Zakaria, Journal of International and Global Economic Studies, 7(1), June 2014, 58-81

Imperfection of Credit Markets, Speculative Bubbles and Financial Accelerator in Morocco

Firano Zakaria

University Mohammed V Rabat-Agdal

Abstract : The credit market continues to be the main mechanism for financing investments in developing countries, particularly in Morocco. In this sense, monetary and macro-prudential policies require the inclusion of this market in macroeconomic analysis. In this article, we use the model proposed by Bernanke et al. (1999) "BGG" in the case of Morocco to answer two main questions: is there a mechanism for financial accelerator in Morocco, according to which macroeconomic shocks can be amplified and lead to greater instability of the macroeconomic framework. In a second step, we propose a new monetary rule, taking into account changes in asset prices and the possibility of speculative bubbles in Morocco. The results argue that credit market imperfections in Morocco amplify macroeconomic shocks and affirm the hypothesis of the existence of financial accelerator in Morocco. In addition, the counterfactual analysis shows that the Taylor rule augmented with asset prices provides greater economic stability.

Keywords: financial accelerator, rational bubbles, financial frictions.

*JEL Classification***:** D53, E44

1. Introduction

The model of new macroeconomic synthesis were widely considering that the financial activities do not affect the real economy. It is obvious, when one considers that the financial sector, which plays the role of intermediation, can create value and therefore affect the price formation. Fisher (1933) and Keynes (1929) were the first to consider the boom (or cycles) in the financial markets may adversely reflect on the real economy. However, macroeconomic models have always overlooked this design by choosing a real doctrine.

Thus, a model that describes effectiveness the reality of economy must be able to include any component that may impact the price formation as well as economic growth. In this perspective, the model of Bernanke et al. (1998, 1999) aimed to ensure that imperfections in financial markets, especially the credit market, can be easily incorporated into macroeconomic models. In addition, their development at a macroeconomic framework improves the perception of all economic policies and provides a framework for analyzing more realistic and adapted to better decision making.

In the same view, integration of credit markets in macroeconomic models can incorporate a significant financial friction's which often faces borrowers. Certainly, the perfection of the market ensures optimality allocation of savings into productive investment, however, the existence of imperfection (rationale financial frictions) supports the need for have financial intermediaries that can provide an additional profit of information there by reducing friction and to ensure optimal loan contracts and borrowing (Diamond et al (1983)).

Beyond the desire to describe the reality of the economy (the existence of financial intermediation), the introduction of the credit market in macroeconomic models used to insert the credit frictions in a traditional cyclical analysis. It is able to improve the analysis of cycles and also to achieve a better explanation of macro financial evolution. In other words, the existence of these frictions on the credit market may have significant effects on the behavior of macroeconomic variables, in particular on the economic cycle. As indicated in Bernanke et al. (1998) in the BGG model, financial frictions significantly impacting economic cycles and can cause deformation of the prices. In other words, monetary policy and productivity shocks, even when they are quite small, can have important consequences when there are financial frictions on the credit market.

The introduction of the credit market (financial frictions) can also provide an appropriate framework for formulating empirical answers concerning the problem of the choice of the optimal structure (Modigliani et al. (1954), "MM"). In the sense that the existence of financial frictions on the credit market can't make sense of the MM theorem from which the value of the firm is independent of its financial structure.

In this context, the introduction of frictions on the credit market can put forward a concept of financial accelerator (Bernanke et al. (1999)), which can amplify and propagate macroeconomic shocks. The financial accelerator stems from the existence of the choice between internal financing and external financing which is in function of the risk premium (the difference between expected return and cost of capital) and collateral of borrowing firms. In this context and when market imperfections are already taken into account, borrowers tend, if there is a low flow to use a financial intermediary, which massively increases the agency costs. In this context, the banks should demand more profitability to satisfy all requirements of the internal and external financing.

In this respect, and in an environment of asymmetric information, the risk premium is inversely related to the net value of the firm. Indeed, when the value of the firm increases the risk premium decreases due to the presence of a low exploitation risk and also because of the behavior of investors and banks. When investors have little money to invest in a particular project the use of financial intermediary becomes a necessity, however, this ability involves the occurrence of a conflict of interest between the two parties (agency problem), which results in an increase in agency costs thereby increasing the risk premium.

At equilibrium, the lenders are required for higher costs by seeking a higher return. As such, external funding is pro-cyclical in reason to the pro-cyclicality of profits and asset prices, while the risk premium is countercyclical weighing negatively on the loan and therefore in investment and spending production.

The inclusion of financial frictions on the credit market does not entail much loss of relevance in terms of analysis of stabilization policies. In contrast, the framework also allows taking into account issues related to nominal and real rigidities. Thus, the framework presented in this work takes into account the relationship between asset prices and investment and productive heterogeneity between firms.

This paper presents a model with financial frictions on the credit market in Morocco. The goal is to confirm that financial frictions in the credit market have a significant impact on the degree of propagation of shocks. In other words, the existence of agency problems related to the presence of financial intermediation is ahead the phenomenon of financial accelerator. In addition, the paper presents a new augmented Taylor rule for the case of Morocco, to stabilize the macroeconomic framework in the presence of speculative bubbles and therefore achieve a goal of financial stability. The next section shows how we can integrate financial frictions in function optimization companies and all economic agents involved. The second section

develops the log-linear model that will be used in estimation. The following section describes how bubbles can be integrated into a macroeconomic rational framework. The final section presents the results obtained.

2. Financial Frictions and Economic Sectors

The introduction of financial frictions in a new Keynesian (NKM), requires all of the relationships surrounding lending and borrowing between private agents take place in a framework of macroeconomic equilibrium. In this sense, it is important to review the way in which we define the heterogeneity among agents. Then, to allow better integration of financial frictions on the credit market, it is essential to use a new reading of financial contracts between private agents to integrate the logic of financing through the use of mediation financial. The following developments are only interested in the second track trying to integrate a new design of financial contracts including the use of external financing in a manner to maintain the relevance of the balance of the financial structure of private agents, without the need to expand the heterogeneity of agents.

In light of these developments, the model presented here is based on the work of Bernanke et al. (1999) and to integrate and assess the role of financial frictions in macroeconomic modeling framework to the case of Morocco. The model is composed of three types of economic agents namely, households, entrepreneur, retailers, the central bank and the fiscal authorities. The distinction between entrepreneurs and retailers need to take into account the rigidity of prices for at least the agents "price-maker". Thus, we assume that there is perfect competition in which entrepreneurs produce goods and sell them to retailers who sell them in a monopolistic market, which give them power over prices.

To incorporate financial frictions in this framework, we assume that entrepreneurs have a finite lifetime on the horizon of a period. This allows assuming that there is a continuous renewal of investment projects (firms) able to reject the hypothesis that the corporate sector can accumulate enough cash flow, leaving disappear external financing. In addition, this assumption facilitates the aggregation of entrepreneurs and limits their number (constant) companies over a period. Thus, in each period entrepreneurs acquire production equipment (only new firms have the opportunity to acquire these investments, firms continue to use their existing capital accumulated beyond). These investments are used to produce the work, according to a given technology, final goods, using a self-funding and / or a loan from a financial intermediary.

The net worth of entrepreneurs is assumed to be two sources namely: benefits and their own work. This value plays an important role in the choice of financing and the use of external financing in particular. Thus, very colossal values are an important source of cash flow and little discouraged borrower's recourse to external funds, which significantly reduces the risk premium.
The existence of a risk premium is argued by a simple agency problem (see above). In this regard, the financial contract must be developed to the extent that it allows limited risk premium by reducing conflicts of interest and potential agency costs.

To integrate all of these arguments in a macroeconomic model, it is necessary to proceed in two steps: first time use a redefinition of the functions of entrepreneurial behavior to integrate their use of funding from external to a financial intermediary and a second time to include these results in a new Keynesian. In this sense, the result would be to assess the impact of using funding exogenous macroeconomic stability and its effect on the propagation and amplification of shocks.

