Why liquidity interventions are they optimal in the case of Morocco for financial stability?

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Abstract. *In this paper a general equilibrium model was developed to simulate the impact of unconventional measures on macroeconomic and financial conditions in Morocco. The particularity of this model is that it includes most of the nominal and real rigidities, financial frictions, based essentially on BGG model (1999, 2001). The model also includes the possibility that the monetary authorities intervene directly in the balance sheets of commercial banks to financing a part of their assets (Gertler et al. (2011)). Through the inclusion of interventions by the central bank, a comparison was made. This is to compare two macro-financial environments. The first considers the absence of a proactive policy of the monetary authorities, while the second considers a passive situation where the central bank is neutral and only uses its key interest rate following a standard Taylor rule (financial stability function). The simulation results clearly show that monetary policy actions at the balance sheets of commercial banks have had a positive effect on macroeconomic and financial conditions. Thus, the use of balance sheet policy helped initiate the economic recession and reduce its duration and to give more impetus to the economic recovery. We conclude that the absence of such interventions, the banking sector and key macroeconomic indicators, including bank lending and economic growth, reportedly accused of a serious problem to threaten macroeconomic and financial stability.*

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1. Introduction

Central banks normally use conventional instruments of monetary policy, in particular interest rates, to achieve its ultimate goals as awarded at their statutes. Through the policy interest rates, central banks tend to communicate on growth prospects trying to anchor expectations of economic agents and act on future inflation developments.

These decisions to the interest rate and the ensuing announcements affecting initially the money market (interbank) and when it operates efficiently, central banks have the power to govern effectively trajectories of short-term interest rates. In this context, the central bank intervention on the markets for the liquidity management with the objective to reduce the interest rate of short-term is considerate to able to maintain macroeconomic stability target. This injection of liquidity is then transmitted to several markets including the credit market and interest rates long-term are prominent elements for investment and consumption decisions in the economy.

Moreover, in times of crisis, the implementation of monetary policy is a more complex exercise because of the existence of financial frictions on the various markets. In fact, the drying up of liquidity and stop transactions on the interbank market may limit the ability of central banks to control the interest rate of short-term and at the same time reduce the effectiveness of conventional transmission channels monetary policy. Also, when a crisis breaks on other financial markets may prevent the transmission of monetary policy to asset prices.

The recent financial crisis (2008) has led most major central banks to cut key interest rates to stimulate growth. These actions were continued until the key interest rates have reached levels close to zero. For fear of tougher economic conditions, many central banks are devoid of their conventional instruments (interest rate) and have taken action based on the unconventional monetary policies.

On the theoretical level, there is no consensual definition of unconventional monetary policies, however, many theorists agree that these policies relate to interventions aimed partly to correct a malfunction in the mechanisms of transmission of conventional monetary policy and secondly to stimulate economic growth and hence aggregate demand and the price level. In this sense, are considered unconventional measures, all the provisions put in place during the financial crisis of 2007-2008 and addressed to solve the liquidity problems of banks and other financial institutions, notably through the purchase of private and public capacity and the adoption of specific forms of communication able to restore confidence in the different compartments of the capital market and

influence the expectations of economic agents regarding future paths of interest rates.

The central bank practice in the use of these measures are heterogeneous because of differences in the structure of financial systems, the severity of the impact of the financial market crisis and the perception and judgment made by the authorities money. This heterogeneity of the measures employed by central banks is also due to the lack of theoretical and empirical bases for the effectiveness of these measures (Trichet, 2010). It is only recently that empirical studies have been undertaken to achieve identify how these unconventional mechanisms affect economic conditions and help boost aggregate demand. On this record, it is noted that the actions of central banks developed and emerging ones were heterogeneous. Although the first have the ability to use interest rates accommodative manner their counterparts emerging could not follow the same strategy as a result of internal and external vulnerability of their economies and their dependencies of capital flows.

Unconventional policies are defined as the set of mechanisms that restore the effectiveness of the transmission channels of monetary policy[1] without having to use the guiding interest rates. Lorenzo Bini Smaghi (2008) defined the unconventional monetary policy as all measures to directly influence the cost and availability of external financing from banks, individuals and non-financial corporations. These sources may take the form of liquidity by the central bank, loans or securities. Generally, these policies are used in situations where the policy rate is near or equal to zero[2] describing a deteriorating global demand and a general decline in price levels (for example, the crisis in Japan).

However, Borio (2010) argues that this type of policy can be driven independently of the level of interest rates if two conditions are met: first, it is necessary that these operations are sterilized so as to ensure that the amounts of bank reserves are not affected by excess liquidity and inflationary pressures resulting like interventions on the foreign exchange market[3]. Then, the central bank is allowed to ensure that these unconventional measures have no impact on the level of the reference interest rate because of changes in amounts of currency markets. As such, the compensation of excess reserves should help to achieve this goal because of the indifference of banks in relation to excess currency markets.

The lack of a theoretical consensus on forms of political balance has resulted in heterogeneous practices that have sometimes led to contradictory actions of central banks. However, Borio et al. (2010) proposed a classification of unconventional monetary policies by reference to two criteria: (1) the impact of these measures on the balance sheet of the private sector and (2) the target market. The first type pays more attention to the theory of imperfect substitutability of

financial assets (Tobin (1963, 1969), Friedman (1956)), while the second type focuses on the fact that it is not only changes in the composition of the balance that is important but also the way in which these operations are performed and communication strategies there to.

In fact, there are four types of unconventional policies namely the exchange rate policy, the policy of debt management, credit policy and policy management of bank reserves. In the case of exchange-rate policy the central bank tends to change the net foreign currency position of the private sector through direct intervention in the foreign exchange market. The intention of the monetary authorities is to affect the exchange rate, the level and volatility, some of the level of key interest rates[4].

Regarding policy debt management, actions by central banks aimed entirely the public debt market and affect the financial assets issued by the state and held by the private sector. The central bank commits this type of measures to alter the performance of government securities and therefore it is involved in changing the prices of financial assets in their entirety.

In the case of the credit policy, the strategies of the Central Bank target specific compartments of private debt. This is achieved by affecting the amount of private assets held by the monetary authority or otherwise through changes in public and private assets held by the private sector. This type of configuration can be adopted by using several approaches, including the extension of collateral relating to monetary transactions, the provision of loans to the private sector and the acquisition of the assets of the private sector.

Table 1. *Effect on private balance sheet*

		Net position of foreign currency	Change of composition of public debt in balance sheet	Change of composition of private debt in balance sheet
Market target	**Foreign currency**	*		
	Public debt		+	
	Private asset			•
	Bank reserve	x	x	x

Exchange policy (*); public debt policy (+); credit policy (•); bank reserve policy (x).

Source: Borio et al., 2010.

