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Impact of Liquidity Level on the Monetary Policy Transmission Effectiveness of the Moroccan Central Bank (Bank Al Maghrib)

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ABSTRACT: In the context of international financial crisis, this paper aims to analyze the impact of the liquidity level on the monetary policy transmission effectiveness of the Moroccan Central Bank (Bank Al Maghrib, BAM). After a long period of liquidity excess, the Moroccan banking system through, since 2007, a liquidity shortage that forces BAM to inject a regular and massive quantity of liquidity. Thus, to evaluate the influence of liquidity level on the monetary policy transmission effectiveness of Bank Al Maghrib, we apply a VAR modeling over the period 1998-2012, by distinguishing the period of liquidity excess and liquidity shortage and using two types of liquidity indicators. Our results show that in an excess liquidity period the monetary policy transmission would be less efficient, especially in the longer term. Instead, a liquidity shortage situation makes it more effective.

Keywords: Monetary Policy Transmission; Liquidity; VAR modeling.
JEL Classifications: C5; E5

1. Introduction

This article aims to analyzing the impact of change in the liquidity level variation on the monetary policy transmission efficiency of Bank Al Maghrib (BAM), the Central Bank of Morocco. Indeed, after a long period characterized by an excess liquidity, the Moroccan banking system through, since 2007, a liquidity shortage period that forces the central bank (Bank Al Maghrib) to conduct massive and regular injections of liquidity. This liquidity shortage is mainly due to the lack of foreign exchange reserves subsequent to the degradation of the Moroccan balance trade, compounded by the recession in Europe and the world.

The BAM activism falls within the international financial crisis. This exceptional situation has led central banks in developed countries such as the Fed, the ECB and the Bank of England to adopt unconventional expansionary monetary policy called "quantitative easing" by providing enormous liquidity to international banks by making redemptions securities in the financial markets.

Theoretically, the liquidity injections by the central bank in the banking system across money creation, is likely to affect the real economy through changes in prices and the trajectory of economic growth. In fact, the quantitative theory of money assuming steady speed of circulation of money tries to show the existence of a direct relationship between monetary liquidity and prices trends.

In this framework, our study is structured in two parts. In the first, we discuss briefly the theoretical foundations of the influence of the state of liquidity level (excess or deficit) on the implementation of monetary policy before reviewing the excess liquidity and deficiency situation. Our second part is devoted to the estimation of a simple VAR during the period 1998-2012. We will try to distinguish between periods of excess liquidity and shortage, to analyze their influence on the monetary policy transmission efficiency of the Moroccan central bank.

2. Definitions and Measurement Indicator of the Liquidity Level

The quantitative equation of money, developed by Fisher in 1912, still continues to provide the theoretical framework that measures the liquidity level in the economy: excess or shortage. Accepting the hypothesis of an adequate fit of the velocity of circulation of money to ensure the accounting identity, excess / lack of liquidity in the economy would be caused by excess / insufficiency of money supply compared to the volume of transactions in goods, services and financial assets.

Before turning to the question of measurement indicators, we explore briefly the liquidity concept.

2.1. Definitions of liquidity

Backs and Kramer (1999) propose two types of liquidity: market liquidity at the micro level and monetary liquidity to the macroeconomic framework. Market liquidity refers to the ease[1] in the settlement of securities transactions without incurring very high price fluctuations.

Monetary liquidity is defined in the macroeconomic context and is measured according to GDP and interest rates in the short term for example (Bastidon et al., 2012). Indeed, the monetary authorities adjust the liquidity through the injections and reversals on the money market depending on the situation of the credit market (Aglietta et al., 2012).

Excess or lack of monetary liquidity are measured within the quantitative theory of money, which suggests that money supply excess in comparison to its demand causes a rise in prices of goods, services and financial assets. As an extension of the Fisher equation, the monetarist insists since the 1970s that the money created by the banking system[2] during the distribution of credit to the economy, should not exceed the money demand. This last depends on economic cycles (Medhioub, 2007), but also on production, inflation and the differential interest rate between the short and the long term rates (Giese and Tuxen, 2007).

2.2. Liquidity measurement indicators

Excess or lack of liquidity is a normative notion that compares the money growth rate, expressed as a monetary aggregate, with some reference values related to the price stability objective of the monetary authorities. The difficulty to define the money growth rate consistent with the price stability objective (economic growth and employment for some central banks) resides in the existence of several indicators in the literature (Gerdesmeir and Polleit, 2005)[3]. Recall that, to monitor the progression of the money supply, Bank Al Maghrib has changed, temporarily and alternately since about two decades, his intermediate money target from M1 to M3.

Since 2001, the ECB has been using the gap between the M3 growth and an econometric estimation of equilibrium value. For the ECB, the nominal money gap, the real money gap and the monetary overhang variances[4] are likely to provide in the medium term signals for monitoring price stability.

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[1] This facility requires that the characteristics of immediacy, depth, breadth and resiliency are checked for financial markets.

[2] The banking system is defined in a broad sense: the central bank, banks, non-bank financial institutions are forced to manage the liquidity of households.

[3] These authors have proposed the price gap as indicator of variance between prices in the short and long term. When the current price level is very different from the long-term level, upward / downward expectations are formed on the level of future prices.

[4] The ECB sets the *nominal money gap* as a liquidity variance, existing at some point between the observed nominal stock of M3 and expected level of balance, the latter corresponds to a reference value of 4.5% , since December 1998, serving as reference year.

The *real money gap* is liquidity gap between the actual stock of real monetary aggregate (taking into account the price level) and an estimated equilibrium real level. The *monetary overhang* is defined as a difference between the nominal stock of a monetary aggregate and its estimated equilibrium as determined from actual production values and the short-term interest rate stock. This gap is expected to capture a momentary disruption of the money market, in particular macroeconomic conditions.

2.2.1. The money to GDP ratio indicator

Monetary liquidity gap indicators, measured by nominal money gap and the real money gap have the disadvantage of setting, somewhat arbitrary, the reference period to estimate the equilibrium level of the monetary aggregate nominal amount (Gouteron and Szpiro, 2005). This explains the fairly widespread use of money to GDP ratio. Central banks have often to use the report M2, M3 or M4 to GDP. They also calculate the deviation of this ratio from its trend determined by a Hodrick-Prescott (HP) filter.

2.2.2. Bank reserves and liquidity conditions

The reserve requirement level is also cited in the literature as an instrument to represent the banks liquidity level (excess / shortage). However, the reserve requirements optimal level compatible with a bank profitability target should be mentioned (Poole, 1968; Saxegaard, 2006). As a percentage of deposits, required reserves cannot be lent by banks to their customers. Among these reserves, a small part can be held in banks as free reserves, the other most important part, corresponding to a coefficient of regulatory minimum reserves requirement, must be entrusted to the domestic central bank. These reserves requirement intended to control bank liquidity may be the source of money creation characterizing a situation of excess or lack of liquidity and affecting shock, and therefore the establishment of monetary policy (Kamgna and Ndambendia, 2008).

2.3. The Excess Liquidity Impact on the Monetary Policy Efficiency

Excess liquidity situation can cause a loss on the monetary policy transmission efficiency to the real activity via the interest rate, credit and other prices asset channels (exchange rate and stocks prices in particular). According to the quantitative money theory, a money supply excess compared to the economy's need funding could raise prices and thus reducing the monetary policy effectiveness.

J. Tobin (1969) and F. Modigliani (1986) analysis are an illustration of this finding. Indeed, following a monetary easing or excess liquidity, the stock prices could appreciates, thereby increasing the wealth of firms and households. Accordingly banks lend them easily and at very favorable conditions. Reassured, these agents increase their spending (investment and consumption). The same reasoning can be applied to real estate prices, but this time with a more comforting effect on banks' balance sheets.

In the same context Cao et al. (2008) show that the availability of liquidity encourages banks to take excessive risks (bubbles) in the downstream to be bailed out in a crisis (Jim Gregory Armstrong and Caldwell, 2008). Excess liquidity can therefore lead to the formation of real estate and financial bubbles whose explosion is always disastrous for the economy.