2.1. Optimal structure of capital: Modigliani and Miller have false?

Investment decision at the firm (production) is related to the level of capital required and also the rate of return expected. In this perspective, the expected rate of return and capital are endogenous variables within the macroeconomic framework of the proposed model. It is considered that the time « t» the contractor acquires capital (Kt+1) for possible use at the time « t+1 » .The price will be spent on the acquisition of a unit of capital is denoted (Qt+1). The return on investment is sensitive to two types of risk including: systemic risk and idiosyncratic risk. The first type is common to all firms, while the second is related to factors specific to the company. Operating in an equilibrium framework only specific risk is considered. To this end, the profitability of the company at the time « t+1 » is ω*RKt+1, ω is with the idiosyncratic risk factor which the process is i.i.d. and the distribution function is positive with an expected equal to unity.

The year of production of the company must be closed by making a profit to support the entire production costs and capital expenditures. In this sense we note that:

$$B_{t+1}=Q_tK_{t+1}-N_{t+1} \qquad (1)$$

N is the profit and B is the debt that the company needed to acquire capital for the production QtKt+1. We note that the benefits generated (N) is assumed to be reinvested is in other words the flow. The borrowing is done with a financial intermediary which in turn collect savings from households.

The integration policy of credit in the perception of the investment and valuation is the source of existence of the financial accelerator. However, the integration of the intermediary requires the analysis of the financial contract between the company and banks. Indeed, its inclusion implies the occurrence of agency problem in relation to conflicts of interest. According to the contract theory and on the basis of the approach CVS (Costly state verification) Townsend (1979), the financial intermediary must always arbitrate in the credit market by spending a cost audit in order to have the relevant information on investment projects. In fact, firms are less motivated to give relevant information on their financial reality, when they generate profits, by contrast, in case of failure or loss, she practices full transparency. In this sense, the financial intermediary must always paid a significant cost to get to finance firms and to have the power to collect information continuously and integrity. With regard to these behaviors, the external financing may be of a costly and especially in case of non-availability of collateral.

As a result, the intermediary is obliged to pay an additional cost to be able to follow and be informed on the evolution of corporate returns. This cost is equivalent to the cost of liquidating firms' $u * w * R_{t+1} * Q_tK_{t+1}$. To reduce these costs reach reduce the contract between the company and the intermediary must maintain macroeconomic balance and not constrain the financing of productive investments.

According to the hypothesis of Modigliani and Miller (1957), the expected rate of return on investment R_{t+1} is supposed to be determined. The only uncertainty comes from the level of idiosyncratic risk related to a specific company. For this purpose, the contractor is a capital Q_tK_{t+1} which determines the level of return required and the interest rate borrowing Z_{t+1}, under the condition that the amount borrowed Z*B, allows equalize the returns generated by the firm and the amount of interest payable in optimal conditions.

$$\tilde{\omega}*R_{t+1}*Q*K_{t+1}=Z_{t+1}*B_{t+1} \qquad (2)$$

The optimal level of idiosyncratic risk $\tilde{\omega}$ to equalize the performance of the company with the requirements of the financial intermediary. If $\tilde{\omega} > \omega$ the contractor cannot meet its own commitments vis-à-vis donors receive the amount $(1-u)\,\omega R_{t+1} Q_t K_{t+1}$. However, in the reverse situation, the contractor can make a profit to cope with different commitments and also identified additional profits.

In this sense, the financial intermediary therefore requires an additional cost from the contractor to finance its projects, this cost can be written as follows:

$$[1 - F(\tilde{\omega})] Z_{t+1}^{j} B_{t+1}^{j} + (1-u) \int_{0}^{\infty} \omega R_{t+1} Q_t K_{t+1} \mathrm{d}F(\omega) = R_{t+1} B_{t+1} \qquad (3)$$

The right side of the equation represents the opportunity cost and the left when it is on the cost required by the borrower. This last part is divided into two: the cost of liquidation and the repayment of principal. If we replace Z by its value to find the requirement of donors based on specific risk, we can write have the following equivalence:

$$\left\{ [1 - F(\tilde{\omega})]\tilde{\omega} + (1-u) \int_{0}^{\infty} \omega \mathrm{dF}(\omega) \mathrm{R}_{t+1} \mathrm{Q}_t \mathrm{K}_{t+1} \mathrm{dF}(\omega) \right\} \mathrm{R}_{t+1} \mathrm{Q}_t \mathrm{K}_{t+1} = \mathrm{R}_{t+1} \left(\mathrm{Q}_t \mathrm{K}_{t+1} - N_t \right) \quad (4)$$

with $F(\tilde{\omega})$ is the enterprise default rate.

In cases where the level of ω is not acceptable and pose a risk to inerent borrowing activity. In this perspective, the company is unable to honor its commitments vis-à-vis the financial intermediary. This denier would be able to take credit rationing[1].

On the basis of its developments and considering the expected returns are determined, in this case we can write the profitability of the project the contractor as follows:

$$E \left\{ \int_{0}^{\infty} \omega R_{t+1} Q_t K_{t+1} dF(\omega) - (1 - F(\tilde{\omega})) \tilde{\omega} R_{t+1} Q_t K_{t+1} \right\} \qquad (5)$$

By combining the expected return with the requirement of financial intermediary found the following relationship:

$$E \left\{ \left[1 - u \int_{0}^{\tilde{\omega}} dF(\omega) \right] U_{t+1}^{rk} \right\} E\{R_{t+1}^{k}\} Q_t K_{t+1} - R_{t+1}(Q_t K_{t+1} - N_{t+1}) \quad (6)$$

Knowing that $U_{t+1}^{rk} = R_{t+1}^{k} / E\{R_{t+1}^{k}\}$ is the completion rate of return from its conditional expectation. If we denote the discount rate of return on capital is $s = E\{R_{t+1}^{k} / R_{t+1}\}$ whose value is greater than 1, in this case the optimal condition for d 'buy capital in the financial intermediary:

$$Q_t K_{t+1} = \vartheta(s) N_{t+1} \qquad (7)$$

Beyond a relationship can be derived by replacing s by its value:

$$E\{R_{t+1}^{k}\} = s \left(\frac{N_{t+1}}{Q_t K_{t+1}} \right) R_{t+1} \qquad (8)$$

This relationship is the core of the macroeconomic model with frictions on the credit market, it describes the risk premium. The latter is the product of leverage and the rate of return achieved.

[1] It is assumed that the relationship between default rates and specific risks and convex. In case of high specific risk, the rate of profit increases to a certain threshold, however, the relationship between the two is reversed. As threshold is exceeded by the risk can induce a borrower default.

If you equity financing only (flow) rate of return is equal to the expected rate of return achieved is the optimality condition if no contract of financial intermediation.

After defining how the integration of external financing must change the behavior of entrepreneurs and the definition of the notion of risk premium which is the core of the financial accelerator. We present thereafter the equilibrium conditions of the various economic agents and their objective functions.

2.2. The entrepreneur sector

The agency problem between the lender and the borrower will be included in a general equilibrium framework for improving the standard DSGE model for the case of Morocco. The innovation relates to the integration of financial frictions on the credit market resulting from the optimality under the contract between donors and contractors, is due to the existence of agency costs.
Changes to the model are considered for endogenous the cost of capital of the company and also the expected return of investment projects, taking into account costs related to the use of bank credit.

Sector entrepreneurs acquire capital in each period and consist of two components: capital and labor:

$$Y_t = A_t K_t^{\alpha} L_t^{1-\alpha} \qquad (9)$$

If you consider that I was spending in terms of capital, then we can write:

$$K_{t+1} = \theta\left(\frac{I_t}{K_t}\right)K_t + (1-\sigma)K_t \qquad (10)$$

With σ is the rate of depreciation of the capital.

