Determinants of Money Demand: Evidence from MENA

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Abstract
Demand for money plays a major role in macroeconomic analysis, especially in selecting appropriate monetary policy actions. Therefore, the permanent need to search for a model of the demand for money which to be both theoretically coherent, empirically stable and robust is one of the most important issues in macroeconomic policy. In this paper, we investigate the influential factors on money demand among MENA countries during 1980-2013. The results of estimation show that inflation as a key determinant has negative and significant effect on money demand. Also, exchange rate and income play negative and positive role in explaining the changes in money demand respectively.
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1. Introduction

Demand for money is an important element in macroeconomic analysis, especially in constructing an optimal and identical monetary policy. Erroneously in money demand estimated will make the monetary authorities take a wrong action when policy is designed. Implementation of such policy as a following will bring a disaster to the country. Therefore, numerous theoretical literature and empirical studies on the demand for money were conducted to provide more understanding about conditions and features of demand for money. Most of the theoretical grounds and accumulated evidence indicate that a strong link between money and price, no matter studies of period of accelerating and sustained inflation as well as studies of demand for money. The significance of the expected rate of inflation as a factor influencing the demand for money is well established.

Although, it has been generally accepted that amount of money demanded responds to expected rate of inflation, the expected sign of the relationship between expected rate of inflation and demand for money still remained some controversies. Several theoretical and empirical literature show a negative relationship between inflation and demand for money. Nevertheless, some economists and researchers have accounted for the opposite. There is also a possibility that the demand for money influenced by inflation positively. Recently, linear co-integration analysis has been the mainstream approach in examining the money demand function. Studies of Cagan as well as most later empirical work is essentially single equation regression and postulate a linear relationship between expected rate of inflation and demand for money. However, there is some empirical evidence suggest that Cagan money demand function does not fit well for low and high inflation period at the same time and present of a varying coefficient (Cagan, 1956, Barro, 1970, Khan, 1975 and Bental and Eckstein, 1997). Theoretically, there is no reason to believe that economic systems must be intrinsically linear. Empirically, there were a great number of studies showing that inflation rate causes a non-linear in the relation with demand for money. Michael *et al.,* (1994) points to the necessity to distinguish between high inflation and hyperinflation episodes in the study of money demand. Empirical result of Lutkepohl *et al.,* (1999) show that transition function is close to step function which implies a different adjustment for positive and negative inflation rate. Hence, the model indicates that agent react differently to positive and negative inflation rate. Test of no additional non-linearity suggest that the non-linearity was found after the estimation. Empirical results of B. Emiliano *et al.,* (2009) using time-series approach are consistent with cross-country evidence of study by De Grauwe and Polan (2005). Findings of both studies show that money velocity is positively correlated with money growth and inflation under high inflation. On the contrary, velocity is negatively correlated to inflation and money growth under low inflation. A low real money demand is same as high money velocity. If such a nonlinear relationship exists then it should be possible, in principle, to estimate the threshold level, at which the sign of relationship between the inflation and money demand would switch. However, the test of possibility exist of threshold level, typically is more focus on the relationship between inflation and economic growth.

This study is an attempt to empirically investigate the role of inflation on the money demand function in MENA countries. This paper is organized as follows: The next section review the relevant literature. Section 3 presents the theoretical framework. Section 4 explains the model framework. Section 5 reports and discusses the econometric results. Section 6 concludes.

2. Literature

A considerable body of literature has investigated the demand for money in developing countries (Sanjay, 1998, Omotor, 2009, Vuong and Tran, 2010) such as developed countries (Hamburger, 1977, Beyer, 1988, Brand and Cassola, 2000, Calza, *et al.,* 2001). Since the purpose of this paper is not to make review of the empirical

literature in sequel of the paper we made short sublimate of the empirical literature that emphasizes the demand for money.

Klacek and Smidkova (1995) estimated the long-run demand for broad and narrow money in the Czech Republic since transition. The authors initially include GDP as a scale, but the estimated function did not characterize a money demand function due to incorrectly signed parameters. Private consumption was then used, since it may give a better approximate of the volume of transactions. This estimated model had the correct signs, with private consumption having a significant effect. The inflation term was significant for narrow money, while the interest rate on foreign (German) bonds was significant for broad money.

