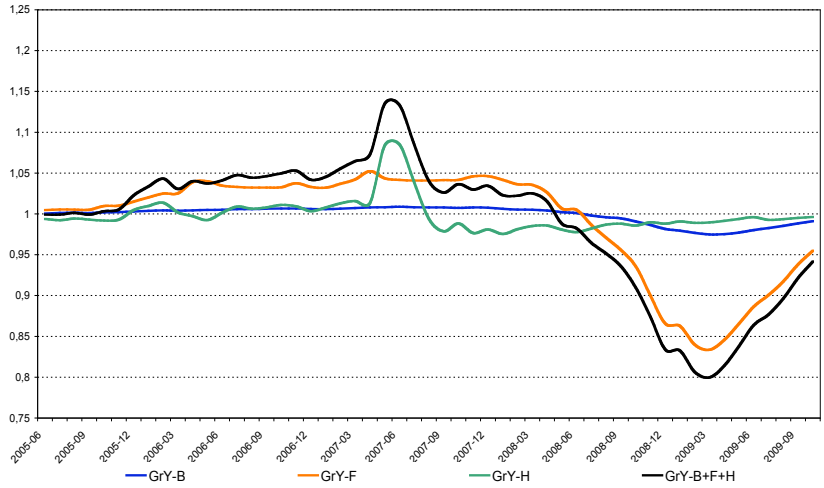


Figure 3 **State of confidence in France. Effects on the growth rate of our economy**

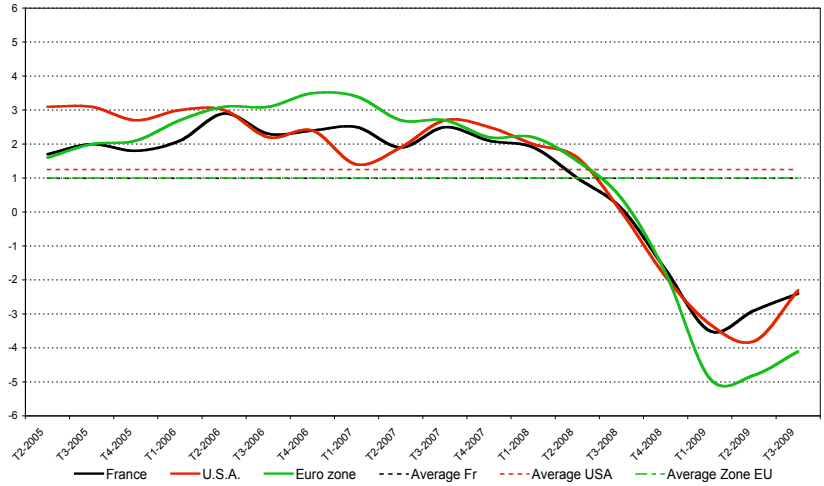
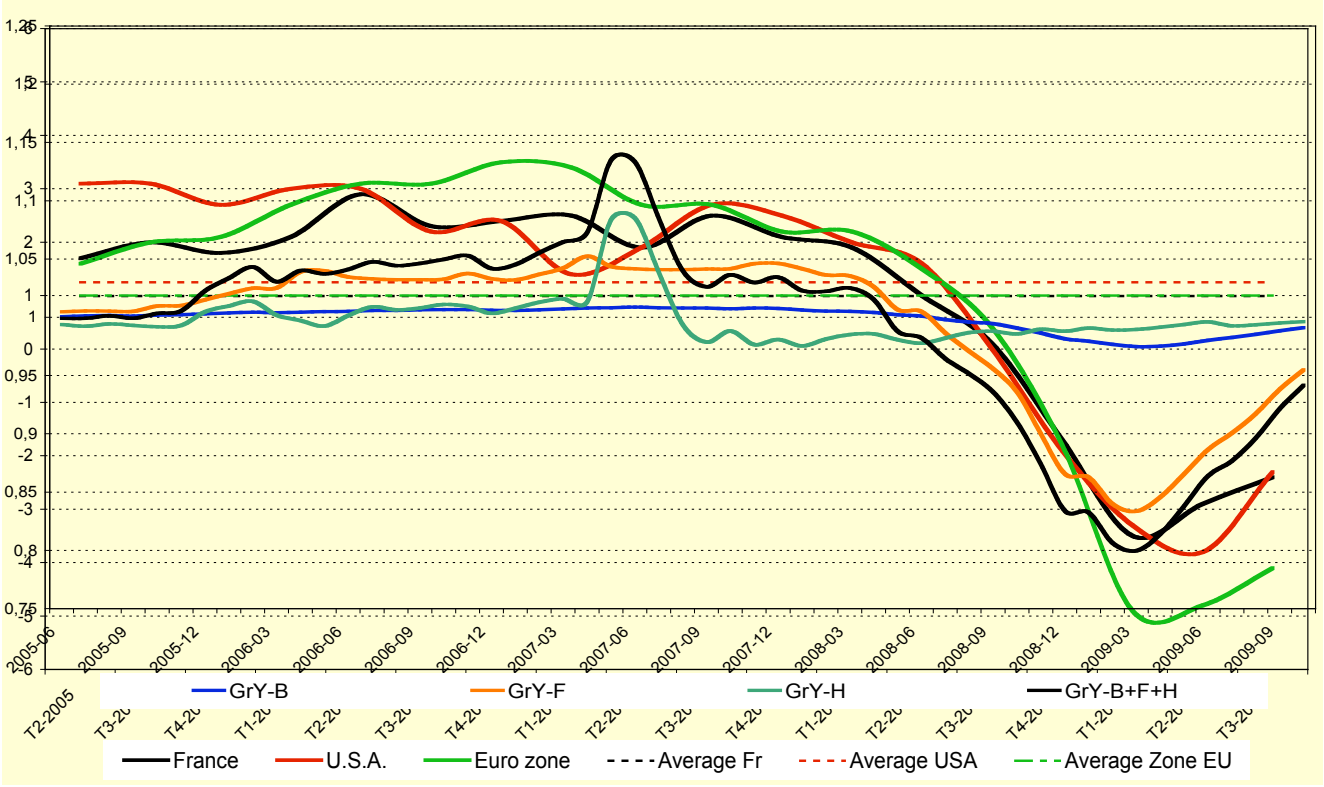


