An Empirical Analysis of the Money Demand Function in Syria

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ABSTRACT

The existences of a well define and stable money demand function is an essential condition for the reliable transmission of the money supply impact to aggregate demand. Furthermore, this stability is the key choice for Central Bank to select between monetary policy tools. This paper investigates if a stable money demand function can be found for Syrian economy for the period 1990:1 up to 2009:4. The empirical results show that real money demand M2 and its economics determinants are weakly cointegrated. On the other hand, stability test and Error Correction Model have provided a support that money demand function is unstable in the Syrian economy, and this instability could be due to structural changes in the function. These findings support the choice of exchange rate as a nominal anchor for Syrian monetary policy to tie down the price level and achieve its stability. Indeed, there are two main reasons beyond the gradual giving up the money supply as an intermediate target in the Syrian monetary policy. ***First***; the transition process to the social market economy in 2000s, which was accompanied by ongoing financial and trade liberalization, interest rate is not employed effectively and the credibility of monetary policy hasn't built yet, and as a result, unstable money demand function is exist. ***Second***; the path from a fixed exchange rate regime to more flexible one, where the only way for any desired adjustments under fixed regime will be through the inflation (increase the money supply) in the economy.

Key words: *Error Correction Model, Unstable Money Demand Function and Nominal Anchor*

JEL Classification Codes: E31, E41, E51

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1. INTRODUCTION

The groundbreaking development in economic theory was coincided with the growing acknowledgment among economists of high costs of inflation. It made clearly why the money demand function is such an important link between the monetary and real sphere in the economy. The analysis of money demand function is regarded as a key factor in conducting reliable strategy of monetary policy and selecting the suitable nominal anchor that monetary policy makers use to tie down the price level. The marvellous strides in monetary analysis showed why a nominal anchor, such as the inflation rate, an exchange rate, or the money supply, is such a crucial element in achieving the price stability.

The most well-known fact in the last 25 years is the level of inflation and its variability around this level has declined in developed countries *(Moutot and Vitale, 2009)*. Of 223 countries, 193 currently have annual inflation rate less than or equal to 10 percent, while 149 have annual inflation rate less than or equal to 5 percent (Mishkin, 2007). Monetary policy has played a crucial role and become so successful in taming inflation. Indeed, central banks have changed their strategy of the conduct of the monetary policy "lean against the wind" to maintain the macroeconomic and financial stability. In this respect the stability of money demand function is a natural starting point for comprehensive realizing of monetary policy strategy, where Nominal shocks mainly originate from instability of money demand function (Abdelali Jbili and Vitali Kramarenko, 2003).

In fact the choice of the intermediate target in the monetary policy strategy is one of the principal purposes in the central banks. Theoretically the choice of target is located between monetary aggregate and interest rate, building on that, the volatility of money demand has significant importance to know how monetary policy should be conducted. If most of the aggregate demand shocks which affect the economy come from the expenditure side (***IS Curve)*** then a policy of targeting the money supply will be stabilizing, relative to a policy of targeting interest rates. In contrast, if most of the aggregate demand shocks come from changes in money demand ***(LM Curve)*** and then a policy of targeting the money supply will be destabilizing, hence unstable money demand function ***(LM Curve Volatility)*** implies that central bank should use the rate of interest, instead of money supply, as monetary policy instrument. Therefore, the above discussion implies that the volatility of money demand matters for how monetary policy should be conducted.

The present study aims to fill the existence gap in literature related developing countries by providing a study case about Syrian economy, and seeks to explain the factors that underlie

the stability or instability of money demand function. These factors include mainly two theoretical variables, scale variable and opportunity cost variable which consider a significant puzzle in the developing countries; hence in Syrian economy and over 23 years the interest rates were nearly fixed and determined by administrative decisions not by market forces. Therefore the paper examines the role of foreign interest rate, expected rate of inflation and oil prices in the money demand function as the appreciate measures of opportunities cost of holding money in Syrian economy. On the other hand, our study argues that money demand analysis, probably, is still relevant in developing and transition countries where long-run economic growth is so linked to money expansion (Yu and Tha Gan, 2009). Although ever the recent researches have reduced the importance of monetary aggregates in conduct an effective monetary policy.

Therefore, the main contribution of this paper is twofold; first, this is the first attempt to estimate and analysis the demand for real money function in the Syrian economy, where to our knowledge there has been no theoretical or empirical test on the money demand function in the Syrian economy. Second the study deals with all the proxies that could capture the effects of opportunity cost of holding money, the effects of foreign factors and the effect of currency substitution in the Syrian economy. Third, how could developing country such as Syria deal with the existence of unstable money demand function in the economy.

The structure of this paper is organized as the following, section two present the literature review for the money demand function, whereas in section three we explain the current monetary policy strategy in Syrian economy, where the section four and five is devoted to theoretical and empirical methodology, finally the conclusion of this study and the main policy implementations.

2. LITERATURE REVIEW

The money demand function has long been a fundamental building block in macroeconomic modelling and an important framework for monetary policy. The literature on money demand function estimation is extensive; most of this literature is concerned with the existence of a stable money demand function. Notable references are Laidler (1985), Lucas (1988), Hoffman and Rasche (1991), Miller (1991), Baba et al. (1992), McNown and Wallace (1992), Stock and Watson (1993), Mehra (1993), Miyao (1996), Ball (2001), and Anderson and Rasche (2001). For a recent literature survey, see (Sriram, 2001).

The recent literature on monetary economics seems to de-emphasize the role of monetary aggregates in the transmission of monetary policy. This reflect a perspective that under an

interest-rate-based policy, the equilibrium quantity of money is not a variable of interest to policymakers seeking to stabiles output and inflation (*Duca and VanHoose, 2004)*. The analysis of money demand is less important now than it has been in the past. This change has happened because Central banks, to a large extent, are employing short term interest rate as policy tool which de-emphasize the role of monetary aggregate. In addition, financial innovations and ongoing improvements in information processing technology have affected payment and portfolio allocation behaviour and the Central Bank could lose the control over aggregate demand (McCallum, 2003). Even though the interest rate-based policy has reduced the importance of monetary aggregates, demand for money remains relevant. This is especially for developing, transition and some developed countries like Germany, where monetary authorities continue to emphasize the role of money demand function on their monetary operations.

The above discussion aims to know which policy variable monetary policy will use to stabilize the inflation in the long run. In this context, several economists have argued that the steady-state of inflation is ultimately determined by the rate of money growth, but Woodford (2007), argues that it is not appropriate to believe that money growth determines inflation in the long run. Recently, that idea has been rebuttal to emphasize again that money growth determines inflation in the long run indeed, where Woodford depend on beneath assumptions concern Central Bank's long run control of the interest rate (Edward Nelson 2008).

The question is what determines the anticipated rate of inflation, the answer is located between two opinions; either introduces a money demand equation and hence appeals to the quantity theory or simply to identify the steady-state rate of inflation as the central bank's target rate. The latter seems to be much more plausible in a world that central bank policy is fully credible (Lothian and McCarthy, 2009). Of course the developing countries are not that case where the credibility of monetary policy hasn't built yet and short run interest rate is not employed effectively.

Empirical studies regarding money demand function in developing countries generally use Goldfeld model. Recently, Yu and Tha Gan (2009) indicated that ECM clearly showed that there is a long-run relationship between real money balances and its determinants. Inoue and Hamori, (2008) indicated that when money supply is represented by M1 and M2, a cointegrating vector is detected among real money balances, interest rates, and output in India. In contrast, it was found that when money supply is represented by M3, there is no long-run equilibrium relationship in the money demand function. Hamori, (2008) analyzed the

money demand function in Sub-Saharan African, his empirical results revealed that there exists a cointegrating relationship of the money demand function in the Sub-Saharan African region. In other words, there is a close relationship between the money supply and the real economy over the long term, and monitoring money supply promises to play an important role in stabilizing the level of prices in this region.

Tuck Cheong Tang (2007) found that real M2 aggregate, real expenditure components, exchange rate, and inflation rate are cointegrated for Malaysia, the Philippines, and Singapore. Using narrow money demand for Indonesia as it described in Hossain (2007), the empirical results suggest that real income, and inflation (proxy for expected inflation) and the return on foreign financial assets are the major determinants of narrow money demand function.