The arrangement proposed by Borio et al political balance. (2010) was used to analyze in depth the policies undertaken by several major central banks in response to the financial crisis. Indeed, quantitative easing employed by the ECB

and Japan during the crisis liquidity trap (1997-2006) is characterized by the definition of an explicit target for bank reserves, a conditional commitment to keep the reserve levels in the future and a massive purchase of government bonds. Therefore, the quantitative easing policy is a mixture of reserves and a policy of debt management with the use of a particular communication strategy in times of crisis with respect to future prospects. Other authors prefer to call this type of policy as policies aimed at reducing long-term interest rates via an expansion of liquidity reserves (Spiegel (2001)). During the current crisis, the Bank of England described quantitative easing as the purchase of assets from the public and private sectors using central bank money. This is basically the combination of the two policies for managing debt and reserves management (Auerbach and Gale (2009), Krugman (2009), Taylor (2009) and Kemp (2008)). In addition, all measures taken by the ECB since 2009 have aimed to ensure the flow of bank credit through long-term loans at low rates against a broad range of collateral. Given the emphasis on bank credit and the significant impact of these measures on the profile of the ECB balance sheet, these actions can be classified as credit policy.

However, the experience of the Fed is a little different, in the sense that Bernanke (2009) speaks more easing credit is to purchase securities lending programs by using central bank money. The distinction is that the relaxation of credit involves the purchase of private and public securities, thus representing a combination of policy debt management and credit policy without targeting bank reserves.

Staying out of the financial crisis in the beginning, Morocco has been affected by the economic downturn in Europe because of strong synchronization of the economic cycle. Thus, we have seen a slowdown in foreign demand and a decline in foreign exchange reserves. This has resulted in an increase in liquidity requirements by commercial banks to reach extreme levels during the years 2011 and 2012. These support measures in terms of liquidity have been undertaken in order to maintain the interest rate and the growth rate of credit to the economy through the management of long-term rates and risk premiums.

In the present paper, it is therefore necessary to examine the consequences of policies taken after the occurrence of the international financial crisis to enhance the liquidity of Moroccan banks and consider whether to continue to use these policies to balance to revive credit and therefore investment and production. It is in this work focus only on liquidity interventions made by the monetary authorities. In this sense, the other measures that have been undertaken have been neglected including political interest rates and reserve requirements.

This paper is structured as following. The next section focuses on empirical studies that have examined the effects of unconventional policies on the economy and in particular the risk premium on growth and inflation. The third section is

devoted to the presentation of the model to use in order to achieve enough to make a convincing answer to the question of the effectiveness of these interventions on the economic and financial plan. The last section, in turn, presents the results and recommendations to consider improving the balance sheet policies used by the Central Bank.

2. Empirical review

Although empirical work on the impact assessment of policies on economic conditions and their ability to stimulate economic growth as well as credit to the economy is very recent, they could say that the policies undertaken by central banks in recent years have helped to limit the effects of the financial crisis and prevent its escalation.

Most studies analyzing the macroeconomic effects of unconventional policies have focused on key variables that may be affected due to the use of these policies by drawing on the analysis of unconventional transmission channels. And interest has focused in particular on the analysis of the effects on long-term rates, investment, consumption, the economic growth rate and the exchange rate.

Empirically these studies adopt two approaches: a statistical and structural approach based on DSGE models and econometric macro models approach. Baumeister and Benati (2010) use a VAR and confirm that a shock to the long rate has substantial effects on economic activity in the industrialized countries. Gagnon and others (2010) analyze the effects of LSAP programs (large-scale asset Purchases) of the EDF and confirm that the programs undertaken by the latter have been able to prevent the occurrence of deflation and a collapse of rates interest.

Lenza, Pill and Reichlin (2010) also use a statistical model (VAR) to assess the impact of unconventional measures in the Euro zone. They estimate a Bayesian VAR model in which they argue that if the ECB interventions have not held the credit impairment would have been greater. Thus, they show that the growth rate of industrial production was 3 points lower in 2010 and inflation has fallen by 0.5 basis points over the same period. Adopting the same approach Giannoni, Lenza, Pill and Reichlin (2011) find that the measures taken have been very effective to mitigate the effects of the crisis on the monetary aggregates and credit.

Peersman (2011) used a structural VAR to identify the main stylized facts of the transmission of unconventional policies in Europe. The author included a new shock to the banking credits based on the assumption that the balance sheet policies impact the conditions for granting credit. On this note, the author

proposes that the transmission of unconventional policy to bank credit and to the same extent that the policy interest rate, but it remains longer.

Del Negro et al. (2010), using the second family of models based on structural general equilibrium models. They say with their model with financial frictions that extraordinary interventions (purchase of illiquid assets) of the Fed have prevented the collapse of interest rates and reduce the risk of deflation. According to their model, this decision is particularly effective when rates reach near-zero levels.

Chung et al. (2011) use the model of the FED, FRB/U.S. to analyze the effects of political balance. Model simulations have the advantage to consider not only the initial impact of purchases of illiquid but also the dynamic effects of programs EDF capital. Thus, they confirm that the LSAP program increases the yield of 3% above the steady state during the second half of 2012, increases the use of 3 million workers and stabilize inflation around 1 percentage point more high if n 'there was no intervention. The results obtained using these unconventional measures are equivalent to a reduction of 300 basis points in the benchmark rate since 2009. Fuhrer and Olivei (2011) using the FRB / U.S. model analyze the effects of the second easing program (QE2) and argue that these measures helped to increase 60 to 90 basis points in real GDP over two years and helped lower the unemployment rate of only 0.5 points.

Overall, studies on the macroeconomic effects of unconventional policy stated that the interventions by major central banks, including the Fed and the ECB, have been crucial to avoid a collapse in interest rates and helped to contain the risks deflationary. However, the results obtained using these works are to be taken with some caution for two reasons. First, most of the work considers the relationship between macroeconomic aggregates remained stable during the crisis, something that is not as evident when markets do not work in a normal manner. Then the evaluation of the effects of political balance may underestimated the actions of monetary authorities because of the importance of financial frictions that fuel rationing credit exercised by banks and also because of the failure to take into account the entire financial system in the formal modeling framework.

Like these works, the present paper is to evaluate the effectiveness of the monetary policy reaction in response to the increased risk both economically and financially. Thus, Morocco, against countries with flexible exchange rate regime and inflation targeting, he opted for policies other than quantitative easing to restore confidence and reduce the drying up of liquidity in different markets money. However, the uses of these measures since 2011 require an assessment to be able to describe their relevance.

3. Model

The model adopted in this paper, inspired by the work of Gertler et al. (2011), consists of five economic agents: households, financial intermediaries, producers of investment goods producers and retailers property. These are supposed to be in a monopolistic competitive market in order to facilitate the integration of price rigidity in Calvo. In this context, it is also assumed that the monetary authority is able to conduct policy rate (conventional) and political balance (unconventional).

3.1. Household

Households are presented through a representative household that consumes, saving and labor supply to financial and non-financial. In this sense, households may pay financial intermediaries and government. In the first case they are deposits in credit institutions and in the second they invest in treasury bills.