Figure 3 bis **Observed growth rate of the economy: France, U.S.A., Euro zone (Quarterly data at annual rate and period average) Source OCDE**

The drop in state of confidence of firms at the beginning of 2008 explains the depressed effective demand, *i.e.* the desired growth rate of accumulation of capital (Figure 5) and then the rate growth of the economy. But, banks have also a little responsibility, because financing conditions deteriorate. The rate of utilization of productive capacity falls (Figure 6). The confidence of households increases in the second quarter of 2007 and it explains that the maximum of effective



demand is at the middle of 2007. The crisis is deeper after august 2008. However, it is the state of confidence of firms (effective demand) that is the driven sector in the economy as it Keynes explained in the *General Theory*. It is important to note that it is a complete hazard if the average of the true rate of growth is 1% on the period as in the figure 3 since all values on the vertical axis are homogenized to one for the steady state, *i.e.* for the first period (May 2005).

There is a relative inertia of the unemployment. With the crisis in the real world, unemployment increases with a delay, but it will begin to decrease with a larger delay. In our experiments, the rate of unemployment is correlated to the output gap and it reacts immediately. It would be necessary to put a variable delay of several months.

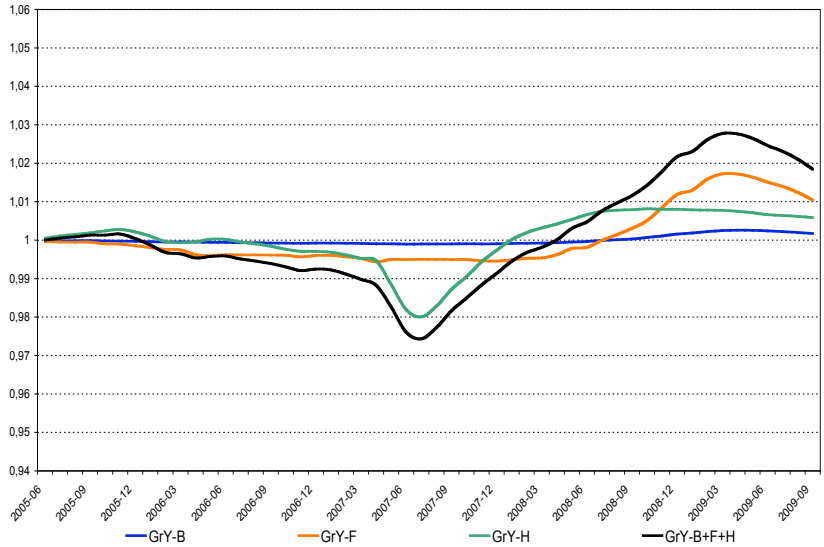


Figure 4 **State of confidence in France. Effects on the output gap of our economy**