3. THE CURRENT MONETARY POLICY STRATEGY IN THE SYRIAN ECONOMY

During the reforms period after 2000, the Syrian social and economic regime has experienced structural changes in terms of enhancing social goods as decent schools, health care and civic rights. On the other hand, many difficulties concern oil production, ongoing economic liberalization, and political tensions in the Middle East region as well. Nevertheless, those hard conditions beg the question if the monetary authority able to conduct an efficient monetary policy. In term of maintains price stability, supports sustainable economic growth and well standards living. Notably, price stability and output stability are reinforced and promote the economic development process in Syria which faces two main challenges:

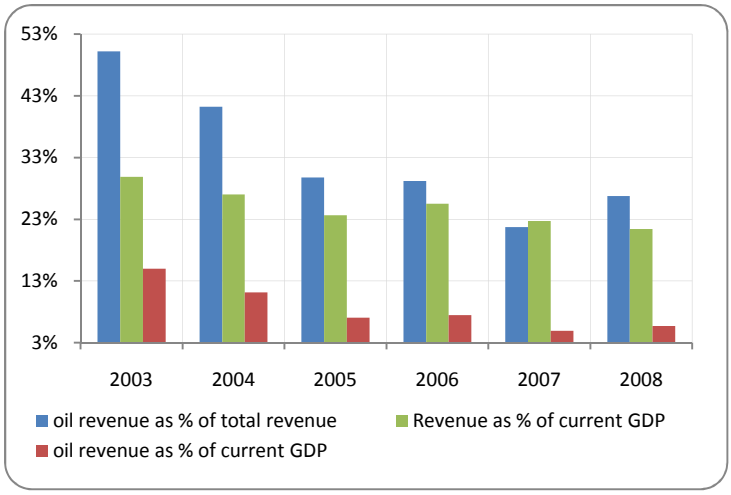
First, the sharp decline in the oil production, which is still considered, to some extent, the cornerstone in Syrian's public budget and relying to the tune of 25 percent of GDP on oil revenues (IMF, 2006) in financing public spending. Furthermore, the government is still saddled with deficit spending through borrowing from frail public banking sector, companied with unsteady stream of oil revenues (table1) and the moderate level of the overall tax burden.

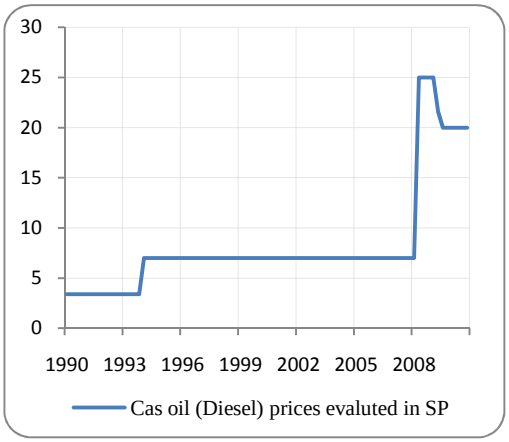
Table (1) main income and fiscal indicators

	2003	2004	2005	2006	2007	2008	2009e
Real GDP growth	…	6,9%	6,2%	5,0%	5,7%	4,3%	5,9%
Revenue as % of current GDP	29,9%	27,0%	23,7%	25,5%	22,7%	21,4%	18,3%
Oil revenue as % of current GDP	15,0%	11,1%	7,0%	7,4%	4,9%	5,7%	…
Overall budget balance as % real GDP	3,2%	5,8%	6,5%	4,8%	4,8%	4,3%	…

Source: CBS, quarterly bulletin No.3-4 Year 2009

Figure (1) oil revenue as % of total revenue and current GDP, Figure (2) Diesel price developments





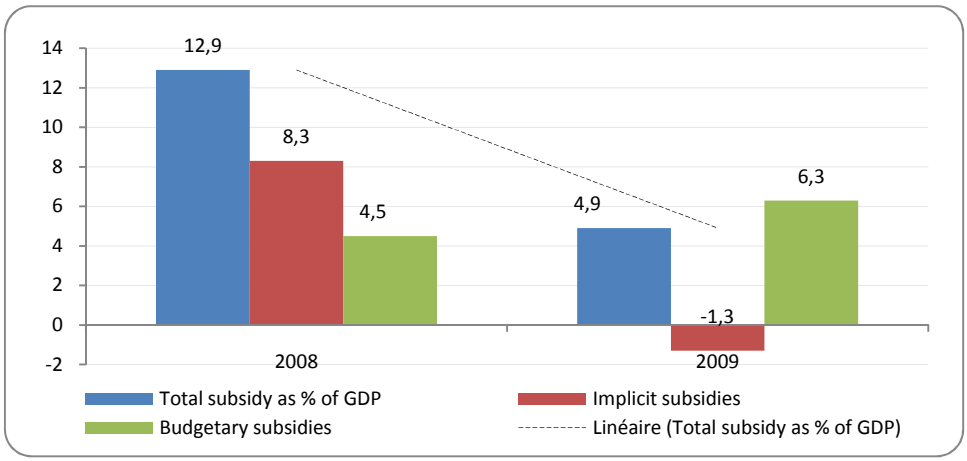
In addition, subsidized public goods and services are still delivered through wide range in the economy, which in turn saddled the overall balance by the second round effects of budget deficit (table 2). In April 2008 the government has decided to reform the energy subsidises by increase the price of key petroleum products. In order to moderate the impact of high prices, the government issued coupons, allowing every family to buy up to 1000 liters of diesel at low price. These compensatory measures amounted to 4.5 percent of GDP (IMF, 2009). Although the significant increase in the prices of key petroleum product, implicit subsidies still about 8.3 percent of GDP at the same time as the international price increase in 2008.

Table (2) energy subsidy price reforms in Syria (IMF, 2009)

Energy subsidy reforms		***2008***	***2009***
Gas oil (Diesel)	Adjustments of prices	7 to 25 SP/liter	25 to 20 SP/liter
Fuel oil		6 to 9 SP/liter	…
Gasoline		36 to 40 SP/liter	…
Total subsidy as % of GDP		***12.9***	***4.9***
Implicit subsidies		8.3	-1.3
Budgetary subsidies		4.5	6.3

These reforms decrease diesel and fuel consumption, therefore the implicit subsidies drop clearly in 2009 with the decline in international oil prices. As the result the total subsidy became about 4.9 percent of GDP (IMF, 2009), where the budgetary compensatory measures amounted to 6.2 and implicit subsidies -1.3 percent of GDP, figure (3).

Figuer (3) Total subsidy as % of GDP

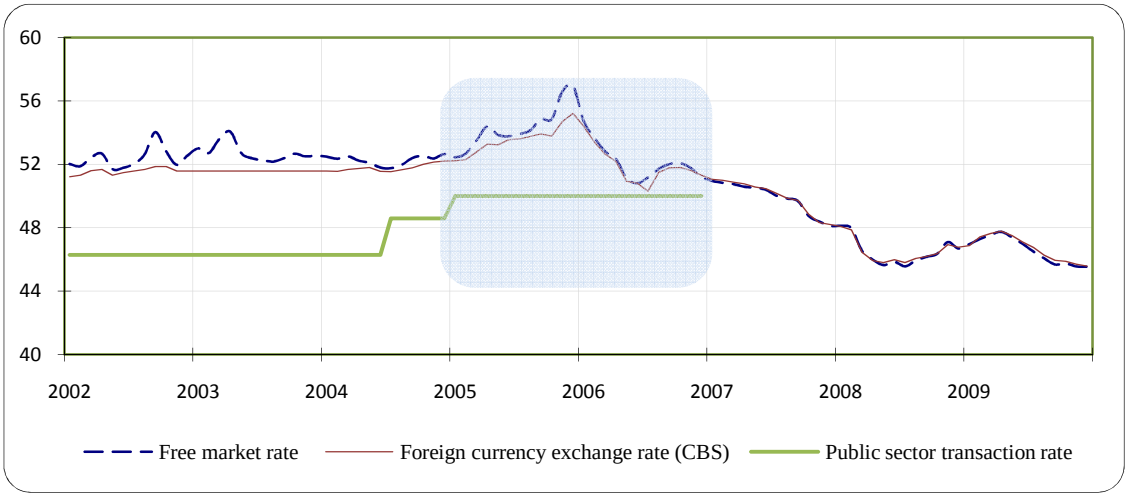


Second, the progress made in transition to a market economy which should response more to the market forces. It is not merely a question of transition to market-oriented economy, but this transition should achieve better allocation for the resources in terms of quantity, quality and justice and then improving the delivery of public goods. Since 2000 Syria has introduced a wide range of institutional reforms have been put in the place, on the other hand, reform agenda must emphasize decisively on the remaining structural reforms, and modernizing of the legal and regulatory framework in order to encourage private investment and enhance competitiveness.

The main task given to the Central Bank is to provide the economy with a nominal anchor to keep inflation within limits well-matched with the other macro-economic objectives. Therefore CBS had reached an important milestone in 2005 when it decided to adopt the structure of interest rate system. Indeed, that was a real breakthrough in the Syrian monetary policy's understanding, given the fact that interest rates was fixed, associated with multiple exchange rates system and crippled monetary policy.

Syria's current monetary and exchange rate policy framework is in transition in terms of new regulations that were issued and some positive effects which were achieved. Major reforms are in progress, reinforcing by the overall liberalization of the economy, as key elements of the traditional policy tools including multiple exchange rates and financial repression are being dismantled. In particular, the economically significant exchange rates were unified on January 2007 (figure 4), and substantial progress toward current account convertibility has been achieved since September 2006 when access to foreign exchange was made available to private sector import (Saker and Moalla, 2007).