The household population is divided into two: workers from non-financial companies and other from banks. For this purpose, the sources of household income come from both their travails in productive enterprises and the management of banks. Thus, each time the proportion of households working with non-financial companies is "1-f" while bankers represent the fraction "f". Each time an individual can choose to transit from one situation to another. In this sense, it is considered that a banker can maintain its function during two periods with probability « Ɵ » And can change jobs with inverse probability of « 1-Ɵ ». For this purpose, the percentage of bankers who can change function is equivalent to « (1-Ɵ).f ».

The household thus maximizes its next objective function:

$$maxE_t \sum_{i=0}^{\infty} \beta \left[\ln(C_{t+i} - hC_{t+i-1}) - \frac{\aleph}{1+\varphi} L_{t+1}^{1+\varphi} \right] \quad (1)$$

Note that:
C – consumption;
h – consumption habit;
L – work.

With $0 < \beta \; and \; h < 1$ and $\varphi, \aleph > 0$. Utility to maximize the household's standard form (see Woodford (2003)). Household incomes come from their work, rates of return on deposits with banks and dividends from various financial and non-financial. In this context, the household budget constraint is as follows:

$$C_t = W_t L_t + P_t - T_t + R_t B_t - B_{t+1} \quad (2)$$

W – salary;
P – profit of enterprise;

T – taxes;
R – deposit rate;
B – deposits.

The first order conditions obtained from this optimization program give rise to the following equivalences:

$$U'_{ct}W_t = אL_t^\varphi \quad (3)$$

With:

$$U'_{ct} = (C_t - hC_{t-1})^{-1} - \beta hE_t(C_{t+1} - hC_t) \quad (4)$$

And

$$E_t\beta ב_t R_{t+1} = 1 \quad (5)$$

$$ב = \frac{U'_{c,t+1}}{U'_{c,t}} \quad (6)$$

3.2. Financial intermediation

The main function of financial intermediaries is lending to productive enterprises using household deposits. In this sense, their existence facilitates the optimal allocation of resources and reduces the agency problems between investors and depositors by tapping into their information superiority. Taking this role, banks are at risk of transformation by providing long-term loans through the use of short-term funds.

Consider the income of banks « N », Customer deposits (main resource banks) are noted « B » and the quantity and price of bank assets are « S » and « Q » respectively, then:

$$Q_t.S_t = N_t + B_t \quad (7)$$

With reference to this definition, $Q_t.S_t$ represents the total assets of banks and therefore the loans to the private sector. In this classic presentation, it is assumed that banks operate in a normal situation where the funds are intended for the private sector and funded entirely by households. In this context, the intervention of the central bank through a credit policy is currently neglected due to the maintenance of confidence in the intermediation system.

In this context, the income of the bank is its capital, while deposits are treated as debt. The income generated by the bank will be equal to the difference between the return generated and the cost of capital:

$$N_{t+1} = R_{t+1}^k Q_t S_t - R_{t+1} B_t = \left(R_{t+1}^k - R_{t+1}\right) Q_t S_t + R_{t+1} N_t \quad (8)$$

The future income generated by the bank is the difference between the returns generated through credit operations and returns paid to depositors. The premium $\left(R_{t+1}^k - R_{t+1}\right)$ describes the possibility of the existence of asymmetric information between depositors and non-financial companies and it also reflects the opportunity cost due to the use of external financing (Bernanke et al., 1999 (BGG)).

It should be noted that financial intermediaries choose to finance the economy if the current value of the risk premium is much higher than $0^{(4)}$. This implies that economic prospects are favorable and allow outperforming the cost of capital.

According to the relationship describing the determinants of income (equity) banks, it is clear that any increase in assets $(Q_t S_t)$ resulting in an increase in earnings. In a rational manner, the intermediate will be encouraged to increase their assets by lending to infinity. To highlight this strategy banks continue to borrow from households. However, banks need to ensure an optimal level of liquidity for depositors (for fear of a bank run). These to maintain and continue to provide funding to banks they may require that the income of the bank is greater than a specified fraction of the assets. Applicants are expected to recover any time this fraction. Then, the updated income (V) the banking firm must still meet the following condition:

$$V_t \geq \partial Q_t S_t \quad (9)$$

Based on this relationship, banks may continue to grant credit, as the income generated can satisfy this constraint.

Following the assumption of Gertler et al. (2011), the value of the bank can be written according to the expected rate of return due to a change in assets $Q_t S_t$ and changes in equity N_t.

Suppose that "v" is the expected return generated following a change in assets$^{(5)}$ of bank and μ the expected return following a change in equity. In this sense, the value (or income) of the bank is of the form:

$$V_t = v_t . Q_t S_t + \mu_t . N_t \quad (10)$$

With:

$$v_t = \beta\left(R_{t+1}^k - R_{t+1}\right) + \beta * x_t * v_{t+1} \quad (11)$$

$$\mu_t = \beta * z_t * \mu_{t+1} \quad (12)$$

Note that, $x_t = \frac{Q_{t+1}S_{t+1}}{Q_t S_t}$ and $z_t = \frac{N_{t+1}}{N_t}$. Depending on the condition set by depositors on funds to finance and the minimum liquidity to hold in this case, the value of the bank is equal to:

$$\partial Q_t S_t \leq v_t Q_t S_t + \mu_t N_t \qquad (13)$$

As such, the asset size of the bank or the amount allocated to finance investment is constrained by the following equation:

$$Q_t S_t = \frac{\mu_t}{\partial - v_t} N_t \quad (14)$$

Note now that:

$$\frac{\mu_t}{\partial - v_t} = \emptyset_t \quad (15)$$

This relationship describes the relationship between assets and equity held by the bank. In other words, this report is the leverage ratio (assets to equity). Thus, banks must ensure compliance of the relationship required by depositors. Indeed, the amount of credit granted is based on the income of the bank and the level of leverage ratio.

Explain this in detail: banks acting in an increase in credit to the economy contribute to increase the parameter "v" and thus increase the leverage ratio allowing them to generate more profit at the expense of depositors and their requirements in terms of liquidity. As such, the banker defined more expansionary strategies to increase the proportion of "v", the more it is facing a growing likelihood that depositors withdraw their deposits. In this situation the bank is forced to satisfy this condition and ensure that $0 < v_t < \partial$ to continue to meet the demands of depositors. In this context, depositors demanding to maintain fraction $\partial Q_t S_t$ for their own liquidity needs can tolerate against by the bank uses in addition to a fraction $v Q_t S_t$, provided that the difference between these two proposals are less than the return on equity N.

Through what has been mentioned, the future income of the bank can be written in terms of the risk premium and leverage:

$$N_{t+1} = \left[\left(R_{t+1}^k - R_{t+1} \right) \emptyset_t + R_{t+1} \right] N_t \quad (16)$$

$$z_t = \frac{N_{t+1}}{N_t} = \left(R_{t+1}^k - R_{t+1} \right) \emptyset_t + R_{t+1} \quad (17)$$

$$x_t = \frac{Q_{t+1}S_{t+1}}{Q_t S_t} = \frac{\emptyset_{t+1} N_{t+1}}{\emptyset_t N_t} = \frac{\emptyset_{t+1}}{\emptyset_t} z_t \quad (18)$$

The income of the bank increased in function of leverage and the risk premium. Growth spread between lending and deposit rates used to increase the future income of the bank. Leverage occurs to increase the performance. The more the leverage ratio is more significant banking activity rises to generate more income.

