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DEMAND IN MOROCCO

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Financial Liberalization and Money Demand in Morocco

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Abstract

This paper investigates whether the financial liberalization that Morocco has been undertaking since the early 1990's has affected the demand for money. To achieve this analysis, the Johansen maximum-likelihood procedure is employed to estimate the long-run equilibrium relationship between real money aggregates (M1 and M3) and their determinants. The empirical results indicate that for both narrow and broad money demand for the period 1982Q1 to 2005Q4, there exist long-run money demand functions. These findings are corroborated by the error correction method. The results point also to the significance of foreign influences and more precisely to the relevance of the role of the foreign interest rate variable that was omitted in previous studies. Stability tests conducted don't indicate the occurrence of a structural break in money demand.

ملخص

(M3 M1)

.2005

1982

I. Introduction

Since the early 1990s, Morocco has been undertaking a gradual liberalization of its financial system with the aim of putting in place a modern financial market that promotes healthy mobilization of savings and optimal allocation of financial resources. The reforms have mainly focused on modernization of the monetary policy instruments and overhauling the financial system's legal and regulatory framework.

Key elements of the reform process were eliminating quantitative ceilings on credit, liberalizing interest rates, introducing market-based instruments of monetary policy and developing capital markets. As a consequence, the financial sector grew significantly in depth and breadth. The M3/GDP ratio rose from 52% in 1989 to 103.7% in 2005. The stock market started to develop with market capitalization rising from less than 3% of GDP in 1989 to 55% in 2005.

Domestic financial reforms were accompanied by a gradual dismantling of exchange restrictions. In 1993, Morocco achieved current account convertibility and in 1996, a foreign exchange market was established ending the Central Bank's monopoly on holding and managing foreign currencies. More recently in 2001, commercial banks were allowed to make investments abroad. The removal of foreign exchange controls on non-residents and the deregulation of financial markets have substantially changed the environment in which the monetary policy operates.

Against this background, the aim of this paper is to examine whether the financial liberalization has affected the money demand behavior. This issue is very important, because the stable demand for money is an important prerequisite for formulating and operating monetary policy.

The economic literature has identified many channels through which the financial liberalization may affect money behavior. Increased competition between financial institutions, the introduction of new technology (ATM, bank cards) and the availability of financial instruments to money may affect the interest elasticity of money. Following financial liberalization, increased shifts between money and new financial assets may reduce the stability of the monetary aggregates, thereby reducing the predictability of the money demand (Khan and Sundararajan, 1991).

Evidence pointing to the instability of money demand has been empirically found in many developing countries. Using a traditional money demand function, Arrau et al (1991) failed to find a cointegration relationship between the money and its determinants in 8 developing countries (including Morocco), among a sample study of 10 countries. In their analysis of the money demand in the ASEAN countries, Dekle and Pradhan (1997) confirmed the existence of instability between money, economic activity and growth especially as financial liberalization intensified.

This paper is organized as follows. In the first section, we will expose a brief description of the main features of the financial sector reform and its impact. We will review, in the second section, the framework of monetary policy management pursued by the Central Bank. In the third section, we will examine briefly the existing research on money demand in Morocco and some data issues. Finally sections 4 and 5 are devoted to analyzing the cointegration properties of data and testing the stability of M1 and M3.

II. Financial Sector Liberalization and its Effects

Until the early 1980s, the Moroccan financial sector was strictly regulated through administered interest rates and direct credit. Its role was to collect savings and channel them to government and public enterprises as well as priority sectors (mainly tourism and agriculture) at subsidized rates. During that period the monetary authorities relied heavily on credit containment (*encadrement du crédit*), selective credit instruments and administratively deposit and lending rates. These measures led to distortions, inefficiencies, resource misallocations and weakened the incentives for banks to attract private savings¹.

Since the mid 1980's, Morocco had implemented — with the IMF and WB — a supported structural adjustment program. Following a gradual approach, the major reform of its financial sector aimed to increase competition between financial institutions, enhance financial intermediation and improve management and resource allocation².

The reforms encompassed the deregulation of banking activity, the recourse to indirect monetary instruments, the development of financial markets and the introduction of new financial instruments, the strengthening of the prudential regulation and the banking supervision and the reduction of the privileged access of the Treasury to financial resources.

The impact of the financial reforms is visible in many areas³:

Growth of the Financial Sector

The gradual liberalization of the interest rates was initiated in the early 1980's along with the reduction of the interest subsidies to priority sectors. By 1996, controls on lending and deposit rates were completely eliminated except for a ban on remuneration of sight deposits and controls on interest rates for small saving deposits. This helped put an end to the negative real interest rates which in the past had weakened the capacity to mobilize savings.

The removal of quantitative credit ceilings in 1991, the gradual elimination of the minimum Treasury papers holding requirement and the liberalization of interest rates led to the development of the financial sector in terms of depth and breadth. The M3/GDP ratio rose from 52% in 1989 to 72.6% in 1997 and 103.7% in 2005 (Figure 1). Accordingly, the velocity of Money declined substantially (Figure 2).

The move to more market-based financing of the budget pushed the share of the private sector in total domestic credit from 55% in 1988 to 64% in 1997 and to 77% in 2005.

Capital Markets Developments

The implementation of a new securities law in 1993 initiated the management and the ownership of the stock exchange by the private sector and the establishment of the stock exchange commission (Conseil Déontologique des Valeurs Mobilières-CDVM) to ensure transparency in the stock market. This law, together with the introduction of financial instruments like auctioned Treasury bills in 1989, negotiable debt instruments in 1995 and mutual funds in 1996, contributed significantly to the development of the Moroccan capital market. The market capitalization, as a percentage of GDP, rose from 2.6% in 1989 to 55% in 2005.

¹ For example, during 1986, banks refused to accept time deposits of more than six months and until the early 1990's banks required strict conditions (in terms of minimum wage) for those who desired to hold checking accounts.

² See Nsouli et al(1995) for a review of the main reforms in the financial sector during that period.

³ For a recent review analysis of the financial sector reform in Morocco, see Chorfi(2005), and IMF (2003) and Sekkat and Achy(2004)

The mutual funds (OPCVM), created in 1996 have expanded rapidly. Their net assets have increased from DH 2.7 billion in 1996 to DH 86.5 billion in 2005 while their number has surged from 22 in 1996 to 185 in 2005. In parallel with these developments, the issuing of auctioned treasury bills was very successful showing clearly in the increase of the stock of these securities from DH24.5 billion (or 24% of the domestic public debt) in 1995 to DH 251.5 billion (96% of the domestic public debt) in 2005. The market in negotiated securities also developed but at lower pace. The outstanding stock reached DH 9.5 billion by December 2005.

Capital Account Liberalization

The domestic financial reforms were accompanied by a gradual liberalization of the capital account. Morocco achieved current account convertibility in 1993, and liberalized certain capital account transactions — notably inward foreign investment and external borrowing by residents — in 1996. Also in 1996, an interbank foreign exchange market was established putting an end to the Central Bank's monopoly on holding and managing foreign currencies. More recently, in 2001, commercial banks were allowed to make investments abroad.

III. The Reform of the Monetary Policy Framework

The monetary policy of Bank Al Maghrib (BAM), the Moroccan Central Bank, aimed for maintaining price stability. The formulation of monetary policy centered on an annual monetary program discussed with the government⁴. The theoretical framework of the program is a monetary approach to the balance of payments. The Central Bank, implements the monetary policy in the context of a fixed exchange regime (a peg to a basket of currencies). The anchor to the exchange rate is supplemented by establishing a target for the money supply growth. First, the target of M1 growth is estimated and serves in the formulation of the M3 growth. Second, the evolution of M3 in absolute terms is divided between external and internal components. Third, using the projection of credit to the private sector established on the basis of economic growth, the change in credit to the public sector is deduced as residual.