Empirically, Gouteron and Szpiro (2005) found that excess liquidity does not allow explaining the prices asset variation. That is, excess liquidity complicates the task of the central bank, as on the one hand, it cannot predict or judge the formation of bubbles (Mishkin, 2008). Hence changes in prices asset may affect the monetary policy transmission.

Similarly, the use of the reserve requirement as excess liquidity indicator reveals its direct influences on the bank liquidity demand and the money creation. The unpaid reserves requirement imposed to commercial banks enables to raise the cost of their resources and reduce the credit supply to the economy. It is well established that the liquidity level (excess or shortage) complicates the implementation of monetary policy based on interest rates and reserve requirements instrument in developing countries such as Morocco.

Artus and Virard (2010) questioned the consequences on the liquidity of expansionary monetary policies, conducted by major central banks (FED, ECB and Bank of England, in particular) since the financial subprime crisis: "the size of the global liquidity has become such that if it is used again to buy a risky asset, the price of it will indeed increase significantly. The explosion of bubbles formed accordingly might lead to the sustained deflation. In addition the excess liquidity decor relates more and more financial markets to the real economy "(pages 46-47).

According to the same authors (Artus and Virard, 2010)) "That's why we notice cycles of asset prices that have less correlated with economic cycles, but more related to the interaction between excess liquidity and investors enthusiasms (or aversion observed risk). This disconnection between financial markets (prices asset) and the real economy is very worrying, since it means that asset prices

do not give reliable information about the situation in the real economy and reflect only the amount of liquidity and often mimics investor behavior" (Pp 48).

2.4. The Liquidity Shortage Impact on Monetary Policy Transmission

Theoretically a liquidity crisis occurs when a bank (economic operator) has a plan of action but cannot achieve it due to shortage of liquidity. So there can be several concepts of liquidity shortage because a company which cannot borrow from banks must and/or can be financed directly in the market by issuing securities. But Kahn and Wagner (2010) argue that the effect and weight of the liquidity shortage depend on the size of the banking system, the ability of stakeholders to procure external liquidity and on their long or short memory[5].

The analysis of liquidity risk in banks invites us to cite Goodhart (2008) who advances that "Liquidity and solvency are the two pillars of banking, often indistinguishable from each other. An illiquid bank can rapidly become insolvent, and vice versa "(page 41). Similarly, Douglas and Raghuram (2003) conducted an analysis of banking crises, solvency and liquidity shortage, and concluded that the bank contagion is a major risk because it can lead to a general failure and thus a liquidity crunch because of the structure and interconnection of the financial system. This systemic risk complicates the task of the central bank and compromises the monetary policy transmission.

As viewed from the side of the market information, Stiglitz (1981) emphasizes the role of financial market imperfections in the occurrence of credit rationing fearing the risk of illiquidity and insolvency of borrowers. Investors on their part, more suspicious, withdraw their deposits and aggravate the liquidity crisis.

This rationality reduces the resources of banks and makes the maturity transformation, main mission of banks, very difficult and risky. Financial institutions, therefore, work in priority to secure their own refinancing and prefer to have cash to meet their commitments rather than lending and take the risk of insolvency of the counterparty. Banks can therefore be brought to "cut credit flowing ", raise interest rates and tighten their financing conditions. This kind of situation amplifies the restrictive effects on the distribution of credit and the financing of the economy and can greatly affect the monetary policy transmission by altering the functioning of the credit channel.

In support of this observation Loisel and Mesonnier (2009) argues that the propagation of the *Subprime* crisis in 2007 disturbed the monetary policy transmission process, because it has negatively affected the balance sheets of banks and caused a rise in risk premium due to the climate of mistrust that is installed despite interest rate cuts by central banks. This chaining effect reinforces the pessimistic expectations and brakes investment decisions and consumption and therefore reduces aggregate demand.

In the same analysis, Douglas and Raghuram (2010) argue that the frame lack of confidence or fear of the future grows economic agents to move away from assets, which lowers their course and may make them less liquid. This negatively behavior impacts on the wealth of economic agents forces them to reconsider their investment decisions and consumption. The effect of liquidity shortage on the transmission passes here by the credit and the asset price channel.

The liquidity level is very critical for the behavior of financial institutions and the action of the central bank. It strongly affects the monetary policy transmission and financial stability conditions. That is why during liquidity crises, the central bank is obliged more than ever to fulfill its role as lender at last resort and to multiply its interventions with greater flexibility (De Bandt and Pfister, 2004). In practice, the central bank provides liquidity in normal times and in financial crisis because markets need its funding to function normally (De Bandt and Pfister, 2004). These liquidity injections allow banks to continue to operate and avoid a systemic crisis that is likely to collapse the entire system by "domino effect".

In reaction to the liquidity shortage and to manage better the commercial banks liquidity, all central banks, such as BAM, should take measures like major international central banks that have been very responsive by lowering their key interest rates to levels near zero (Shigenori, 2010). Except that, the interest rate cannot decrease infinitely (Loisel and Mesonnier, 2009), hence depriving the central bank to continue to operate its main short-term interest rates. It is forced to take

[5]Their capacity to remember and learn from the old liquidity crisis.

unconventional measures (Bernanke et al., 2004). As an illustration the major international central banks have started to provide emergency liquidity (De Bandt and Pfister, 2004.). For example the Fed injects huge of liquidity through its quantitative easing program (QE), the ECB for its part has adopted a Long Term Refinancing Operation (LTRO)[6].

In questioning the value of the intervention of the central bank and relying on the Keynesian affirmation arguing that if the money supply increases, the interest rates could drop. Bottomley (1966) argues that in addition to the reward for the renunciation of liquidity, administrative costs and effects of monopoly are also important in determining the interest rate in developing countries. Thus any discussion about this issue in this countries requires more precautions and to take into account the specificities of their financial systems.

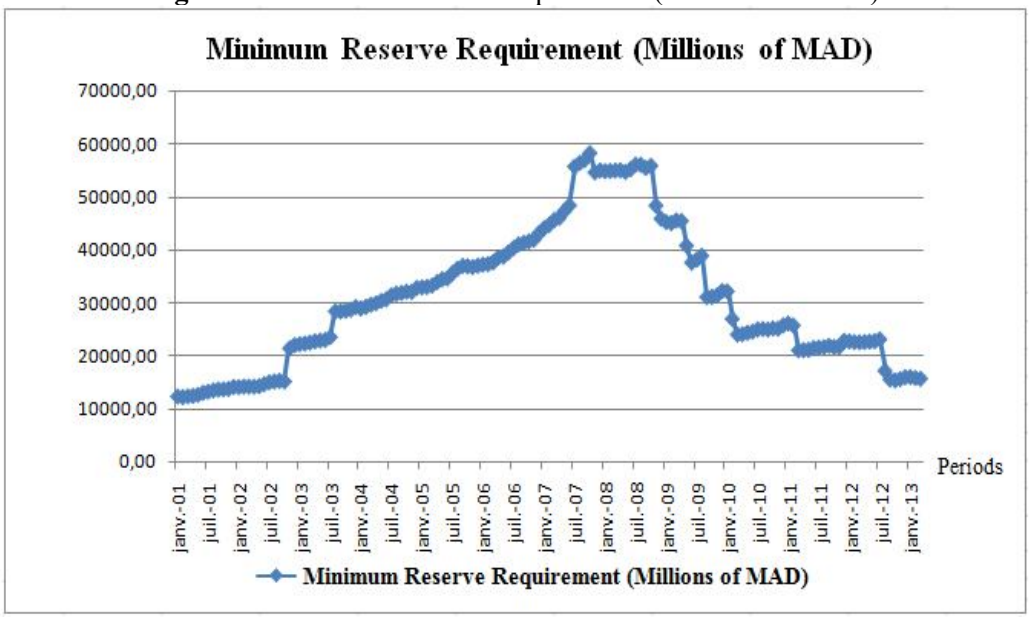
This literature survey shows that the liquidity level affects the transmission and influences the central bank action. The impact of liquidity level on monetary policy transmission passes primarily through the traditional transmission channels, namely those of interest rates, credit and asset prices.