Figure (4) foreign currency exchange rate (USD against SYP) developments



Indeed, it cannot turn a blind eye to the fact that Syrian banking system is undeveloped and there are no money markets. Furthermore, the CBS relies exclusively on credit ceilings and refinancing facilities to regulate domestic liquidity and although lending rates have been liberalized, indicative deposit interest rates on Syrian pound (SP) deposits are used to set benchmark interest rates, in the absence of a T-bill market. There is need to enlarge the efforts to develop the monetary policy framework by steadily replacing the administrative for conducting the monetary policy with market-based tools On the other hand, Syrian's pound *de jure* peg to a band around the Special Drawing Rights (SDR) can provide a strong monetary anchor, while allowing some flexibility in the pound rate *vis-à-vis* major currencies. The pound appears to be *de facto* pegged to a basket in which the dollar has a larger weight than its weight in the SDR basket.

The gradual move toward greater exchange rate flexibility over the medium-term, as the monetary policy framework, would increase monetary policy independence and maintain external stability. The above main considerations suggest theoretically that Syria should use the exchange rate as the main anchor of its monetary policy framework, but should also guarantee some flexibility and expand it gradually over the medium term as the key ingredients for a more flexible arrangement are progressively developed (Neil Saker and Rakia Moalla, 2007). This argument (Mishkin, 2007) is still subject to the mirage of exchange rate regime in developing countries. Thus the choice of flexible exchange rate is likely to be second order importance to the good development fiscal, financial and monetary reforms institutions.

4. THE THEORETICAL MODEL OF MONEY DEMAND FUNCTION

The Keynesian theory supposed an easy monetary policy to keep interest rates low in order to stimulate the investment to offset the shortages of demand. Post Keynesian developments (Baumol and Tobin) showed that, contrary to the Keynesian postulate that transaction demand for money is a function of current income (Dwivedi, 2008), the transaction demand for money is also a function of interest and its elasticity. Later Milton Friedman, building on the Cambridge version of the quantity theory of money, developed a new monetary theory, which brings out the money demand function. Hence in this simple formulation demand for money is a function of real income and nominal interest rate, as long as its velocity is constant

$$(M/P)^d = f(Y, i) \dots f_Y > 0, f_i < 0$$

Most post Keynesian theories of demand for money emphasize the store of value, i.e., the asset function of money (portfolio theories of money). Mankiw suggests that the amount of money holding is determined by the optimal combination of risk and return offered by money and alternative assets (Mankiw, 2000). In addition to risk and return factors demand for money depend on the total wealth of the households. Thus the demand function for money with respect to portfolio theory can be written as the following:

$$(M/P)^d = f(W, r_s, r_b, \pi^e)$$

There isn't much difference between the two money demand function, where the real income Y can be considered as 'proxy' for real wealth W, and the nominal interest rate i is the sum of the real return on bonds r_b and the expected inflation (π^e), i.e. $[i = r_b + \pi^e]$.

The validity of portfolio theory depends on which measure of money is being considered M_1, M_2 *or* M_3 thus portfolio theory may not be convenient when applied to M_1 as a measure of money supply, because M_1 includes only currency and other deposits, which earn zero or very low rates of interest. But portfolio theory may offer a reasonable explanation when applied to demand for M_2 *or* M_3.

The starting point of empirical money demand analysis is the choice of variables to be included in the money demand function. It is common practice to assume that the desired level of nominal money demand depends on the price level, a transaction (or scaling) variable, which is usually, defined as the real GDP (real income) or the real consumption, whereas the vector of opportunity cost variable is usually considered as the interest rate on alternative asset. In this respect the general design of money demand function is assumed to take the following practical form:

$$\frac{M^d}{P} = \alpha_0 + \alpha_1\, Scale\ Variable + \alpha_2\, Opportunity\ Cost\ Variable$$

Where M^d the demand for money balances, P is the price level, $\frac{M^d}{P}$ is the demand for real money, Y is the real income that represents the scale variable and r is the interest rate on the alternative assets which represent the opportunity cost variable. Following the empirical literature on money demand in developing countries (*Goldfeld, 1992; Goldfeld and Sichel, 1990)*, the long-run money demand can be specified in the following (natural) logarithmic form:

$$\ln m_t^d = \beta_0 + \beta_1 \ln y_t + \beta_2 \ln i_t + \beta_3 \pi_t^e + \varepsilon_t$$

In most empirical studies, the interest rate term is used in non-logarithmic form, which leads to the following:

$$\ln m_t^d = \beta_0 + \beta_1 \ln y_t + \beta_2 i_t + \beta_3 \pi_t^e + \varepsilon_t$$

$$\beta_1(Income\ Elasticity) = \frac{d \ln m_t}{d y_t} > 0$$

$$\beta_2(Semi - Interest\ \ Elasticity) = \frac{d \ln m_t}{d i_t} < 0$$

$$\beta_3(Semi - Inflation\ \ Elasticity) = \frac{d \ln m_t}{d \pi_t^e} < 0$$

Where m_t^d is the desired demand for real money balances, defined as the demand for money supply deflated by the price level p, y_t is a scale variable (for example, real measured income), i_t is the nominal interest rate on financial assets which represents alternatives to holding money, π_t^e is expected inflation which measures the rate of expected return on physical assets, and ε_t is an error term. The function m_t^d is increasing in y_t and decreasing in both i_t and π_t^e *(Hossain, 2007).* When physical assets represent the major alternative to holding money in high or hyperinflationary countries, the money demand may be specified as a function of expected inflation alone $\frac{M^d}{P} = f(\pi^e)$ (Phillip Cagan, 1956), (Peter Bofinger, 2001).

A surprising feature of this specification is the inclusion of the inflation as a determinant of the demand for money, which can be neglected because it is already included in the nominal interest rate (the Fisher relation). However, if the difference between the short-term and long-

term nominal interest rate is included in the specification of the money demand function, the impact of inflation rate gets lost.

$$i_S = \pi + r_S$$

$$i_L = \pi + r_L$$

Where r_S and r_L are representing the real interest rate, the difference between both rates becomes:

$$i_S - i_L = r_S - r_L$$

Therefore it becomes necessary to include the inflation term explicitly (Peter Bofinger, 2001), the semi-elasticity of inflation is negative, since the higher inflation rate implies higher opportunity costs of holding money compared with real assets.

4.1 Definition of Money

Many believe that the use of broad definition of money and lower interest-elasticity are correlated. In response Friedman (1968) and Meltzer (1963) suggested that the appropriate definition of money should be empirical matter *(Apostolos Serletis, 2007)* and if the broad money is empirically found to have a more stable relationship with the economic variable than the narrow money, then broad money should be used in empirical analysis.

4.2 Scale Variable:

The scale variable in the money demand function is used as a measure of transactions relating to economic activity, therefore transactions theories of money demand emphasize the level of income as the scale variable whereas the asset theories do more emphasize on wealth. Wealth however, is difficult to measure.

4.3 Vector of Opportunity Cost Variable

In the Developed Countries, the nominal interest rate considers an appropriate proxy for the opportunity cost of holding money, whereas the weak financial markets and administrative interest rates are the overriding feature in most of the developing countries *(Dornbusch and Fisher, 1990)*. In most developing countries the nominal interest rate is institutionally determined; it doesn't fully capture the opportunity cost of holding money (Hossain and Chowdhury, 2001). Furthermore, the administrative nominal interest rates are not often adjusted for changes in inflation and consequently the real interest rate became negative. Therefore to overcome on this problem researchers use often the consumer price index as the proxy for the interest rate variable (Bahmani-Oskooee and Tanku, 2006).