Before 1991, the monetary policy relied extensively on direct credit controls mainly the credit containment, the minimum treasury paper holding requirement (*plancher d'effets publics*) and administratively set interest rates structure. The conduct of monetary policy was at that time heavily constrained by the excessive domestic financing requirements and the decreasing efficiency of the direct monetary instruments which focused mainly on quantitative ceilings. The disadvantages of direct instruments was reflected in (i) lack of competition in credit allocation between banks (as each bank's share in the total credit was frozen at the 1976 level), (ii) distortion in term-based structure of interest rates (in 1989, the interest rates on 10 and 15-year bills and bonds were 1.5 percentage points lower than rates on bonds with 2 and 5-year maturities) and (iii) negative real interest rates contributing to the misallocation of resources. In addition, the direct instruments became less effective in limiting the expansion of domestic credit. As a consequence, BAM begun to rely increasingly on indirect instruments to control credit expansion, while abolishing, at the same time, the quantitative ceilings. (Nsouli et al, 1995)

⁴ A new bank charter promulgated in November 2005 gives BAM greater autonomy in conducting monetary policy and prohibits financial assistance to the Treasury.

In 1995, BAM redefined its intervention policy in the money market through four instruments:

- weekly 7-day liquidity auctions that set the floor intervention rate
- a 5-day repurchase window that sets the ceiling intervention rate
- advances, at a penalty rate, in the event of debits at the end of the day on banks current accounts, and
- open-market operations.

In October 1999, BAM made use of the open market operations for the first time in order to mop up the excess liquidity following the sale of the 2nd GSM license which generated more than twice the expected foreign currency receipts. This intervention was insufficient, forcing BAM to create a new window to drain excess liquidity in the form of repurchases to the banks at 4.5% rates.

After a pause in 2000 and the first quarter of 2001, the overnight money market interest rate dropped below the floor rate (Figure 3), following a sustained increase of the foreign reserves which began in the second half of 2002. The net foreign assets increased by 25% annually between 2000 and 2005, contributing by 50% to the annual 10.2% M3 growth during the same period — a rate slightly greater than the monetary target (Table 1).

BAM accommodated this situation by making successive cuts in its intervention rates bringing its liquidity auction rate from 5% in 2001 to 3.25% in 2003 (see Figure 3). In parallel, it resorted actively to liquidity withdrawal operations, initiated swap operations and also raised the monetary reserve requirements ratio from 14% to 16.5% (Figure 4). Yet, the interbank rate continued to fall, forcing the Central Bank, on January 7th 2004, to permanently install a facility deposit at the initiative of banks at a rate of 2.25%, which became the *de facto* new floor rate.

The sustained increase of net foreign assets over the past years was fuelled by the expansion of remittances from Moroccans living abroad (MLA), and to some degree by the performance of tourism receipts and the surge in capital inflows driven by punctual privatization operations.

Remittances increased from 5.8% of GDP during the period 1996-2000 to 8.6% of GDP during the period 2001-2005 and a big chunk of these transfers was deposited with Moroccan banks. By the end of 2005, remittances by MLA made for 35% of total sight deposits and 25% of total time deposits in the Moroccan banking system. These shares were approximately 8 % above the share that prevailed in 1983 (see Table 2).

Aware of the increasing importance of the MLA as a source of hard currency, the authorities put in place, from the early 1970's, a range of incentives aimed at encouraging MLA to send their revenues home. Until April 1987, MLA were offered a 2.5 to 10% bonus on the Dirham equivalent of foreign currency transfers. Moreover, their sight deposits in Dirham within the banking system were remunerated at a rate of 8% from 1983 through 1990. Starting January 1987, their revenues from time deposits were exempted from taxes. These measures managed to maintain the upward trend of MLA's remittances and consequently their deposits.

The MLA's remittances also affect the demand side of money especially in summer when their demand for domestic currency notes increases. Indeed, 62% of MLA's annual home visits occur during the third quarter, triggering a seasonal pick demand for banks notes. As shown by figure 5, there is a clear relationship between the cash remittances of MLA and the variations of domestic currency held by the public.

IV. Estimation of the Money Demand for Morocco

A. Review of Research on Stability of Money Demand for Morocco

Research on money demand in Morocco has not received sufficient attention. The studies analyzing the money demand function are limited. The most recent estimations of money demand for Morocco date back to the mid 1990's (Nsouli *et al*, 1995 and Hoffman and Tahiri, 1994)⁵. The issue of stability of money demand was initially raised by Zejly (1990) who analyzed the money demand for the period 1930-1985. Based on chow tests, he rejected the existence of a structural break in 1959 — the year that marks the creation of the post-independence financial system and the setting of a new currency. This result was corroborated by the findings of Hoffman and Tahiri (1994). Using more advanced techniques (Johansen procedure and DOLS), they estimated the demand for nominal money for the period 1959Q1-1988Q2 and explored the stability of the relation beyond 1980 by examining the recursive estimates. They couldn't reject the parameters constancy during that period.

However, Arrau et al (1990) failed to find a cointegration relationship between the money and its determinants for Morocco either by using the traditional formulation or the extended ones that include proxies for financial innovation (time trend or M2/M1). This result should be considered with caution as it estimated the elasticity to income at the range 0.19-0.28, which appears meaningless when compared with existing estimates which are larger than one⁶.

Previous research on the stability of money demand in Morocco covered a period when the reform of the financial sector had not yet gained momentum. As addressed in the previous sections, the major reforms of the financial sector during the post-independence period first started in the mid 1990's with the implementation of the new banking law and the reform of the monetary policy. Whether a stable money demand exists for the post-reform period has not yet been investigated. In this paper will try to fill this gap by extending the analysis to the most recent data.

The long-term demand for money is generally represented by the following functional relationship:

$$M/P = f(S, OC)$$

Where M represents the monetary aggregate, P stands for the price, S is the scale variable for economic activity and OC is a measure of the opportunity cost for holding money.

It's important at this point to mention that although money demand theories (which put emphasis on either transactions, speculative, precautionary or utility considerations) differ in the role assigned to each determinant, they commonly share the most important variables (Sriram, 1999a).

Initially, we intended to analyze the influence of the financial liberalization through the inclusion of a proxy variable into the money demand function. The proxies of financial liberalization, most commonly used in the empirical analysis, are transactions paid by bank or ATM cards (See Columba for an application for Italy and Mannah-Blankson and Belye for Ghana) or stock market indices (Ibrahim, 2001 for an application for Malaysia). Unfortunately, these proxies are meaningless in the case of Morocco; the Moroccan stock market index has fluctuated strongly during pronged periods in the past and transactions through bank cards are still limited. Both reasons prevented us from including those regular proxies in our money demand function.

⁵ Among the studies on the demand for money in Morocco, there are Zejly (1990) and El M'kaddem (1995).

⁶ Zejly found an estimate of long-run elasticity of money to income at 1.55 while Nsouli et al (1995) found estimates for income elasticity at 1.13 for real M1 and 1.32 for real M2.

B. Data:

We will alternatively employ the real narrow (LM1P) and the real broad money (LM3P). M1 includes means of payments directly usable for transactions: banknotes and coins in circulation and demand accounts. M3 includes, in addition to M1, passbook and saving accounts, time deposit accounts, fixed-term securities as well as certificates of deposits. For the scale variable we will use real GDP (LGDP) and alternatively real non-agricultural GDP (LNAG_GDP) obtained from the Moroccan Directorate of Statistics. The consumer price index is selected as the price variable.

To represent the own rate of money, we will retain the interest rate on saving accounts *SVR* (taux d'intérêt sur les comptes sur carnets).

Finally, we will choose the yield on the 6-month treasury bills *TB6M* (bons trésor sur formules émis dans le public) to represent the yield on assets alternative to money because it's the only data available for the time period of the study. The source data is Bank Al-Maghrib.

Although Morocco still maintains restrictions on capital account operations for residents and despite the evidence that interest of non residents in Moroccan treasury bills and the stock market is still limited, we will consider a variant of the model with additional variables to capture foreign influences channeled through MRA remittances:

- exchange rate of Dirham/ French Franc in level(*XRDHFF*) and in variation (*XRDHFF_V*)
- and French interest rate on deposits (*F_SVR*) obtained from IFS CD-ROM and Banque de France⁷.

This will allow us to take into account the increasing role of MRA deposits in the demand money and the portfolio arbitrage that they face between holding assets in Dirham or in foreign currency.

Data is quarterly covering the period 1982:Q4 to 2005:Q4. Data is seasonally unadjusted as seasonal filtering affects the power of the unit root and cointegration tests (Ghysels, 1990).