To allow the price to be variable and also to make endogenous considering, according to the approach of Kiyotoki et al. (1997), as:

$$Q_t = \frac{1}{\left[\theta'\left(\frac{I_t}{K_t}\right)\right]} \qquad (11)$$

By assumption we note that the cost of production in intermediate 1/X, equivalently X is considered the mark-up of the monopoly. In this case the rent to pay for a unit of capital is equal to:

$$\frac{1}{X_{t+1}} * \frac{\gamma Y_{t+1}}{K_{t+1}} \qquad (12)$$

Thus, profitability can be written as follows:

$$E\{R_{t+1}^k\} = \frac{\frac{1}{X_{t+1}} * \frac{\gamma Y_{t+1}}{K_{t+1}} + Q_{t+1}(1-\sigma)}{Q_t} \qquad (13)$$

Hence we find that:

$$E\{R_{t+1}^k\} = s\left(\frac{N_{t+1}}{Q_t K_{t+1}}\right)R_{t+1} \qquad (14)$$

On the labor factor, the contractor uses two types of labor, that performed by himself and that relating to household labor.

$$L = H_t^{\tau}(H_t^e)^{1-\tau} \qquad (15)$$

H_t^e : is the working time of entrepreneurs, whereas it is equal to unity. We also note that V is the shares held by the contractor and W_t^e is his salary. For this purpose, the income of the entrepreneur is equal to:

$$N = \rho V_t + W_t^e \qquad (16)$$

With ρV_t is partly owned by the shareholder at the time t-1 is the shareholders who own the company abandoned the difference$(1-\rho)V_t$.

The value of shares is equal to (see previous section):

$$V_t = R_t Q_{t-1} K_t - \left(R_t + \frac{u \int_0^{\infty} \omega R_t Q_{t-1} K_t dF(\omega)}{Q_t K_{t+1} - N_{t+1}} \right) (Q_{t-1} K_t - N_t) \qquad (17)$$

This last relation describes the value of the shares at time t is the difference between the profits generated by the business $R_t Q_{t-1} K_t$, less the amount paid to the financial intermediary $\left(R_t + \frac{u \int_0^{\infty} \omega R_t Q_{t-1} K_t dF(\omega)}{Q_t K_{t+1} - N_{t+1}} \right) (Q_t K_{t+1} - N_{t+1})$ with $(Q_t K_{t+1} - N_{t+1})$ is debt and $\frac{u \int_0^{\infty} \omega R_t Q_{t-1} K_t dF(\omega)}{Q_t K_{t+1} - N_{t+1}}$is the risk premium associated with an external financing.

For capital work is noted that the demand for labor is expressed in the following form:

$$(1-\rho)(1-\tau) = X W_t^e \qquad (18)$$

$$(1-\rho)\tau = X W_t \qquad (19)$$

W_t : Real household salary and W_t^e real entrepreneur salary. Under the assumption that the work of the entrepreneur is equivalent to the unit and only household labor is available then we can write the business income or cash flow is equal to:

$$N_{t+1} = R_t Q_{t-1} K_t - \left(R_t + \frac{u \int_0^{\infty} \omega R_t Q_{t-1} K_t dF(\omega)}{Q_t K_{t+1} - N_{t+1}} \right) (Q_{t-1} K_t - N_t) + (1-\rho)(1-\tau) A_t K_t^{\alpha} L_t^{1-\alpha} \qquad (20)$$

Otherwise we can write

$$N_{t+1} = V_t + (1-\rho)(1-\tau) A_t K_t^{\alpha} H_t^{(1-\alpha)\tau} \qquad (21)$$

Cash flow (net) = value of shares + production at time t +1

This relationship is fundamental since it describes the benefit of the company in relation to the value of the shares (based on debt-related costs) and also the final production of the period. In this case, future profits can be influenced by the risk premium which can have a boom character through its influence on the performance of firms and hope not described the relationship described above. For this purpose, any income will fluctuate due to changes in the value of shares and the proposed funding policy. By contrast, this equation can also provide a framework for discussion on changes in the value of the shares. Indeed, income fluctuations may also affect the value of shares and accordingly the premiums required by donors (roughly the cost of capital) and also on the capital structure choice.

This framework therefore provides a tool for validation of the optimal structure of firms and provides abolition regarding the theory of the independence of the funding. Indeed, the choice of financing influences the choice of investment and vice versa.

2.3. Household sector

The representative household labor among firms, uses and he is able to invest and save in the financial intermediary. If we consider that "C" is for household consumption, M / P is the currency held by it. H, W, T and D are the hours of work, wages unitary tax payable to the government and term deposits deposited with the financial intermediary. Finally, we note that "d" is the dividends received from the company he owns.

It is therefore considered that the objective function to maximize the household can be written as follows:

$$\max E \sum_{k=0}^{\infty} \beta^k \left[\ln(C_{t+k}) - \varphi \ln\left(\frac{M_{t+k}}{P_{t+k}}\right) + \vartheta \ln(1 - H_{t+k}) \right] \qquad (22)$$

Under constraint:

$$C_t = w_t H_t - T_t + d_t + R_t D_t - D_{t-1} + \frac{(M_{t-1} - M_t)}{P_t} \qquad (23)$$

Consumption=salary+ dividends+ returns of deposits – deposits (t-1) + change of monetary expenditures

The derivation of the objective function under the constraint of households presented above provides the conditions for first orders:

$$C_t = E\left\{\beta \frac{1}{C_{t+1}}\right\} R_{t+1} \qquad (24)$$

$$W_t \frac{1}{C_t} = \vartheta \frac{1}{1 - H} \qquad (25)$$

$$\frac{M}{P_t} = \varphi C_t \left(\frac{R_{t+1} - 1}{R_{t+1}}\right)^{-1} \qquad (26)$$

It should be noted that deposits are equal to the amounts borrowed from the broker.

2.4 Intermediaries sector and price formation

The intermediate sector was added to the model for the reasons mentioned previously regarding the rigidity of prices that must include the proposed macroeconomic model. Thus, this sector is considered to be monopolistic competition. The level of production is defined as follows:

$$Y_t^f = \left[\int_0^1 Y_t(z)^{\varepsilon - 1/\varepsilon} \, dz \right]^{\varepsilon/\varepsilon - 1} \qquad (27)$$

Prices in turn are defined by:

$$P = \left[\int_0^1 P_t(z)^{1 - \varepsilon/\varepsilon} \, dz \right]^{1/\varepsilon - 1} \qquad (28)$$

Overall production is as follows:

$$Y_t^f = C + C + I + G + u \int_0^{\omega} \omega R_t Q_{t-1} K_t \mathrm{d}F(\omega) \qquad (29)$$

Curve of demand to intermediate sector is as follows:

$$Y_t(z) = \left(\frac{P_t(z)}{P_t}\right) - Y_t^f \qquad (30)$$

So that the intermediate sector to determine its sale price, it is important that it is the ability to know perfectly the balance between supply and demand in the sector contractors producers. By introducing the rigidity of prices, following Calvo (1983), we assume that the agent can vary its price with probability$(1-\theta)$.

If we accept that P* is the price of retailer and Y* is the corresponding production, so we can assume that the intermediate sector maximizes the following objective function:

$$\sum_{k=0}^{k} \theta^k E_{t-1}\left[\left[\beta \frac{C_t}{C_{t+k}}\right] \frac{P_t^* - P_t^w}{P} Y_{t+k}^*(z)\right] \qquad (31)$$

With $P_t^w = \frac{P_t}{X_t}$ is nominal price of production.

Differentiating with respect to the optimal price P* we obtain the following equilibrium condition:

$$\sum_{k=0}^{k} \theta^k E_{t-1}\left[\left[\beta \frac{C_t}{C_{t+k}}\right] \frac{P_t^*}{P_{t+k}} - Y_{t+k}^*(z)\left[P_t^* - \left(\varepsilon/_{\varepsilon - 1}\right) P_t^w\right]\right] = 0 \qquad (32)$$

If we introduce rigidity in Calvo with stationnary parameter θ we obtain:

$$P_t^* = [\theta P_{t-1}^{1-\varepsilon} + (1-\theta)(P_t^*)^{1-\varepsilon}]^{\frac{1}{1-\varepsilon}} \qquad (33)$$

From these last two equations using a log-linearization we obtain the form of the Philips curve which will be later in the simulation and the estimation of the model for the case of Morocco.