Cuthbertson and Brendin (2001) criticize the model of Klacek and Smidkova, (1995) because in their choice of determinants, is not included the degree of dollarization of the economy as a factor for money demand (problem dollarization in Czech economy was evident in the analyzed period). Cuthbertson and Brendin (2001) analyze the demand of money for the period 1992-1997, also using VECM method. The results of their study show that the level of GDP, the inflation rate and the degree of dollarization of the economy have an impact on the demand for money. Coefficients of the above determinants in their model are statistically significant and have the expected sign, according to the theoretical assumptions. Poland's transition process began in conditions of great economic instability, high levels of external debt and high budget deficit. Therefore, the stabilization of the economy, pursued mainly through price control and suppression of high inflation as the main goal of monetary policy.

Klos and Wrobel (2001) analyze the effects of monetary shocks in Poland caused by exchange rate changes on GDP, credit, prices and demand for money, and the effect of these shocks proved to be statistically significant in all cases. The strongest effect of monetary shocks on prices was observed 20 months after the occurrence of the shock.

Maravić and Palić (2005) analyze the long-term and short-term money demand in Serbia for the period January 1996 to March 2005, using Johansen cointegration technique and VECM. As an indicator of the real demand for money they used real M1. The cointegration analysis shows that there is a strong cointegration relationship between real money, overall economic activity, inflation and interest rate on deposits in denar. Short-term model (ECM) shows that the most important determinant of real money demand is inflation and exchange rate. The analysis has proved that the interest rate on deposits in denar, is statistically insignificant determinant and does not have significant role in money demand. The results of the empirical analysis suggest that the demand for money in the whole analyzed period is unstable.

3. Theoretical framework

The theory of money demand has been in the forefront of academic debates for many years. The earliest theory of money demand was implicitly put forward by Irving Fisher when he laid the quantity theory of money demand. Fisher (1911) argued that the demand for money is solely a function of income. Keynes (1936) in his liquidity preference theory of money demand argued that people demand money for transactional, precautionary and speculative motives. He argued that money demand depends on both income and interest rate. Portfolio theories of money demand treat money like any other asset and used the assets' demand theory to derive the money demand theory. They argued that people hold money as part of their portfolio of assets because money offers different combination of risk and return than other assets. Inventory theories of money demand postulate that money demand for transactional motives have a positive relationship with income and a negative relationship with nominal interest rate earned on alternative assets. The Baumol-Tobin model is the most well-known inventory theoretic approach model. A cursory look at these theories is presented below.

Quantity Theory of Money Demand

The earliest theory of money demand was implicitly put forward by Irving Fisher when he laid the foundation of the *Quantity Theory of Money*. The quantity theory of money demand is explained using the equation of exchange. According to the old Fisher equation of exchange, the demand for money in an economy is solely a function of the volume of transaction in an economy. In other words, people demand money solely for transaction purpose and the more money people need for transactional purpose, the more money they will demand. This relationship between money demand and the level of transaction is expressed in the equation below:

$$MV=PT \tag{1}$$

where, M is the quantity of money balances; V is the transactional velocity of money; P is the price level and T is the volume of transactions. Fisher (1911) argued that people demand money only for transactional purpose and the demand for money is inelastic to interest rate changes. This equation was later modified by the Cambridge School and they presented a slightly different version of the old equation by replacing T with Y. The modification is due to the fact that there is a problem inherent with the original Fisher equation because the number of transactions in an economy is difficult to calculate. Hence, Y output is used as a proxy for transaction

T because the more an economy produces, the more goods and services are bought and sold. With this modification by the Cambridge economists, the equation of exchange becomes:

$$MV=PY \tag{2}$$

This equation is transformed into the Quantity Theory of Money Demand by solving for the real money balance (M/P) and thus rewriting the equation as:

$$(M/P)= (1/V) Y \tag{3}$$

Equilibrium in the money market is where the quantity of real money supplied (M/P) is equals to the demand for real money balance $(M/P)^d$ and 1/V is also equal to *k*, which is constant reflecting institutional and technological features of the economy which are stable in the short run. This now gives us the quantity theory of money demand as:

$$(M/P)^d= kY \tag{4}$$

Thus, the quantity theory of money demand function shows that the demand for real money balance is solely a function of real income and this relationship is stable over time.