C. Unit Roots

Before modeling the demand for Dirham, we examined the orders of integration of all considered variables using the augmented Dickey-Fuller (ADF) tests. The tests were conducted by both including and excluding seasonal dummies. The lag length is determined by the Schwartz Information Criterion. The results are reported in Table 3. They indicate clearly that all variables are I(1) with the exception of inflation and exchange rate variation which are I(0).

V. Analysis of the Real Narrow Money M1

We consider the following conventional formulation of the demand for real M1:

$$LM1P = \gamma_1 + \gamma_2 LGDP + \gamma_3 SVR + \gamma_4 INF + \varepsilon$$

Where $LM1P = \ln(M1/P)$;

$LGDP = \ln(GDP)$

$SVR =$ Interest rate on passbook accounts

$INF =$ Annualized inflation rate

⁷ http://www.banque-france.fr/fr/stat_conjoncture/series/statmon/html/idx_tmf_france_fr.htm

A. Co-integration Analysis

We employ the Johansen's procedure (1988) to conduct a cointegration analysis of the real narrow money M1 and its potential determinants — namely the real GDP and the yield on saving accounts. Seasonal dummy variables were included in the test. Given that we had quarterly data we began the analysis with 5 lags and repeated the test by reducing one lag at a time in order to avoid over-parameterization. We found that there is a cointegration at lag 4. As shown in Table 4, the trace and maximum Eigenvalue tests clearly reject the absence of a cointegration relationship. The results are significant at 1 percent level and indicate the existence of a unique cointegrating vector in the model which could be interpreted, in its normalized form, as the long run demand of real M1 as follows:

$$LMIP = 1.865*LGDP - 1.803*SVR - 0.239*INF$$

The results indicate that the long-run income elasticity is 1,87 which is fairly high. This could indicate that Morocco is far from having completed the monetization of its economy. Indeed, the share of bank notes in circulation in total M1 is at 30% which is high by emerging market standards. The importance of using cash⁸ in the economy reflects from one side the existence of the important informal sector in the Moroccan economy which is estimated at around 40% of total GDP (Haut Commissariat au Plan, 2002) and from the other side, it reflects the low development of retail banking. Only 18% of the adult population has a bank account, while the use of bank cards is still at an embryonic stage⁹. Similarly, the density of the banking network is low and exhibits striking divergences between urban and rural areas with density estimated at 140,000 inhabitants per branch in the rural areas against 15,000 for the whole economy.

The coefficient of the interest rate on deposits in the national saving fund deposit is significant and with the expected sign which indicates that the interest rate does account in arbitrage between cash and sight deposits that don't bear interest and the closest substitutes — namely the passbook saving deposits. The yield on these deposits has dropped sharply from 8% in late 1997 to 1.5% in 2005. In the same time, the share of M1 in broad money M3 increased from 61% in the mid 1990's to 67% in 2005. Although the coefficient for inflation has the adequate sign, is not significant.

The cointegration test results also give an indication of the adjustment process. The feedback coefficient for the money equation is estimated at -0.11 which indicates a relatively slow adjustment to lagged excess holdings of money; only 11% is adjusted in the first quarter. However, the coefficient compares to available estimates for real narrow money demand for developing countries. Ibrahim (2001) found an adjustment coefficient for M1 in Malaysia at -0.0734 (for the period 1997-1998) and -0.1657 (for the sub-period 1986-1998), Anglingkusumo (2005) estimated the adjustment coefficient at -0.173 for Indonesia and Pinon-Farah (1998) derived an adjustment coefficient at -0.0879 for demand for M1 in Mozambique.

B. Stability Analysis

In order to assess the stability of the model, we carried the following parameter constancy tests: the recursive residuals, CUSUM and CUSUMSQ tests. Figure 7 below reports the results of these tests for *LMIP* equation. Results for *LGDP* and *SVR* equations were also conducted but are not reported here. In general, the model shows considerable stability throughout the period.

⁸ See IMF (2003) for analysis of the payments system in Morocco.

⁹ The transactions paid through bank cards in 2005 amounts to DH 2.4 billion which represent only 0.5% of GDP. See also Al Bayane (2005).

C- Short-Run Model for Real M1

Table 4 also reports the results of testing weak exogeneity of a given variable for the cointegrating vector. The statistic test whether for the variable i or for the the i^{th} row $\alpha_i = 0$ (Johansen 1992, Johansen and Juselius, 1990, Ericsson et al 1998). If $\alpha_i = 0$, disequilibrium in the cointegrating relationship doesn't feedback directly onto the variable i . The tests show that the weak exogeneity is rejected for *LMIP* at 1 percent level while it's accepted for *LGDP* and *SVR*.

Cointegration and weak exogeneity results allow us to consider single equation framework for analyzing the short run dynamics for D(LM1P) (Ericsson et al, 1998). This will allow us to examine how adjustments are processing, in order to restore the equilibrium in the long-run in response to short-term disturbances in demand for M1. We constructed the error correction model by regressing the first difference of real narrow money *LMIP* on four lags of the first difference of real narrow money, GDP and Inflation and on one period lag of the residual from the cointegration relationship. The error correction term EC is obtained from the previously estimated equation above. Starting from an unrestricted short run model we applied the general to specific approach (see Cuthberston, 1992) and retained the following parsimonious model:

Adjusted R-squared	0.342617	S.D. dependent var	0.022691
S.E. of regression	0.018398	Akaike info criterion	-5.046552
Sum squared resid	0.026401	Schwarz criterion	-4.765036
Log likelihood	232.0483	F-statistic	6.038095
Durbin-Watson stat	1.845660	Prob(F-statistic)	0.000002
Jarque-Bera Test for normality	0.996221	P-value	0.607678
Breusch-Godfrey Serial Correlation LM Test	0.941121	P-value	0.445087
Arch(4)	1.367049	P-value	0.252921
Reset(4)	0.838448	P-value	0.505158
W. Heteroskedasticity Test:	1.031159	P-value	0.434788

As suggested by the diagnostic tests (reported in table 5), the ECM performs well. It doesn't suffer from residual serial correlation, heteroskedasticity or non normality as none of these tests reveal a problem.

The results of the ECM confirm the significance of the feedback effect with an adjustment coefficient at -0.10. The seasonal dummies are all significant. We turn now the analysis of the stability of the short run model. The graphical assessment of the stability using the recursive residuals, CUSUM and CUSUMSQ tests is reported in the figures below. There is no observed period of instability.

VI. Analysis of the Real Broad Money M3

We consider the following conventional formulation of the demand for real M3:

$$LM3P = \gamma_1 + \gamma_2 LGDP + \gamma_3 SVR + \gamma_4 INF + \gamma_5 TB6MR + \gamma_6 FF_SVR + \gamma_7 XRDHFF_V + \varepsilon$$

Where	LM3P	=	ln(M3/P);
	LGDP	=	ln(GDP)
	SVR	=	Interest rate on passbook accounts
	TB6MR	=	yield on 6_months treasury bills
	INF	=	Annualized inflation rate
	FF_SVR	=	interest rate on deposits in France
	XRDHFF_V	=	annualized variation of exchange rate of DH vis-à-vis the French Franc

A. Co-integration Analysis

For the analysis of the real M3 demand, we will consider additional variables:

- The 6-month T-bills rate *TBR6M* (bons sur formules du trésor) to represent the opportunity cost of alternative assets to money. The expected sign is negative.
- The exchange rate of Dirham vis-à-vis the French Franc *XRDHFF*. It's the amount of Dirhams for one French Franc. For the post euro introduction period, the rate was calculated based on the irrevocable rate between euro and French Franc. The rate was adjusted for the period 1982-1987 to include the exchange rate bonuses offered during that period by the authorities on migrant's remittances.
- The interest rate on demand deposits in France *FF_SVR* is also included to represent the opportunity cost for Moroccan residing abroad of holding money balances in Morocco.

The inclusion of the two latter variables constitutes a major difference with the previous money demand studies conducted for Morocco which have just considered a closed economy framework with the exception of Hoffman and Tahiri (1991). In their paper, they considered the Swiss interest rate on the ground that there is enough capital mobility (in and out) in Morocco. However, this assertion is challenged by several facts; foreign portfolio investments in Morocco are limited¹⁰ and Moroccan residents are prohibited from investing abroad. In our case, the exchange rate of the Dirham vis-à-vis the French Franc and the interest rate on demand deposits in France are included to capture the foreign influences on the money demand exposed in the first section, that are channeled essentially through the MRA's remittances. The expected sign for the exchange rate variable is positive as MRA tend to transfer more if they expect more Dirham equivalent for their foreign currency transfers.