3.3. Unconventional policy and bank assets

The discussion in the previous section returns to formalize joint credit for the private sector ($Q_t S_t$). To implement a credit policy and intervention by the monetary authorities in an unconventional way in the markets, it is assumed that the monetary authority is able to facilitate the granting of credit by intervening directly in the credit market.

In this context, suppose the fraction financed by the central bank's total assets is $(Q_t S_{gt})$[6]. To this end, total assets available to financial intermediaries will be as follows:

$$Q_t S_t = Q_t S_{gt} + Q_t S_{pt} \quad (20)$$

In this context the central bank finances a portion of bank assets through purchases of bonds issued by the government. The central bank using securities purchase strategies fueling financial intermediaries additional liquidity should necessarily increase their assets and therefore finance investment projects[7].

This part financed by the authorities will be equal to:

$$Q_t S_t = \omega_t Q_t S_{gt} \quad (21)$$

The parameter ω describes the extent of the credit policy of the central bank, the more it increases, the response of the monetary authority is expansionary and vice versa. And authorities involved in financial intermediation, not to replace the banks but to ensure financing of the economy, reduce risk aversion and restart lending.

The expected performance of these government operations is the difference between the expected rate of return on funded projects and the interest rate on bonds. Considering that the government is not obliged to comply with the requirements of depositors enjoying better quality borrower, the total assets of banks should be equal to:

$$Q_t S_t = \emptyset_t N_t + \omega_t Q_t S_{gt} \quad (22)$$

In this sense, the total assets from financial intermediation are equal to the income from private activities taking into account the leverage ratio and resources from public authorities. After a rearrangement of this equivalence, it is possible to consider that:

$$Q_t S_t = \frac{\emptyset_t}{1 - \omega_t} N_t \quad (23)$$

From equation (23), it should be noted that the bank's assets is based on three parameters: the income or bank capital (N_t), the leverage ratio ($\emptyset_t$) and the share of assets financed by the government using strategies credit policy (ω_t).

3.4. Enterprises

The business sector is composed of three types of producer:

- producer of capital;
- producer of intermediate goods;
- and producer of final goods.

The first two contractors operate in a market of perfect competition, while the latter is considered monopolistic competition to include the possibility of price rigidity.
The company sells production of intermediate goods production companies' details. Indeed, the company operates in time "t" to acquire the capital K_t for use in the production will subsequently sell during the next period (t +1).

Thus, to enable him to produce the company is able to claim credits for financing from financial intermediaries. In this sense, the value of the company's capital should be equal to the assets of the banks.

$$Q_t K_t = Q_t S_t \quad (24)$$

Under this assumption, the flows of banks are used only to finance investment projects of companies. In this sense, the bank finances the entire loan application business. This is true under the assumption that there is no friction with respect to the financial information on the company. Thus, the bank is assumed to have perfect information about the company and its activity against his relationship with depositors.

In this context, the only constraints are those related to funds available to the bank, which in turn should affect the level of funding for companies and at the same time financing costs. Under these assumptions, the enterprise produce (Y) on the basis of two factors of production, capital and labor.

$$Y_t = A_t (U_t \, \Lambda_t \, K_t)^{\alpha} L_t^{1-\alpha} \quad (25)$$

With:
U_t – the rate of capacity of utilization;
$\Lambda_t \, K_t$ – the actual amount of capital[8];
L – the work.

The prices of production P_{mt} are equal to:

$$P_{mt}(1-\alpha)\frac{Y_t}{L_t} = w_t \quad (26)$$

Thus the return of enterprise is:

$$R_{kt} = \frac{\left[P_{mt}\alpha\frac{Y_t}{\Lambda_t K} + Q_t - U_t\right]\Lambda_t}{Q_{t-1}} \quad (27)$$

Producers of capital operate in a market of pure and perfect competition. Their work focuses on the supply of intermediary companies' capital to carry out their operations.

Assuming that the stock investment is "I", "Iss" potential and "In" net capital investment created where, $I_{nt} = I_t - U_t\Lambda_t K_t$, In this case, the objective function of maximizing capital producers is as follows :

$$\max E \sum_{t:1}^{\infty} \beta \Lambda_t \left\{(Q_t - 1)I_{nt} - f(\frac{I_{nt} + I_{ss}}{I_{nt-1} + I_{ss}})\right\}(I_{nt} + I_{ss}) \quad (28)$$

The first order condition is given by:

$$Q_t = 1 + f(.) + \frac{I_{nt} + I_{ss}}{I_{nt-1} + I_{ss}}f'(.) - E\beta\Lambda_t \left(\frac{I_{nt} + I_{ss}}{I_{nt-1} + I_{ss}}\right)^2 f'(.) \quad (29)$$

Regarding the third business details, it operates in a market of monopolistic competition to reflect rigidities in prices. Production is defined in terms of the total production of various companies:

$$Y_{ft} = \left(\frac{P_{ft}}{P_t}\right)^{-\varepsilon} Y_t \quad (30)$$

And

$$P_t = \left[\int_0^1 P_{ft}^{1-\varepsilon} df\right]^{1/1-\varepsilon} \quad (31)$$

In this sense, the firm maximizes the following function:

$$\max E \sum_{t:1}^{\infty} \gamma\beta \Lambda_t \left\{\frac{P_t^*}{P_{t+1}}\prod_{k=1}^{i} 1 + \pi_{t+k-1} - P_{mt+i}\right\}Y_{ft} \quad (32)$$

γ is elasticity of rigidities of price, P_t^* is optimal price, P_m marginal cost[9] and π inflation rate. Thus the first order condition is given by:

$$\sum_{t:1}^{\infty} \gamma\beta\,\Lambda_t \left\{ \frac{P_t^*}{P_{t+1}} \prod_{k=1}^{i} 1 + \pi_{t+k-1} - uP_{mt+i} \right\} Y_{ft} = 0 \quad (33)$$

$$u = \frac{1}{1 - 1/\varepsilon}$$

In this sense, the commodity price changes according to the following equation:

$$P_t = [(1-\gamma)(P_t^*)^{1-\varepsilon} + \gamma(\pi_{t-1}P_{t+1})^{1-\varepsilon}]^{1-\varepsilon} \quad (34)$$

3.5. Monetary and fiscal policies

The overall output of the economy is composed of consumption "C" investment "I" budget expenditure "G" and government intervention in favor of the financial intermediary.

$$Y_t = C + I + G + f\left(\frac{I_{nt} + I_{ss}}{I_{nt-1} + I_{ss}}\right)(I_{nt} + I_{ss}) + \omega_t Q_t K_t \quad (35)$$

