The stability of the demand for money function in Islamic and non-Islamic monetary policy regimes

Ibrahim L Awad[1] and Alaa M Soliman[2]

ABSTRACT

This study, using quarterly data from Egypt and Iran, extends the literature on demand for money by examining the stability of money demand functions in two different monetary policy regimes, an Islamic banking system and a conventional banking system. A stable demand for money enables central banks accurately to predict the demand for money and hence attain a price stability objective through the adjustment of the money supply. This paper adopts a restructured form of Friedman's (1956) model, which considers real demand for money as an extension to the theory of demand for durable goods. The study estimates the long-run demand for money functions in Iran, which represents an Islamic banking system, and Egypt, which represents a conventional banking system. The study then examines empirically the stability of the demand for money function under two different financial systems. The study finds that the demand for money function is stable under the Islamic banking system and unstable under the interest-based banking system.

1. INTRODUCTION

THE WIDE SPREAD OF THE ISLAMIC FINANCIAL SERVICES INDUSTRY in more than seventy countries has been asymmetric regarding scale. Some countries have implemented a fully-fledged Islamic financial system (hereafter, IBS) in which the banking system follows Islamic rules and monetary policy is conducted using fully *Shariah* (or Islamic Law)-compliant instruments (e.g. Iran and Sudan). Other countries have implemented a dual-financial system in which Islamic banks (IBs) exist alongside conventional (or interest-based) banks where the monetary policy is managed by both *Shariah*-compliant instruments and conventional monetary policy instruments, (e.g. Malaysia). Many other countries have financial regulations in place to regulate the setting up of either Islamic banks or even Islamic windows inside conventional banks, where monetary policy is conducted entirely using conventional monetary policy instruments, (e.g. Egypt, Turkey and the UK: Awad 2015).

The monetary policy regime that Islamic central banks commonly adopt to achieve their goals is the monetary targeting regime. In other words, monetary policy is formulated to determine the desired (or targeted) level of money supply, (i.e., the level of money supply that insures adequate liquidity compared to the capacity of the economy to supply goods and services). The chosen level of money supply is determined by demand for money at full employment, within the framework of price stability (Chapra 1996; Fahmy 2006).

A stable demand for money function enables the central bank accurately to predict demand for money and hence control the money supply (using monetary policy instruments) in order to achieve the primary goal of monetary policy, price stability.

In general terms, the success of the monetary targeting regime hinges on two basic assumptions; (i) the relationship between the goal variable and the monetary targets must be strong enough; (i.e., money velocity is predictable), (ii) monetary aggregates must be under the control of the central bank; (i.e., the money multiplier is predictable) (Batini *et al* 2005).

Anderson (1985) identified three sources of instability of the demand for money; (i) changes in the velocity of circulation in response to fluctuations in interest rates, (ii) the demand for money function itself may shift. For instance, financial innovations and deregulation of interest rates may shift the demand for money at the prevailing levels of nominal interest rates, and (iii) over shorter periods the money stocks actually held may not correspond to the desired money balances. If the speed of adjustment is low, then the mismatch between the desired and the actual money balances will induce large and unexpected changes in the velocity of circulation, leading to an unstable demand for money function.

However, some researchers (Chapra 1996; Fahmy 2006) argue that the prohibition of nominal interest rates and the dependence on a profit-sharing ratio mechanism under Islamic banking systems (IBS) would stabilise the demand for money function. Speculative capital flows arising from interest rate differentials and exchange rate expectations are not likely to impair the stability of demand for money function under IBS. Demand deposits will pay no interest and time deposits are equity-oriented and committed for relatively longer periods. Exchange rate expectations, however, can be discouraged and their monetary effect can be neutralised.[3]

This paper investigates the stability of demand for money function under two varied banking systems; a fully-fledged IBS and a conventional banking system. Because of the lack of data for the Sudanese economy, the study is limited to the Iranian economy, where a fully-fledged Islamic banking system is adopted. For the purpose of comparison, the demand for money function in the Egyptian economy is estimated, where the Egyptian economy is taken to be an interest-based economy. Firstly, we estimate the long-run demand for money functions in the Iranian and Egyptian economies; and, secondly, we compare the stability of the demand for money function in the two cases under

study. A descriptive analysis is utilised to investigate the variables of the demand for money function, with econometric techniques utilised to estimate the money demand functions and test their stability.