$$\ln m_t^d = \beta_0 + \beta_1 \ln y_t + \beta_2 LCPI + \varepsilon_t$$

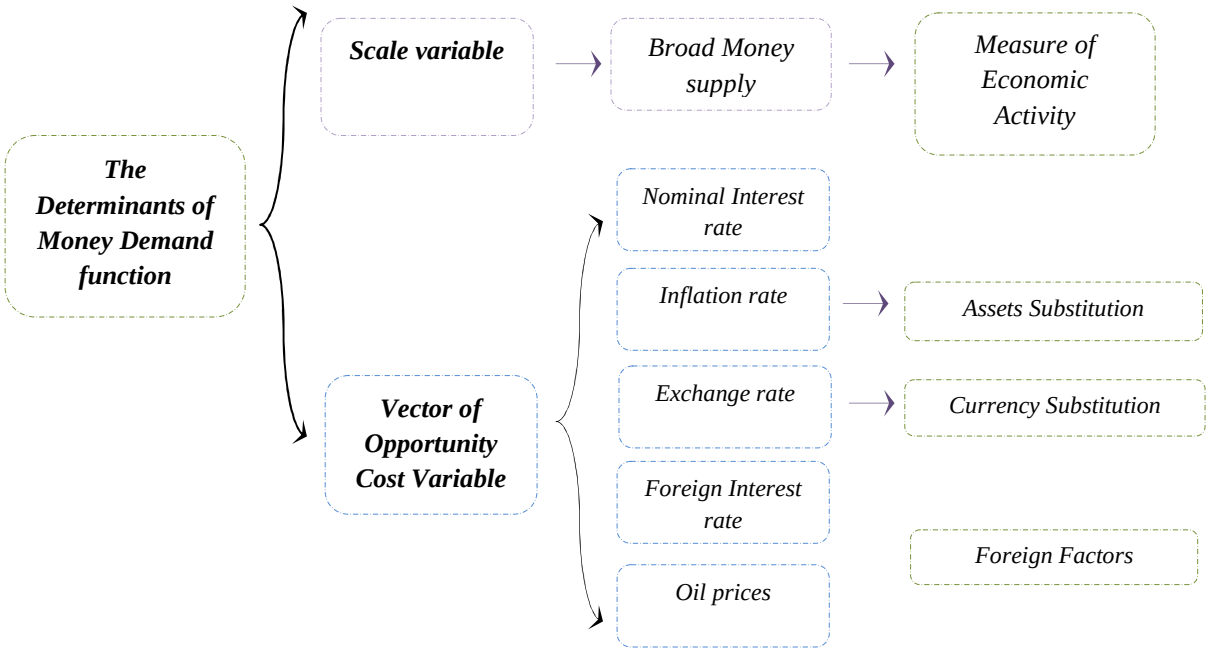
In fact, ***Assets Substitution*** in developing countries usually takes place between money and real assets as inflation hedges and not between money and other financial assets. Thus the expected rate of inflation rather than the nominal interest rate can be regarded as a better proxy for the opportunity cost of holding money in developing countries. Furthermore, given the fact of ***currency substitution*** in some of developing countries, many studies included nominal exchange rate as an explanatory variable in the estimated equation (Samreth and Sovannroeun, 2008). In less developed countries, since there is a black market for foreign exchange, it has been suggested that the free market exchange rate rather than the official rate should be the determinant of the demand for money.

$$\ln m_t^d = \beta_0 + \beta_1 \ln y_t + \beta_2 LCPI + \beta_3 ex_t + \varepsilon_t$$

To capture the effects of ***Foreign Factors*** many studies on the demand for money in developing countries have included the impact of foreign interest rate and the expected rate depreciation of the domestic currency (Oluwole and Olugbenga, 2007).

$$\ln m_t^d = \beta_0 + \beta_1 \ln y_t + \beta_2 LCPI + \beta_3 \ln ex_t + \beta_4 i_t^* + \varepsilon_t$$

The inclusion of foreign interest rate in the money demand function is to capture the effect of capital mobility and the expected exchange rate captures the substitution between domestic and foreign currencies, which its impact on the demand for money can be either positive or negative.



5. DATA, METHODOLOGY AND EMPIRICAL STUDY

5.1 Data

The sample study consists of 80 quarterly observations [1990 up to 2009] as the following:

$LRM1$ = logarithm value for real narrow money balances(M_1) [define as the demand for narrow money supply deflated by the price level].

$LRM2$ = logarithm value for real broad money balances(M_2) [define as the demand for broad money supply deflated by the price level].

$LRGDP$= logarithm value of real GDP [Gross Domestic Product].

$LCPI$ = logarithm value of consumer price index.

LEX= free market foreign exchange rate (US. Dollar against Syrian bound).

i_t^* = the return on foreign financial assets foreign interest rate (Federal Fund rate)

LOP= logarithm value of international oil prices evaluated in US dollar.

In fact, the choice of a proxy for the opportunity cost of holding money is not feasible for the Syrian economy because interest rate data on domestic financial assets were administrative rates. Indicative deposits interest rates are available only since the late of 2007 Therefore the study uses proxies ($LCPI$,i_t^*) to capture the concern effects of the opportunity cost of holding money.

5.2 Methodology and empirical study

To examine the stability of money demand function in terms of use the broad money supply (M_2), two types of cointegration tests should be conducted to explore the stationary of the linear combination of nonstationary variables. A specific problem of empirical estimations of the demand for money is the nonstationarity of the real money stock, the real income, and sometimes also the interest rate variables. In ordinary least square estimation this can lead to spurious regressions. However, this is not the case if non-stationary variables are cointegrated. If the variables are cointegrated, it is possible to differentiate between a long-term and short-term relationship (Peter Bofinger, 2001). The long-term relationship (Static Equation) is based on the following money demand function:

$$LRM2 = \beta_0 + \beta_1 LRGDP + \beta_2 LCPI + \beta_3 Lex + \beta_4 i_t^* + +\beta_5 LOP\varepsilon_t$$

Therefore, we should check the stationary of these variables on both levels and first difference (I1) to know the order of integration.

5.2.1 Tests for Order of Integration (Unit Root Test)

To estimate the money demand function, the stability of the time series variable needs to be examined. To assess the time series' properties, a unit root test (Augmented Dickey-Fuller ADF) is applied to all the variables that are of interest in this analysis. It is well known that using nonstationary variables in a regression tends to give spurious results. But provided that series co-integrate, meaningful results can be obtained through the use of Error Correction Models. The importance of unit root test stems from the fact that it determines whether each data series is stationary (unit root do not exist) or non-stationary (Yu and Gan, 2009). Table (3) indicates the results of unit root test on the level and the first difference of each variable. The ADF test results show that the null hypotheses cannot be rejected; therefore, the tests confirm that all the variables are integrated processes in the first difference.

Table (3) unit root test

Main variables	***ADF test statistics***		***Test critical values***		***P value at 5%***	
	Level	***I1***	***Level***	***I1***	***Level***	***I1***
LRM2	-0.56	-3.19	-2.90	-2.90	0.87	0.024*
LRGDP	-1.19	-4.36	-2.90	-2.90	0.67	0.0007*
LCPI	-0.81	-3.64	-2.90	-2.90	0.81	0.007*
LEX	-1.94	-7.94	-2.89	-2.89	0.30	0.000*
LOP	-0.32	-8.23	-2.89	-2.89	0.91	0.000*
i_t^*						
*ADF test confirms that all variables are integrated processes in the first difference						

The economic research is often looking for a clear relationship such as RGDP Granger cause RM2 not in the other way. Therefore Granger Causality test is used to determine whether RGDP really affects RM2 by reflecting mere one relationship. The following table (4) shows that at 5% probability we reject the null hypothesis and real GDP cause money supply indeed. The previous findings argue that a stable money demand function could be present by using cointegration analysis.

Table (4) Granger Causality test

Pair wise Granger Causality Tests [Sample: 1990:1 2009:4]			
Null Hypothesis:	***Obs***	***F-Statistic***	***Probability***
LRM2 does not Granger Cause LRGDP	*78*	*0.87*	*0.42*
LRGDP does not Granger Cause LRM2		*3.06*	*0.05*

5.2.2 The Two-Step Engle-Granger cointegration Test for Long Run:

Suppose that we have two variables Y and X following the random walks, but ΔY_t and ΔX_t are stationary. Then to test whether Y_t and X_t are cointegrated, we simply run the cointegrating regression as following:

$$Y_t = \alpha + \beta X_t + \mu_t$$

Then testing whether the residual, μ_t from this regression are stationary. If they were not cointegrated, any linear combination of them would be nonstationary. Specifically, we test the hypothesis that μ_t is not stationary, i.e. the hypothesis of no cointegration. A test of the hypothesis implies that μ_t is nonstationary and it can be done in using ADF test.

$$\Delta\mu_t = \emptyset\,\mu_{t-1} + \sum_{t=1}^{N} b_i\,\Delta\mu_{t-1} + \epsilon_t$$

Where $\emptyset$ and b_i are the estimated parameters and ϵ_t is the error term. If the t statistic of $\emptyset$ coefficient exceeds the critical value, the μ_t residuals from the cointegration regression are stationary; in addition, the independent variable and dependent variable are cointegrated, i.e. have an equilibrium relationship in the long term, where the variables cannot move independently of each other, and the dynamic paths of such variables must be linked to the current deviation from the equilibrium relationship. Table 5 and six show the regression results for both definitions of real money supply and their determinants.