Capital evolves according to the following equation:

$$K_{t+1} = \Lambda_t K_t + I_{nt} \quad (36)$$

Government spending and intervention in the banks' assets are financed by taxes and spreads over the intermediation of the government through emissions obligations.

$$G + \omega_t Q_t K_t = T + (R_{kt} - R_t)B_{gt} \quad (37)$$

Furthermore, we believe that the reaction function of the central bank and Taylor-type, including inflation, the output gap and inertia[10]:

$$i_t = (1-\rho)[i + \alpha_{inf}\pi_t + \alpha_{outgap}(logY_t - logY_t)] + \rho i_{t-1} + \varepsilon_t \quad (38)$$

While the reaction function of the monetary authorities is effective in normal times, in a regime of inflation targeting. In contrast, in the presence of crisis characterized by a deflationary spiral and very close to zero interest rates, it becomes inappropriate because of financial frictions and non-effectiveness of conventional transmission channels. In this sense, other unconventional policies are carried out. In fact, and as we have seen, using unconventional policies, the central bank uses a quantitative approach to increase the money supply and thus boost growth and reduce interest rate spreads and in particular those of long-term:

$$\omega_t = \widehat{\omega} v[(logR_{kt} - logR_t) - (logR_k - logR)] \quad (39)$$

In this context, the central bank injects liquidity in banks' balance sheets by referring to differences in interest rates and therefore it operates according to the levels of risk in the market. When the spread rate deviates from its equilibrium (steady-state), then the central bank injects liquidity to finance investment.

In times of crisis, the central bank should give the Taylor rule since the inertia of interest rates is insignificant. In this model, we consider the inertia parameter ρ is equal to 0 when we are in the presence of a financial or economic crisis. This leaves the central bank's scope to respond solely on growth and inflation in their future developments.

4. Simulation results

Inspired by the work of Gertler et al. (2011) should help to answer two key issues relating to the economic situation in Morocco. At first, taking into account that this model allows us to consider that the central bank can intervene through unconventional policies to support the economy and boost growth in response to unfavorable market conditions. We can check for the case of Morocco relevance use policies to allow assessments to boost economic growth and at the same time lending to the economy. In a second step, this model incorporating financial frictions should explain in a more rational way the current situation in Morocco.

4.1. Calibration

To meet the above objectives, the model was calibrated based on the Moroccan data using databases HCP[11] for the year 2013. Parameter calibration is performed in a standard manner. The discount rate is extracted from the risk-free rate of treasury bills. Thus, we consider that it is equal to 0.99. The elasticity of substitution is itself calibrated to 1. Moreover, the consumption patterns of households are approximated to 0.9. The inverse of the elasticity of labor is estimated at 0.2. For other parameters related to the household, they are considered standards. Moreover, the survival rate of households is almost 97%. The share of capital employed compared to work in the vicinity of 1/3.

However, for the parameters of the monetary rule, they are calibrated using two approaches; the first considers that normal economic conditions the interest rate is the only instrument to use. Moreover, in the second situation of crisis, the rate rule is abandoned and considers that the credit policy is the most effective. In this context, the setting of the inertia of the interest rate is in the first case and 0.8 in the second it is considered invalid. The coefficient of inflation embedded in the rule is considered in both cases equal to 1.5 and the output gap is -0.125.

In times of crisis, monetary authorities activate their credit policy to strengthen bank balance sheets and facilitate the granting of credits. In the model presented, we believe that the coefficient describing the response to a change in foreign exchange rate is equivalent to 8 calibrated through share of injections of the Moroccan central bank to total bank assets.

Table 2. Calibration

Parameter description	Value
Discount rate	0,99
Elasticity of substitution	1
Formation of habit	0,815
Inverse of work elasticity	0,276
Marginal elasticity of depreciation of salary	7,2
Probability of life	0,97155955
Rate of capital depreciation	0,025
Calvo parameter	0,779
Parameter of price index	0,241
Parameter of interest rate inertia	0 et 0,8
Inflation parameter	1,5
Output parameter	-0,125
Persistence of capital shock	0,66
Persistence of technological shock	0,95
Persistence du fiscal shock	0,95
Persistence of unconventional policy	0,66
Level of unconventional policy	8

4.2. Reading of the current situation: interpretation of the model

Morocco was immune to the global financial crisis in those early events. However, after the latter has resulted in a slowdown in the partner countries, particularly in Europe, Morocco was quick to see the situation more difficult.

Thus, we are seeing a slowdown in credit to the economy characterized by rising levels of growth rates in double figures, with growth rates of around 2% and 5%. Moreover, economic growth is regressed to about 2.7% in 2012. During the year 2013, the situation is even more worrying because of the decline in credit growth as well as the deterioration of the quality of bank assets since we are seeing a slight increase in rate of nonperforming loans.

The model with financial frictions expected to transcribe more pertinently this situation by giving more importance to imperfections in the credit market due to the integration of financial intermediation. By adopting the approach of BGG (1999), that the risk premium anchor agents' expectations and determine the choice of funding, we could say that the proposed model helps to explain the current situation in basis of existing economic and financial dynamics. Indeed, we

considered for purposes of illustration a productivity shock to reproduce the known Morocco following the decline in foreign demand by lowering the rate of economic growth and the level of the production and scenario. In addition, other additional shocks, monetary and bank asset quality policy have been developed to describe more dynamic transmission of shocks in the presence of financial frictions.

In what follows, we analyze the results from a standard DSGE model (without financial frictions) and another with financial frictions in BGG (1999). The productivity shock is intended to capture the decline in non-agricultural growth experienced by the country during the past two years. The classic real DSGE model cycle not including financial intermediation tends to minimize the loss of productivity due to the absence of financial frictions often contributing to amplify shocks in the economy.