The expected sign for interest rate on French Franc deposits is negative. At this point it is worth noting that MRAs, in most cases, prefer to make deposits in Dirham (and not in convertible Dirham or foreign currency accounts) which are not convertible, and therefore they are not allowed to retransfer them abroad because of applied exchange restrictions. So, any rise in foreign interest with regards to the Moroccan interest rate will induce the MRA to reduce their future remittances rather than to retransfer their existing savings in Dirham.

¹⁰ See the publication on the International Investment Position for 2005 (Office des changes, 2005 (www.oc.gov.ma))

Table 6 reports the analysis of the cointegration results for the model that includes seasonal dummies. The most satisfactory combination is obtained when considering the non agricultural GDP (*NAG_GDP*) as the scale variable and the level of the exchange rate of Dirham/FF instead of the variation. We also dropped the inflation variable which wasn't significant and had the wrong sign. The 5-lag model was found to be the most appropriate. The rank indicates the existence of 4 equations at 5% level and 3 equations and 1% level. However, the maximum Eigenvalue test found only one cointegrating relationship at 1% level. The normalized cointegration vector is derived as follows:

$$LM3P = 1.410 LNAG_GDP + 2.251SVR - 4.479 TBR6M + 0.164 XRDHFF - 4.262 FF_SVR$$

All variables have the expected signs. The long-run income elasticity of M3 is estimated at 1.41 which lies within the range of previous estimates; El'M'kddem(1995) found an elasticity of 1.42, Zejly(1990) an elasticity of 1.55 and Nsouli et al (1995) an estimate of 1.32. A long run elasticity greater than unity is something usually witnessed in developing and emerging countries. For instance, using different approaches, Gu (2004) found an estimate of elasticity for real broad money in China at 1.32. Dekle and Pradhan (1997) estimated the elasticity at 1.39 for Indonesia and 1.56 for Malaysia and Brissimis et al (2003) evaluated the income elasticity of M3 at 1.674 for Greece. The large value for income elasticity of money in developing countries reflects the scarcity of alternative assets in which to hold money (see Agenor and Montiel, 1999).

The opportunities for alternative financial investments are still limited in Morocco. The liquid investment¹¹ aggregates (Placements Liquides (PL)), which include saving instruments that could be easily converted into a means of payment, was only 8.4% of M3 in 2005 and exhibited a downward trend in past years (Figure 9) when one would have expected an increase as the yield on term deposits, the main component of M3, had dropped sharply. The weighted average remuneration rate on 6-month deposits within the banks was 3.3% in December 2005.

The lack of diversification and availability in financial instruments may reflect the insufficient development of Moroccan capital markets¹²: Only 53 firms are listed in the stock markets. Furthermore, the market in negotiated securities has proved difficult to develop where the stock outstanding of securities, which represents less than 2% of M3, barely reached DH 9.5 billion in December 2005. The other factor explaining the scarcity of alternative financial instruments is the importance of privatization proceeds realized by Morocco during the recent years. Along with a contained public deficit, this has slowed the recourse of the government to domestic financing. In 2005, nearly 70% of the liquid investments (PL) consisted of treasury bills and bonds.

The coefficient associated with the interest on saving account *SVR* (-2.25) is in the same order as in the real M1 equation but with an opposite sign. The semi-elasticity of the money to the yield on treasury bills variables *TB6MR* and to the interest rate on deposits in France *FF_SVR* are significant, with a large magnitude. Their coefficients are statistically not

¹¹ The liquid investments (PL) aggregates were introduced by the Central Bank to take into account new financial instruments held by individuals and non financial enterprises. They encompass four separate and non overlapping categories: PL1 includes 6-month T-bills issued on tap and negotiable claims (retail treasury notes, commercial paper and bonds issued by investments companies) other than those issued by banks, PL2 consists of securities issued by monetary mutual funds, PL3 covers securities issued by mutual funds specialized in bonds and PL4 consists of securities issued by mutual funds specialized in equities.

¹² As an indication of the scarcity of opportunities in investing in financial instruments, the recent introduction in the stock market of Addoha — a real state enterprise — was subscribed ten-fold while the subscription process of Risma — a real estate firm in tourism sector — was suspended on the third day (the process was meant to last 5 days) due to over subscription.

different (Chi-sq(1)= 0.012789 [p-value= 0.91]) which could indicate that the MRA (Moroccan Residing Abroad) put the same weight as the residents on the opportunity cost of holding money in Dirham.

The coefficient of the exchange rate *XRDHFF* has the expected sign. However, it fell just short of being significant.

The coefficient of adjustment for the real broad money is estimated at -0.235, twice the adjustment speed of the real narrow money. Nearly ¼ of the disequilibrium in real M3 is corrected during the first quarter. The same magnitude for the adjustment speed of the broad money has been found for developing countries (-0.28 for Tunisia (Treichel, 1997)).

B. Stability Analysis

The following figures report the graphical assessment of the parameter constancy for the LM3P using the recursive residuals, the CUSUM and the CUSUMSQ tests respectively. Apart from the fact that CUSUMSQ statistic seems to be crossing marginally the upper bound, the three statistics don't seem to indicate episodes of instability. The same analysis has been conducted for the other variables (the results are not reported here). The tests didn't indicate a lack of parameter constancy.

C. Short-Run Model for Real M3

As shown in Table 6, the tests significantly rejected the weak exogeneity of the real broad money and both interest rate variables *SVR* and *TB6MR* at 1%. It's interesting to note that the interest rate on saving account *SVR* failed the weak exogeneity test in the real broad money function while it was statistically considered weakly exogenous in the real narrow money function. It must be due the fact that the minimum remuneration rate on saving accounts *SVR* is set periodically by the monetary authorities according to a formula which includes lagged values of the yield on T-bills. Not surprisingly, the exchange rate variable (as Morocco has a peg) and the foreign interest rate were found to be weakly exogenous.

With these results in hand, we can consider a single equation to represent the error correction model for real broad money. We apply the general to the specific approach on an unrestricted error correction model with 5 lags to obtain the following parsimonious model:

The diagnostic tests don't indicate any serious problem with the ECM. The feedback effect is significant (-0.145) but slightly lower than the estimate derived from cointegration analysis. As for M1, seasonal dummies are significant

The following figures report the results of the stability analysis (recursive residuals, CUSUM and CUSUMSQ) of the equation. They exclude the existence of instability periods.

VII. Conclusion

In this paper, we try to find out whether the successive reforms of the financial sector launched since in the early 1990's have affected the demand for money in Morocco. This issue is very important as the predictability of the money is the cornerstone of a monetary policy that relies on targeting monetary aggregates.

Using the cointegration approach, we could determine the existence a unique long-run relationship (i) between the real narrow money, the real GDP and the interest rate on saving accounts and (ii) between the real broad money, the non agricultural real GDP, the interest rate on saving accounts, the yield of treasury bills and the foreign interest rate.

The income elasticity of the real broad money (1.41) lies within the range of previous estimates. The income elasticity of the real narrow money was slightly higher (1.87) pointing

to the importance of cash-use in the economy (the share of bank notes in circulation in total M1 is at 30%). Both relationships have proved to be fairly stable during the period 1982Q4-2005Q6, based on the recursive residuals, CUSUM and CUSUMSQ tests.

However, it's legitimate at this point to ask ourselves whether we should be preoccupied by the stability of money as it appears that the main drivers identified in the literature (technology advances and development of alternative financial instruments) of money instability are still at their early stage of development in Morocco:

- In 2005, cash credit transactions represented only 0.5% of GDP and the economy still relied heavily on cash as a payment instrument;
- Apart for the primary market for public auctions, the capital markets are still underdeveloped. Only 53 firms are listed in the stock market and the market in negotiated securities has proved difficult to develop with the stock outstanding of securities reaching barely DH 9.5 billion in December 2005, representing less than 2% of M3.