2.5. Government

Regulatory authorities are inserted in two types of cyclical policies namely fiscal policy and monetary policy. Regarding fiscal policy, we believe that the government finance budget expenditures through the easing of taxes and also by increasing liquidity.

$$G_t = \frac{M_t - M_{t-1}}{P_t} + T_t \qquad (34)$$

G : fiscal expenditure, M : money et T : taxes.

The monetary authorities follow the level of money creation in the economy through monitoring interest rates and monetary creations using the Taylor rule (see the log linear model equations).

3. Model

The log linearization of the model is a standard way in this context we present the model to be used only and that is the model already presented by Bernanke et al (1999). It is however

important to note that the equations of the models have the particularity to resume financial accelerator presented in the previous section.

If we want to summarize the characteristics of the model, it was noted that:

- It is composed of three central agents (households, entrepreneurs and intermediaries) with the presence of monetary and fiscal authorities;
- it takes into account the rigidity of prices Calvo (1983) by incorporating imperfect competition in the intermediate sector and the ability to set prices according to a given probability between 0 and 1 to describe price inertia;
- Contractors are pure and perfect competition to allow the formation of an optimal financial contract;
- Entrepreneurs can borrow from financial intermediaries to occur during a period;
- The intermediary requires a risk premium that determines the level of cost of capital and the impact of investment choices.

In presenting the following functions log linearized considering that the variables are tiny deviations from the equilibrium state and capital ratios describe the equilibrium ratios in question.

Demand equations:

$$y_t = \frac{C_t}{Y_t}c + \frac{I_t}{Y_t}i + \frac{G_t}{Y_t}g + \frac{C_t^e}{Y_t}ce \qquad (35)$$

$$c_t = -r_{t+1} + E(c_{t+1}) \qquad (36)$$

$$c_t^e = n_{t+1} + \log\left(\frac{1 - \frac{C_{t+1}^e}{N_{t+1}}}{1 - \frac{c_t^e}{N}}\right) \qquad (37)$$

$$E\left(r_{t+1}^k\right) - r_{t+1} = -v[n_{t+1} - (q_t + K_{t+1})] \qquad (38)$$

$$\left(r_{t+1}^k\right) = (1-\varepsilon)(y_{t+1} - k_{t+1} - x_{t+1}) + \varepsilon q_{t+1} - q_t \qquad (39)$$

$$q_t = \varphi(i_t - k_t) \qquad (40.\ prix\ des\ actifs)$$

with;

$$\varepsilon = \frac{1-\delta}{1-\delta+\alpha Y/(XK)}$$

Supply equations:

$$y_t = a_t + \alpha k_t + (1-\alpha)\tau h_t \qquad (41)$$

$$y_t - h_t - x_t - c_c = \mu^{-1} h_t \qquad (42)$$

$$\pi_t = E_{t-1}\{\kappa * (-x_t) + \beta\pi_{t+1}\} \qquad (44.\ Ajustement\ des\ prix)$$

With:

$$\kappa = \left(\frac{1-\theta}{\theta}\right)(1-\theta\beta)$$

State equations :

$$k_{t+1} = \delta i_t + (1-\delta)k_t \qquad (43)$$

$$n_{t+1} = \gamma \frac{RK}{N}\left(r_t^k - r_t\right) + r_t + n_t + \frac{\left(\frac{R^k}{R-1}\right)K}{N}\left(r_t^k + q_{t-1} + k_t\right) + \frac{(1-\alpha)(1-\tau)(Y/X)}{N} y_t - x_t \quad (44)$$

Monetary policy rule

$$r_t^n = \rho^{bc} r_{t-1}^n + \sigma\pi_{t+1} + \varepsilon^{BC} \quad (45)$$

Fiscal policy rule

$$g_t = \rho^{fisc} g_{t-1} + \varepsilon^{fisc} \quad (46)$$

Productivity processus

$$a_t = \rho^{tech} a_{t-1} + \varepsilon^{tech} \quad (47)$$

The first equation is a version on log linear global resources. Elements contributing to the change in production are household consumption, investment, government consumption and the variation of marginal importance in the consumption of entrepreneurs. The second equation describes the function of Euler consumption. Coefficient equal to unity, associated with interest rate reflects the inter-temporal elasticity of substitution. By adopting the Euler equation implicitly assumes that the friction on the credit market does not affect the behavior of households[2]. The following equivalence is the use of the contractor remains marginal and depends only on corporate income.

Equations (39 to 40) represent the investment demand and simplifications are log-linear functions presented in the investment sector entrepreneurs. The first equation (the financial accelerator) describes the effect of the net value of the company (the difference between the value of the company and debt) on the investment decision. This equivalence comes from the existence of financial frictions on the credit market. Indeed, in the absence of such frictions the expected return on investment would be equal to the cost required by donors. In this perspective, the funding is used up until the two rates become equal. In other words, if we consider that the expected return is greater than the opportunity cost required by the financial intermediary, the Contractor may increase its reliance on external financing and vice versa. Indeed, surveys of financial frictions, the cost of external financing depends on the contribution of entrepreneurs in financing the project, that is to say, the net value of the company. The increase in the contribution of the shareholders (equity ratio increased relative to total capital) reduces the cost of external financing enabling increased investment. The other two equations represent forms log linear marginal product of capital and the relationship between asset prices and investment.

The three supply equations following (42, 43 and 44) are respectively the production function, equilibrium in the labor market, the right side of Equation 8 describes the marginal productivity of labor weighted by the marginal utility of consumption. To balance this utility is inversely related to the mark-up (x) intermediary companies. The last equation (44) characterizes the functions of price adjustment by incorporating the assumptions of Calvo (1983), this is the famous Philips curve[3]. It should be noted that the mark-up (x) varies inversely with the application, ie, if demand increases the mark-up decreases and vice versa. By integrating this strategy led by the rigidity of the intermediate firms is that of a monopoly. If demand increases, they choose to drive strategies by the amount trying to sell more, resulting in an increased supply from entrepreneurs increase their competitive price pure and perfect. While in monopolistic competition, intermediaries are forced to lower their mark-up (x). And the

[2]This assumption is strong; however, for reasons of simplification it is accepted.

[3] This form is different from the standard curve in the fact that Philips integrated perception ahead of inflation (forward looking)

negative sign in the relationship of Philips captures the dynamics under the assumption of price rigidity. In this perspective, inflation depends on price rigidity and the coefficient κ is inversely related to the stiffness coefficient θ.

The following two equations (44 and 45) are a representation of the state variables; shareholders and net income in a respective manner. The evolution of net income (equation 45) depends on the profitability of entrepreneurs (RK) from the capital (N) and also the delay of the net income of the previous period. It should be noted that the difference between the rate of return on capital and the risk-free rate has a disproportionate impact on the net because of the existence of the financial accelerator presented earlier. In this sense, this difference is weighted by the ratio between capital and contribution of entrepreneurs (K/N). In practice, the financial accelerator mechanism is given via the net income of the firm affects investment choices via equation (39) arbitration. In addition, a surplus of this model is the ability to characterize the evolution of the net income of the firm.

The last block of equations describes the reaction functions of the monetary and fiscal authorities. The central bank reacted with a rule governing interest rates with the instrument nominal interest rate. Although the monetary policy life standard to reduce fluctuations in inflation following the changes in the output gap, the use of interest rate can be useful also to reduce the fluctuations from the financial accelerator presented in this model. The last two equations (47 and 48) relate to the fiscal rule and the process generating productivity shocks. These processes were considered to have autoregressive behavior.

4. Integrate Speculative Bubbles to Macroeconomic Model

The model presented above is a financial accelerator model that captures financial frictions in the credit market. The integration of decision theories helped form a financial contract that supports external financing of investments. However, the integration of financial intermediation is overwhelming problems related to price formation in financial markets. The financial system is often confronted with problems of disconnection prices fundamental values due to the existence of high probability of resale rights of shareholders. These deviations of asset prices give birth to what is called speculative bubbles.

We presented in the previous sections that the price of capital is equal to:

$$Q_t = \frac{1}{\left[\theta'\left(\frac{I_t}{K_t}\right)\right]} \qquad (48)$$

It is assumed that the fundamental price is Q_t which is determined from the future growth prospects and dividends earned by the owners of capital.

$$Q_t = \frac{D_{t+1} + (1-\delta)Q_{t+1}}{R^q_{t+1}} \qquad (49)$$

This relationship describes the fundamental value of a single period. It should be noted that δ is the depreciation of the capital D is dividends.