3. Empirical Study

3.1. Liquidity and the monetary policy implementation in Morocco

To investigate the liquidity level impact on the monetary policy transmission over the period 1998-2012, we examined the evolution of liquidity during this period. We first had to define the liquidity measure to adopt. Two indicators were chosen. The amounts of the minimum reserve requirement (MRR) and the liquidity of the economy (LECO), calculated by the ratio M3/GDP[7]. BAM retains M3 as monetary aggregate as an intermediate target of monetary policy transmission[8].

Figure 1. Minimum Reserve Requirement (Millions of MAD)



[6] LTRO (*long term refinancing operations*) operation of the ECB. The Federal Reserve conducts his QE (*quantitative easing*) and *Twist* operations to reduce long-term rates in the federal debt. For more information about the Twist program http://www.federalreserve.gov/faqs/money_15070.htm.

[7] Represents the inverse of the velocity of money circulation (Coutière et al., 1976).

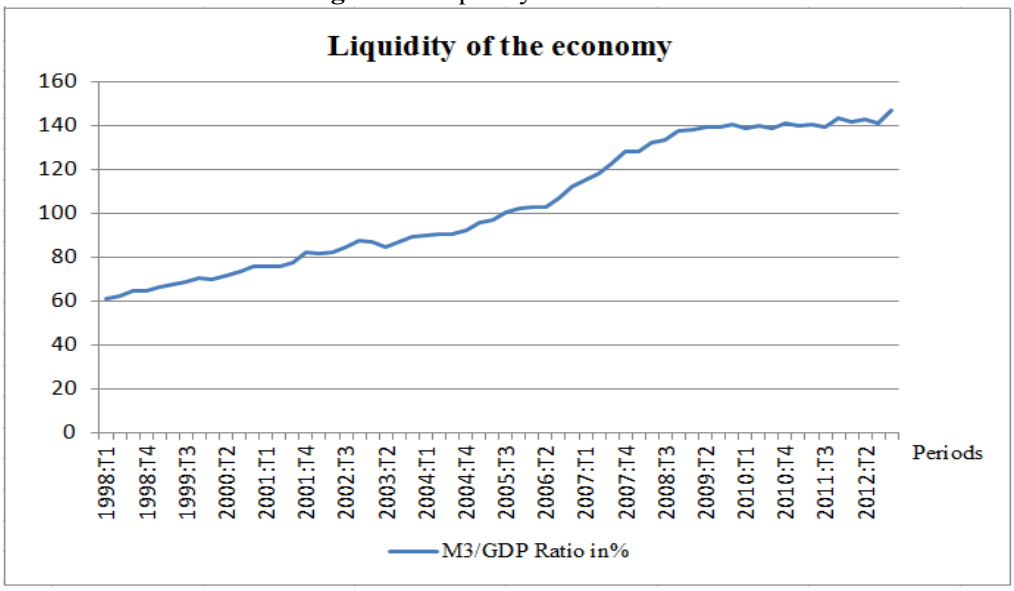
To calculate the ratio we apply the same methodology as Gouteron Szpiro (2005) and Sheikh HM., (2013), that is in other words $M3_t$ / (GDP_t GDP_{t-1} + GDP_{t-2} GDP_{t-3}) .

[8] M3 is used in Morocco since 2006 and before 1999 as the largest monetary aggregate (BAM Annual Report 2007).

The analysis of the amounts of reserves requirement (Figure 1) shows clearly two periods, separated by a landing from July 2007 to January 2009[9]. The first (2001/June-January 2007) is characterized by an increase in the amounts combined with increase in the reserve requirement rate decided by BAM to reduce the level of liquidity in the interbank market. The second period (January 2009-January 2013) is marked by a drying up of liquidity, illustrated by the dramatic decline in the amounts of minimum reserves lodged at BAM.

Although the liquidity evolution in the economy (Figure 2) has undergone a smaller increase, since 2008, before a stabilization in subsequent years.

Figure 2. Liquidity ratio M3/GDP



Over the period 1998-2007 we find that M3 growth is much higher than that of GDP. Then M3 growth is reduced, we conclude that the slowdown in liquidity of the economy is rather explained by the more pronounced decrease in M3 growth in comparison to the GDP growth since 2007 (table 1).

Table 1. Growth rate of M3 and GDP (%)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
M3	6	10,2	8,6	17	10,2	8,1	8,3	14,3	18,2	17,4	13,5	7	4,1	6,5	5,2
GDP	7,7	0,5	1,6	7,6	3,3	6,3	4,8	3	7,8	2,7	5,6	4,8	3,7	4,9	2,7

Source: BAM and HCP (High Commission for Plan) reports.

Analysis of liquidity factors indicates that they have played a crucial role in the installation of excess liquidity. Indeed privatizations[10] have generated to the Moroccan State 23 345 Millions of Moroccan Dirham (MAD) in 2001, 14 145 millions MAD in 2003 and only 70 millions MAD in 2011. This shows that privatization revenues, whether internal or external, have fueled massive liquidity, almost only, during the first period (1999:8-2007:2).

The part of expenditure investment on GDP, representing the role of the Treasury reached 6.3% of GDP, its highest level in 2009[11], before beginning a decrease in the subsequent years. This

[9] This period can be interpreted as a transition or delay before that the Moroccan economy was affected by the financial crisis in late 2007.

[10] http://www.finances.gov.ma/docs_internet/esp_doc/2012/depp/7426_recettesprivat_plf2012fr.pdf.

[11] http://www.finances.gov.ma/portal/page?_pageid=53,17813790&_dad=portal&_schema=PORTAL.

reflects the efforts undertaken by Morocco to reduce the public deficit. Regarding external factors, the level of net international reserves shows declining in capacity of imports coverage in the second period. It is on average, about 6 months in the second period against 9 months ago[12].

For their part the foreign direct investment also recorded a decline during the second period. They reached 26 billion MAD in 2011 after the peak of 36 billion MAD in 2007[13].

The transfer of Moroccans living abroad for their part experienced stabilization in 2011 and 2012 after a strong increase between 2000 and 2007. They went from 23 billion MAD in 2000 to 55 billion MAD in 2007 and stabilize at more than 50 billion MAD afterwards[14]. In addition to this, capital outflows which should logically influence the liquidity level and foreign assets, especially after the partial opening of the capital account for Moroccan institutional investors and the relaxation of capital outflows to individuals[15].

The combination of all these factors, along with others, can help to understand the evolution of the liquidity position in the Moroccan economy between 1998 and late 2012. From this analysis and referring to the communication of Bank Al Maghrib (BAM), it is clear that the period can be separated into two parts. The first, from 1998:1 to 2007:2, is characterized by excess liquidity, while the second, between 2007:3 and 2012:4, is marked by a lack and even liquidity shortage.

As part of its prerogatives, Bank Al Maghrib conducts monetary policy by influencing liquidity by relying on various tools:

The injection liquidity channels: on the one hand, the call for tender for the 7-day advances initiated by BAM. Their rate is the director interest rate of the monetary policy. On the other hand, permanent credit facilities during 24 hours can be initiated by banks. The rate of these facilities serves as the corridor ceiling rate limiting fluctuations of the interbank rate.

The withdrawals liquidity channels: they are the 7-day liquidity withdrawals on BAM initiative, and deposit facilities which the rate represents the lower limit of the overnight rate corridor.

The fine-tuning operations: these operations are promptly carried out by the central bank to mitigate the effects of unexpected fluctuations in bank liquidity on interest rates. These processes take the form of temporary or farms acquisitions or divestments of Treasury bills (Open Market). And may also be Swaps operations.

The minimum reserve requirement: the amount of the account holdings that banks are required to maintain at the Bank Al Maghrib.

BAM has also features a tool to issue and redeem its own shares to control the liquidity level.

3.2. Estimation and results of the VAR models

We adopted two approaches to measure liquidity. The first is based on the liquidity of the economy (LECO), while the second employs the amount of minimum reserve requirement[16] (MRR). In addition to these two variables on which we bring innovations[17] (shocks), we use the interbank rate (INTERATE) as a monetary policy instrument proxy; the consumer prices index (CPI) and GDP as target variables, even if BAM is clearly focused on price stability as a priority[18].