In fact, the observed increase of the ratio M3/GDP (103%) which is at the same level of the developed countries, is more an indication of the paucity of alternative financial instruments than an indication of monetization of the economy as the retail banking covers only 16% of the adult population (IMF, 2003).

In a context of the limited interest of nonresidents for portfolio investments in Morocco and the prohibition for residents to invest abroad, the significance of the foreign interest rate underlines the portfolio choice that Moroccans residing abroad (who already hold 37% of time deposits in Moroccan banks) face between investing in Morocco.

We also considered error correction models that provide us with insight on the short run dynamics of the money demand. They corroborate the findings of the cointegration analysis concerning the significance of the adjustment process with 11% of the disequilibrium in M1 being corrected in the first quarter and at least 15% is adjusted in the first quarter for M3. It was also found that short-run money (M1 and M3) demands are stable.

The main policy implication from the study is that the conduct of the monetary policy is still feasible given that the demand for money has proven stable.

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Figure 1: Monetary Aggregates, 1982-2005

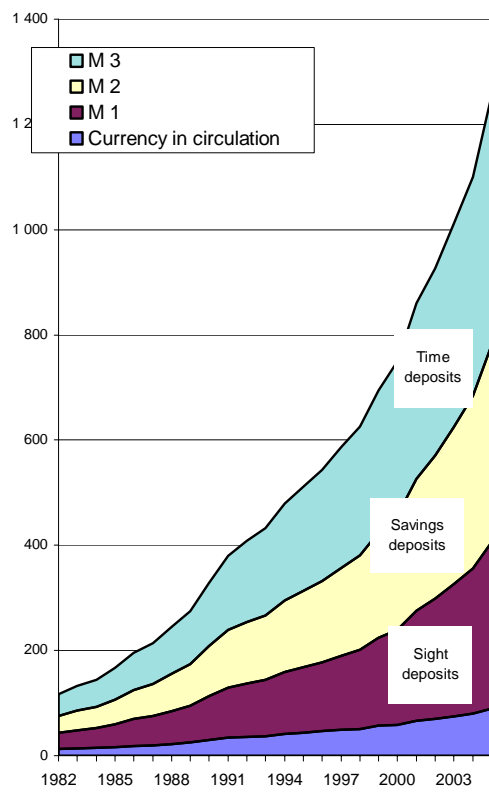


Figure 2: Velocity of M1 and M3, 1982-2005

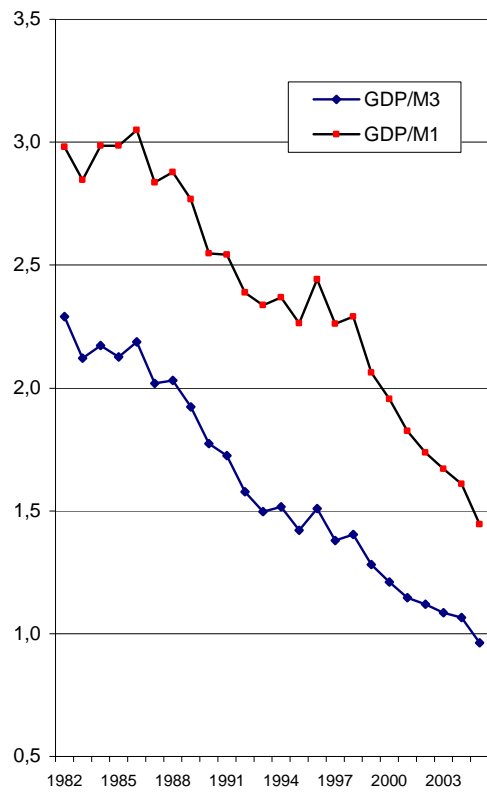
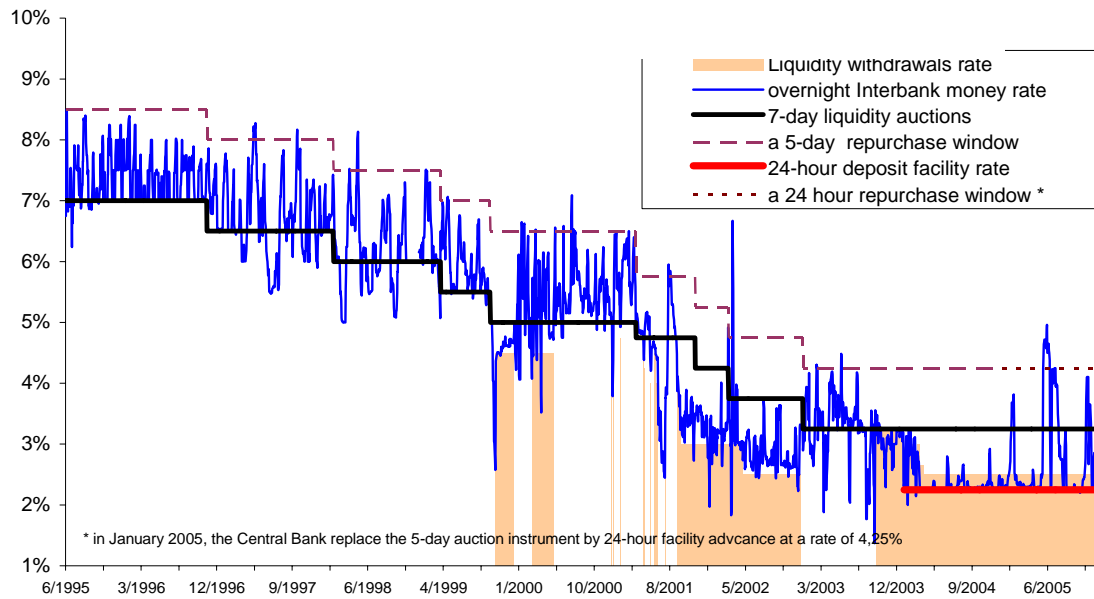


Figure 3: Daily Money Market Rate and Monetary Policy Instruments (June 1995 – December 2005)



**Figure 4: Central Bank's Weekly Intervention in the Money Market (Daily Average)
June 1986 – December 2006**

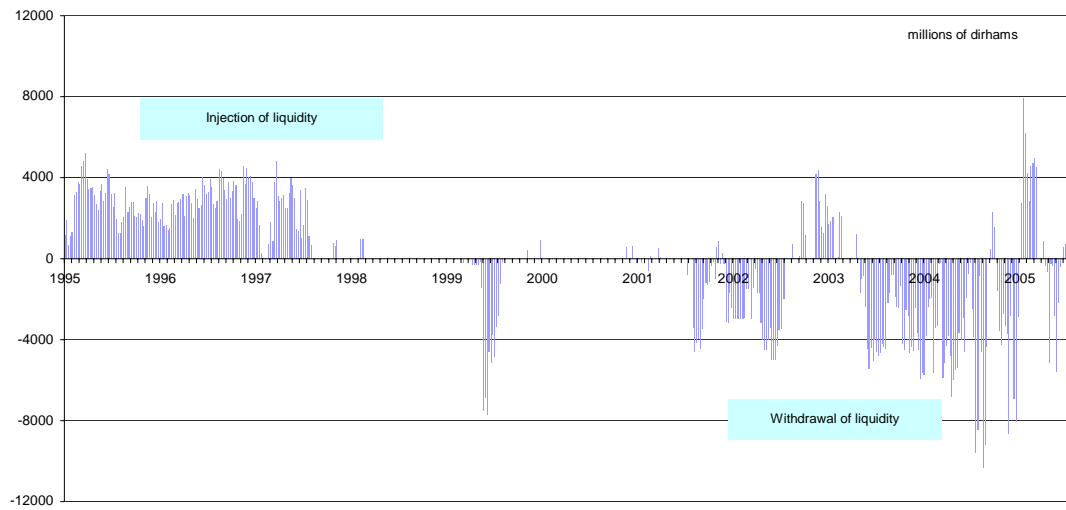


Figure 5: Relationship between the Domestic Currency and MLA's Remittances in Cash 1989 -2005 – Quarterly Data