To take account of speculative bubbles, we consider the hypothesis that asset prices may deviate from fundamental prices. Note that S is the real price, so we adopt the presentation of Blanchard et al (1988) we can write:

$$a(S_t - Q_t) = \partial B_{t+1} \qquad (50)$$

With ∂ actualization factor and a<1. Without bubbles $\partial = 0$. According to the definition of the bubble we can write the rate of return based on the actual price of profitability related to fundamental price.

$$R_{t+1}^{s} = R_{t+1}^{q}\left[a(1-\delta) + (1-a(1-\delta))\frac{Q_t}{S_t}\right] \quad (51)$$

According to this relationship, in the absence of bubbles Q=S is then $R_{t+1}^{s} = R_{t+1}^{q}$.

Taking into account the existence of bubble in the capital market, public authorities must take into account this reality by integrating it into their decision device in order to avoid the adverse effects of bubbles. In this sense Bernanke et al (1999) proposes to increase the rule of the central bank through the introduction of changes in asset prices. So the new rule would be:

$$r_t^n = \rho^{bc} r_{t-1}^n + \sigma\pi_{t+1} + \sigma_{bubbles}\log\left(\frac{S}{S_{t-1}}\right) \quad (52)$$

The interest rate adjustment is done by taking into account the movements of inflation and also the evolution of asset prices. In other words, the central bank reacted in response to the prospect of inflation and also when asset prices begin to show a significant increase.

5. Estimate Model

The model with financial frictions on the credit market can include credit dynamics in an environment that may be affected by informational asymmetries. And also in the presence of asset price model can also incorporate the possibility of existence of a rational nature bubble. The model is used to estimate mode using the Bayesian approach. Dynare clone was used for this purpose. The Moroccan data were used to determine the set of parameters with which the model will be calibrated.

The data used for calibration are extracted from the HCP. However, it should be noted that most of the variables are expressed in deviation from the logarithm of the equilibrium state.

We use the following relation for all data, except for the case of ratios that make up the model:

$$\breve{x} = \frac{x_t}{x^*} - 1 \; et \; x_t = (\breve{x} + 1)x^* \quad (53)$$

$x^*$is potential value. To arrive at this estimate variable we use the HP filter that determines the long-term trend. This relationship is used later in the result set. It should be noted that the impulse responses are expressed in deviation from the steady state (Table 1).

The parameters used and the initial values of some ratios were calibrated according to the values shown in the table 2.

The estimation method used is the Bayesian method on the clone Dynare using MCMC algorithms to achieve the parameters which determine the distributions were calibrated. Estimates were performed on data from 2000 to 2011 on a quarterly basis. The estimation results of the model are shown in the table below in comparison with baseline values selected for the Moroccan economy. It should be noted that two types of models will be compared with a subsequent possibility of the presence of bubbles and the second representing a fundamental equilibrium.

The estimated DSGE model with frictions on the credit market in the case of Morocco confirms an important finding in relation to the propagation of macroeconomic shocks.

The assumptions made in the theoretical development of the model, including the ability of firms to use financial intermediaries, can provide a framework for analyzing macroeconomic conditions in Morocco taking into account the frictions that can impede the relationship between the system financial intermediation and investment. Indeed, the impulse responses using three types of shocks, monetary, fiscal and productivity argue that the existence of the risk premium (after agency costs imposed by financial intermediaries) are likely to impact the decisions investment firms.

5.1. Financial frictions in Morocco

In addition to the results obtained by comparing a model without frictions financial, where the rate of return expected by investors is equal to the risk-free rate (absence of agency costs), with a financial accelerator model confirms that the integration of friction costs and additional funding from external amplify macroeconomic shocks.

The introduction of frictions in the model confirmed that macroeconomic shocks tend to grow on the basis of the existence of risk premium related to the use of external financing. The monetary policy shock confirms that the response of the output gap is more or less important when integrated frictions in the credit market, it is the same with regard to interest rates and inflation. Regarding the fiscal shock results seem to produce the same trends. On the basis of these two graphs it is clear that the financial accelerator process is crucial in the dynamic propagation of shocks. Indeed, each decision using cyclical monetary and fiscal instruments will tend to be amplified as a result of existence of frictions on the credit market.

This is also confirmed by analyzing the variance decomposition model which shows that the impact of monetary and fiscal policy have a significant impact on the variables that drive much of the investment decision. As a side note, therefore, that rising interest rates explain much of the variation in the prices of assets and net income of firms (flow). In this sense, decisions on monetary and fiscal control may with huge effects on the choice of financing and investment.

Furthermore the ability of the model to take into account the phenomenon of financial accelerator is capable of producing results taking into account the risk premium. Thus, the model allows reproducing information on the evolution of risks to businesses and default rates may overwhelm when significant decrease rates of return beyond the rate charged by financial intermediaries.

To describe the relevance of this model in terms of analysis, we use the impulse responses of the estimated model. The analysis of impulse responses is limited solely to monetary policy shock due to a 1% increase in interest rates.

The effects of a 1% increase in interest rates on all macroeconomic aggregates are more or less intuitive and can confirm the relevance of the model with financial frictions. The most important is that this shock also impact financial aggregates which attract investment decision in Morocco. In fact, higher interest rates reflected positively on the risk premium by increasing requirements of banks in terms of opportunity cost, which negatively affects the profitability of investments and the income generated by firms. Also, this impact occurs by lowering the price of assets that are negatively correlated with interest rates, however, we can see that the use of financial intermediaries increases justified by lower revenue firms. On a theoretical level, the decline in cash flow encourages firms to have a heavy reliance on banks and an increase of conflicts of interest and premiums accordingly.

Furthermore, the analysis can produce this type of model including this informational asymmetry on the credit market, the model taking into account the financial accelerator helps explain some episodes experienced by the Morocco in recent years.

Growth experienced by Morocco during the last decade and specifically between 2005 and 2010, this is manifested by an increase in overall economic aggregates and in particular the income generated by firms and production that follows. This increase in production and income was primarily due to lower risk premiums on the credit market. In fact the opening on external financing and lower interest rates resulted in a better appreciation of the value of the productive sector. However from 2010, the revenues of firms experienced a downward trend and risk premiums have recorded significant increases.

In the same vein, we note that during the years 2003 to 2008, investment firms increased significantly, although the use of external finance remains low. From 2009 we see that the investment starts fell thus describing a drop in flow due to lower revenues. This justifies the use of more external financing during this period justifying and tighter financing conditions in Morocco due to higher risk premiums.

5.2. Speculative bubbles and central bank rule

The existence of asset prices in the macroeconomic framework facilitates the integration of the notion of a speculative bubble, in relation to which the monetary authorities should be responsive on adjusting the interest rate to extreme fluctuations in asset prices in markets capital. To this end, the Central Bank should include asset prices in monetary policy by interacting according to deviations of price and in case of formation of speculative bubbles. In this section we prove that the use of a monetary rule taking into account asset prices ensures better stability of the macroeconomic framework. To this end, we compare two types of monetary rule namely the conventional Taylor rule and a second incorporating asset prices.

This counterfactual analysis to choose the most optimal rule in favor of better regulation of the macroeconomic framework. In addition, the integration of asset prices in the device allows to take into account the financial stability to regulate the price deviations from the fundamental value. In fact, most of dysfunctional capital markets have reasons for the formation of bubbles that never ceases to produce rational expectations wrong.