Our database is quarterly and covers the period 1998-2012. It is issued from the annual reports of BAM, High Commission for Plan (HCP) and the Office of exchange (OC). The statistics and data

[12] BAM annual reports from 2000 to 2012.

[13] BAM annual report of 2007.

[14] Reports of the Office of exchange available on the website: www.oc.gov.ma

[15] For example: the Moroccan office of Exchange proceeded to increase the amount of investment of Moroccan enterprises abroad (30 millions MAD to 100 Millions MAD in Africa), and the increase in tourism allocation of 20 000 MAD to 40 000 MAD. For more details see the website of the Office http://www.oc.gov.ma/portal/

[16] The nature of the reserves held by the central bank may be free (at the choice of banks) or obligatory (the conditions and amounts are imposed by the regulatory authority).

[17] The variation of the MRR can be derived from a rate of change as / or variation of liquidity. In this study, the impact on the reserve requirement rather reflects an increase in liquidity.

[18] BAM declared also work for a stable and sustained economic growth (price stability is a prerequisite for stable and sustained growth economic growth).

that have an international character are obtained from the International Monetary Fund (IMF) and World Bank (WB).

After verification of the technical requirements[19] for a simple VAR modeling[20], we estimated two groups of models[21]. Both contain an indicator of liquidity (MRR or LECO), the interbank interest rate, GDP and consumer prices index (CPI). Series are ordered from the most to the least exogenous[22]. Liquidity indicator is placed in the first place, followed by the interbank rate, GDP and prices index at the end.

The analysis of the Impulse Response Functions (IRFs)[23] and the Forecast Error Variance Decomposition (FEVD)[24], reported in the appendix, have allowed us to summarize and synthesize the results in the following tables. Therefore, tables 2 and 3 summarize the technical specifications and the results of each model.

Table 2. Approach based on the M3/GDP ratio

VARs Models	Results of shocks on the liquidity ratio
Model 1 INTERATE, LLECO, LGDP, LCPI. 1998:1 - 2012:4 Lags (1).	→ Increase of the interbank rate (not as expected). → Lowers activity (not as expected) and causes higher prices, the rise in prices, before they stabilize subsequently (low magnitude). → GDP depends more on the interbank rate (7.2%) and liquidity (4.3%). → Prices (CPI) depend on the liquidity and interbank interest rate around 2%. → The interbank rate seems to depend very low on liquidity (1.9%), it is explained mainly by its own innovations.
Model 1.1 INTERATE, LLECO, LGDP, LCPI. 1998:1 - 2007:2 Liquidity excess Lags (1)	→ Increase the interbank rate over a short period (disappearance of the reaction after 2 quarters). → Short and meaningful drop of activity, followed by a slight increase before amortising at the end of the 3rd quarter. The prices reaction is negative but insignificant. → GDP is explained around 14% by liquidity and 11% by the interbank interest rate. → The prices depend mainly on the interbank interest rates than on the liquidity (8% against 0.6%). → The share of interbank rate explained by the liquidity is negligible (1.6%).
Model 1.2 INTERATE, LLECO, LGDP, LCPI. 2007:3 - 2012:4 Liquidity shortage Lags (1)	→ Positive reaction of the interbank rate over 2 quarters, before falling more slowly in negative territory and exhaustion on the 4 quarter. → Very short increase (1 quarter) of GDP. Prices rise in Q1 and decrease thereafter until disappearance of the effect in the fourth quarter. → GDP largely explained by the interbank rate (average 24%) than by liquidity (3%). → Prices are explained more by the interbank rate (13%) than by liquidity (6%). → The share of interbank rate explained by the liquidity is negligible (1.3%).

[19] The series are expressed in logarithms except the interbank interest rate (INTERATE). Series that are integrated have been transformed on stationary series (see Tables of stochastic properties of the series in the Appendix Figure VII).

[20] For more details, see Sims (1980), and Mignon and Lardic (2002).

[21] Estimates are made using the Eviews 5 software.

[22] Based on the VAR methodology and like Goux (2003), Endut et al. (2009) and Allegret et al. (2007), we used the hypothesis which states that the first variable is influenced only by its own shock, the second by its own shocks and those of the first as so on.

[23] Appendix Figure VIII. a and VIII. b.

[24] Appendix table VI.

Table 3. Approach based on the Reserve Requirement

VARs Models	Results of shocks on minimum reserve requirement
Model 2 INTERATE, LMRR, LGDP, LCPI 1998:1 - 2012:4 Lags (1)	→ Positive reaction of the interbank rate, it depreciated gradually after the third quarter. → Decrease of GDP in the first quarter followed by a depreciation. Prices rise and stabilize gradually after the 7th quarter. → GDP depends on the interbank interest rate (6.4%) than on the liquidity (4%) → Prices depend on the interbank rate in the short-term and on the liquidity on the long-term. → The share of interbank rate explained by the liquidity is very low (2.7%).
Model 2.1 INTERATE, LMRR, LGDP, LCPI 1998:1- 2007:2 Liquidity excess Lags (1)	→ Positive response of the interbank rates, the impact decreases and disappears gradually after 2 quarters. → GDP reacts negatively, rising again before the effect was wasted. → very slightly negative price reaction, converging to zero. → GDP and prices depend more on the interbank rate than on the liquidity shortage with clearly pronounced effect for prices. → The interbank interest rate depends very low on liquidity (only 0.4%).
Model 2.2 INTERATE, LMRR, LGDP, LCPI 2007:3 - 2012:4 Liquidity shortage Lags (1)	→ interbank rate increases on the first two quarters, before the gradual depletion of the effect. → Strong decline in GDP and stabilization of its negative reaction. → Slight increase and stabilization of prices. → GDP depends on the interbank rate mainly in the short term and on the liquidity in the long-term. → Prices depend on the interbank rate mainly in the short term but and on the liquidity in the long-term. → The interbank interest rate depends very low on liquidity (only 0.4%).

3.3. Results Analysis

The interbank rate reacts to the liquidity increase in both approaches along the study period. In excess liquidity situation, this effect is bullish, which is contrary to expectations and difficult to explain. This result may depend on the configuration of the Moroccan interbank market, where the interbank interest rate may be determined by other factors, probably different from liquidity (Bottomley, 1966).

When the market is crossing a liquidity shortage, interest rate is rising early but is decreasing at the end. This is due to the transmission delay and the time it takes for economic agents to adapt their behavior[25]. They remember the shortage and take time before realizing the impact of the liquidity increasing. These outcomes announce the existence of a weak and slow monetary policy transmission due to disturbances of the liquidity level.

For the target variables, our estimate shows that over the entire period, the interbank rate influences the GDP while prices depend jointly on the liquidity and the monetary policy. The liquidity impact on the prices is not obvious. This is confirmed in the model including the amounts of the minimum reserve requirement (LMRR) because the interbank rate seems to determine the target variables only in the short term, while the effect of liquidity would be dominant in the long term. This result is corroborated by the findings of Moumni and Dasser (2011).

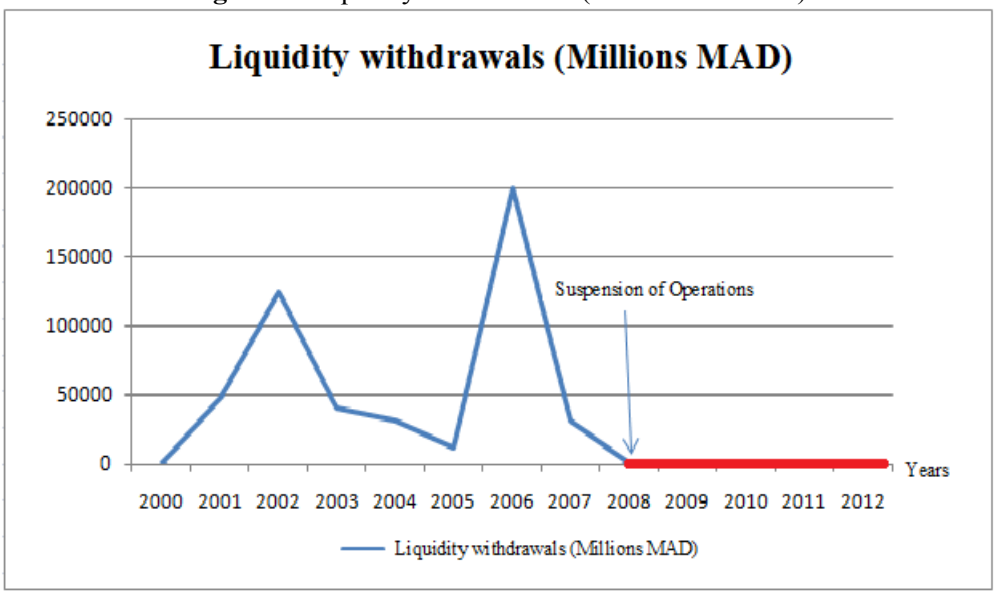
The cutting of the study period shows that prices depend more on the monetary policy, despite the context of an excess liquidity, while economic activity (GDP) is more sensitive to liquidity level and monetary policy conditions.