Liquidity Preference Theory of Money Demand

Keynes in his famous book "*The General Theory of Employment, Interest and Money*" identified three motives why people demand money: the transactional motive, the precautionary motive and the speculative motive. Keynes developed a more general and realistic theory of money demand than Irving Fisher in his *liquidity preference theory*. Contrary to Fisher, Keynes believed that the demand for real money balances depends on both interest rate and income. According to Keynes (1936), the volume of transactions is positively related with income and if income increases, the demand for real money balances also increases for transactional and precautionary motives. Moreover, Keynes argued that money demand for speculative motives is interest rate elastic because interest rate is the opportunity cost of holding money. Hence, the Keynesian money demand function is expressed as:

$$(M/P)^d= f(Y, i) \tag{5}$$

According to the model above, the demand for real money balance is a function of income and nominal interest rate. Money demand is positively related with income and inversely related with interest rates. Keynes further argued that the velocity of money (V) is not constant but instead it is positively related with interest rates which fluctuate considerably.

Moreover, the liquidity preference function implicitly captures the effect of inflation on the money demand. This can be demonstrated by introducing the Fisher equation, which states that nominal interest rate is the sum of the real interest rate and expected inflation, into liquidity preference function. The Fisher effect is written as:

$$i= r + \pi^e \tag{6}$$

The Fisher equation states that there is a one-to-one relationship between expected inflation π^e and nominal interest rates. This now gives us the Keynesian money demand function that captures the effect of inflation on real money demand as:

$$(M/p)^d= f(r + \pi^e, Y) \tag{7}$$

This equation implies that the demand for real money balance also depends negatively on the expected rate of inflation. Inflation rate positively influence nominal interest rate and nominal interest rate is the cost of holding money. This explanation gives us a more sophisticated explanation of money demand than the quantity demand of money theory because it shows that money demand is an increasing function of income and a decreasing function of both interest rate and expected rate of inflation.

Portfolio Theories of Money Demand

Portfolio theories of money demand provide a microeconomic explanation of money demand which emphasize the function of money as a store of value. Portfolio theories of demand for money emphasize that people hold money as part of their portfolio of assets because money is one asset among several and it offers a different combination of risks and return than other assets. Friedman (1956) and Tobin (1958) formulated the most well-Known portfolio theoretic approach models. Portfolio theories of money demand treat money like any other asset and used the assets' demand theory to derive the money demand theory. According to these theories, the demand for money should be a function of the risk and return offered by money and by the alternative assets that households can hold instead of money. Moreover, it should also be a function of wealth, since the size of wealth determines the amount of the portfolio to be allotted between money and the alternative assets. This version of money demand can be expressed as:

$$(M/p)^d= f(r_s+ r_b+ r_m+ \pi^e, Y_p) \tag{8}$$

Where r_s is the expected return on stock/equity, r_b is the expected return on bonds, r_m is the expected return on money, π^e is the expected inflation rate and Y_p is the permanent income which is used as a proxy for wealth.

According to portfolio theories, since the demand for assets increases as wealth increases, the demand for money is also positively related with permanent income because higher wealth means larger portfolio. The three main assets identified by proponents of portfolio theories of money demand were bonds, stocks and goods; and they argued that the incentive to hold money depends on the attractiveness of these assets comparing to holding money. Expected returns on these assets are negatively related with the demand for money. As r_s or r_b increases, money demand declines because it becomes less attractive to hold money comparing to stock or bond holding.

Furthermore, an increase in expected inflation π^e also reduces money demand because money became less attractive as its real value depreciates over time. Mankiw (1997) highlighted that from the viewpoint of portfolio theories of money demand, the liquidity preference function of money demand is just a useful simplification of the general theory of money demand because firstly it uses real income Y as a proxy for real wealth W and secondly only the nominal interest rate on money is included while ignoring the returns on other alternative assets.