In this sense, the innovation of this work is to propose to the use of a monetary rule including responsiveness to future changes in asset prices. And two rules have competition:

A rule increased asset price (S):

$$r_t^n = \rho^{bc} r_{t-1}^n + \sigma\pi_{t+1} + \sigma_{bubbles}\log(\frac{S}{S_{t-1}})$$

The forward looking Taylor rule:

$$r_t^n = \rho^{bc} r_{t-1}^n + \sigma\pi_{t+1}$$

The counterfactual analysis we use is based on the study of standard deviation of key variables that are used to verify the stability of the macroeconomic framework. The results we obtained are transcribed in the table below:

The analysis of the volatility of macroeconomic aggregates indicates that the presence of bubbles in asset prices, it is more appropriate to use a monetary rule including changes in asset prices. In this sense, the central bank should react each time by conventional instrument to achieve the reduction of macroeconomic instability after a slide in prices of their underlying trend. The volatility of macroeconomic aggregates is lower when using a Taylor rule augmented by asset prices. The standards deviations in Table 3 describes a low volatility when the monetary authorities use a rule taking into account changes in asset prices.

6. Conclusion

Using the model with frictions in the credit market has confirmed that macroeconomic shocks tend to grow due to the existence of a phenomenon from the accelerator agency costs required by financial intermediaries. The framework of macroeconomic analysis that must now provide the monetary authority to stabilize the economy must include the credit market to ensure better conduct of monetary policy. Regarding financial stability, expanding the model to take into account the bubbles will better macro-prudential regulation as a result of taking into account the volatility of asset prices. In this sense, the monetary rule should be rehabilitated to include a new component, namely asset prices.

Endnotes

Dr. Firano Zakaria, Faculty of laws, economics and socials sciences Rabat-Agdal. Email: firanou@yahoo.fr.

References

Bernanke, B., Gertler, M., 1989. Agency costs, net worth and business fluctuations. American Economic Review 79, 14–31.
Bernanke, B., Gertler, M., 2000, Monetary policy and asset price volatility. Working paper No. 7559. NBER.
Bernanke, B., Gertler, M., Gilchrist, S., 1999. The financial accelerator in a quantitative business cycle framework. In: Handbook of Macroeco-nomics. North-Holland, Amsterdam.
Blanchard, O.J., Kahn, C.M., 1980. The solution of linear difference models under rational expectations. Econometrica 48, 1305–1311.
Bouakez, H., Cardia, E., Ruge-Murcia, F., 2005. Habit formation and the persistence of monetary policy shocks. Journal of Monetary Economics 52, 1073–1088.
Calvo, G.A., 1983. Staggered prices in a utility-maximizing framework. Journal of Monetary Economics 12, 383–398.
Carlstrom, G., Fuerst, T.S., 1997. Agency costs, net worth, business fluctuations: A computable general equilibrium analysis. American Economic Review 87, 893–910.
Cespedes, L.F., Chang, R., Velasco, A., 2004. Balance sheets and exchange rate policy. American Economic Review 94, 1183–1193.
Christiano, L., Eichenbaum, M., Evans, C., 2005. Nominal rigidities and the dynamic effects of a shock to monetary policy. Journal of Political Economy 113, 1–45.
Christiano, L.J., Motto, R., Rostagno, M., 2003. The Great Depression and the Friedman–Schwartz hypothesis. Journal of Money, Credit, Bank-ing 35, 1119–1197.
Cook, D., 1999. The liquidity effect and money demand. Journal of Monetary Economics 43, 377–390.
Dib, A., 2003. An estimated Canadian DSGE model with nominal and real rigidities. Canadian Journal of Economics 36, 949–972.
Dib, A., 2006. Nominal rigidities and monetary policy in Canada. Journal of Macroeconomics 28, 285–304.
Elekdag, S., Justiniano, A., Tchakarov, I., 2006. An estimated small open economy model of the financial accelerator. IMF Staff Papers 53, 219–241.
Fisher I., 1932, The Debt Deflation Theory Of Great Depressions , Econometrica, 1 : 337-57.
Fukunaga, I., 2002. Financial accelerator effects in Japan's business cycles. Working paper No. 2002, Bank of Japan.
Gertler, M., Gilchrist, S., Natalucci, F., 2003. External constraints on monetary policy and the financial accelerator. Working paper No. 139. BIS (Journal of Money, Credit, Banking, in press).
Gilchrist, S., 2004. Financial markets and financial leverage in a two-country world economy. In: Banking Market Structure and Monetary Policy. Central Bank of Chile, Santiago.
Greenwood, J., Hercowitz, Z., Huffman, G., 1988. Investment, capacity utilization, the real business cycle. American Economic Review 78, 402–417.
Greenwood, J., Hercowitz, Z., Krusell, P., 2000. The role of investment-specific technological change in the business cycle. European Economic Review 44, 91–115.
Hall, S., 2001. Financial accelerator effects in UK business cycles. Working paper No. 150. Bank of England.
Hamilton, J.D., 1994. Time Series Analysis. Princeton Univ. Press, Princeton.
Iacoviello, M., 2005. House prices, borrowing constraints and monetary policy in the business cycle. American Economic Review 95, 739–764.
Ian Christensen, Ali Dib, 2007, The financial accelerator in an estimated New Keynesian model, Review of Economic Dynamics 11 (2008) 155–178
Ireland, P.N., 2003. Endogenous money or sticky prices? Journal of Monetary Economics 50, 1623–1648.

Kiyotaki N. And J. Moore, 2007, Credit Cycles ., Journal Of Political Economy, 105, Pp. 211248.
Kiyotaki, N., Moore, J., 1997. Credit cycles. The Journal of Political Economy 105, 211–248.
Meier, A., Müller, G.J., 2006. Fleshing out the monetary transmission mechanism: output composition and the role of financial frictions. Journal of Money, Credit, Banking 38, 1999–2133.
Minsky H. P. 1977, A Theory Of Systemic Fragility, In E. I. Altman And A. W. Sametz (Eds.), Financial Crises, Wiley, New York.
Mishkin F. S. 1991, Asymmetric Information And Financial Crises: A Historical Perspective, Financial Markets And Financial Crises, Hubbard R G (Ed), University Of Chicago Press, Chicago.
Primiceri, G.E., 2006. The time varying volatility of macroeconomic fluctuations, Working paper No. 12022. NBER.
Taylor, J.B., 1993. Discretion versus policy rules in practice. Carnegie-Rochester Conference Series on Public Policy 39, 195–214.
Tovar C., 2006. Devaluations, output, the balance sheet effect: A structural econometric analysis. Working Paper No. 215. Bank for International Settlements.
Yun, T., 1996. Nominal price rigidity, money supply endogeneity, business cycles. Journal of Monetary Economics 37, 345–370.

Table 1 : descritpion of endogenous variables

Variables	description
y	Production
c	Consumption
i	Investment
g	Expenditure of government
i_r	Real interest rate
i_n	Nominal interest rate
nu	Income of enterprise
ce	Consumption of enterprise
prime	Risk premium
x	Marginal cost
l	work
pi	Inflation rate
a	Productivity shock
k	Capital
q	Assets prices

Table 2 : initial value and calibration

Notation	description	Value in 2011
C/Y	Ratio of consumption over production	0.57 (HCP[4])
C^e/Y	Business consumption versus production	0.01 (HCP)
G/Y	Government spending relative to production	0.17 (HCP)
I/Y	Investment compared to the production	0.29 (HCP)
Sigma	Elasticity of substitution of consumption[5]	1
Epsilon (ε)	Parameter marginal production of capital	0.95
Vphi (φ)	Elasticity of investment reported capital ratio	0.25
Alpha(α)	Share capital	0.29
$(1-\alpha)$	Share work	1-0.29
Eta (μ)	Coefficient of labor	3
Kappa (κ)	Setting the marginal cost curve Philips	0.08
Psi (β)	Parameter of forward looking Phillips curve	0.5
Delta (δ)	Depreciation rate of capital	0.025
Rho (ρ^{bc})	Interest rate coefficient optimal Taylor rule	0.9
Vsigma (σ)	Inflation coefficient of the forward looking Taylor rule	0.1
bbeta (β)	Discount rate	0.99
v	Elasticity of external finance premium	0.05
kn	Ratio of capital to income ratio	2
nk	1/kn	-
1-omega $(1-\tau)$	Corporate default rate	Omega is calibrated to Morocco to 98% only 2% of companies can go bankrupt.