In times of liquidity surplus we could expect an increase in bank lending and thus inflationary pressures, but the empirical study reveals that prices are content and more dependent on the decisions of the central bank. This relative efficiency of monetary policy transmission under structural excess

[25] It is assumed that expectations are not sufficiently developed and the actions of the agents are not anchored on the decisions of the BAM. In Morocco, economic agents are low-skilled, BAM is building its reputation and educate agents.

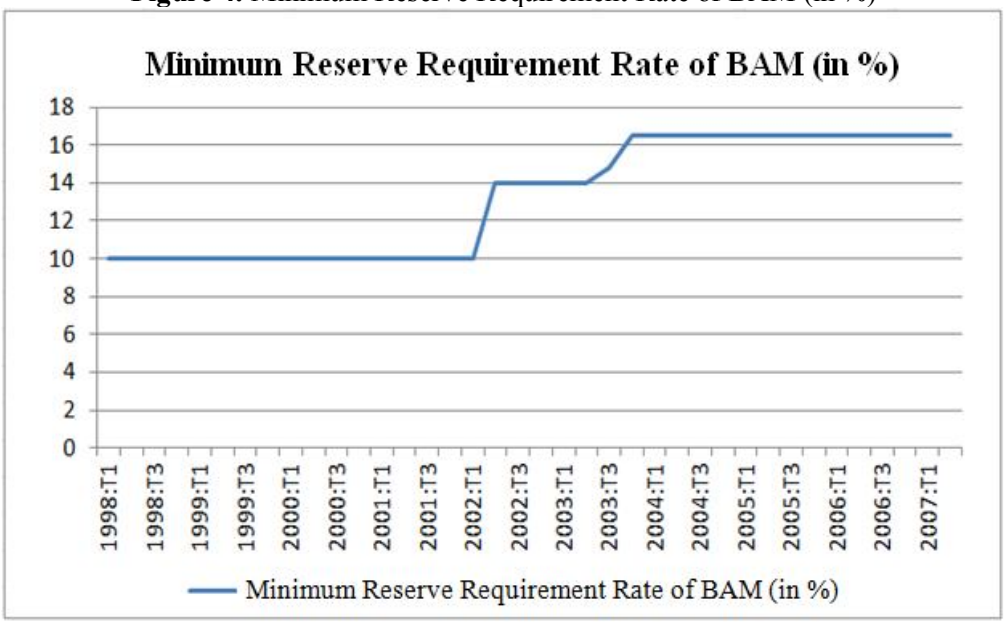
liquidity is explained by the Bank Al Maghrib activism over this period. The monetary institution developed a device liquidity withdrawals which allowed him to puncture weekly large volumes of liquidity[26] between 1998 and the second quarter of 2007; these operations were significantly reduced until they stop at the beginning of 2008 (figure 3).

Figure 3. Liquidity Withdrawals (Millions of MAD)



In the same line of action, BAM has increased at several times, the reserve requirement rate. Figure 4 shows as well as the rate increased from 10% in early 1998 to 16.5% between the second quarter of 2003 and the second quarter of 2007. This relatively high rate attests the importance of the structural excess liquidity phenomenon in Morocco.

Figure 4. Minimum Reserve Requirement Rate of BAM (in %)



[26] A record of 200 000 MAD was reached in 2006.

The transmission capacity of monetary policy in times of excess liquidity can also be explained by the oligopolistic nature of the Moroccan banking system. For example the concentrated nature of the Moroccan banking market allows to the five first banks[27] to dominate the credit market. They distributed more than the half of the credits in 2002, and their share is constantly increasing, it even reached 81% in 2012 (Table 4). This situation does not allow providing a competitive climate binding rates change to the market conditions.

Table 4. The Moroccan banking market characteristics.

Years / Characteristics	2002	2004	2006	2008	2010	2012
Number of banks	21	17	16	18	19	19
The share of the top 5 in the market credit (in %)	60,4	71	76	80	81	81

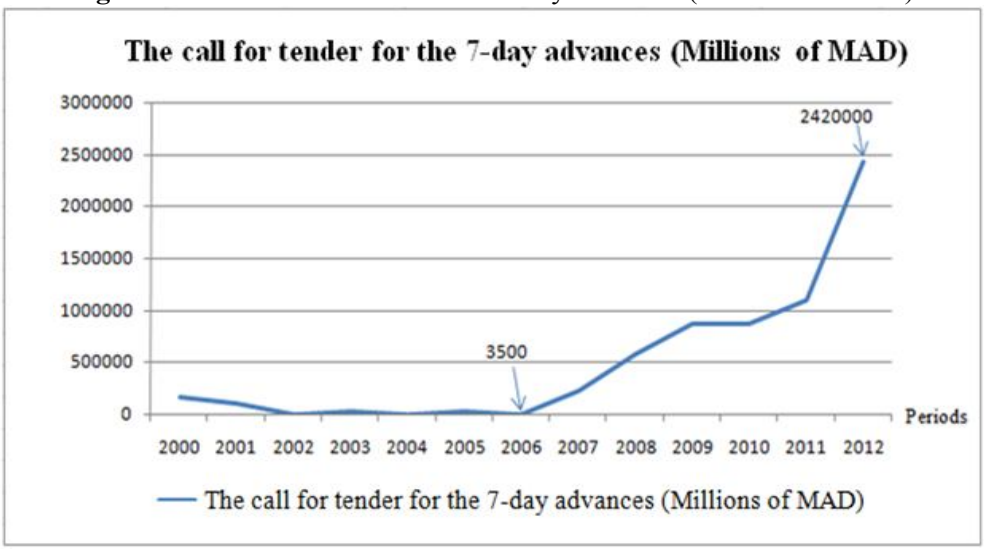
Source: Annual Reports of the DSB (the direction of Banking Supervisors).

During the liquidity shortage period, the monetary policy transmission seems to be improving in the case of the first approach (ratio M3/GDP). While it is efficient only in the short term in the second case (LMRR). In the long term, the liquidity level seems to influence the prices and GDP responses, thus affect ultimately the monetary policy transmission.

As an explanation, the decrease of the liquidity level has allowed the central bank to regain control of the money market through various monetary operations. In other words, the liquidity crunch has forced banks, the main vector for the monetary policy transmission, to refinance them at the central bank and get the cash they need to meet their commitments. This process allows the interest rate and the credit channels to become more operational.

In this regard the call for tender for the 7-day advances recorded unprecedented growth, from 3.5 billion MAD in 2006 to 2 420 billion MAD in 2012, so a multiplication by about 691 times, after a quasi-abstention during the excess liquidity period (from 2000 to 2007) (Figure 5 and table 5). It should also be noted that the weekly average amount of BAM interventions has increased by about 11 times during the liquidity shortage (2007-2012).

Figure 5. The call for tender for the 7-day advances (Millions of MAD)



[27] Attijariwafa bank, Popular Bank of Morocco (BPM), BMCE Bank, Moroccan Society General banks (MSGB) and Moroccan Bank for Trade and Industry (MBTI). Source: http://economie.jeuneafrique.com classification (2011).