The remainder of this paper is as follows; section two explores the variables of the demand for money functions reported in the literature. Section three highlights the variables in the demand for money function in Islamic and non-Islamic banking systems. Section four discusses data and estimation results. Section 5 offers concluding remarks.

2. Variables in the demand for money function

The classical quantity theory regards the holding of money as a means to facilitate transactions and has no intrinsic utility. According to Fisher's (1911) 'equation of exchange', the quantity of money in circulation, M_s, is related to the volume of transactions, T, and the price level of its related items, P_t, through a proportionality factor, V_t, called 'transactions velocity of circulation of money', that is:

$$M_s V_t = P_t T \tag{1}$$

In the Cambridge approach or cash balance approach, money is held not only as a medium of exchange but also as a store of value. According to Pigou (1917), the demand for money, M_d, other things being equal, is proportional to the level of nominal income, py, such that $M_d = kpy$. Clearly, the ratio k of nominal income that individuals hold in cash balances might depend on interest rates and the level of wealth, or even nominal income. Incorporating into the money market equilibrium condition:

$$M_s V = py \tag{2}$$

where V (= $1/k$) is the income velocity of circulation.

The introduction of the interest rate into the demand for money function came under the so-called 'speculative demand', incorporated by Keynes. The Keynesian demand for money function, therefore, incorporates two variables, such that:

$$M_d / P = f(y, i) \tag{3}$$

where M_d/P is the real demand for money, y stands for real income and mirrors the transaction and precautionary demand for money. i stands for the nominal interest rate and reflects the speculative demand for money.

Chapra (1996) argues that the demand for money under IBS consists of two components: transactionary and precautionary demand for money. Speculative demand for money is expected to be minimised or even absent, because of the absence of interest rates. Individuals are not expected to retain liquid balances in excess of transactionary and precautionary needs as long as they can make profits, or at least avoid the erosive effect of Zakah (a rate

of 2.5 per cent to be paid annually on liquid funds according to Islamic law) and inflation, by investing their excess liquidity in *Shariah*-compliant financial assets. Thus, transactionary demand will incorporate *Shariah*-compliant investment which has a positive relationship with the expected rate of return. Since the expected rate of return does not fluctuate greatly, as with the interest rate the transactions demand for money would be more stable under IBS.

Nonetheless, the client's share in the expected return on *Shariah*-compliant investment, α_c (= $1-g_b = g_c)R^e$), can be regarded as a straightforward alternative to the nominal interest rate adopted by conventional banks.[4] R^e is the expected rate of return on *Shariah*-compliant investment, g_b symbolises the profit-sharing ratio on *Mudarabah* (trust finance) and *Musharakah* (joint venture finance) investments owed to commercial banks, and g_c (=1- g_b) is the outstanding client's profit-sharing ratio.[5]

Demand for money under IBS can be explained similarly to the Keynesian model, where a negative relationship exists between the demand for money and α_c. The higher the α_c (either because of an increase in g_c, or because of high expected rate of return, R^e, given g_c) the higher the opportunity cost of holding liquid funds, and the lower the demand for money.

Similar to the nominal interest rate, Islamic central banks can use commercial banks' profit-sharing ratio, g_b, as a monetary policy instrument.[6] Setting g_b could be based on monetary policy directives and the expectations about the rate of return, R^e. An increase in g_b, (or equally a decrease in g_c and hence α_c) will stimulate demand for money (and vice-versa).[7]

The assumption that individuals will not hold liquid funds other than for transactionary and precautionary purposes because of the erosive effect of *Zakah* is based on an implied assumption that liquid money will remain idle for a time period of a full year. Clearly, such an assumption is not realistic where individuals under IBS can diversify their portfolios from a spectrum of Islamic financial assets, (e.g. *Sukuk*, Islamic bonds).