Inventory Theories of Money Demand
Another microeconomic theory of money demand is the inventory or transaction theories of money demand because they emphasize the role of money as a medium of exchange. Inventory theories of money demand consider the demand for money for transactional motives. The Baumol-Tobin model is the most well-known inventory theoretic approach model. Baumol (1952) and Tobin (1956) explicitly formulated a transactions demand for money in an inventory theoretic approach that provides a microeconomic explanation of money demand by analyzing the costs and benefits of money holding. The cost of holding money is the forgone interest and the benefit of money holding is liquidity. According to this theory while agents receive income periodically for instance monthly, they make transactions at a constant rate over the period. The agent can decide to hold his entire income to make his daily transactions or save his entire income in an interest-bearing savings account or other interest-earning assets. However, there is a trade-off between the costs of holding his income – interest cost (r) – and the transaction cost (c) of converting interest-bearing assets into money. Thus, the optimal strategy is to hold a portion of his income as money and another portion in interest-bearing assets. The Baumol-Tobin model postulated that the optimal average money demand is given by:

$$\frac{M^d}{p} = \sqrt{\frac{cY}{2r}}$$

(9)

Where c is the cost of converting interest-bearing assets into money, r is the nominal interest rate, p is the price level and Y is income. Therefore, the Baumol-Tobin model postulates transactional money demand to have a positive relationship with income and a negative relationship with nominal interest rate earned on alternative assets. Moreover, the transaction cost of converting wealth between interest-bearing assets and money also has a positive relationship with money demand. If transaction cost declines, for example the introduction of Automatic Teller Machines, more wealth is held in the form of interest-bearing assets and less in the form of money. Thus, according to the Baumol-Tobin model the income elasticity of money demand and the interest rate elasticity of money demand are $\frac{1}{2}$ and $-\frac{1}{2}$, respectively. This implies that average money demand should increase by 5 percent when income increases by 10 percent and average money demand should decline by 5 percent when interest rate increases by 10 percent. Inventory theories of money demand provide a microeconomic explanation of the liquidity theory of money because they show that money demand is positively related with income and negatively with interest rates.

4. Model Framework
Dominated of previous studies provide the empirical evidences and show that demand for money depends on level of transactions or economic activities which is represented by variable expressing real wealth, real income or expenditure, and opportunity cost of holding money which is peroxided by various kinds of market interest rates and rate of inflation. Generally, money demand function is used in this study can be specified as:
M = f(Y, Inf, Exc)   (10)
        M is the log of real money aggregates (lnM1 and lnM2) and used as the dependent variable in the functional relationship which represent the narrow money and broad money respectively. Log of real gross domestic product (lnGDP/P) will be used as scale variable (Y). It is expected to be positively related to the real demand for money. Inf shows inflation rate and Exc represents exchange rate.

        In addition to income, there are other variables that need to be considered in the demand for money function. One important controversial variable is the interest rate. The traditional money demand models postulate that the demand for real cash balances is negatively related to the yield on financial assets (interest rate). The domestic interest rate represents the opportunity cost of holding money; thus the public would prefer

to hold more financial assets such as treasury bills, bonds, etc., during times of high interest rate. In the money demand function for the financially developed industrial countries, this is beyond controversy. However, the role of interest rate in developing economies deserves some attention. The standard demand for money model which requires a well-developed financial market, has been corroborated by many theoretical and empirical studies. Keynes was the first to realize the importance of the speculative demand for money in the presence of capital markets. But, whereas Keynes' analysis is based on risk, others emphasized, be importance of interest rate using other approaches. While Tobin's analysis is founded on uncertainty and Baumol's on some kind of inventory model, Friedman used a variety of interest rates as the yields on financial asset.

However, despite the different approaches or explanations, theoretical reasoning and empirical investigation have indicated the importance of interest rate for the demand for money. Because of collinearity in interest rates, an important empirical simplification in asset money demand functions has been the introduction of only one interest rate to represent the entire measure opportunity cost of holding money. One of the earliest attempts was by Hamburger (1977), who specified the demand for real M, as a function of real income, lagged M1, and three rates of return the commercial bank savings deposit rate, the U.S. government bond rate, and the dividend-price ratio on equities. Khan (1980) expanded the range of the opportunity cost of money in his equation to include the entire term structure of interest rates. Among developing countries, it is quite widely accepted that interest rate is in practice an unsatisfactory measure of the opportunity cost of holding money. In the first place, financial markets outside the banking system are not well developed, so that the possibilities of substitution between money and other financial assets are limited. Second, a more practical objection is that observed interest rates are often centrally determined and remain unchanged for long periods. So, there is insufficient variation in this interest rate to enable its influence on the demand for money to be estimated with confidence. Many studies that include interest rate as an argument in the money demand function for developing countries, have shown the existence of a negative relationship between the domestic interest rate and the demand for money. For example, Swelem's (1974) study indicated that the interest rate as an opportunity cost for holding money has a highly significant negative effect on the demand for money in Egypt. Bassha's (1984) study found out that inter-bank interest rate has a significant effect on the demand for money function in Kuwait.