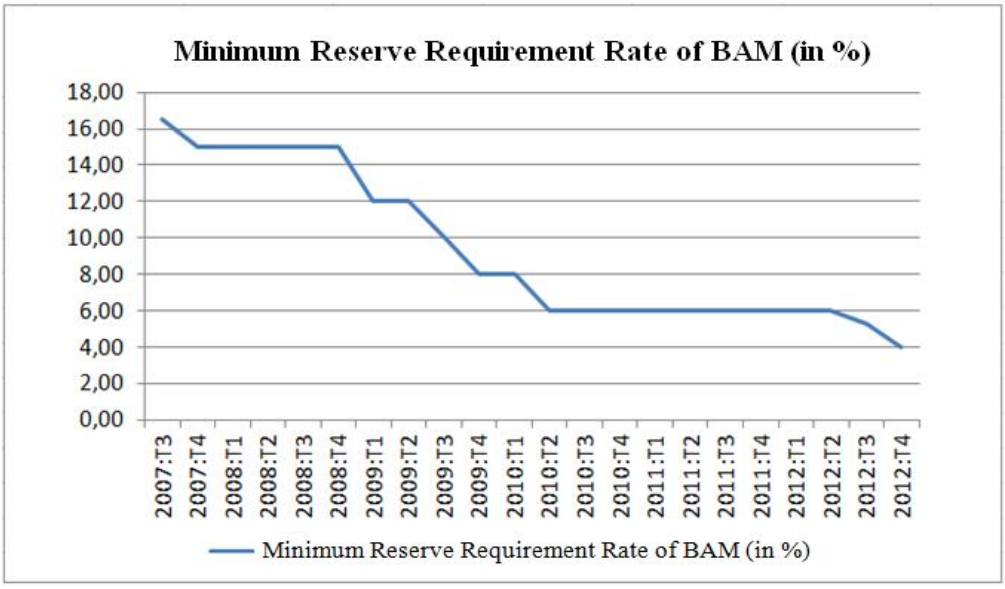
Table 5. Annual Intervention Frequency of BAM

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Number of interventions	54*	24	0	16	0	11	2	37	50	51	52	52	52
Weekly Interventins Average (Millions MAD)	3016	2040	0	575	0	509	66	**4240**	**11012**	**16569**	**16705**	**21212**	**46538**

*Although the number of intervention is comparable to that of recent years, the annual injection amount was only 162 billion MAD.
This frequency interventions is due to strained bank liquidity, due to the effect of foreign exchange outflows and the expansion of banknote circulation (BAM report 2000 page 80)

To suit to the liquidity lack in the Moroccan interbank market, BAM has reduced the reserve requirement rate repeatedly bringing it from 16.5% in 2007 to 4% in late 2012 (figure 6).

Figure 6. Minimum Reserve Requirement Rate of BAM (in %)



In line with the Bernanke et al. (2004) recommendations, BAM expands the eligible collateral to monetary policy operations to the deposit and effects certificates representatives of the private claims of small and micro businesses (BAM annual report of 2012). It has also elaborate at the end of 2012 a circular adopting the Liquidity Coverage Ratio (LCR) of Basel III, which requires banks to hold liquid assets of high quality and unencumbered to face any net outflows liquidity[28].

In times of liquidity shortage, Moroccan banks tend to include, more and more, the central bank decisions under the conditions applied to their clients. Accordingly, the interest rate has become less rigid, it increases more easily. Only the degree of impact depends on the banks size, the level of their own funds and on the economic conditions that can inspire trust or distrust (Kahn and Wagner, 2010).

During the liquidity shortage period BAM intervenes less by the monetary policy interest rate[29], while other central banks have declined their monetary policy rates to levels virtually nil to avoid the negative effects of the liquidity shortage and revive the economy. This strategy board of Bank Al Maghrib is difficult to justify, especially with an annual inflation average closer to 1.5% in

[28] For more details see pages 23 and 24 of the 2012 Annual Report of the BSD (Banking Supervision Direction) in BAM.

[29] The monetary policy interest rate of the BAM decreased from 6.5% in 1998 to 3.25% on the period from 2008 to 2011 and 3% in 2012.

the first study period and 1.65% for the second[30]. The desire to support savings and attract deposits is not convincing either, because the majority of deposits in banks are not remunerated. They represent above 50% of the total deposits over the period 2000-2012, it has reached a record of 60% in 2005[31]. In the same reasoning, the undeniable effectiveness of reserve requirements does not justify the massive recourse to its use. BAM should develop other instruments and make them more operational.

4. Conclusion

It follows from this paper that the liquidity level is likely to slow or limit the monetary policy transmission effectiveness. So, liquidity seems determinant for the monetary policy strategy of BAM. We can be arguing that during periods of abundant liquidity, the monetary policy transmission is less obvious, especially in the long term. This is because the BAM actions may be limited in time of structural excess liquidity. Instead, situations of liquidity shortage make it more effective.

It should also be noted that in developing countries such as Morocco, a significant proportion of the injected liquidity is absorbed by the informal market, and no longer reappears in the monetary and financial statistics. So, monetary authorities need to provide better liquidity requirements to make appropriate decisions.

In addition, part of Moroccan citizens, do not entrust their savings to banks, to respect the Muslim religion recommendations, which prohibit the application of interest on loans and deposits[32]. Theoretically, an installation of Islamic banks[33] in Morocco would, perhaps, resolve this limit and provide more reliable statistics on liquidity. It might be useful to consider that the introduction of new products inspired by the Islamic banking system can potentially improve the rate of bankarisation, increase the volume of liquidity and boost the Moroccan financial system[34].

Similarly, without wishing to exaggerate the virtues of control outflows, we should remain vigilant about capital movements easing measures (especially the exit) to avoid a liquidity crisis related to capital flight[35]. This question is not independent of the current fixed exchange rate regime of the MAD. Therefore any attempt to flexibilize the present exchange rates system should be sufficiently prepared and thought.

In addition, BAM should encourage or force banks to manage better their liquidity position and explore further actions by the monetary policy interest rate, especially as the inflation level allows that. In this regard, the liquidity managing and intervention without sending a negative signal to the market seems to be a challenge for monetary authorities. They must also prepare a smoothly transition focusing on more interest rate policy instead of the quantity of money, a long time favored.

References

Aglietta, M., Carton, B., Szczerbowicz, U. (2012), La BCE au chevet de la liquidité bancaire, *La lettre du CEPII n° 321, Mai.*

Allegret, J-P., Sand-Zantman, A. (2007), Transmission des chocs et mécanismes d'ajustement dans le Mercosur, *Revue de l'OFCE, avril*.

Armstrong, J., Caldwell, G. (2008), Les banques et le risque de liquidité : tendances et leçons tirées des récentes perturbations, l'évolution des politiques et de l'infrastructure, Banque du CANADA*, Revue du Système Financier*, Décembre 2008.

Artus, P, Virard, M-P. (2010), *La liquidité incontrôlable*, Pearson éducation France, Paris.

Baks, K., C. Kramer (1999), Global liquidity and asset prices: measurement, implications and spillovers, *IMF working paper, 168.*

[30] Statistics from the World Bank.

[31] Author's calculations from Annual Reports of BAM.

[32] This behavior is known, but there are neither statistics nor even rough estimate on this.

[33] This is a simple purely economic conjecture and not a matter of ideological or philosophical.

[34] The rate of bankarisation is likely to increase as well.

[35] As the countries of South East Asia have experienced in the 1990s.

Bastidon, C., Gilles, P., Huchet, N. (2012), Chocs de spread, liquidité du marché interbancaire et politique monétaire, 61ème Congrès de l'AFSE, Paris.

Bernanke, B.S., Vincent, R.R., Brian, P.S. (2004), Monetary Policy Alternatives at the Zero Bound: An Empirical Assessment, Brookings *Papers on Economic Activity*, 2, 1-78

Bottomley, A. (1966), La théorie monétaire de Keynes et les pays en voie de développement, In: Tiers-Monde, tome 7 n°27. pp. 533-545.

Cao, J., Illing, G. (2008), Liquidity shortages and monetary policy, *CESifo working paper*, No. 2210, http://hdl.handle.net/10419/26255

Cheik, H-M. (2013), *Excès de liquidité monétaire, objectif d'inflation et stabilité financière*, PhD thesis, University of Rennes I, France.