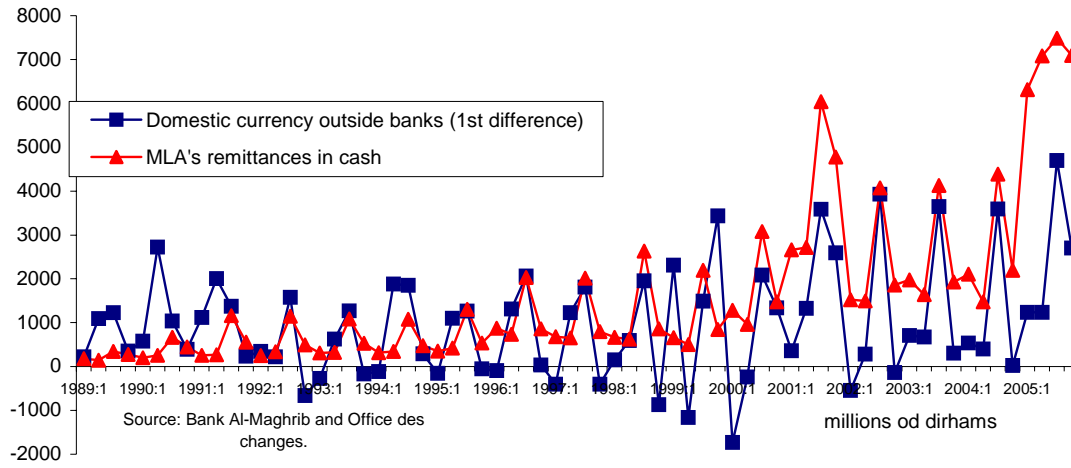


Figure 6: Graphical Presentation of the Variables, 1982Q4-2005Q4

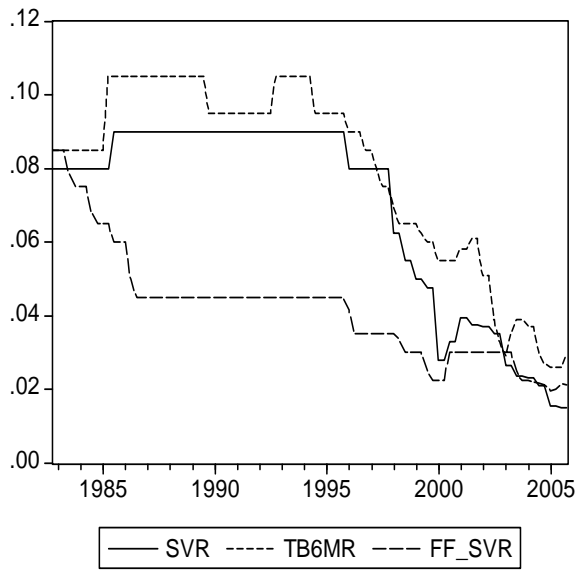
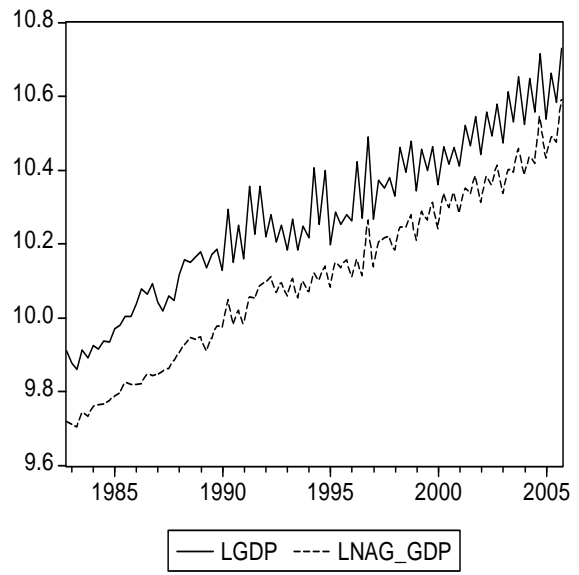
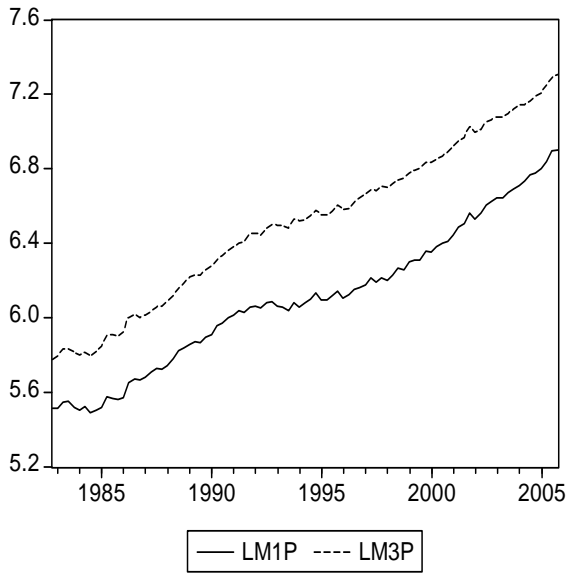