Furthermore, the simulation through a model with financial frictions can describe with more rigors the effects of reduced productivity. In this sense, a 10% decrease in productivity leads to a slower growth up more than 10% compared to the equilibrium level. This decrease was partly due to a decline in investment and consumption coupled with a slowdown in asset prices. The decline in asset prices should more to lower investment and consumption resulting in higher risk-free rate because of the increased risk and lower banking income. Moreover, the rate of return on investment should respond negatively to down due to the contraction of production thereby resulting in an increase in the risk premium[12]. The decline in productivity would also result in a decline in inflation to return to its equilibrium state due to the expected decline in interest rates. Regarding the banks' capital, they will have to record a decline in levels due to the increase in the risk premium and lower production and consequently investment banking.
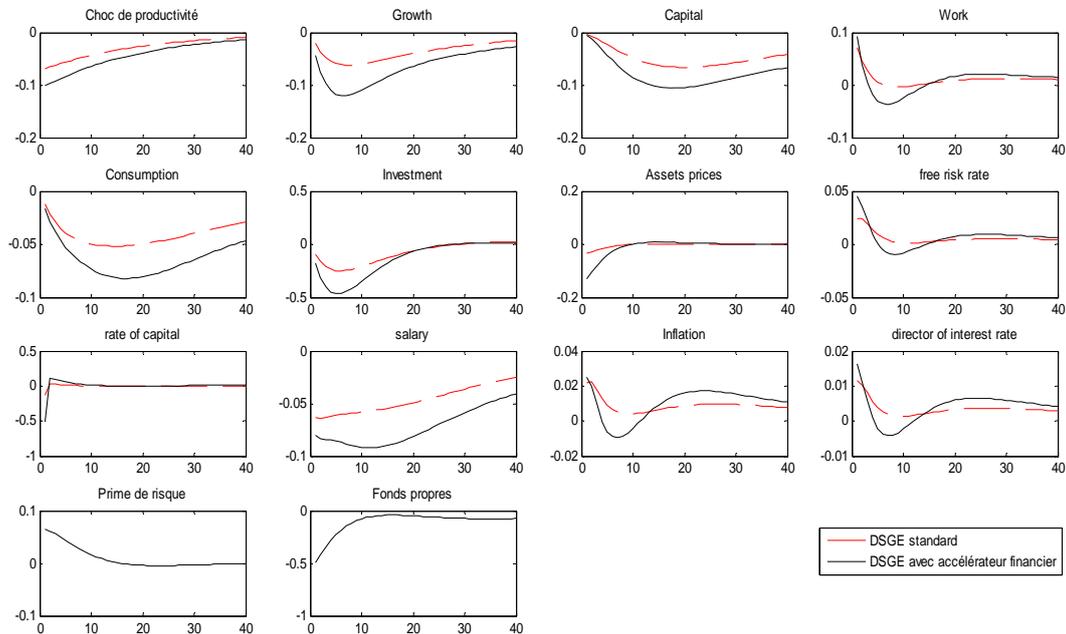
Figure 1. *Comparison between the model with and without financial frictions (productivity shock)*

The second shock was considered is on the decline in the quality of bank assets. The comparison between the model with and without financial frictions says that the integration of these improves the quality of the impulse responses of the macroeconomic model. The decline in the quality of the investment banking or capital assets is likely to reduce investment and therefore asset prices. These regressions are partly due to the decline in the quality of bank assets leading to distressed sales to meet the requirements of depositors and capitalists in connection with the leverage ratio imposed by donors. This results in the first place, depending on the model with financial frictions in lower bank capital due to losses on assets. Then distressed sales boost falling asset prices increasing thereafter the risk premium and lowering bank results. Companies in a situation of rising risk premiums will lower the investment and production and thus reduce their rate of return are a major determinant in the financing decision. In this situation, compounded by the existence of financial frictions, the return of macroeconomic aggregates to their equilibrium to soften the effect of the shock on the capital can only be done after 10 quarters. So, according to this analysis we expect a recovery in non- agricultural growth after about 3 years.
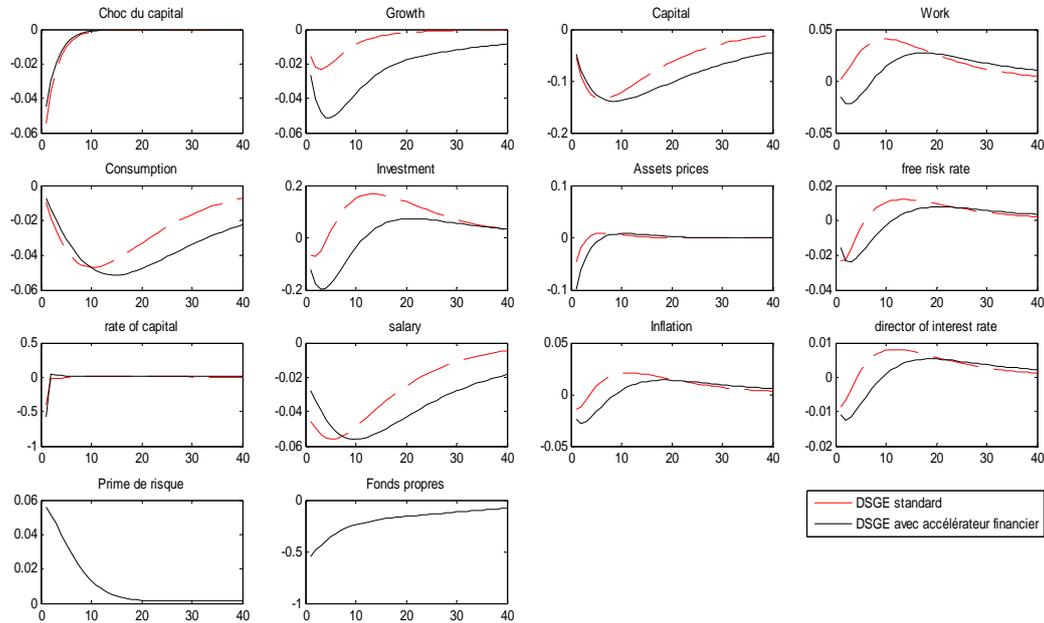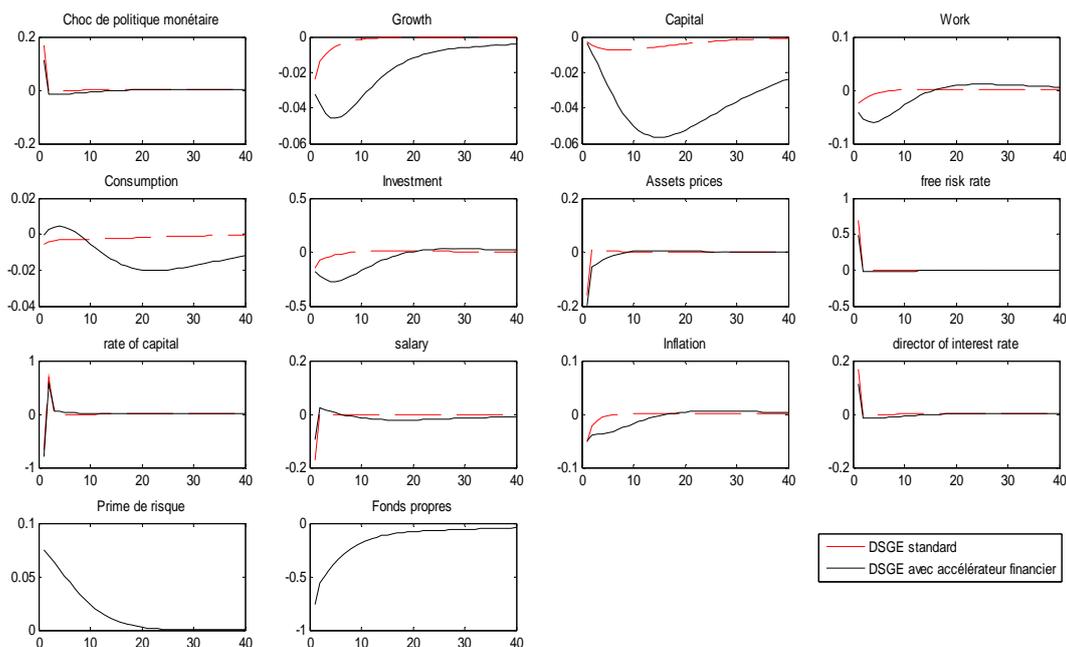
Figure 2. *Comparison between the model with and without financial frictions (impact on capital)*

As for the impact of monetary policy, an increase in interest rates was intended to analyze the effect of increased business by monetary authorities because of inflationary pressures in 2008 and 2009. The standard DSGE model indicates that this increase in key interest rates results in a decrease of growth more or less low, which restores the balance in six quarters. Also, according to this model without friction, lower inflation during the same period to return to its equilibrium state. It is the same for other macroeconomic variables.