Coutière, A., Cantet, M., Faure, D. (1976), Taux de liquidité dans les différents pays occidentaux, Statistiques et études financières. 22, 3-25.

De Bandt, O., Ch. Pfister (2004), Politique monétaire, capital bancaire et liquidité des marchés, *Revue d'économie financièr.*

Diatkine, S.S. (2002), Les fondements de la théorie bancaire Des textes classiques aux débats contemporains, © Dunod, Paris, 2002, pp. 20.

Douglas, W.D., Raghuram, G.R. (2003), Liquidity Shortages and Banking Crisis, *NBER WP Series 10071*, http://www.nber.org/papers/w10071

Douglas, W.D., Raghuram, G.R. (2010), Fear of fire sales and the credit freeze, *Bank for International Settlements (BIS) Working Papers No 305*, article available on the website (www.bis.org).

Dowd, K. (2009), Moral Hazard and the Financial Crisis, *Cato Journal,* 29(1), 158.

Endut, N., Morley, J., Tien, P. (2009), The Changing Transmission Mechanism of U.S. Monetary Policy, *Central Bank of Malaysia, Washington University in St. Louis, Wesleyan University, 12 May.*

Giese, J. V., C. K. Tuxen (2007), Global Liquidity and Asset Prices in a Cointegrated VAR, *Nuffield College, University of Oxford, and Department of Economics, Copenhagen University.*

Goodhart, C. (2008), Liquidity risk management, Banque de France *Financial Stability Review - Special issue on liquidity*, 11, 39-44.

Gouteron, S., D. Szpiro (2005), Excès de liquidité monétaire et prix des actifs, *Banque de France, Notes d'études et de recherche, septembre.*

Goux, J.F. (2003), Conditions monétaires et activité économique dans la zone euro, université Lyon 2 et GATE- CNRS*, 20èmes journées internationales d'économie monétaire et bancaire, 5- 6 juin*, Birmingham.

Kamgna, S.Y., Ndambendia, H. (2008), Excès de liquidité systémique et effectivité de la politique monétaire en zone CEMAC, Rapport de Groupe de Travail, ISSEA, Yaoundé, Cameroun.

Kahn, C.M., Wagner, W. (2010), Sources of Liquidity and Liquidity Shortages, Department of Finance, University of Illinois Urbana-Champaign and Department of Economics, Tilburg University, http://dev3.cepr.org/meets/wkcn/1/1748/papers/Wagner.pdf

Loisel, O., Mesonnier, J.S. (2009), Unconventional monetary policy measures in response to the crisis, *Current issues 1*, Banque de France.

Medhioub, I. (2007), Asymétrie des cycles économiques et changement de régimes : cas de la Tunisie, *L'Actualité économique*, 83(4), 529-553.

Mignon, V., S. Lardic (2002), Économétrie des séries temporelles macroéconomiques et financières, Edition Economica.

Mishkin, F. S. (2008), How should we respond to asset price bubbles? Financial *Stability Review, No. 12 – Valuation and financial stability*, October 2008.

Modigliani, F. (1986), Life Cycle, Individual Thrift, and the Wealth of Nations, *American Economic Review,* 76(3), 297-313.

Morsink, J., Bayoumi, T. (1999), A Peek Inside the Black Box : The Monetary Transmission Mechanism in Japan, *International Monetary Fund, IMF WP*/99/137.

Moumni, N., Dasser, S. (2011), Pertinence d'une règle de type Taylor dans la politique monétaire active de Bank Al-Maghrib, *Académie Hassan II des Sciences et Techniques, Collège Etudes stratégiques et développement économique, Ecole académique Modélisation et prospective économique, Troisième session 2011*, Nouvelle économie du développement, 25-26 mars, Rabat, Maroc.

Polleit, T., Gerdesmeier, D. (2005), Measures of excess liquidity, *Business school of Finance & Management, Working Paper 65*.

Poole, W. (1968), Commercial bank reserve management in a stochastic model: implications for monetary policy, *The Journal of Finance, vol.23, n° 5*, pp. 769-791.

Saxegaard, M. (2006), Excess liquidity and effectiveness of monetary policy: evidence from sub-saharan Africa, *Working Paper n° 115, IMF*.

Shigenori, S. (2010), Size and Composition of the Central Bank Balance Sheet: Revisiting Japan's Experience of the Quantitative Easing Policy, Federal Reserve Bank of Dallas. *Globalization and Monetary Policy Institute, Working Paper No. 42*, January 2010.

Sims, C.A. (1980), Macroeconomics and reality, Econometrica, 48(1), 1-48.

Stiglitz, J., Weiss, A. (1981), Credit rationing in market with imperfect information, *American Economic Review*, 71(3), 393-410.

Tobin, J. (1969), A General Equilibrium Approach To Monetary Theory, *Journal of Money, Credit and Banking*, 1(1).15-29.

Bank Al Maghreb (BAM) Annual Reports from 1998 to 2012.

Banking Supervision Annual Reports of Bank Al Maghreb from 2006 to 2012.

European Central Bank:
http://www.ecb.europa.eu/ecb/educational/facts/monpol/html/mp_014.fr.html

Federal Reserve (Fed) http://www.federalreserve.gov/faqs/money_15070.htm

The Moroccan Central Bank (Bank Al Maghreb) website : http://www.bkam.ma/

Moroccan Ministry of Finance website:
http://www2.finances.gov.ma/docs_internet/esp_doc/2012/depp/7426_recettesprivat_plf2012fr.pdf
http://www.finances.gov.ma/portal/page?_pageid=53,17813790&_dad=portal&_schema=PORTAL

Reports of *the Office of exchange* available on the website: www.oc.gov.ma

Appendix

Figure VII. Stochastic properties of the series.
We used the usual tests to verify stationarity : Augmented Dickey-Fuller (ADF), Phillips-Perron (PP) and Kwiatkowski, Phillips, Schmidt and Shin (KPSS).

Model 1 and 2 (1998 :1-2012 :4)

Serie	ADF	PP	KPSS	Conclusion
LGDP	NS(Ct and T)	S (Ct and T)	NS(Ct and T)	**NS(Ct and T)**
LCPI	S (Ct and T)	S (Ct and T)	S (Ct and T)	**S (Ct and T)**
INTERATE	NS(Ct and T)	NS(Ct and T)	NS(Ct and T)	**NS(Ct and T)**
LLECO	NS	NS (Ct)	S (Ct and T)	NS
LMRR	NS (T)	NS (T)	NS(Ct and T)	NS (T)

S : Stationary ; NS : non- stationary ; Ct : Constant ; T : Trend.

Model 1.1 and 2.1 (1998 :1-2007 :2)

Serie	ADF	PP	KPSS	Conclusion
LGDP	NS(Ct and T)	NS(Ct and T)	NS(Ct and T)	**NS(Ct and T)**
LCPI	S (Ct and T)	S (Ct and T)	S (Ct and T)	**S (Ct and T)**
INTERATE	NS	NS	NS(Ct and T)	NS
LLECO	NS(Ct and T)	NS(Ct and T)	S (Ct and T)	**NS(Ct and T)**
LMRR	NS(Ct and T)	NS(Ct and T)	S (Ct and T)	**NS(Ct and T)**

S : Stationary ; NS : non- stationary ; Ct : Constant ; T : Trend.

Model 1.2 and 2.2 (2007 :3-2012 :4)

Serie	ADF	PP	KPSS	Conclusion
LGDP	S (Ct and T)	S (Ct and T)	S (Ct and T)	**S (Ct and T)**
LCPI	NS(Ct and T)	NS(Ct and T)	S (Ct and T)	**NS(Ct and T)**
INTERATE	NS	S (Ct and T)	NS(Ct and T)	NS
LLECO	NS(Ct and T)	NS(Ct and T)	NS(Ct and T)	**NS(Ct and T)**
LMRR	NS(Ct and T)	S	S (Ct and T)	S

S : Stationary ; NS : non- stationary ; Ct : Constant ; T : Trend.

Figure VIII. a. Impulse Responses Functions (IRFs).