Table (5)

Summary statistics												
Dependent Variable: LRM2 (Real Broad Money Supply) {Sample: 1990:1 2009:4 Included observations: 80}												
LRM2	***LRGDP***		***LCPI***		***LEX***		***IUS***		***LOP***		***Test of cointegration***	
	Coeff	***Prob***	***Coeff***	***Prob***	***Coeff***	***Prob***	***Coeff***	***Prob***	***Coeff***	***Prob***	ADF t-stat	***Prob***
Model1	2.45	0.00	-0.82	0.006							-1.65	0.45
Model2	2.55	0.00	-0.92	0.005	-0.32	0.48					-1.59	0,48
Model3	2.02	0.00	-1.01	0.00	1.07	0.01	0.34	0.00			-2.67	0.08
Model4	2.11	0.00	-1.19	0.00			-0.05	0.00	0.30	0.00	-2.73	0.073
Model5	2.02	0.00	-1.01	0.00	1.08	0.01			0.34	0.00	-2.67	0.081
Model6	1.73	0.00	-0.96	0.00	1.21	0.00	-0.05	0.00	0.37	0.00	-3.54	0.009*
Model7 LM2	1.73	0.0	0.036	0.86	1,21	0,00	-0.05	0.00	0.37	0.00	-3.54	0.009*
* Significant at 1% ** Significant at 5% *** Significant at 10%												

Table (6)

Summary statistics												
Dependent Variable: LRM1 (Real Narrow Money Supply) {Sample: 1990:1 2009:4 Included observations: 80}												
LRM1	***LRGDP***		***LCPI***		***LEX***		***IUS***		***LOP***		***Test of cointegration***	
	Coeff	***Prob***	***Coeff***	***Prob***	***Coeff***	***Prob***	***Coeff***	***Prob***	***Coeff***	***Prob***	ADF t-stat	***Prob***
Model1	1.90	0.00	-0.81	0.00							-1.76	0.39
Model2	1.90	0.00	-0.80	0.002	0.026	0.94					-1.77	0.39
Model3	1.70	0.00	-0.76	0.001	0.04	0.89	-0.04	0.00			-2.42	0.14
Model4	1.61	0.00	-1.05	0.00			-0.04	0.00	0.21	0.00	-2.81	0.07
Model5	1.49	0.00	-0.87	0.00	1.08	0.002			0.26	0.00	-3.28	0.02**
Model6	1.23	0.00	-0.83	0.00	1.21	0.00	-0.05	0.00	0.28	0.00	-4.07	0.001*
Model7 LM1	1.73	0.00	0.036	0.86	1.21	0.00	-0.05	0.00	0.37	0.00	-3.54	0.009*
* Significant at 1% ** Significant at 5%												

The estimated regression models (1, 2, 3 and 4) do not show a statistically significant long run equilibrium relationship for both definition of money M1 and M2. The estimated model number (6) support that the real income, price level, foreign exchange rate, foreign interest rate and oil prices are the key determinants of money demand in the Syria economy. In fact, between the two definitions of money aggregates, the results obtained with broad definition of money are superior to those with narrow definition of money.

As indicated above, the estimation equations are using real M2 and real M1 and for both of them we have cointegrating relationship both economically and statistically significant at 1% significance level. As a consequence all the coefficients bear the anticipated singe which consistent with the general judgment in the literature.

Estimation Equation, model 6(table 5, 6):

*LRM2 = C (1) + C (2)*LRGDP + C (3)*LCPI + C (4)*LEX + C (5)*IUS + C (6)*LOP*

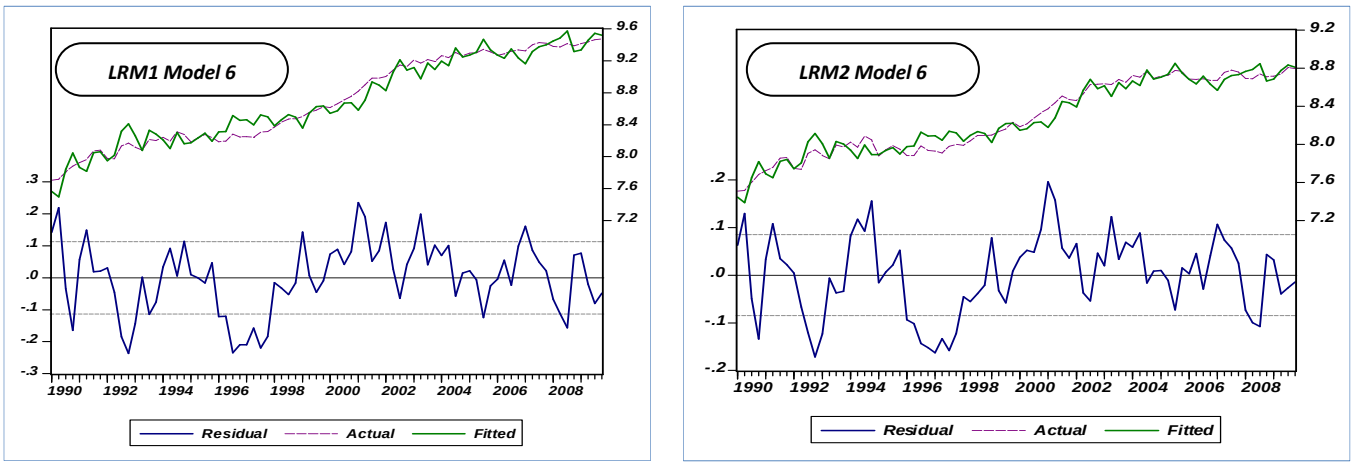
Substituted Coefficients:

*LRM2 = - 14.1 + 1.73*LRGDP - 0.96*LCPI + 1.21*LEX - 0.05*IUS + 0.37*LOP*

*LRM1 = - 8.64 + 1.23*LRGDP - 0.83*LCPI + 1.21*LEX - 0.05*IUS + 0.28*LOP*

Furthermore, ADF test (the unit root test for the residuals) shows that there is a long run equilibrium relationship statistically significant at 1%, i.e. the residuals from the cointegration regression are stationary, figure (5).

Figure (5) the residuals of long run cointegration relationship



Demand for real M2, is more sensitive to both real GDP and price level than real M1. The long run income and price elasticity of the demand for real money have remained strong and significant meaningful sign [1.73- 2.11], [-1.19- 10.83] respectively, in the tested models (4, 5 and 6) (tables 5 and 6). On the other hand, the long run exchange rate elasticity is found to be a little high [1.08- 1.21] for both real M2 and M1modeles (5 and 6). This positive relationship between foreign exchange rate (currency depreciation) and real money demand, it could reflect the currency substitution in the Syrian economy.

Both price level and foreign interest rate are used as proxy of opportunity cost of holding money and they have a negative expected singe but foreign interest rate has a very marginal effect [-0.05]. Moreover the significance effect of price level may capture the assets substitution in the Syrian economy especially real-estate and gold. Given the Syrian economy as an oil exporting country which removes to be in the last 5 years a net oil importing country, international oil prices have a small positive effect on the demand for real money, using both definition (M1 and M2). However this positive relationship reflects the income effect caused by the increase of oil prices in the oil exporting countries.

The real money demand function regards as a demand for real narrow or broad money balances. This means that there is no "***Money Illusion***" where people act rationally and tend to think of money in its real rather than nominal values. Therefore, an increase in the price level

should impose a proportional increase in the demand for nominal money (Hossain, 2007), leaving the demand for real narrow money unaffected. In this respect, models (4, 5, and 6) (tables 5 and 6) shows that price level changes have a substantial effect on the demand for real money. In contrast, price level has relatively a very small effect on the demand for nominal money as are shown in model (7) (tables 5 and 6). That means people thing of money in its nominal value rather than its purchasing power.

According to Granger theory two or more integrated time series that are cointegrated have an error correction representation (Engel and Granger (1987)). However the Error Correction Model (ECM) allows estimating both short-term and long term effects of explanatory time series variables. In this dynamic system the deviation of the current state from its long-run relationship will be fed into its short-run dynamics. Therefore the bivariate single equation error correction model is the following:

$$\Delta Y_t = \alpha_0 - \alpha_1(Y_{t-1} - \beta_1 X_{t-1}) + \beta_0 \Delta X_t + \varepsilon_t$$

In the ECM equation (Luke Keele 2004) the current change in Y is a function of the current change in X (the first difference of X) and the degree to which the two series are outside of their equilibrium level in the previous time period, i.e. the current change in Y is a function of the first difference of X and the first difference of the residual of the long-run equation.

$\boldsymbol{\beta_0}$: captures any immediate effect that X has on Y described as a short-run effect.
$\boldsymbol{\beta_1}$: reflects the long term equilibrium effect of X on Y.
Finally the long term effect occurs at a rate dictated by the value of $\boldsymbol{\alpha_1}$ (it is the loading factor or the speed of adjustment).

Given the presence of co-integration, according to Granger's representation theorem, the co-integrating variables are represented by an Error Correction Mechanism (ECM) describing the short run dynamics. Applied to money demand analysis, the ECM model explains quarter-on-quarter money demand (dLRM2) in terms of the error from the long run co-integration vector (dReside01) and the significant order lagged of dependent variables (table (7)).

To account for the presence of seasonality in the quarterly money supply data, seasonal dummies (SD1, SD2, and SD3) were included in the equation. These are the forces that could drive money balances back to their long run equilibrium levels in the short run.