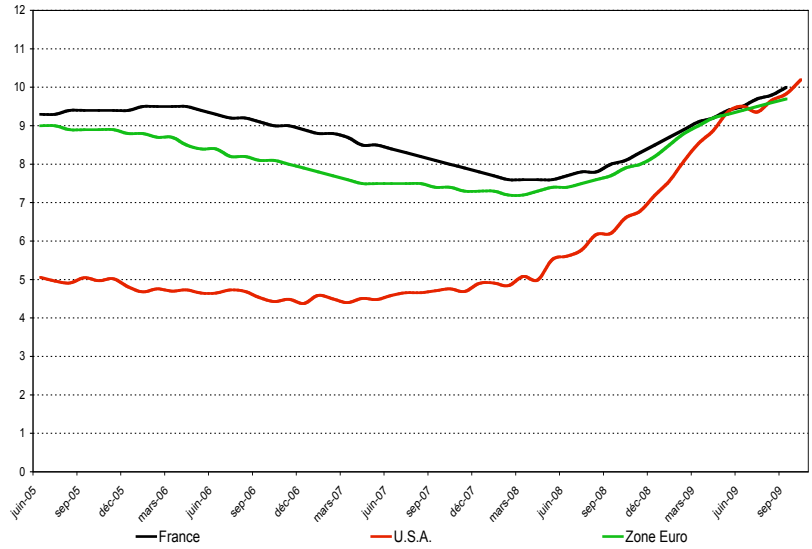


Figure 4 bis **Observed rate of unemployment: France, U.S.A., Euro zone (Quarterly data at annual rate and period average) Source OCDE**

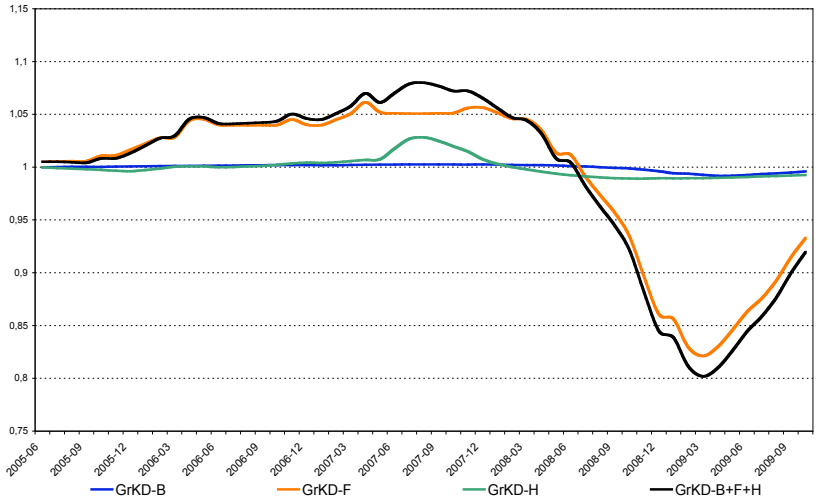


Figure 5 **State of confidence in France.**
Effects on the desired growth rate of accumulation of capital of Firms

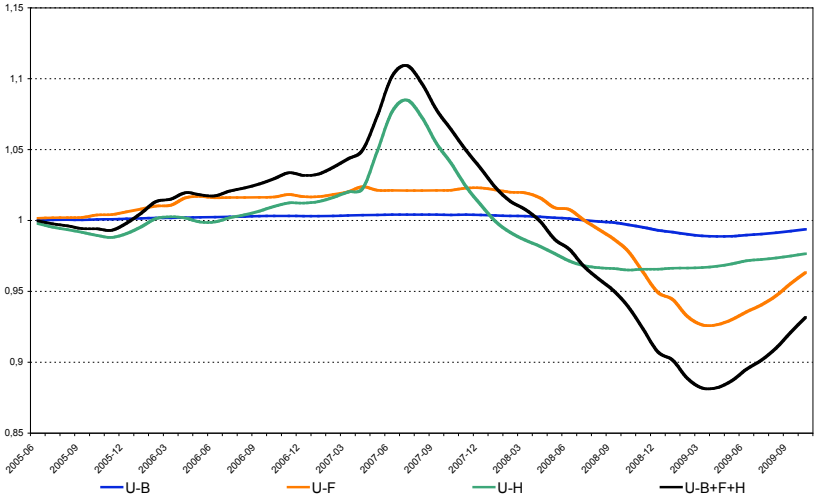


Figure 6 **State of confidence in France. Effects on the capacity utilisation rate of firms**

The effects on the self-financing of firms are interesting (Figure 7). With the higher borrower and lender's risks, firms and banks reduce external financing, but the strong fall of the demand of financing avoids a credit crunch. The self-financing of firms increases and this corresponds to the supply shock. The leverage ratio of firms increases with the shock of demand (households), but strongly decreases with raising borrower's risk (Figure 8). Firms reduce seriously their indebtedness and it impact positively the lender's risk of banks. With the expectations of banks, the lender's risk increases. But the global effect of the reduction of firms' indebtedness is a lower lender's risk and we observe no important rationing on firms (Figures 9 and 10). The fall of collateral value, the supposed lowest solvency of firms and the new strict convention of firm indebtedness explain the rise of the lender's risk from the banks' point of view. On the contrary, the lost confidence of households involves a shock of demand and self-financing of firms decreases. With the policy mix, the higher government deficit allows an increase of the cash flow of firms. Their self-financing increases. Government indebtedness substitutes the one of firms (Figure 13).