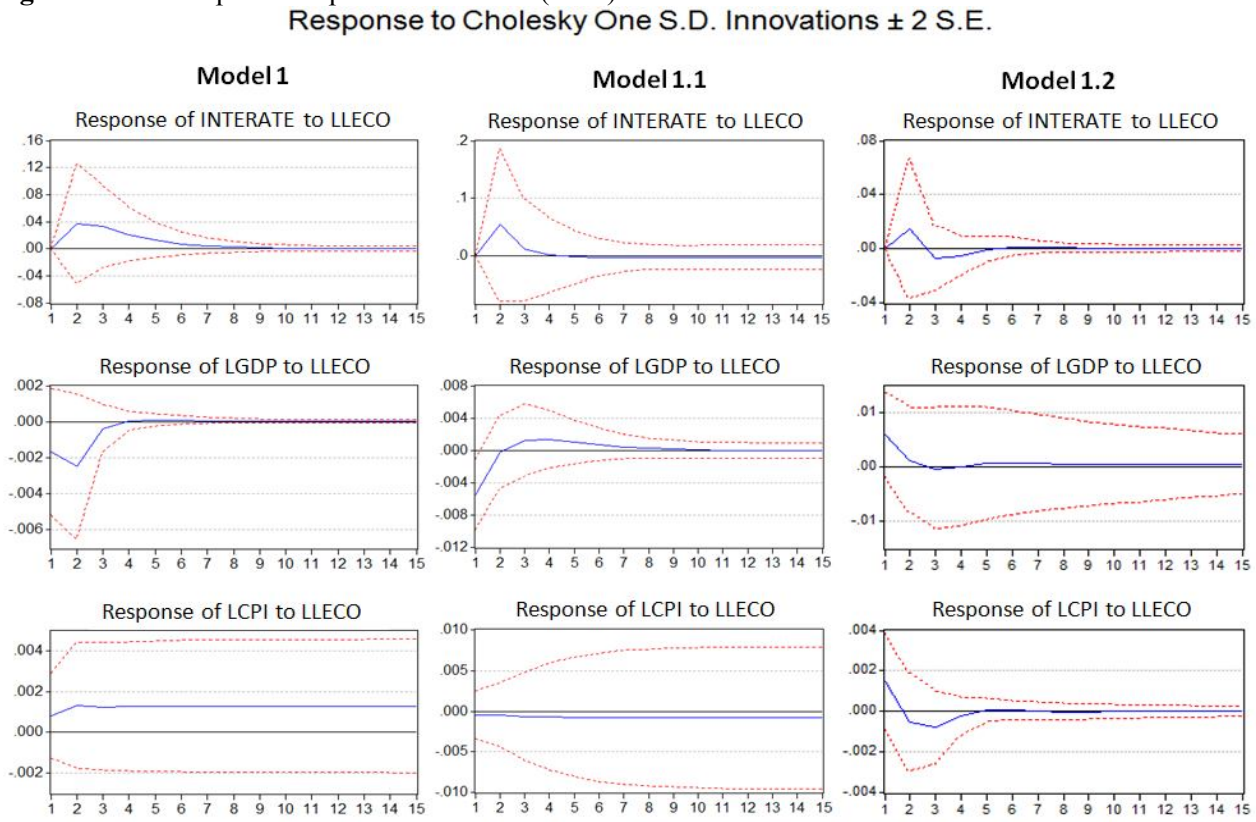


Figure VIII. b. Impulse Responses Functions (IRFs).

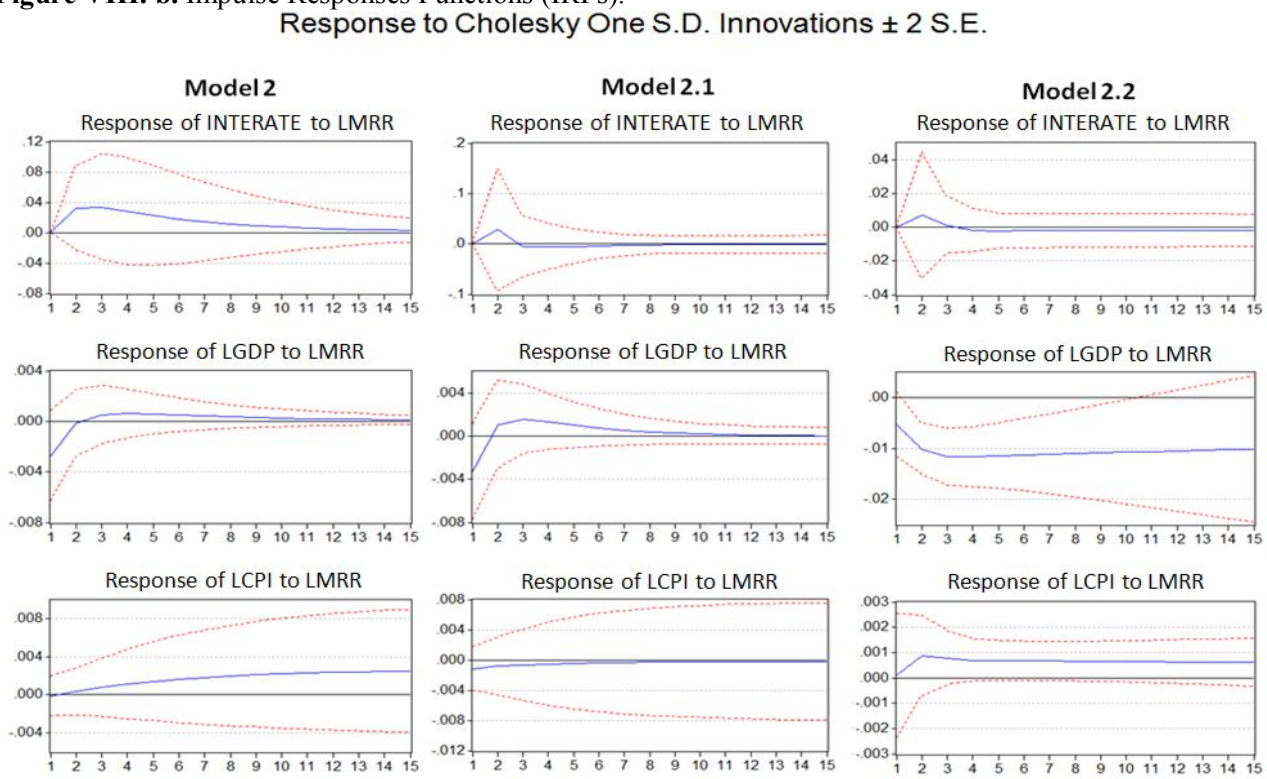


Table VI. Forecast Error Variance decomposition:
Forecast Error Variance decomposition (FEVD) of variables depending on liquidity (LLECO and LMRR) and the interbank rate (INTERATE) in%.

		FEVD of GDP				FEVD of (CPI)				FEVD of INTERATE			
	Period / Due to	1	5	10	15	1	5	10	15	1	5	10	15
Model 1	Liquidity	1,4	4,3	4,3	4,3	1	2,1	2,3	2,3	0	1,9	1,9	1,9
	INTERATE	7,5	7,2	7,2	7,2	3	3,6	2,2	2	10	93	93	93
Model 1.1	Liquidity	14	14	14	13	0,2	0,4	0,6	0,6	0	1,6	1,6	1,6
	INTERATE	11	11	11	11	5,5	8,4	8,6	8,7	10	95	94	92
Model 1.2	Liquidity	9	2	1,5	1,2	6	6	6	6	0	1,3	1,3	1,3
	INTERATE	18	26	26	26	15	12	13	13	10	89	89	88
Model 2	Liquidity	3,5	3,7	4	4	0	1	3	5	0	2	2,7	2,7
	INTERATE	6,5	6,3	6,4	6,4	3	2,9	2	1,6	10	93	93	93
Model 2.1	Liquidity	5	7,2	7,5	7,4	1,6	0,7	0,4	0,3	0	0,4	0,4	0,4
	INTERATE	11	10	10	10	5	8	8	8	10	95	94	93
Model 2.2	Liquidity	10	63	76	81	0	5,5	10	14	0	0,2	0,3	0,4
	INTERATE	15	10	5	4	12	12	12	11	10	88	88	88