Table (7)

Summary statistics (Dynamic Equation)																
Dependent Variable: dLRM2 (dlrm2=lrm2-lrm2(-1)), Sample: 1990:1 2009:4 Included observations																
Independent Variables	***dLRM2***		***dLRGDP***		***dLCPI***		***dLEX***		***dIUS***		***dOP***		***Residuals***		***Seasonal Dummies (SD)***	
	Prob		***Prob***		***Prob***		***Prob***		***Prob***		***Prob***		***Prob***			***Prob***
Lag(-1)	0.30	-	0.005	-	0.31	-	0.14	-	0.60	+	0.94	+	0.00	+	SD1	0.71
Lag(-2)	0.24	-	0.013	-	0.21	+	0.93	+	0.16	-	0.23	-	0.70	-	SD2	0.51
Lag(-3)	0.55	-	0.09	-	0.64	+	0.004	+	0.66	-	0.56	-	0.82	-	SD3	0.00
Lag(-4)	0.00	+	0.12	+	0.00	- 0.5	0.26	-	0.22	+	0.09	+	0.11	-		
* Significant at 1% ** Significant at 5% *** Significant at 10%																

The dynamic equation should describe changes in the demand for real money and therefore explain it in terms of both long run structural determinants and short run reversals of observed money balances to their equilibrium values. Following the significant lagged order in the table (7), it could estimate the short run behavior of demand for real money in the Syrian economy.

Estimation Equation:

*DLRM2 = C (1) + C (2)*RESID01 (-1) + C (3)*DLRM2 (-4) + C (4)*DLRGDP (-1) + C (5)* D LEX (-3) + C (6)*SD3*

Substituted Coefficients:

*DLRM2 = 0.009+ 0.034*RESID01 (-1) + 0.31*DLRM2 (-4) - 0.16*DLRGDP (-1) + 0.21*DLEX (-3) + 0.026*SD3*

(0.49) *(0.015)* *(0.11)* *(0.51)* *(0.06)*

Durbin-Watson stat DW (2.15)

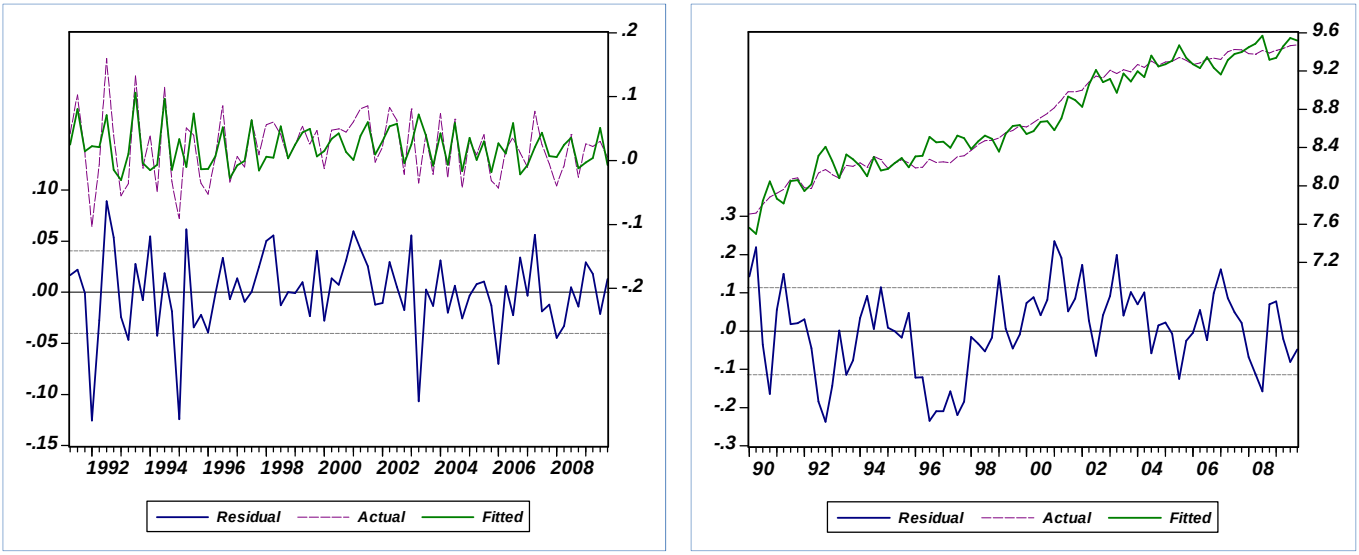
Prob (F-statistic) (0.00002)

The results from the short run equation show that most of the coefficients of lagged variables are not significant even the coefficient of residuals (*RESID01 (-1)*)) (the error-correction parameter). On the theoretical ground we expect a negative coefficient for the error-correction parameter. It appears to be positive which means, that demand for real money will not converge to the equilibrium level in the short run, although ***DW*** statistic does not suggest that autocorrelation is a problem. The residuals from the regression above are shown

in Figure (6). The economy crash of 1992, 1995 and 2002 stands out as a large negative residual: we suppose that, so far as our model is anxious, this break down was not a case of error correction but to a certain extent an "error".

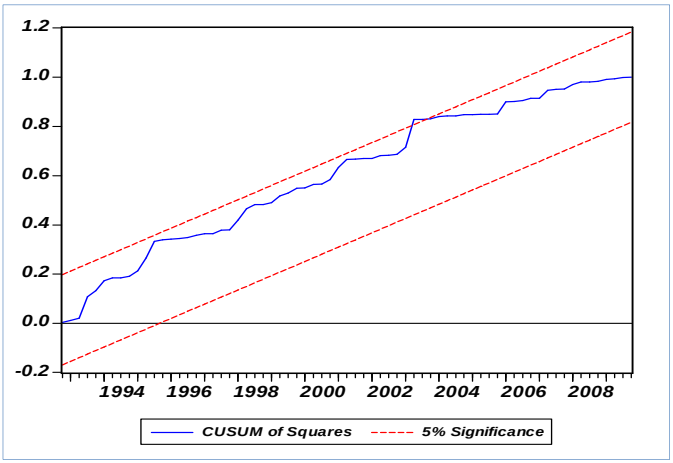
Figure (6) shows the actual value of the demand for real money along with the equilibrium value implied by the model above. An important point here, that the lead up in the demand for real money over the 2000s does not appear as a deviation above equilibrium, but rather as a "catching up" with an equilibrium value that exceeded the actual value for much of the period.

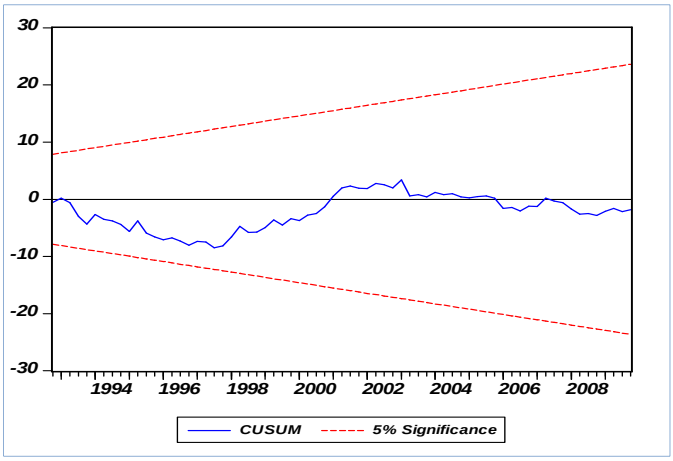
Figure (6) residuals from error correction model & Actual and estimated equilibrium values



Therefore, the stability of the estimated equation has been checked using the CUSUM and the CUSUM of squares-test, figure (7). The results of these tests do not indicate the stability of the estimated equation; moreover the coefficients of this dynamic equation are unstable over time, which prejudice with a prerequisite for using this model for out of sample forecasting. So the stability test supports the results of the dynamic equation and show significant instabilities. Thus, unstable money demand equation seems to exist in Syrian economy for the period 1990 to 2009 in both definition broad and narrow real money supply.

Figure (7) stability tests of short run money demand function





If the analysis has observed unstable money demand function, monetary authority cannot employ money supply controls to maintain and promote price stability and taming the inflation rate. Thus, the instability of the money demand function could be due to the structural breaks in the function (Choi and Jung, 2009).

Syrian economy as a developing country can use neither money supply nor predetermined interest rate to control the inflation rate, given the structural characters of Syrian economy and the need for reliable nominal anchor for monetary policy. On the other hand, the undeveloped banking sector and the ongoing financial sector reforms in the Syrian economy are evocated the instability of money demand function. As a result, the analysis support that using money supply to control inflation is fruitless.

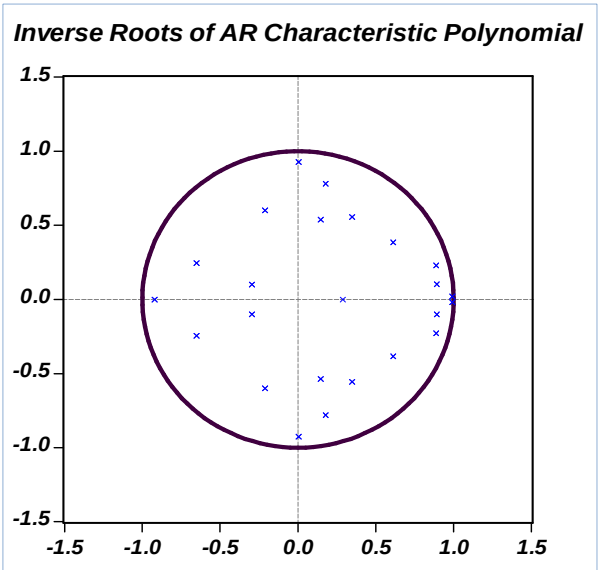
As noted by Pétursson (2000), the development of the financial sector makes the relation between money supply and prices highly unstable. The above discussion argues that the exchange rate should be used as a nominal anchor for Syrian monetary policy to achieve price stability. The analysis suggests that the degree of exchange rate pass-through to inflation play a key role in explaining the price level changes. It emphasizes that exchange rate stability is well-matched with the goal of price stability. Therefore, Central Bank should be as concerned with the exchange rate stability as with price stability. On the other hand, Central Bank has to enhance the path from the fixed exchange rate to a more flexible one even though this path could be fraught with many problems in the short run.