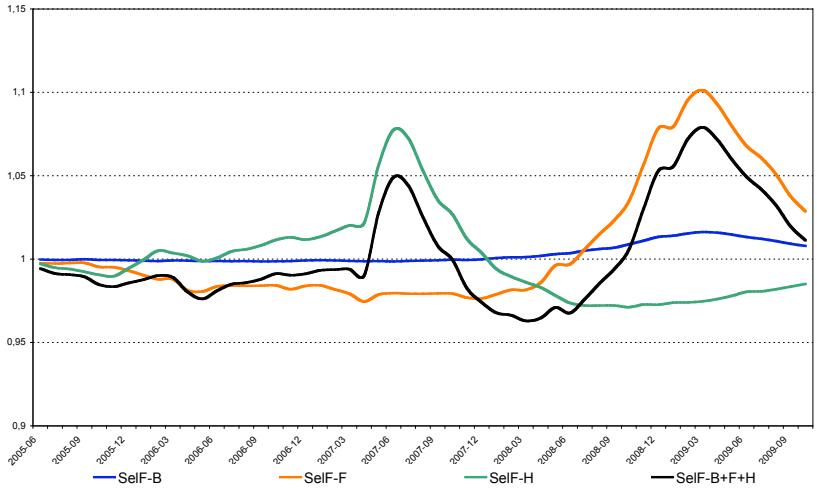


Figure 7 **State of confidence in France. Effects on the ratio of self-financing of Firms**

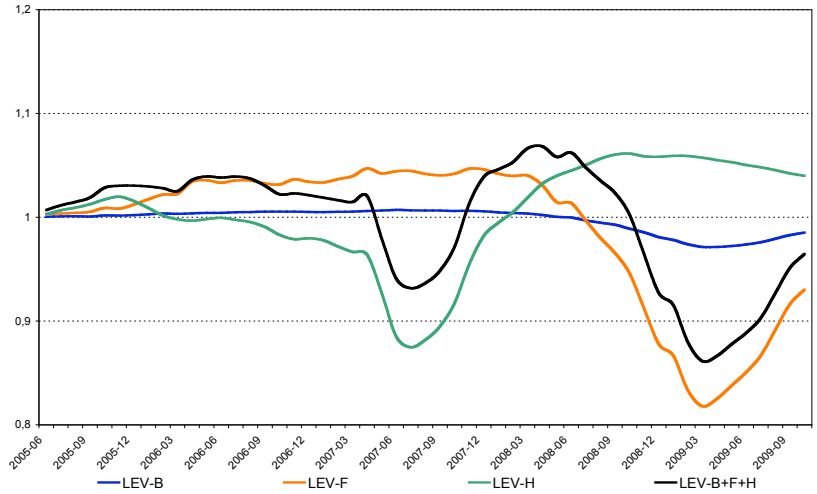


Figure 8 **State of confidence in France. Effects on the leverage ratio of firms ((CP + OF + L) / K)**

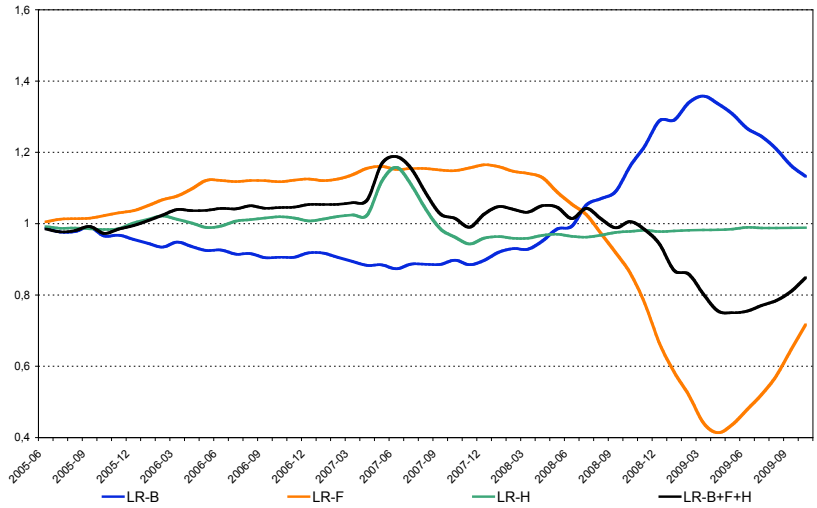


Figure 9 **State of confidence in France. Effects on the lender's risk of commercial banks**