On the basis of the results of several studies as well as the theoretical understanding of interest rate, one can't determine that the rate of interest affects the demand for money in developing countries. So, in developing countries, due to the scarcity of interest rate data, the underdeveloped nature of money and capital markets, and the failure of government regulated interest rates to reflect actual alternative yields available, it seems appropriate to estimate the demand for money function using a measure of expected inflation as the opportunity cost of holding money. As far as the influence of opportunity cost variables is concerned, theory suggests that an increase in the expected rate of inflation would reduce the attractiveness of money balances. This effect should be more pronounced for narrow money, which conventionally has a zero nominal yield, than for broad money, which includes time and savings deposits, whose yield can be adjusted to offset inflationary expectations. The expected rate of inflation was introduced in the demand for money function by Friedman (1956). He argued that the demand for real balances is universally related to the expected rate of inflation. So, an increase in the general price level erodes the real value of money and induces a portfolio shift. Friedman treats the rate of inflation as the rate of return on real assets just as the rate of interest is the rate of return on financial assets. Therefore, higher inflation rates lead people to shift part of their wealth from money and financial assets to real assets which, in turn, means that higher inflation rates are associated with lower demand for money. However, because the effect of inflation rate on the demand for money was relatively neglected except in cases of hyper inflation, it was concluded that moderate rates of inflation do not affect the demand for money.

Empirical work on developing countries has been less successful in discovering significant and stable coefficients for inflation elasticities than for income elasticities. Galbis (1979) found only sporadic evidence of significant negative inflation elasticities in some Latin American countries. Morgan (1979), despite experiments with various specifications of the expected price change variables, was unable to discover any significant relationship with the appropriate sign. Mackenzi (1979) has employed the adaptive expectations hypothesis in order to generate the expected rate of inflation to examine its ability to measure the opportunity cost of holding money in Egypt. The expected rate of inflation was rejected because of its insignificant role as explanatory variable in the demand for money functions. El-Sheikh (1982) also rejected the hypothesis due to the low level and absent trend for inflation rate during the jumble period. To Hemaya (1990) inflation appears not to have any influence on the demand for money in the stock adjustment expectation model. On the contrary, estimates of the error correction model indicate that inflation has significantly affected the demand for the three definitions of money, M1, M2 and M3. Also, Diabi (1993) found that inflation has no significant effect on the demand for money in Algeria. He concluded that there is no relationship between demand for money and the opportunity cost of holding money as measured by prices. His explanation rests on the assumption that the GDP deflator in Algeria is not a good measure for opportunity cost because it includes changes in oil prices, on one hand, and because speculative demand for money in Algeria is relatively weak, on the other. However, there are several

other studies that indicate the significant role of inflation in the demand for money. Akhtar (1974) and Abe, *et al.,* (1975) found a significant role for price expectations in the demand for money function in Pakistan. The role of price expectations has also been central to the studies of Chile by Hynes (1967) and Deaver (1970). Ghosh and Kazi (1977) use a model for Nigeria and like Hynes found evidence in favor of the demand for money in nominal forms being homogeneous of degree one in the price level. Many researchers have solely used the expected rate of inflation to capture the foregone yield on real assets. Nyong (1993) found out that the inclusion of inflationary expectation in the demand for money in South Africa enhanced the functional fit of the model and the inflationary expectation coefficient was statistically significant and of the right sign. This implied that money holders view real goods as an important substitute to holding money balances. The Bahmani-Oskooee and Molixi (1991) study of the demand function for money in 13 developing countries indicated that the inflation rate (or its expectation in some cases) is one of the major determinants of the demand for money in countries. A study by Perera (1988) where partial adjustment mechanism(nominal and real) and adoptive expectation mechanism were incorporated to specify the demand for money function for Sri Lanka indicated that current real income and expected rate of inflation are the major determinants of such a function.