5.2.3 Testing for Cointegration Vector Error Correction Model (VECM):

The vector autoregression (VAR) model is used for analyzing the interrelation of time series and the dynamic impacts of random on the system of variables. A Vector Error Correction Model (VECM) can lead to a better understanding of nonstationary time series variables. The first step in VAR estimation is to select the suitable lag order for the unrestricted VAR and cointegration analysis. In this respect, lag length criteria test computes various criteria to select the lag order of an unrestricted VAR. The VAR lag order selected criteria test indicates that, the lag four is the suitable lag order for the unrestricted VAR (Akaike information criterion (AIC)).

In this respect, the estimated VAR is stable if all roots have modulus less than one and lie inside the unit circle. If the VAR is not stable, certain results (such as impulse response standard errors) are not valid Lütkepohl (1991).

Figure (8) VAR stability test



The vector error correction estimation shows that all the long-run parameters are statistically significant. In contrast, the parameter of RGDP and CPI are not consistent with the conceptual framework of demand for real money, but the rest of variables are economically significant. On the other hand, the Error Correction Term, which measures the speed of adjustments towards the equilibrium level, is significant but it has the unexpected sign (positive sign) (table, 8). The EC term indicates that the converge process to the equilibrium level is very slow and refers to the error situation. Building on that, the short-run dynamics that are shown in appendix (1) are inconsistent in the impact with the long term behavior.

Table (8)

Vector Error Correction Estimates						
Sample(adjusted): 1991:2 2009:4						
Included observations: 75 after adjusting endpoints						
Standard errors in ( ) & t-statistics in [ ]						
Cointegrating Eq:	CointEq1					
LRM2(-1)	1.000000					
LRGDP(-1)	4.464458					
	(1.34828)					
	[3.31123]					
LCPI(-1)	-4.407194					
	(1.32121)					
	[-3.33574]					
LEX(-1)	-8.515877					
	(1.85460)					
	[-4.59175]					
IUS(-1)	0.142357					
	(0.02653)					
	[5.36638]					
LOP(-1)	-1.020719					
	(0.14396)					
	[-7.09053]					
C	-8.026304					
Error Correction:	D(LRM2)	D(LRGDP)	D(LCPI)	D(LEX)	D(IUS)	D(LOP)
CointEq1	0.064086	0.008366	-0.049513	0.028899	-0.311654	0.223665
	(0.03110)	(0.02316)	(0.02114)	(0.01094)	(0.26818)	(0.10337)
	[2.06071]	[0.36117]	[-2.34211]	[2.64109]	[-1.16209]	[2.16371]

The above discussion suggest that money demand function in the Syrian economy is unstable, and the forces that lead the demand for real money balances to their equilibrium level are unrevealing and levelling out in the long term.

6. CONCLUSIONS AND POLICY IMPLEMENTATIONS

In many countries, maintaining price stability and promoting economic growth is an important policy goal. Therefore, if the money demand function is stable over the long term, money supply changes could affect prices and income. It could enable the monetary policy to control the price level changes through adjustments made to the money supply. The money supply as an intermediate target for monetary policy purposes, should meet a stable relationship with the ultimate target. An intermediate target that fulfils the above mentioned criteria also serves as leading indicator for the monetary policy.

The overall regression (first step Engel and Granger cointegration test) results support that the real income, price level, foreign exchange rate, foreign interest rate and oil prices are the key determinants of money demand (M1 and M2) in the Syria economy. In fact, between the two definitions of money aggregates, the results obtained with broad definition of money are superior to those with narrow definition of money. Moreover, money illusion is still relevant in the demand for real money.

The results from the short run equation show that most of the coefficients of lagged variables are not significant even the coefficient the error correction parameter is positive. That means demand for real money will not converge to the equilibrium level in the short run. Therefore, the stability of the estimated equation has been checked using the CUSUM and the CUSUM of squares-test. The results of these tests do not indicate the stability of the estimated equation; moreover the coefficients of this dynamic equation are unstable over time, which prejudice with a prerequisite for using this model for out of sample forecasting.

The stability test supports the findings in the dynamic equation; on the other hand Error Correction Model (ECM) has provided a support that the short- run unstable relationship between M_2 and its economics determinants. Thus, unstable money demand equation seems to exist in Syrian economy for the period 1990 to 2009 in both definition broad and narrow money supply. As a result, the analysis supports that using money supply to control inflation could be fruitless in the Syrian economy, taking into account that these findings are still subject to uncertainties given the serious data shortcomings.

In this respect, the study concluded with some policy recommendations, concerning the existence of unstable long-run money demand function. This finding merely suggests that in the Syrian economy as a developing country, monetary authority can use neither money supply nor predetermined interest rate to control the inflation rate, given the structural characters of Syrian economy and the need for reliable nominal anchor for monetary policy. On the other hand, the undeveloped banking sector and the ongoing financial sector reforms in the Syrian economy are evocated the instability of money demand function. Therefore the paper argues that the exchange rate should be used as a nominal anchor for Syrian monetary policy to maintain and achieve price stability.

Thus Central Bank should be as concerned with the exchange rate stability as with price stability. On the other hand, Central Bank has to enhance the path from the fixed exchange rate to a more flexible, taking into account that the choice of flexible exchange rate is likely to be second order importance to the good development fiscal, and financial and monetary reforms institutions. Therefore the government should continue their structural reforms in order to accelerate the economic and development growth, diversify the economy and generate employment

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Appendix (1)

Vector Error Correction Estimates						
Date: 10/14/10 Time: 17:14						
Sample(adjusted): 1991:2 2009:4						
Included observations: 75 after adjusting endpoints						
Standard errors in ( ) & t-statistics in [ ]						
Cointegrating Eq:	CointEq1					
LRM2(-1)	1.000000					
LRGDP(-1)	4.464458					
	(1.34828)					
	[3.31123]					
LCPI(-1)	-4.407194					
	(1.32121)					
	[-3.33574]					
LEX(-1)	-8.515877					
	(1.85460)					
	[-4.59175]					
IUS(-1)	0.142357					
	(0.02653)					
	[5.36638]					
LOP(-1)	-1.020719					
	(0.14396)					
	[-7.09053]					
C	-8.026304					
Error Correction:	D(LRM2)	D(LRGDP)	D(LCPI)	D(LEX)	D(IUS)	D(LOP)
CointEq1	0.064086	0.008366	-0.049513	0.028899	-0.311654	0.223665
	(0.03110)	(0.02316)	(0.02114)	(0.01094)	(0.26818)	(0.10337)
	[2.06071]	[0.36117]	[-2.34211]	[2.64109]	[-1.16209]	[2.16371]
D(LRM2(-1))	-0.216460	-0.101089	0.311999	0.111404	0.547820	-1.177866
	(0.20646)	(0.15378)	(0.14034)	(0.07264)	(1.78040)	(0.68625)
	[-1.04845]	[-0.65735]	[2.22310]	[1.53362]	[0.30770]	[-1.71638]
D(LRM2(-2))	-0.200534	-0.037732	0.071340	-0.041546	-0.047574	-0.355026
	(0.21576)	(0.16071)	(0.14667)	(0.07591)	(1.86062)	(0.71717)
	[-0.92944]	[-0.23478]	[0.48640]	[-0.54728]	[-0.02557]	[-0.49504]
D(LRM2(-3))	-0.434755	-0.018642	0.394434	-0.148906	-1.063451	-0.883470
	(0.19974)	(0.14878)	(0.13578)	(0.07028)	(1.72251)	(0.66394)
	[-2.17656]	[-0.12529]	[2.90492]	[-2.11879]	[-0.61738]	[-1.33065]
D(LRM2(-4))	0.064509	-0.133101	0.094068	-0.007275	1.303694	-0.380603
	(0.21676)	(0.16146)	(0.14735)	(0.07627)	(1.86927)	(0.72051)
	[0.29760]	[-0.82436]	[0.63840]	[-0.09539]	[0.69743]	[-0.52824]
D(LRGDP(-1))	-0.531601	-0.548874	0.380927	0.036890	-1.772756	-0.966858
	(0.22215)	(0.16547)	(0.15101)	(0.07816)	(1.91573)	(0.73842)
	[-2.39298]	[-3.31700]	[2.52249]	[0.47197]	[-0.92537]	[-1.30937]
D(LRGDP(-2))	-0.184032	-0.245759	0.321124	0.019913	-1.662908	-0.503441
	(0.20597)	(0.15342)	(0.14001)	(0.07247)	(1.77618)	(0.68462)
	[-0.89350]	[-1.60188]	[2.29356]	[0.27478]	[-0.93623]	[-0.73535]
D(LRGDP(-3))	-0.191316	-0.385239	0.051103	0.061913	0.014158	0.145094
	(0.20057)	(0.14940)	(0.13634)	(0.07057)	(1.72964)	(0.66669)