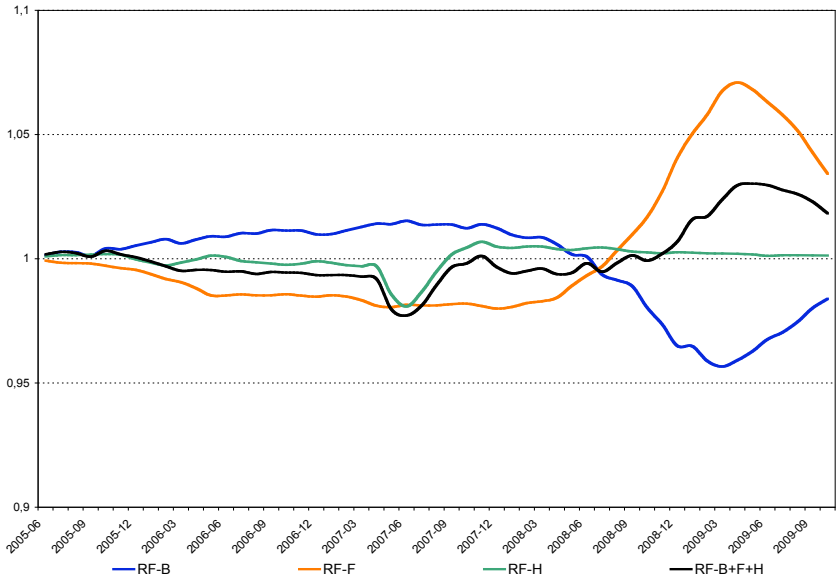


Figure 10 **State of confidence in France. Effects on the rationing of finance from banks**

The consequence is a weak financing rationing of the investment of firms by private banks: $\varphi < \varphi^d$ (Figure 10) during the end of the boom. But during the crisis, the firms reduce deeply their demand of financing and consequently, there is no credit crunch. The financing rationing of firms explains in part an increasing rate of unemployment. It exists a significant fall in the profit of banks. During the crisis, the structure of the balance sheet of private banks 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.

We see the disinflation after May 2007 and the beginning of the deflation at the end of 2008 (Figure 11). With the deep crisis, monetary policy tries to avoid deflation, and then the flexible Taylor rule focuses on unemployment. Key interest rate goes down quickly to stop the fall of prices and of asset prices. The influence of output gap on the key interest rate is the same but is lower than that of inflation, even with our flexible Taylor rule.

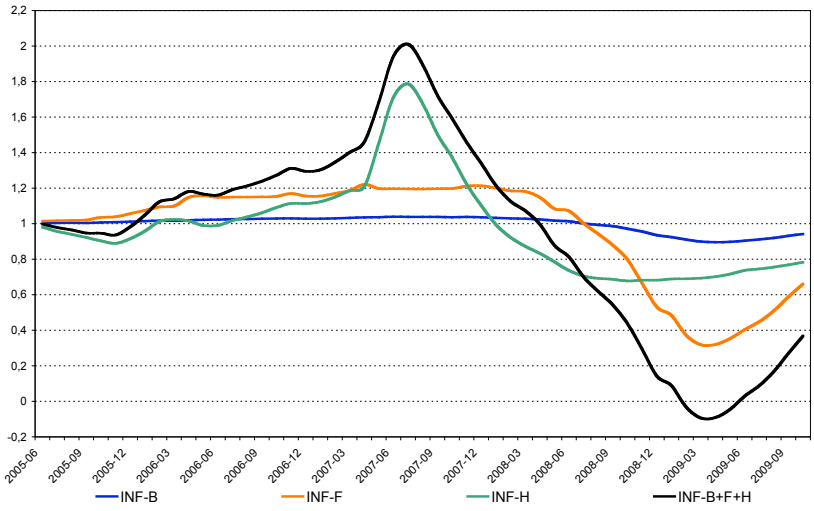


Figure 11 **State of confidence in France. Effects on the rate of inflation**

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. First, the Figure (12) shows the same evolution as the stylized facts of the last crisis: a rise of this spread, which corresponds to higher lender's risk, at the time of the key rate decreasing at central bank. Second, the central bank lowered its key interest rate faster than inflation, particularly to boost the prices of capital assets. We find that the real long term interest rate down more slowly than other rates which reduces the effect of expansionary monetary policy (Figure 13).