Figure 7: Stability Test Results

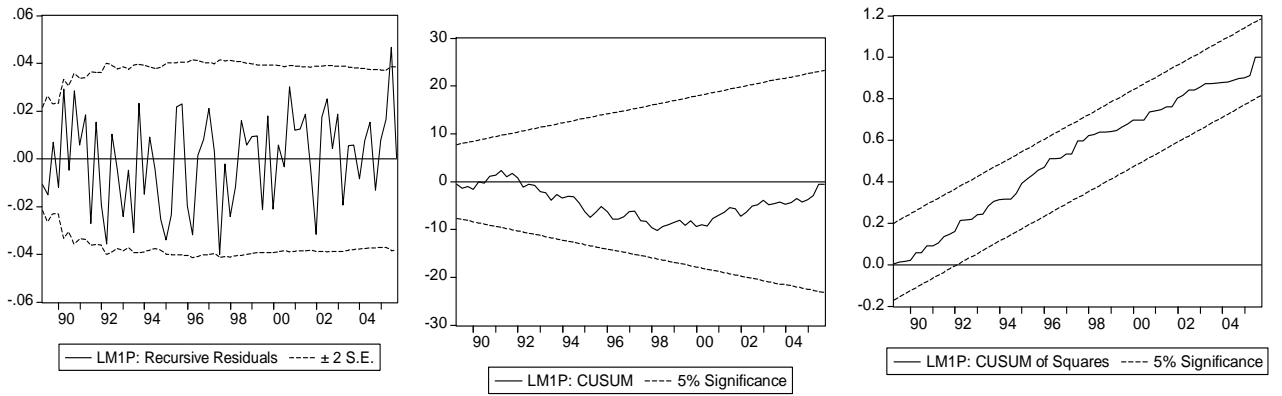


Figure 8: Stability Test Results

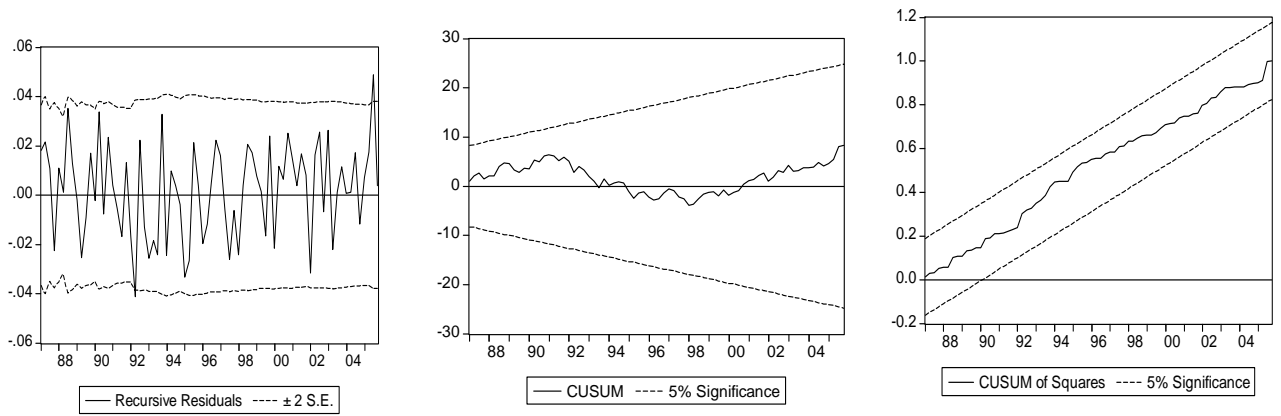


Figure 9: Liquid Investments (PL) in % of M3

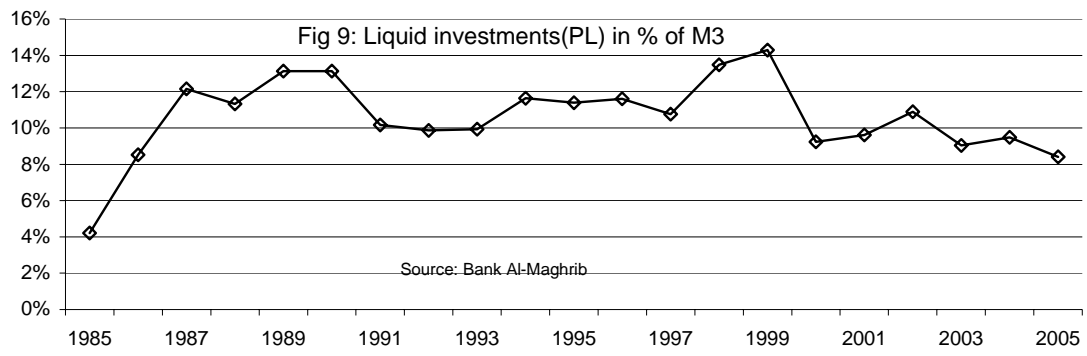


Figure 10: Stability Test Results

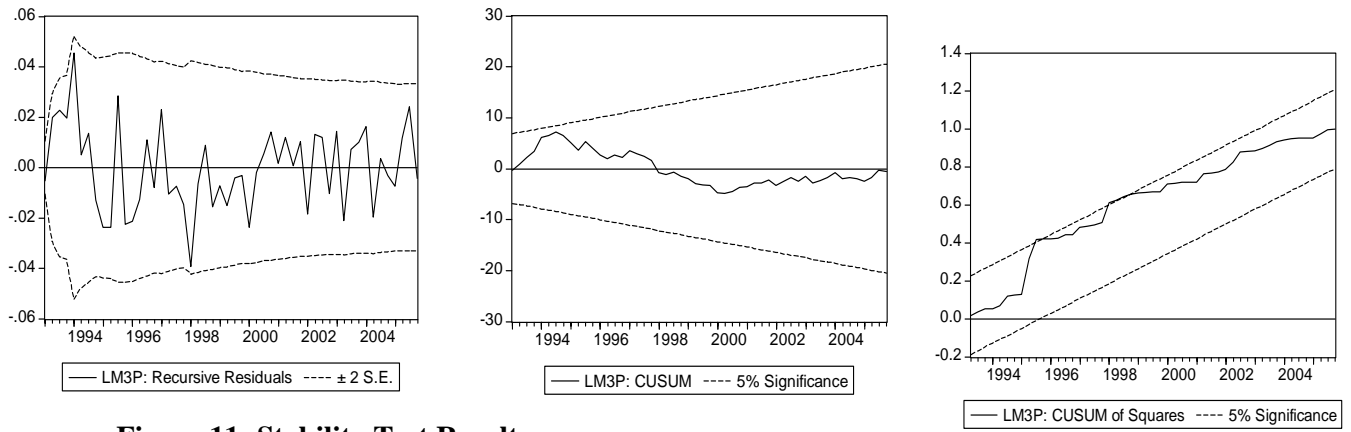


Figure 11: Stability Test Results

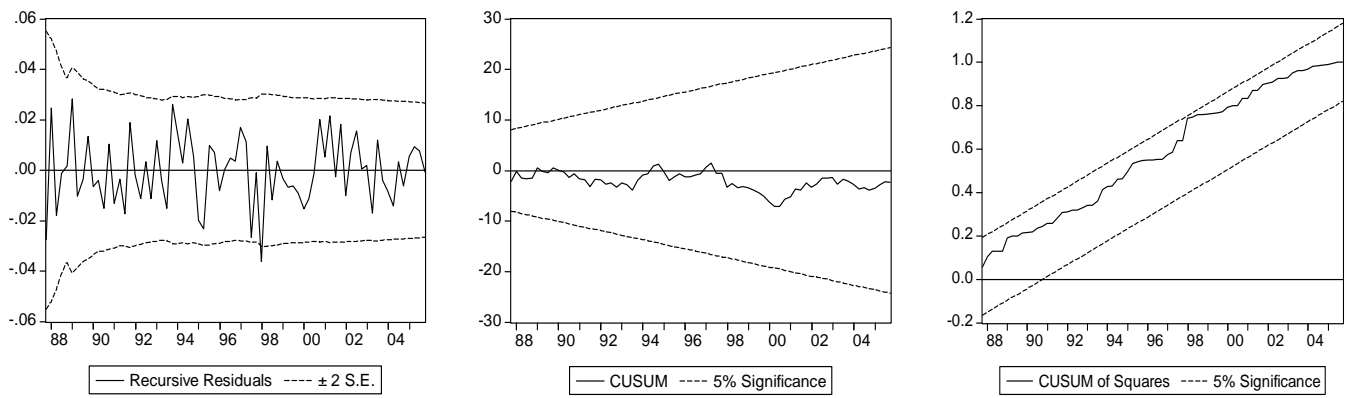


Table 1: Monetary Indicators

	1997	1998	1999	2000	2001	2002	2003	2004	2005
Annual Change in Percent of M3									
Net foreign assets	2,5%	1,0%	6,6%	-1,6%	16,1%	2,6%	4,7%	4,4%	5,2%
Domestic credit	7,3%	6,7%	3,7%	9,4%	0,6%	3,7%	5,2%	3,1%	8,5%
Government	2,2%	-0,8%	-3,5%	3,7%	-2,6%	0,7%	-0,6%	-1,5%	1,1%
Private sector	4,7%	7,1%	7,0%	5,5%	3,0%	2,8%	5,6%	4,3%	7,0%
M3	9,2%	6,0%	10,2%	8,4%	14,1%	6,4%	8,7%	7,8%	14,0%

Source: Bank AL-Maghrib

Table 2: The Evolution of the Deposits in Dirham Held by Moroccans Living Abroad between 1983 and 2005

	1983			2005		
	Sight Deposits	Time Deposits	Total Deposits	Sight Deposits	Time Deposits	Total Deposits
MRA's Deposits (Millions of Dirhams)	4 837	1 150	5987	51108	36795	87903
As % of Total Deposits in the Banking System	23,6%	12,0%	19,9%	23,7%	37,1%	27,9%

Source: Bank AL-Maghrib

Table 3: Results of Unit Root Tests

	Augmented Dickey-Fuller Test					
	Lag Length	Constant	Constant +Seasonal	Lag Length	Constant +Trend	Constant +Trend+Seasonal
		Test Statistic	Test Statistic		Test Statistic	Test Statistic
LMP1	0	1.427	1.501		-1.051	-0.878
LMP3	0	0.384	0.320	0	-1.941	-1.861
LGDP	7	-0.714	-0.697	1	-3.249	-3.161
LNAG_GDP	3	0.402	0.402	3	-2.002	-2.118
SVR	0	0.821	0.993	0	-2.288	-2.138
TB6MR	0	0.613	0.669	0	-2.309	-2.218
Inf	0	-7.263**	-7.100**	0	-8.647**	-8.449**
XRDHFF	1	-2.077	-2.036	1	-1.781	-1.727
XRDHFF_V	0	-6.499**	-6.290**	0	-6.680**	-6.472**
FF_SVR	1	-2.405	-2.363	1	-2.624	-2.561
DLMP1	0	-10.699**	-9.795**	0	-10.984**	-10.093**
DLMP3	1	-8.414**	-8.520**	1	-8.457**	-8.555**
DLGDP	0	-37.098**	-26.108**	0	-36.891**	-25.961**
DLNAG_GDP	2	-11.954**	-9.907**	2	-11.909**	-9.867**
DSVR	0	-10.855**	-10.373**	0	-11.394**	-10.952**
DTB6MR	0	-8.953**	-8.387**	0	-9.285**	-8.707**
Dinf	6	-7.940**	-7.785**	0	-7.896**	-7.740**
DXRDHFF	0	-6.145**	-5.951**	0	-6.283**	-6.089**
D XRDHFF_V	0	-14.301**	-14.096**	0	-14.269**	-14.064**
DFF_SVR	0	-7.407**	-7.223**	0	-7.572**	-7.386**