Given the openness of most contemporary economies, money demand functions should include the effect of external monetary and financial factors approximated by movements in foreign rate and exchange rate. An increase in (expected) foreign interest rates would induce domestic residents to increase their holdings of foreign assets which would be financed by drawing down domestic money holdings. Also a change in exchange rate would affect portfolio decisions between domestic assets and foreign assets. So, if, for example, domestic currency is expected to depreciate, domestic portfolio holders would adjust their portfolio in favor of foreign assets and vice versa. It can be postulated from such effect of external factors that foreign interest rate and exchange rate expectations may have a negative effect on the demand for money. Bahmani-Oskooee and Malixi (1991) assessed whether a change in real effective exchange rate has any impact on the demand for money in 13 developing countries using quarterly data over 19b3-1985.87. Estimates of the short-run elasticities indicated that there are positive as well as negative effects. However, in the long run a change in real effective exchange rate has a significant negative effect on demand for money function in nine out of eleven cases. This indicates that where the currency of each of these countries depreciates, the public holds less domestic currency and more foreign currency which means demand for money increases. This means that there is some kind of substitutability between the domestic currency and some foreign currencies. Empirical results of studies of some of the Arab countries lend strong support to the hypothesis that external developments represented by exchange rate, and in some cases, foreign interest rates influence domestic currency holdings. Domowitz and El Badawi (1987) study indicated that there is a strong effect of the exchange rate variable - defined as a number of units of the country's currency per unit of U.S. dollar - on the demand for money function in Sudan. Darrat's (1984), and Ghamdi (1989) studies found that exchange rate along with foreign interest rate have significant negative effect on the demand for money function in Saudi Arabia. Also, Darrat's (1985) study showed that foreign interest rates play a major role in explaining money demand in the open economies of Saudi Arabia, Libya and Nigeria. Without such a variable, all of the estimated money demand functions appear seriously miss-specified and structurally unstable. Ghamdi's (1989) study tested the effect of the openness of the Jordanian economy on the demand for money function by including foreign interest rate as well as the inflow of foreign aid as major determining factors which were found to have significant effects. The inflow of foreign aid has a significant positive effect on demand for money while low foreign interest rate tends to lower it. So, when exchange rate is identified as one of the determinants of demand for money function in some developing countries, it means that external monetary and financial factors have significant influence on such economies. This implies that the role of fiscal and monetary policy should be changed to reflect such results. It also indicates that there is some degree of substitution between domestic and foreign assets. Monetary policy, which is designed to counteract the effect of external factors on macroeconomic variables such as inflation, for example, must consider the effect of such factors on the demand for money function.

The data sets utilized in this paper cover time series for MENA countries over the period of 1980-2013 and are taken from World Development Indicator published by World Bank.

5. Econometric results

The analyses start by testing the stability of the available data using the panel unit root test. The Levin, Lin and Chu (LLC), Im, Pesaran and Sin (IPS), ADF- Fisher and PP-Fisher tests are used which provide the best results in efficient testing power. The reported probability of all statistics and a 5% significance level are used for making a decision on whether to reject the null hypothesis or not. The results indicate that, probabilities are greater than the significance level which leads to a failure to reject the null hypothesis of existence of a unit root in the series, and the data are stationary after the first difference for all unit root tests. These results confirm that when the stationary of all data is detected the model meets the requirement to proceed with the panel cointegration test. The Pedroni cointegration test is used in order to test whether the dependent variable and the

independent variables exhibit fundamental long-run relationships with each other. The results for the Pedroni test show that the values of statistics are under the 5% critical value. Therefore, we reject the null hypothesis of there being no cointegration vector found in the long run. This indicates that at least one cointegrationng vector exists that offers a stable relationship among variables (Tables 1 and 2).