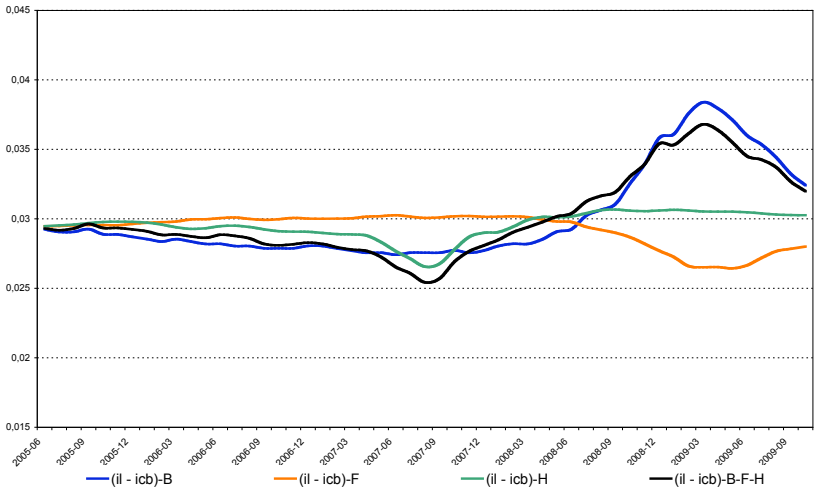


Figure 12 **State of confidence in France.**
Effects on the spread: Long-term interest rate (i_l) – Short-term interest rate (i_{cb})

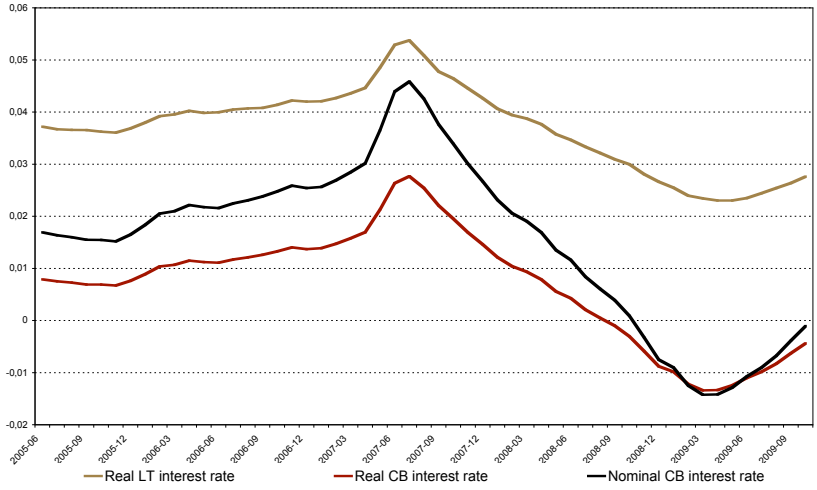


Figure 13 **State of confidence in France.**
Real long-term interest rate, Real short term interest rate and Nominal short-term interest rate (Central bank)

A fall of the state of confidence in the private sector and the crisis involves that the government 'becomes' optimistic and supports the effective demand with an increasing fiscal deficit in 2008. It is the case of France with 8,5% today (Figure 14).