Table 3 : Estimate parameters

Notation	Basis value in 2011	Posteriori value	Distribution
Vphi (φ)	0.25	0.2585	Gamma
Alpha(α)	0.29	0.3484	Gamma
Eta (μ)	3	3.0002	Inv-gamma
Kappa (κ)	0.08	0.0800	Normale
Psi (β)	0.5	0.3989	Gamma
Delta (δ)	0.025	0.0251	Inv-gamma
bbeta (β)	0.99	0.86	Inv-gamma
v	0.05	0.0497	Gamma
1-omega $(1-\tau)$	0.02	1-0.9862	Gamma

Bayesian estimation uses MCMC (20000 simulations).

Table 4 : Variance decomposition

Variables vs shocks	Monetary policy	Fiscal policy	Productivity
Assets prices	91.6%	0.4%	8%
Inflation	98%	0.5%	1.5%
Real interest rate	70%	6%	24%
Income of enterprise	98.41%	0.4%	1.14%

[4] High Commission Plan

[5] Describes the choice between consumption and savings among describes the inverse relationship between interest rates and consumption.

Table 1 : counterfactual analysis

Rules	**Std Taylor rule with assets prices**	**Std Taylor rule without assets prices**
Output gap	1.0427	0.5121
Inflation	0.0216	0.0265
Real interest rate	0.0201	0.0172
Risk premium	0.0717	0.0333
Investment	0.5356	0.4176

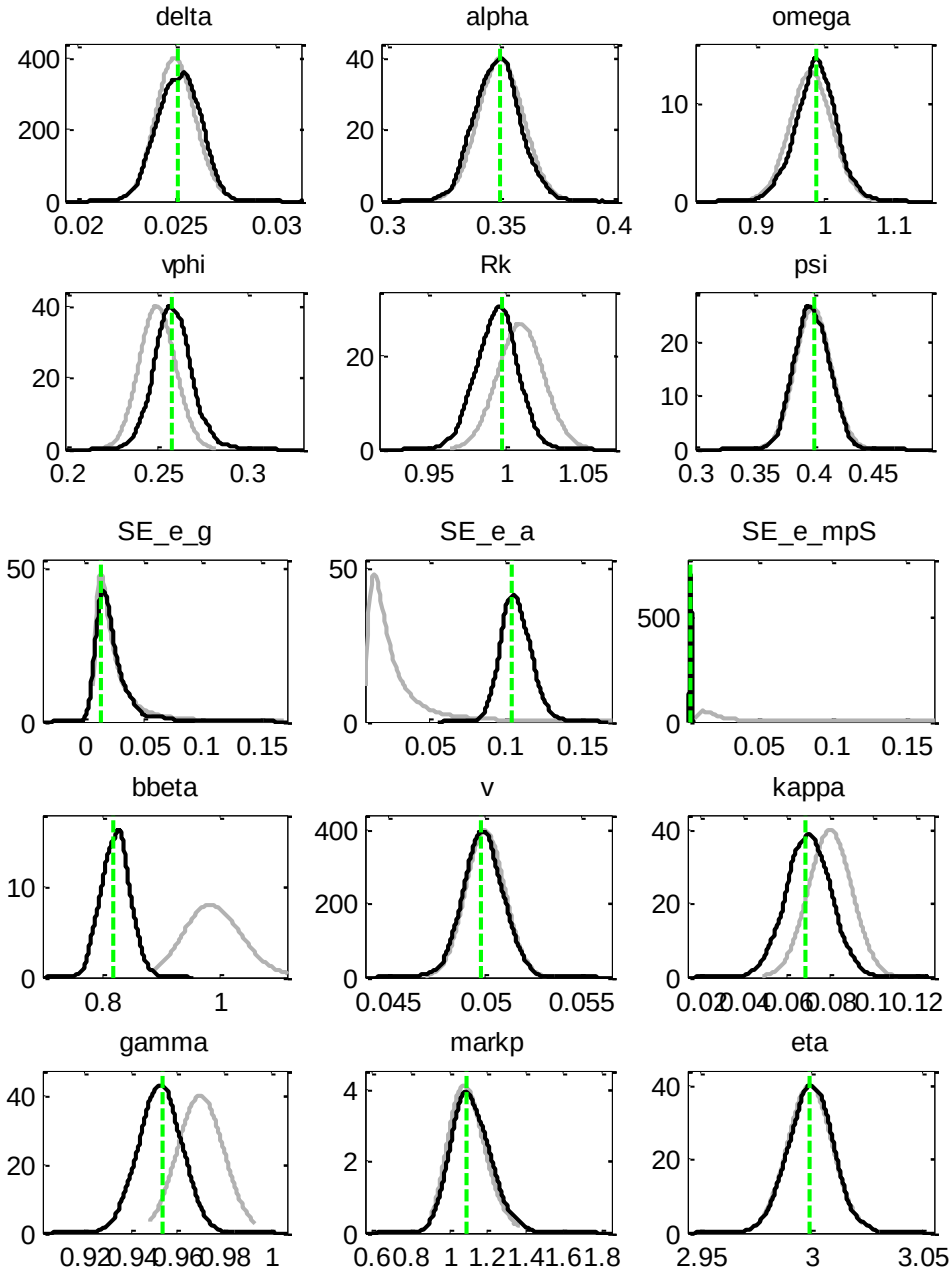

Figure 1: Distributions before and after estimation

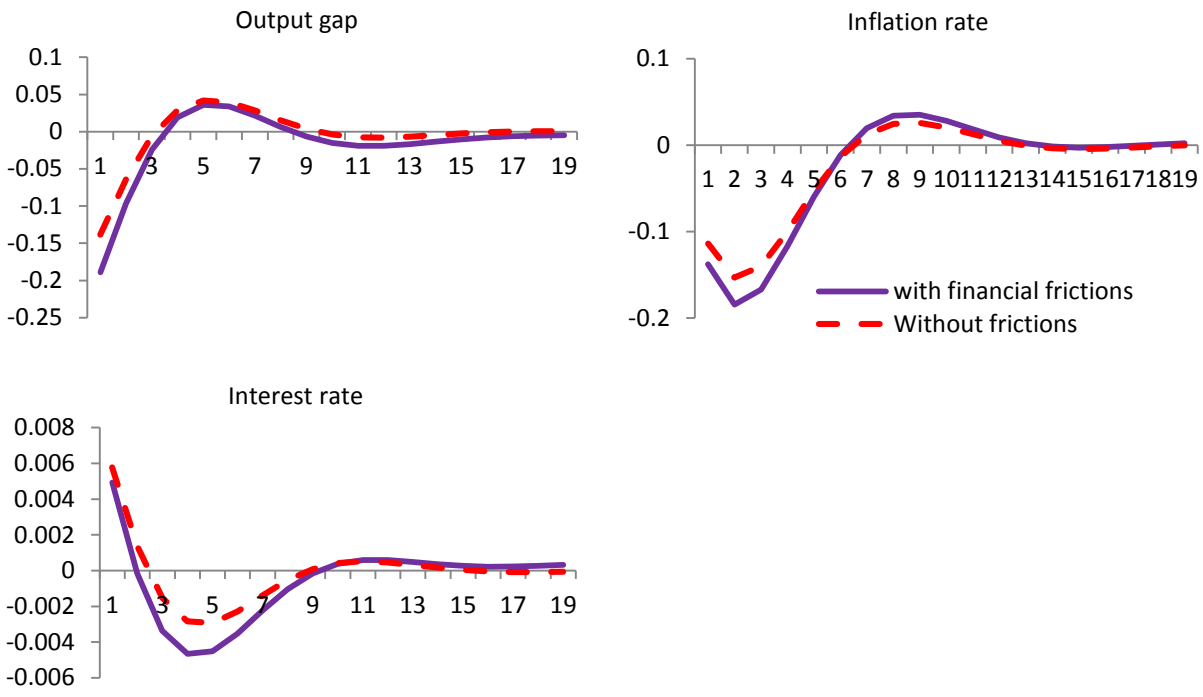

Figure 2 : monetary policy shock: comparison between the model with and without financial frictions on the credit market of Morocco