	[-0.95386]	[-2.57859]	[0.37481]	[0.87733]	[0.00819]	[0.21764]
D(LRGDP(-4))	0.008419	0.232374	0.118330	0.049715	-1.214881	-0.209413
	(0.19393)	(0.14445)	(0.13183)	(0.06823)	(1.67235)	(0.64460)
	[0.04342]	[1.60868]	[0.89761]	[0.72862]	[-0.72645]	[-0.32487]
D(LCPI(-1))	0.127154	0.062428	-0.137635	0.234112	-1.016482	0.681162
	(0.33424)	(0.24896)	(0.22721)	(0.11760)	(2.88232)	(1.11099)
	[0.38043]	[0.25075]	[-0.60577]	[1.99075]	[-0.35266]	[0.61311]
D(LCPI(-2))	0.420482	0.248919	-0.391246	0.218274	-1.302477	0.545872
	(0.27314)	(0.20345)	(0.18567)	(0.09610)	(2.35546)	(0.90791)
	[1.53943]	[1.22346]	[-2.10715]	[2.27124]	[-0.55296]	[0.60124]
D(LCPI(-3))	-0.087653	0.378888	-0.084488	0.078617	-0.113148	0.508482
	(0.26275)	(0.19571)	(0.17861)	(0.09245)	(2.26584)	(0.87337)
	[-0.33360]	[1.93593]	[-0.47303]	[0.85039]	[-0.04994]	[0.58221]
D(LCPI(-4))	0.104454	0.133287	0.208193	0.231395	0.921922	-0.041836
	(0.24633)	(0.18348)	(0.16745)	(0.08667)	(2.12424)	(0.81879)
	[0.42404]	[0.72642]	[1.24332]	[2.66985]	[0.43400]	[-0.05110]
D(LEX(-1))	-0.102377	-0.325771	-0.191278	0.293327	-0.546949	-0.265467
	(0.38444)	(0.28636)	(0.26133)	(0.13526)	(3.31523)	(1.27785)
	[-0.26630]	[-1.13765]	[-0.73194]	[2.16857]	[-0.16498]	[-0.20774]
D(LEX(-2))	0.653868	0.208394	-0.421842	0.079136	3.766554	3.172930
	(0.40727)	(0.30336)	(0.27685)	(0.14330)	(3.51213)	(1.35375)
	[1.60549]	[0.68694]	[-1.52371]	[0.55226]	[1.07244]	[2.34382]
D(LEX(-3))	0.585456	0.495566	-0.408769	0.226843	-1.864925	0.070379
	(0.40855)	(0.30432)	(0.27772)	(0.14375)	(3.52315)	(1.35799)
	[1.43302]	[1.62846]	[-1.47187]	[1.57809]	[-0.52933]	[0.05183]
D(LEX(-4))	0.270399	-0.068217	-0.098915	0.032988	2.249803	1.378649
	(0.33379)	(0.24863)	(0.22690)	(0.11744)	(2.87849)	(1.10951)
	[0.81008]	[-0.27437]	[-0.43593]	[0.28088]	[0.78159]	[1.24257]
D(IUS(-1))	0.000200	-0.001448	-0.022673	-0.001718	0.506302	0.010293
	(0.01771)	(0.01319)	(0.01204)	(0.00623)	(0.15275)	(0.05888)
	[0.01130]	[-0.10976]	[-1.88299]	[-0.27561]	[3.31449]	[0.17482]
D(IUS(-2))	-0.009454	-0.011517	0.020146	0.003029	0.224571	0.008531
	(0.01992)	(0.01484)	(0.01354)	(0.00701)	(0.17179)	(0.06622)
	[-0.47455]	[-0.77617]	[1.48769]	[0.43208]	[1.30723]	[0.12884]
D(IUS(-3))	0.004121	0.006724	-0.003355	0.008336	0.057254	0.059259
	(0.02058)	(0.01533)	(0.01399)	(0.00724)	(0.17751)	(0.06842)
	[0.20018]	[0.43855]	[-0.23976]	[1.15094]	[0.32254]	[0.86610]
D(IUS(-4))	-0.003781	0.002396	0.001043	-0.012796	-0.217729	-0.039060
	(0.01638)	(0.01220)	(0.01114)	(0.00576)	(0.14129)	(0.05446)
	[-0.23078]	[0.19633]	[0.09367]	[-2.21975]	[-1.54104]	[-0.71724]
D(LOP(-1))	-0.024815	0.006498	0.081573	0.002614	0.224710	0.442506
	(0.04307)	(0.03208)	(0.02928)	(0.01515)	(0.37139)	(0.14315)
	[-0.57620]	[0.20255]	[2.78639]	[0.17254]	[0.60506]	[3.09119]
D(LOP(-2))	0.016343	-0.020836	-0.037668	0.013232	-0.808456	-0.281189
	(0.04851)	(0.03614)	(0.03298)	(0.01707)	(0.41836)	(0.16126)
	[0.33687]	[-0.57658]	[-1.14220]	[0.77517]	[-1.93244]	[-1.74374]
D(LOP(-3))	-0.036961	-0.031712	0.035012	-0.008343	0.563942	0.060819

	(0.04799)	(0.03574)	(0.03262)	(0.01688)	(0.41380)	(0.15950)
	[-0.77026]	[-0.88723]	[1.07335]	[-0.49414]	[1.36282]	[0.38131]
D(LOP(-4))	0.071468	0.012488	-0.035261	0.034241	-0.202016	-0.067079
	(0.04440)	(0.03307)	(0.03018)	(0.01562)	(0.38290)	(0.14759)
	[1.60960]	[0.37760]	[-1.16826]	[2.19182]	[-0.52760]	[-0.45451]
C	0.040216	0.021709	-0.013198	-0.011062	0.038869	0.077351
	(0.01532)	(0.01141)	(0.01042)	(0.00539)	(0.13212)	(0.05093)
	[2.62485]	[1.90220]	[-1.26724]	[-2.05200]	[0.29418]	[1.51885]
R-squared	0.548199	0.763784	0.622714	0.609222	0.652528	0.430861
Adj. R-squared	0.317689	0.643266	0.430221	0.409845	0.475246	0.140484
Sum sq. resids	0.081962	0.045475	0.037874	0.010147	6.095228	0.905570
S.E. equation	0.040899	0.030464	0.027802	0.014390	0.352693	0.135945
F-statistic	2.378198	6.337491	3.234995	3.055635	3.680736	1.483798
Log likelihood	149.2916	171.3825	178.2410	227.6338	-12.29606	59.20506
Akaike AIC	-3.287776	-3.876867	-4.059759	-5.376902	1.021228	-0.885468
Schwarz SC	-2.484380	-3.073472	-3.256363	-4.573506	1.824624	-0.082073
Mean dependent	0.020634	0.013579	0.012644	-0.000140	-0.084133	0.017814
S.D. dependent	0.049513	0.051005	0.036832	0.018732	0.486877	0.146634
Determinant Residual Covariance		1.58E-16				
Log Likelihood		821.6968				
Log Likelihood (d.f. adjusted)		725.9215				
Akaike Information Criteria		-15.03791				
Schwarz Criteria		-10.03213				

Appendix (2)

Roots of Characteristic Polynomial	
Endogenous variables: LRM2 LRGDP LCPI LEX IUS LOP	
Exogenous variables: C	
Lag specification: 1 4	
Date: 10/15/10 Time: 10:44	
Root	Modulus
0.991323 - 0.019905i	0.991523
0.991323 + 0.019905i	0.991523
0.004222 + 0.926407i	0.926416
0.004222 - 0.926407i	0.926416
-0.920455	0.920455
0.886949 - 0.229368i	0.916127
0.886949 + 0.229368i	0.916127
0.891399 + 0.102199i	0.897238
0.891399 - 0.102199i	0.897238
0.178282 - 0.780724i	0.800821
0.178282 + 0.780724i	0.800821
0.611649 + 0.384438i	0.722431
0.611649 - 0.384438i	0.722431
-0.651843 - 0.245409i	0.696509
-0.651843 + 0.245409i	0.696509
0.348177 + 0.556122i	0.656124
0.348177 - 0.556122i	0.656124
-0.211012 - 0.601193i	0.637149
-0.211012 + 0.601193i	0.637149
0.146026 - 0.537161i	0.556655
0.146026 + 0.537161i	0.556655
-0.296686 - 0.101200i	0.313471
-0.296686 + 0.101200i	0.313471
0.289169	0.289169
No root lies outside the unit circle.	
VAR satisfies the stability condition.	