In contrast, the model with financial frictions and taking into account the dynamics of the financial system can provide an even finer and closer to what is happening analysis. In this sense, the rise in interest rates Director is able to reduce the investment for a long time and integrating persistence after the existence of financial intermediaries actively analyze the increase in terms of its impact on premium risk. In this context, the increase in premium income reduces the bank and bank asset risk, thereby to raise the demand of depositors in terms of rates payable. The decline in bank assets resulted in lower asset prices that lead to an even sharper decline in inflation. Similarly, the regression of assets reduces the corporate finance indicating a lower rate of return on capital.

Ultimately, the effects of monetary policy shocks, productivity and quality of capital are reduced using models not incorporating financial frictions and lead to decisions underestimating the role of financial intermediation in maintaining

equilibrium macroeconomic. Furthermore, the use of models with financial frictions is able to provide a more appropriate framework for analyzing and describing the best conditions the actual developments of macroeconomic and financial aggregates Moroccan.

Figure 3. *Comparison between the model with and without financial frictions (monetary policy shock)*

## 4.3. Effectiveness of unconventional policy in Morocco

In response to the consequences that could not be detected using the models presence in Morocco and who were mostly inspired by the new synthesis and real business cycle theory, the central bank has begun easing liquidity to achieve reverse the effects of the liquidity crisis following the decline of foreign exchange reserves. Like many central banks in emerging countries were forced to use the same approach to avoid a systemic liquidity crisis, the monetary authorities have responded actively using two approaches:

- An expansion of assets eligible for Euro system counterparties in open market;
- An extension of the duration of these operations to achieve long-term maturities of three months;
- A loans secured by corporate loans to banks (funding policy for lending scheme).

These measures were aimed at addressing the problem of liquidity and intervene directly in the balance sheets of banks in providing liquidity to be able to restart lending to businesses and especially those of small and medium size.

To verify the relevance of these actions taken by the monetary authority, the DSGE model described above is used. Indeed, the intervention of the central bank aims to strengthen banks' resources enabling them to increase their assets and allocate more credit. Thus, the effectiveness of liquidity easing measures should help revive credit, reducing the risk premium and reduce the pressure on lending rates. In this context, two models are in competition. This is the model with financial frictions to describe the effects of economic contractions and the model including the ability of the bank to respond with unconventional monetary policy.

Thus, shocks previously reported are shown for both models to examine the effectiveness of interventions by the central bank. The productivity shock of magnitude of 10% is calibrated with the intervention of the Central Bank calibrated to 8% of total bank assets. This unconventional reaction through an easing of liquidity resulted positively in reducing the magnitude of the decline in productivity. Thus, economic growth down 10% in the model without intervention, while in integrating unconventional policy, the latter is limited to half to a contraction of only 5%. In the same vein, the use of the relaxation of liquidity is able to limit the extent of the productivity shock by almost half and also helps to stabilize the risk premium actively influencing asset prices and rates income (generally long term).
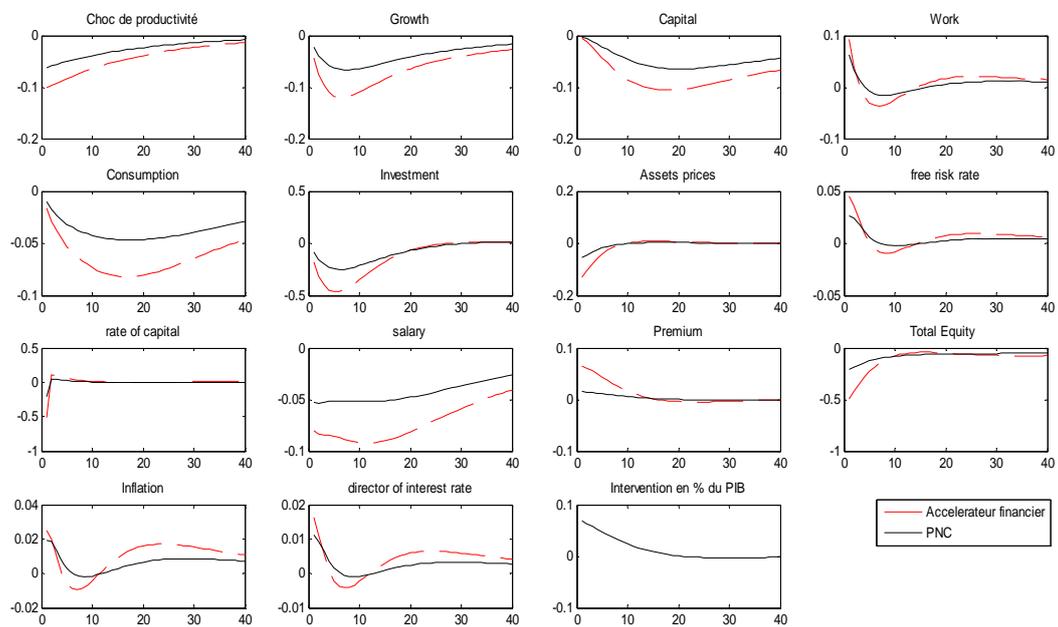
Figure 4. *Comparison between the model with and without unconventional interventions of the central bank (productivity shock)*

Similarly, the reaction of macroeconomic and financial aggregates experiencing decline in the quality of bank assets in the presence of a relaxation of liquidity is impaired. Thus, the reduction in the quality of banks' assets (which can lead to disinvestment "deleveraging") taking into account the intervention of the Central Bank can reduce the impact by restoring confidence in the banking assets. Indeed, the reactivity of the monetary authority is able to reduce the decline in asset prices by manipulating the expectations of economic agents (signaling channel). This will initiate the increase in risk premium and therefore its negative impact on investment and production. And also, these interventions have reduced the period of economic recession in facilitating economic recovery.