** and * indicate the rejection at 1 percent and 5percent significance respectively

Table 4: Co-integration Analysis of Real Narrow Money M1, 1982:Q4 to 2005:Q4

Trace Statistic				
Hypothesized		Trace	5 Percent	1 Percent
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Critical Value
None **	0.328930	62.54786	47.21	54.46
At most 1	0.202972	27.44621	29.68	35.65
At most 2	0.069672	7.482038	15.41	20.04
At most 3	0.012723	1.126842	3.76	6.65
Maximum Eigenvalue test				
Hypothesized		Max-Eigen	5 Percent	1 Percent
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Critical Value
None **	0.328930	35.10165	27.07	32.24
At most 1	0.202972	19.96418	20.97	25.52
At most 2	0.069672	6.355196	14.07	18.63
At most 3	0.012723	1.126842	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level. The system includes a constant seasonal dummies

Unrestricted Co-integrating Coefficients (normalized by b'*S11*b=I):				
	LMIP	LGDP	SVR	INF
	23.80070	-44.39078	42.90285	5.700265
	10.42687	-22.32143	4.391632	-55.61664
	4.285417	-1.920382	73.91965	-5.057873

Unrestricted Adjustment Coefficients (alpha):				
	LMIP	LGDP	SVR	INF
D(LMIP)	-0.004620	-0.000521	-0.004030	-1.19E-05
D(LGDP)	0.012607	0.006046	-0.005183	-0.002675
D(SVR)	0.001082	-0.000149	-0.000258	0.000208
D(INF)	0.003130	0.014318	0.004323	0.000707

1 Cointegrating Equation(s): Log likelihood 786.6077				
Normalized Co-integrating Coefficients (std.err. in parentheses)				
	LMIP	LGDP	SVR	INF
	1.000000	-1.865104	1.802588	0.239500
		(0.07831)	(0.49568)	(0.43116)

Adjustment Coefficients (std.err. in parentheses)				
	LMIP	LGDP	SVR	INF
D(LMIP)	-0.109959	(0.04848)		
D(LGDP)	0.300066	(0.11082)		
D(SVR)	0.025762	(0.00762)		
D(INF)	0.074505	(0.10634)		

Weak Exogeneity Test Statistics				
	LMIP	LGDP	SVR	INF
Chi-sq(1)	5.451661	0.079236	1.340808	0.343244
Probability	0.019550	0.778335	0.246892	0.557963

Significance Test for a Given Variable				
	LMIP	LGDP	SVR	INF
Chi-sq(1)	12.47675	12.14077	7.444006	0.163482
Probability	0.000412	0.000493	0.006365	0.685971

Table 5: Results for Short-Run Model for M1 – Parsimonious Model
Dependant Variable D(LM1P)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EC(-1)	-0.102039	0.036215	-2.817577	0.0062
D(LM1P(-1))	-0.079909	0.103194	-0.774360	0.4411
D(LM1P(-2))	-0.120651	0.100792	-1.197027	0.2350
D(LGDP(-1))	-0.053289	0.068959	-0.772757	0.4421
D(LGDP(-2))	0.042140	0.051406	0.819743	0.4149
D(SVR(-3))	2.256743	0.643772	3.505499	0.0008
D(SVR(-4))	-1.158422	0.711661	-1.627771	0.1077
D(INF(-4))	-0.048714	0.035687	-1.365032	0.1763
S2	0.027233	0.007326	3.717412	0.0004
S3	0.015901	0.006089	2.611347	0.0109
S4	0.023495	0.007425	3.164351	0.0022
C	0.019628	0.003459	5.674285	0.0000
R-squared	0.410622	Mean dependent var		0.015741

Table 6: Co-integration Analysis of Real Broad Money M3, 1982:Q4 to 2005:Q4

		Trace Statistic		
Hypothesized		Trace	5 Percent	1 Percent
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Critical Value
None **	0.470220	144.1262	94.15	103.18
At most 1 **	0.302011	88.85568	68.52	76.07
At most 2 **	0.248779	57.57464	47.21	54.46
At most 3 *	0.202535	32.68778	29.68	35.65
At most 4	0.126559	12.99821	15.41	20.04
At most 5	0.013991	1.225822	3.76	6.65

		Maximum Eigenvalue Test		
Hypothesized		Max-Eigen	5 Percent	1 Percent
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Critical Value
None **	0.470220	55.27052	39.37	45.10
At most 1	0.302011	31.28104	33.46	38.77
At most 2	0.248779	24.88686	27.07	32.24
At most 3	0.202535	19.68957	20.97	25.52
At most 4	0.126559	11.77238	14.07	18.63
At most 5	0.013991	1.225822	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level

1 Cointegrating Equation(s): Log likelihood 1945.636						
Normalized Co-integrating Coefficients (std.err. in Parentheses)						
	LM3P	LNAG_GDP	SVR	TB6MR	XRDHFF	FF_SVR
	1.000000	-1.410548	-2.251372	4.479611	-0.164599	4.262337
		(0.17630)	(1.25402)	(1.12023)	(0.12718)	(1.44551)

Adjustment Coefficients (std.err. in Parentheses)		
D(LM3P)	-0.234983	(0.08374)
D(LNAG_GDP)	0.024279	(0.13988)
D(SVR)	0.052760	(0.01526)
D(TB6MR)	-0.043289	(0.01729)
D(XRDHFF)	0.111061	(0.13294)
D(FF_SVR)	0.007587	(0.01050)

Weak Exogeneity Test Statistics						
	LM3P	LNAG_GDP	SVR	TB6MR	XRDHFF	FF_SVR
Chi-sq(1)	9.115322	0.031199	14.24608	8.268594	0.822533	0.620791
Probability	0.002535	0.859798	0.000160	0.004034	0.364441	0.430753

Significance Test for a Given Variable						
	LM3P	LNAG_GDP	SVR	TB6MR	XRDHFF	FF_SVR
Chi-sq(1)	14.96449	8.242994	2.668753	10.96854	0.972697	5.881684
Probability	0.000110	0.004091	0.102336	0.000927	0.324008	0.015299

Table7: Results for Short-Run Model for M3 – Parsimonious Model**Dependant Variable D(LM3P)**

Variable	Co-efficient	Std. Error	t-Statistic	Prob.
ECM(-1)	-0.144518	0.026822	-5.388060	0.0000
D(LM3P(-1))	0.443140	0.107490	4.122598	0.0001
D(LM3P(-2))	-0.392956	0.091374	-4.300538	0.0001
D(LNAG_GDP(-1))	-0.207270	0.049690	-4.171248	0.0001
D(SVR(-1))	0.978672	0.465082	2.104301	0.0388
D(SVR(-3))	1.841977	0.443095	4.157071	0.0001
D(SVR(-4))	-1.444004	0.461675	-3.127746	0.0025
D(FF_SVR (-3))	-1.802565	0.755743	-2.385157	0.0197
D(FF_SVR (-4))	2.783143	0.753836	3.691974	0.0004
D(INF(-1))	0.109727	0.039203	2.798919	0.0066
S2	0.017426	0.005571	3.128163	0.0025
S3	0.016058	0.004518	3.554144	0.0007
S4	0.021163	0.004837	4.374975	0.0000
C	0.019909	0.002581	7.712054	0.0000
R-squared	0.579106	Mean Dependent var		0.017316
Adjusted R-squared	0.504153	S.D. Dependent var		0.018952
S.E. of Regression	0.013345	Akaike info Criterion		-5.648962
Sum squared resid	0.013000	Schwarz Criterion		-5.252149
Log likelihood	259.7298	F-statistic		7.726187
Durbin-Watson stat	2.265453	Prob(F-statistic)		0.000000
Jarque-Bera Test for Normality	0.396131	P-value		0.820316
Breusch-Godfrey Serial Correlation LM Test	1.865645	P-value		0.162991
Arch(4)	0.332162	P-value		0.855543
Reset(4)	0.812722	P-value		0.521787
W. Heteroskedasticity Test:	0.606271	P-value		0.939599