Table 1: Results for LLC, IPS, ADF and PP

Variable	LLC	IPS	ADF	PP
M	-6.32	-6.25	53.26	55.11
	(0.00)	(0.00)	(0.00)	(0.00)
Y	-2.51	-2.37	32.52	32.28
	(0.00)	(0.00)	(0.00)	(0.00)
Inf	-6.21	-5.93	51.13	68.04
	(0.00)	(0.00)	(0.00)	(0.00)
Exc	-7.56	-6.25	53.24	57.68
	(0.00)	(0.00)	(0.00)	(0.00)

Table 2: Results for Pedroni test

Statistic	Within dimension	
	Statistic	Prob.
Panel v-Statistic	1.51	0.006
Panel rho-Statistic	0.67	0.251
Panel pp-Statistic	-3.11	0.0009
Panel ADF-Statistic	-4.40	0.0000
	Between dimension	
	Statistic	Prob.
Group rho-Statistic	0.780	0.7824
Group pp-Statistic	-1.40	0.0008
Group ADF-Statistic	-2.49	0.0063

Next, the study tests for choosing between a fixed effect and a random effect. In order to validate the results, the Hausman specification test is performed which has an asymptotic chi-square distribution. The resulting probability (0.000) is less than critical value of 5% which supports our view on the fixed effect model. In most regressions, the data suffer from heteroscedasticity. Using the Likelihood ratio test, the hypothesis based on the existence of homoscedasticity in variances is rejected and thus, the model has heteroscedasticity. Therefore we decided to use a remedy for this disturbance. We use the traditional GLS method in order to obtain efficient and robust standard results. Table 3 shows the results of the coefficients for each variable.

Table 3: Results for estimation by GLS

Variables	Coef.	t-statistics	Prob.
Y	0.0001	5.43	0.000
Inf	-0.003	-3.83	0.000
Exc	-0.000	-7.85	0.002
R^2= 0.79		F-value= 18.51	

Table 3 shows the regression result of the relationship between dependent variable (demand for money) and explanatory variables (income, inflation rate and exchange rate) for MENA region. The coefficient of multiple determinations from the result shows that 79% of variation in demand for money is jointly caused by changes in income, inflation rate and exchange rate. The F-ratio of 18.51 being greater than the table F-value of 3.14 at 5% level of significance implies that there is a strong association of demand for money and explanatory variables in MENA. The demand for broad money is positively related to real income which is consistent with expectations. The inflation rate (as the opportunity cost of the monetary asset relative to real assets or other excluded financial assets *e.g.* such as gold and foreign currencies) has a negative significant coefficient, suggesting that the demand for money has also implications for portfolio decisions in these countries. This finding is in line with the finding obtained by Galbis (1979) who found evidence of significant negative inflation elasticities in some Latin American countries. This finding is in disagreement with the finding obtained by Morgan (1979), who in hise experiments with various specifications of the expected price change variables, was unable to discover any significant relationship with the appropriate sign. The estimated coefficient for exchange rate is negative, implying that there exist an inverse relationship between exchange rate and demand for money in MENA. This result is in order with economic condition and is significant at 5% level of significant. The finding is in agreement with the finding obtained by Ghamdi (1989) whose study found that exchange rate along with foreign interest rate have significant negative effect on the demand for money function in Saudi Arabia. Also, Darrat's

(1985) study showed that foreign interest rates play a major role in explaining money demand in the open economies.

6. Conclusion

A correctly specified money demand function is very important in the determination of the optimal way in which the central bank formulates and conducts its monetary policy, whether it follows a monetary regime of money supply targeting or interest rates targeting. The stability of money demand is prerequisite for any policy-driven change in monetary variables to have predictable effect on output, interest rate and ultimately prices through the transmission mechanism of monetary policy. This paper examines the determinants of money demand in MENA region using panel data from 1980 to 2013. In the first step of estimation, Levin, Lin and Chu, Im, Pesaran and Sin, ADF- Fisher and PP-Fisher tests are used to test the stationary of data. The results indicate that, probabilities are greater than the significance level which leads to a failure to reject the null hypothesis of existence of a unit root in the series, and the data are stationary after the first difference for all unit root tests. The Pedroni cointegration test is used in order to test whether the dependent variable and the independent variables exhibit fundamental long-run relationships with each other. The results for the Pedroni test show that the values of statistics are under the 5% critical value. Therefore, we reject the null hypothesis of there being no cointegration vector found in the long run. The results of GLS estimation show that inflation and exchange rate have negative significant effect on money demand in MENA. Also, income has positive role in explaining the changes in money demand.

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