Thus, the positive effects of balance sheet policy can be summarized in their ability to restore confidence in the banking assets thereby restore confidence and limit the possibility of increased risk premiums negatively impacting the production, consumption and investment.
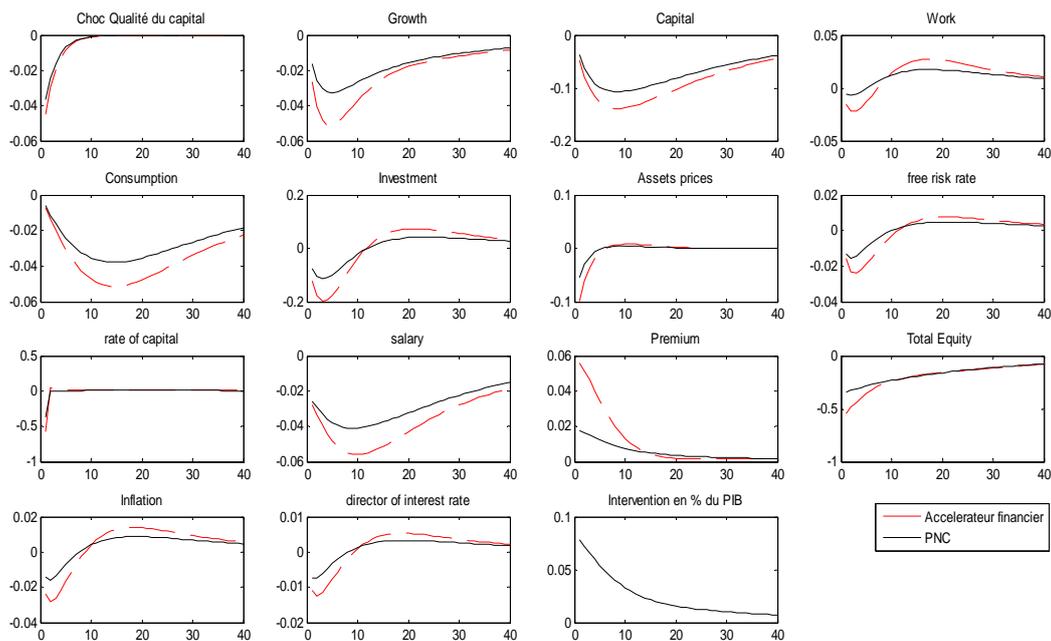
Figure 5. *Comparison between the model with and without unconventional interventions of the central bank (bank assets quality)*

Based on the results, we can say that the use of support measures by the monetary authorities to reduce the duration of the economic downturn and facilitate economic recovery in the best and faster way. Although these policies undertaken since the advent of the global financial crisis and particularly after its

transformation into economic crisis reduce liquidity risk and interest rate risk, however, their use should be more or less controlled. Thus, flooding the financial system of central liquidity can result in high inflation and fiscal slippage. In this sense, the monetary authorities will be required to use a more active policy of communication assuming a strong signal to the market describing their future intentions. In this sense, their intervention should be conditional on an inflation target to tolerate or achieve sales growth to allow anchoring agents' expectations and avoid deforming the budget deficit. Indeed, the actions of the monetary authorities may tax costs to consider; especially the increase in liquidity in the different compartments of capital markets can encourage fiscal authorities to keep an accommodative policy in terms of debt.

5. Conclusion

In response to the international financial crisis, central banks have taken steps to limit the same liquidity problems and help revive the economy. Thus, unconventional policies were undertaken in order to reduce the risk premiums on the types of assets and allowing private agents to rebalance their balance sheets and settle transactions on assets other than government bonds.

The actions of central banks have focused on their balance sheets and referred to allocate sufficient liquidity to banks to enable them to restart lending to businesses and households. This policy generally carried out in situations of close to zero, trying to meet two main objectives. First, reduce the duration of the economic recession and then send to mitigate these effects in different markets and economic and financial agents.

Morocco is affected by the effects of the economic and financial crisis in Europe, was quick to accuse liquidity problems at its various markets. To this end, several measures have been taken up to ease the conditions of eligibility of collateral repo the granting of long-term funding to finance companies.

Although these measures are very recent, an assessment of their effectiveness and relevance is needed. In this context, we have developed in this paper a general equilibrium macroeconomic model to simulate the impact of these measures on macroeconomic and financial conditions. The particularity of this model is that it includes most of the nominal and real rigidities, financial frictions based essentially BGG financial accelerator (1999, 2001). The model also includes the possibility that the monetary authorities intervene directly in the balance sheets of commercial banks in financing part of their assets.

Through the inclusion of interventions by the central bank, a comparison was made. This is to compare two macro-financial environments. The first considers

the absence of a proactive policy of the monetary authorities, while the second considers a passive situation where the central bank is neutral and only uses its key rate in a conventional rule.

The simulation results clearly show that monetary policy actions at the balance sheets of commercial banks (liquidity refinancing) had positive effects on macroeconomic and financial conditions. Thus, the use of a policy review by the central bank helped initiate the economic recession and reduce its duration and to give more impetus to the economic recovery. We conclude that the absence of such interventions, the banking sector and key macroeconomic indicators, including bank lending and economic growth, reportedly accused of a serious problem to threaten macroeconomic and financial stability.

Notes

(1) The credit channel example is ineffective in situations of recession due particularly to losses in the banking system, the blocking of transactions in the interbank market, deteriorating economic conditions and consequently a loss of confidence future prospects and increasing uncertainty and risk premiums.

(2) The interest rate channel may be blocked in two cases: firstly, when the policy rate reaches zero and can not fall, a situation particularly onerous if the expected inflation is negative and a second time when it may be impossible for the central bank to use the channel of interest rates when the economy falls into a situation of liquidity trap.

(3) According to Borio (2010) intervention in the foreign exchange market is an unconventional policy (balance) used by several central banks whose use does not cause a deviation from the target interest rate despite extensions of the central bank balance sheet using (see the experiences of Korea, Thailand and China).

(4) The Federal Reserve has established swap transactions with foreign central banks of Brazil, Korea, Mexico, Singapore and both with 10 developed countries, while the European Central Bank and the Swiss Bank provided the euro in Hungary and Poland. These swaps have facilitated the implementation of measures to relax exchange and helped to improve the liquidity in emerging markets.

(5) $E\beta(R_{t+1}^k - R_{t+1}) > 0$. In the particular case of a perfect market (no imperfection) the risk premium is canceled and the reason for financial intermediaries is dissolved.

(6) In the absence of market failure, banks will be encouraged to increase their assets by distributing funds until the rate of return is equalized with the deposit rates and tend therefore to v 0. In this situation the bank is characterized by a maximum mass where any increase in assets is reflected by more substantial profits. In other words, it becomes indifferent with respect to new investment projects.

(7) A basic assumption is to consider that the prices between the two asset types are similar.

(8) In other words, this policy is to consider that the government issued bonds to be purchased by households and the resulting liquidity will be used to finance investment projects.

(9) The parameter Λ_t is integrated to provide endogenous fluctuations in the amount of capital used by companies to describe the effects of the phenomena of credit rationing.

(10) We define the mark-up as the inverse of the marginal cost.

[11] Le taux d'intérêt est en relation avec l'inflation selon la spécification classique de Fisher.
[12] High Commission for Planning
[13] In case of lower profitability of capital, the contractor is no longer prompted to resort to external financing and at the same time the bank will impose an opportunity cost even more important (Bernanke et al. (1999, 2000).

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