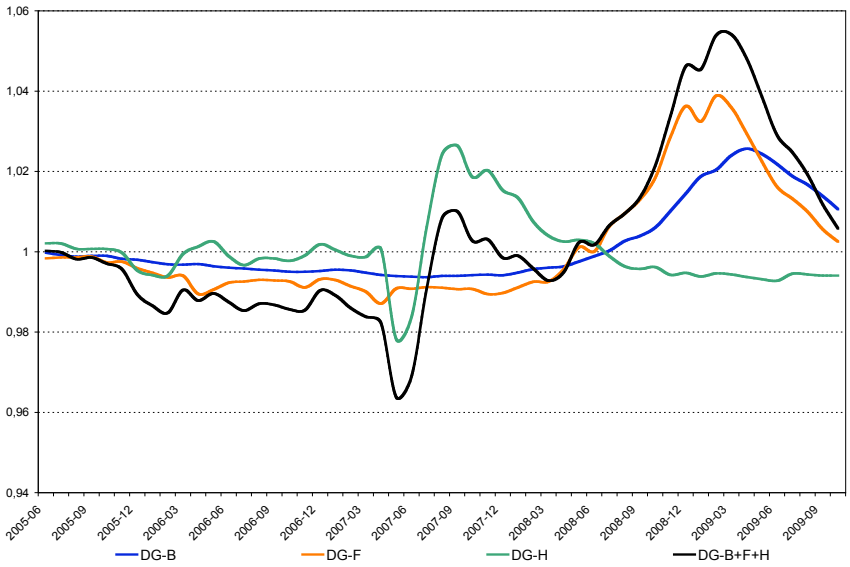


Figure 14 **State of confidence in France. Effects on the Fiscal Deficit.**

* * *

In this paper, 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 with the state of confidence of the private sector. In order to do so, Keynes and Minsky give an adequate framework. We can argue that confidence is a fundamental channel of transmission of a financial crisis to the real world in a global and informational society. This post-Keynesian stock-flow consistent model is a first step into this research agenda.

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Appendix 1. Glossary of variables

Y National income
Y_{fc} Output of full capacity
gr_y Growth rate in the national income
Π Inflation
Π^* Inflation target
N Employment
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

Central Bank

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
α_4 Flexible coefficient on output gap
α_6 Flexible coefficient on inflation gap

Commercial Banks

P_b Banks profits
V_b Net wealth of banks
CG Capital gains of banks (Capital losses of firms)
CGe 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
γ_4, γ_5 State of confidence of banks
r_{of}^a Expected yield of bonds
r_e^a Expected return on equities
P^d Expected distributed profits
lev Leverage ratio
V_C Variation of the value of collateral

Firms

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

Government

G Government expenditure
DG Government deficit
g_{dg} Constant ratio of government deficit
P_{cb} Central bank profits
T Taxes

Households

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
γ_6 Index of state of confidence of households

APPENDIX 2. THE COMPLETE MODEL

(1)	$Y = C + I + G$		National income
(2)	$gr_y = \Delta Y / Y_{-1}$		Growth rate (of national income)
(3)	$T = \tau \, . \, W_{-1}$	With τ: constant	Taxes
(4)	$B = B_{-1} + DG$		Treasury bills
(5)	$i_b = i_l$		Interest rate on treasury bills
(6)	$G = G_{-1} \, . \, (1 + gr_{y\,-1})$		Government expenditure
(7-i)	$DG \equiv G + i_{b-1} \cdot B_{-1} - T - P_{cb}$		Government deficit
(8)	$K = K_{-1} + I$		Stock of capital
(9-iii)	$I \equiv \varphi + IF$		Net investment
(10)	$IF = P^u - amort$		Self financing
(11)	$amort = a_l \cdot L_{-1} + a_{of} \cdot of_{-1} + a_{CP} \cdot CP_{-1}$		Internal Funds
(12)	$I_D = gr_{kD} \, . \, K\text{-}1$		Demand of investment
(13)	$\varphi^d = I^d - IF$		Desired gross investment
(14)	$gr_{kD} = \gamma_0 + \gamma_1 \, . \, r_{cf-1} + \gamma_2 \, . \, u_{-1} - \gamma_3 \cdot FCI_{-1}$	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)	$Y_{fc} = K_{-1} \, . \, \sigma$	With σ : constant	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)	$W = Y \, / \, (1 + \rho)$	With ρ: constant	Wages
(21-ii)	$P \equiv Y - W - i_{l-1} \, . \, L_{-1} - i_{CP-1} \, . \, CP_{-1} - i_{of} \, . \, of_{-1}$		Firms profits
(22)	$P^d = (1 - s_f) \, . \, P_{-1}$	With s_f: constant	Profits distribués
(23-ix)	$P^u \equiv P - P^d$		Distributed profits
(24)	$e = e_{-1} \, . \, (1 + gr_{y-1})$	With gr_e : constant	Number of equities
(25)	$C = (\alpha'_1 . \gamma_6 \, . Y_w^a) + (\alpha_2 \, . \, Y_v^a) + (\alpha'_3 . \, (i_{d-1} - \Pi_{-1}) \, . D_{-1})$	With α_i : constant	Consumption
(26)	$Y_w^a = Y_{w-1} + \theta_h \, . \, (Y_{w-1} - Y_{w\,-1}^a)$	With θ_h : constant	Expected disposable income of workers
(27)	$Y_v^a = Y_{v-1} + \theta_h \, . \, (Y_{v-1} - Y_{v\,-1}^a)$	With θ_h : constant	Expected disposable financial income
(28)	$Y_w = W - T$		Disposable wage income
(29)	$Y_v = i_{d-1} \cdot D_{-1}$		Disposable financial income
(30)	$Y_h = Y_w + Y_v$		Disposable income of workers
(31-iv)	$D \equiv D_{-1} + Y_h - C$		Bank deposits
(32)	$\varphi = \varphi^d \, . \, (1 - LR)$		Gross finance
(33)	$\Delta F = \varphi - amort + CG$		Net finance
(34)	$CG = CG_e + CG_{of}$		Capital gains of banks (Capital losses of firms)
(35)	$LR = \gamma_4 + a_1 . \, (lev_{-1} - lev_c) - b_1 . \, V_C + c_1 \cdot i_{cb}$	With γ_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)	$OF = (\lambda_{10} + \lambda_{11} . \, r_{of}^a - \lambda_{12} \, . \, r_e^a - \lambda_{13} \, . \, i_l - \lambda_{14} \, . \, i_{CP}) \, . \, F$		Bonds (Fixed rate)
(39)	$E = (\lambda_{20} - \lambda_{21} . \, r_{of}^a + \lambda_{22} \, . \, r_e^a - \lambda_{23} \, . \, i_l - \lambda_{24} \, . \, i_{CP}) . \, F$		Equities
(40)	$L = (\lambda_{30} - \lambda_{31} . \, r_{of}^a - \lambda_{32} \, . \, r_e^a + \lambda_{33} \, . \, i_l - \lambda_{34} \, . \, i_{CP}) . \, F$		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) $CG_{of}^{a} = CG_{of-1} + \theta_b \,.\, (CG_{of-1} - CG_{of\,-1}^{a})$ — Expected capital gains on bonds