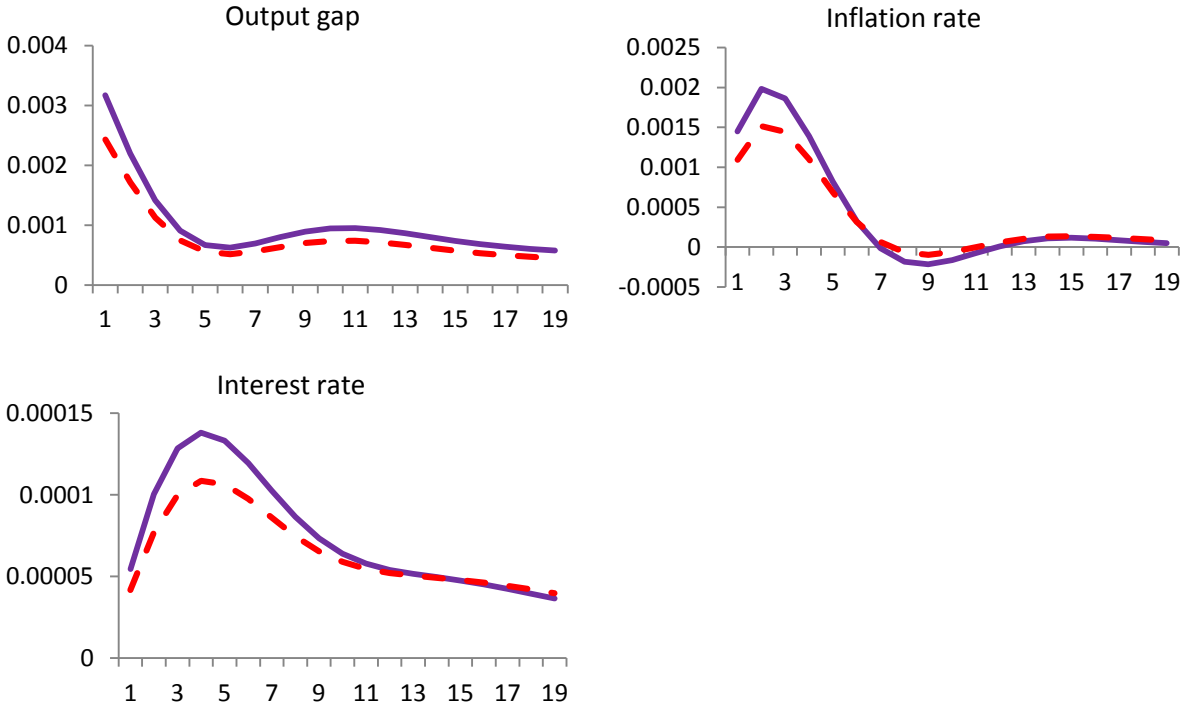

Figure 3 : fiscal policy shock: comparison between the model with and without financial frictions on the credit market of Morocco

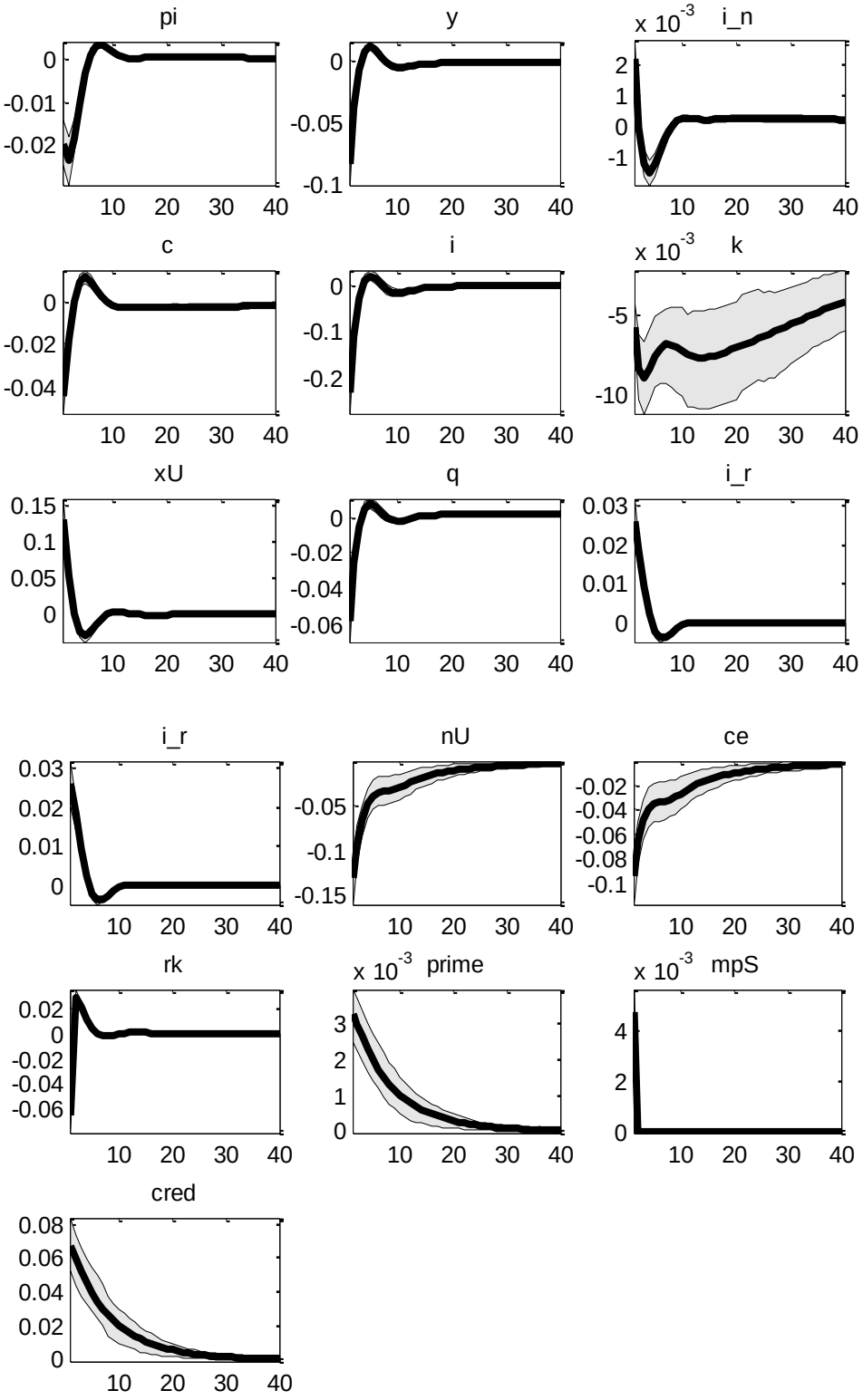

Figure 4 : Monetary policy shock: 1% increase in interest rates (pi: inflation, y: output gap, I_N: nominal interest rate, c: elasticity of consumption, i: investment, k: capital, xU: cout marginal q: asset prices, i_r: real interest rate, nU: firms income (cash flow) that: consumer business, rk: rates of profitability, premium: premium risk cred: sector credit private.

Figure 5: Evolution of entreprises income and risk primium relative to steady state between 2003 and 2011

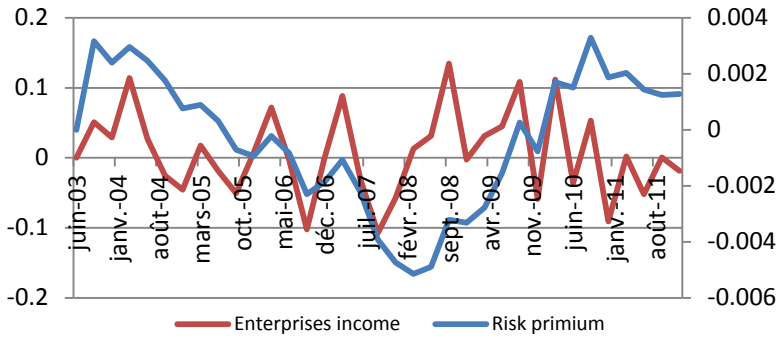

Figure 6:Evolution of credit and investment retative to a steady state between 2003 and 2011)