(44) $CG_{of} = \Delta p_{of} \,.\, of_{-1}$ — 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) $r_e^{a} = (P^{d\,a} + CG_e^{a}) / E_{-1}$ — Expected return on equities

(48) $P^{d\,a} = P^{d}_{-1} + \theta_b \,.\, (P^{d}_{-1} - P^{d\,a}_{-1})$ — Expected distributed profits

(49) $CG_e^{a} = CG_{e-1} + \theta_b \,.\, (CG_{e-1} - CG_e^{a}{}_{-1})$ — Expected capital gains on equities

(50) $CGe = \Delta p_e \,.\, e_{-1}$ — 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 $\chi_1 > \chi_2 > \chi_3$ — Interest rate on comm. paper

(55) $i_d = i_{cb} - \chi_3$ — Interest rate on deposits

(56-v) $P_b \equiv i_{b-1} \,.\, B_{-1} + i_{l-1} \,.\, L_{-1} + i_{CP-1} \,.\, CP_{-1} + i_{of} \,.\, of_{-1} + P^{d} - i_{d-1} \,.\, D_{-1} - i_{cb-1} \,.\, REF_{-1}$ Banks profits

(57) $H = \eta \,.\, D$ — High powered money (bank reserves)

(58-vii) $P_{cb} \equiv i_{cb-1} \,.\, REF_{-1}$ — Central bank profits

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

(60) $\alpha_4 = \alpha_{4(-1)} + (al_4 \,.(OG_R - OG_{R(-1)}))$ — Flexibility on output gap in the Taylor rule

(61) $\alpha_5 = \alpha_{5(-1)} + (al_5 \,.(\Pi - \Pi_{(-1)}))$ — Flexibility on inflation in the Taylor rule

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

(63) $\Pi = \Pi^{*} + d_1 \,.(\, OG_{Rmini} - OG_R) + d_2 \,.(\, OG_{Rmaxi} - OG_R)$ — Inflation (NKPC)

Missing equation[3] : (64-viii) $REF = H$

[3] We have defined the 25 variables of the transactions matrix introducing 36 new variables[3] 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.

APPENDIX 3. TRANSACTIONS MATRIX

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	$- i_{b\,-1}.B_{-1}$				$+ i_{b\,-1}.\ B_{-1}$				0
Interest on loans		$- i_{l\,-1}.L_{-1}$			$+ i_{l\,-1}.L_{-1}$				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				$+ i_{d\,-1}.D_{-1}$	$- i_{d-1}.D_{-1}$				0
Interest on CB advances					$- i_{cb\,-1}.REF_{-1}$		$+i_{cb\,-1}.REF_{-1}$		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			$+ \Delta e\ .\ p_e$			$- \Delta e\ .\ p_e$			0
Δ loans			+ ΔL			- ΔL			0
Δ commercial paper			+ Δ CP			- Δ CP			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

APPENDIX 4. 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		$- e \cdot p_e$		$+ e \cdot p_e$		0
Loans		- L		+ L		0
Commercial paper		- CP		+ CP		0
Bonds (fixed-yield)		$- of \cdot p_{of}$		$+ of \cdot p_{of}$		0
Bank deposits			+ D	- D		0
CB advances				- REF	+ REF	0
Net wealth	- B	$+ V_f$	+ D	$+ V_b$	0	+ K