In light of the above discussion, the demand for money function under IBS may incorporate two variables as follows:

$$M_d / P = f\left\{y, \alpha_c (= (1 - g_b)R^e)\right\} \tag{4}$$

Baumol (1952) and Tobin (1956) adopted what is called the 'nventory approach' to analyse the demand for money for transactionary purposes. Because of the transactions costs of selling financial assets to finance transactions, households hold an inventory of money for transactionary purposes. The household's portfolio problem under these models, therefore, is the balancing of the two competitive purposes for holding money; (i) the need to hold money for transactionary purposes because of the mismatches between receipts and expenditures, (ii) holding liquid financial assets other than money will offer higher yields while money does not. These models lead to the following formula of optimal demand for money:

$$md^* = \sqrt{(cy)/2i} \tag{5}$$

Where optimal demand for real money balances, *md*,* is positively related to transactions costs, *c,* and real income, *y*, and inversely related to interest rate, *i*.

Other models with different approaches have investigated the demand for money for transactionary and precautionary purposes, (e.g. Milbourne 1983; Lucas 1980; Dornbusch and Fischer 1990; Cuthbertson and Barlow 1991). In addition, the store of value function of money has been considered using 'portfolio models', where demand for money is interpreted in the context of a portfolio choice problem. Tobin (1958) reinterpreted Keynes's liquidity preference on the basis of the theory of risk-aversion behaviour, where individuals hold money in their portfolio because the rate of return on holding money is more certain than the rate of return on holding earning assets. Fisher (1975), however, has indicated that risk-aversion behaviour is not sufficient to explain the reasons for holding money, because money is subject to the risk of changes in the general price level.

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In light of the above discussion, real output, *y*, and interest rate, *i*, are the key explanatory variables included in the demand function. However, another approach considers the demand for money as an extension to the theory of demand for durable goods. Similar to goods, individuals hold money because of the utility derived from it. Instead of searching for motives behind holding money, Friedman (1956) assumes that individuals hold money as a durable good. He viewed money as an 'abstract purchasing power' (i.e., individuals hold money with the intention to use it for upcoming purchases). Therefore, money competes with other assets, such as, bonds, stocks, and physical goods in individuals' and business firms' portfolios. From this perspective money services, similar to physical goods' utilities, decline as the quantity of money held increases.

The most significant variables included in Freidman's (1956) demand for money function are as follows:

$$Md / p = f(Y_p, R_b - R_m, R_e - R_m, \pi^e - R_m) \quad (6)$$

Where M_d/p is the real demand for money, Y_p stands for permanent income, R_b is the expected nominal rate of return on bonds, R_e is the expected nominal rate of return on equities, R_m is the expected nominal rate of return on money, and π^e is expected inflation.

Friedman (1956) argues that demand for money is insensitive to the interest rate. That is, when the interest rate rises the expected rate of return on money held as bank deposits, R_m, rises along with the expected rates of return on other assets. Consequently, opportunity cost variables R_b - R_m, R_e - R_m, and π^e - R_m will not produce a significant change in the real demand for money. As a result, real demand for money is determined only by permanent income, Y_p.

3. Variables in the demand for money function in Islamic and non-Islamic banking systems

The present paper adopts a restructured form of Friedman's (1956) model, which considers real demand for money as an extension to the theory of demand for (durable) goods.

Similar to the theory of demand for goods, real demand for money, M_d/p, is determined by real income, y, price of money, P_c, expected price of money, P_c^e, and the relative prices of other alternatives to money (i.e. relative price of bonds, RP_b , and relative price of equities, RP_e) Thus, the demand for money function in real terms is as follows:

$$Md / p = f\left[y, P_c, P_c^e, RP_b, RP_e\right] \quad (7))$$

Real demand for money is expected to have a positive relationship with real income, y. As real income increases, real expenditure and hence demand for real balances increases. Unlike Keynes (1936) and Freidman (1956), who viewed the interest rate as the opportunity cost of holding money, or the price of foregoing liquidity, the present paper measures the price of holding liquidity in terms of the sacrificed real goods and services. The price of money is what we must give up to get it. Put simply, it is the inverse of the price level or, in aggregate, the general price level. If the price of a good X is 0.25 pounds, then the price of a pound is 4X. If the interest rate is ten per cent, an economic agent is then thought to borrow money for ten pence in the pound. The interest rate is considered the rent on money or the price of credit, measured in money, since the economic agent is obliged to return the principal after a specific period of time. Obviously the price to borrow good X is not the same as the price to buy it. The interest rate is the price of borrowing capital rather than the price of money. It goes without saying that a change in the price of

money affects both the rented money and the money an economic agent is paying as rent, leaving the ratio of the two unchanged.[8]

On this basis, the purchasing power of a monetary unit spent on produced and consumed goods and services, P_c, can be measured by the inverse of CPI (or GDP deflator), so, P_c = 100/CPI. For the same reasons, the purchasing power of a monetary unit spent on shares or equities, *Pe*, can be measured by the inverse of share-price index (P_e = 100/share price index). The purchasing power of a monetary unit spent on equities relative to the purchasing power of a monetary unit spent on goods and services, $R/P_e = P_e/P_c$ is defined by CPI/share-price index, that is, P_e/P_c=*(100/share price index)/(100/CPI)= CPI/ share price index.*

The real demand for money is expected to have a negative relationship with the purchasing power of a monetary unit spent on goods and services, P_c. The higher the price level the lower the purchasing power of money, P_c, and hence the lower the cost of holding liquid money, the higher the demand for money.

The expected purchasing power of money, or expected price of money, P_c^e, will have a positive relationship with real money demand. Expecting a high price of money, or a high purchasing power of money, because of future deflation of prices of goods and services would encourage people to hold large real money balances at the current time.

The relative price of a monetary unit spent on equities to the price of a monetary unit spent on goods and services, $R/P_e = P_e/P_c$ (= CPI/share-price index), will have a negative relationship with real money demand. High equity prices that lower the purchasing power of a monetary unit spent on equities, relative to the purchasing power of a monetary unit spent on goods and services, where RP_e gets lower, will decrease demand for equities and hence increase real money demand.

Similarly, the relative price of a monetary unit spent on bonds, to the price of a monetary unit spent on goods and services, $RP_b = P_b/P_c$ (= CPI/bond-price index), will have a negative relationship with the real demand for money. An increase in the price of bonds, by reducing the nominal interest rate, will lower the purchasing power of a monetary unit spent on bonds, relative to the purchasing power of a monetary unit spent on goods and services, where gets lower. Thereby, demand for bonds will decrease and demand for real money increase.

Obviously, the above mentioned variables are relevant to Islamic and non-Islamic banking systems, except for the relative price of money spent on bonds to the price of money spent on goods and services, RP_b. Under IBS, however, RP_b is substituted by the relative price of Islamic bonds, RP_s.[9]

Alternatively, the nominal interest rate in the conventional banking system is a proxy for the relative price of bonds, RP_b, since the nominal interest rate has a negative relationship with the market price, or the current value of

bonds. In addition, the client's share in the expected return on *Shariah*-compliant investment, α_c (= $(1-g_b) R_e$), can be used as a proxy for the relative price of *sukuk*, since α_c has a positive relationship with price of *sukuk* and a negative relationship with the demand for money.

4. Data and estimation results

Using quarterly data, we investigate the stability of the demand for money function specified by equation 7, for Egypt and Iran.[10] As mentioned above, Egypt follows a non-Islamic banking system in which Islamic banks or Islamic windows inside conventional banks are allowed, but the entire banking system is managed by conventional monetary policy instruments. In contrast, Iran has followed a fully-fledged Islamic banking system since March, 1984 when the Iranian government banned the use of the nominal interest rate.[11] Quarterly data for Egypt are available from 2002Q1 to 2013Q4. As for Iran, quarterly data, on most variables in equation 7, are available until 2007Q4. Thus, the study will consider the Iranian case during the period from 1990Q1 to 2007Q4. We take 1990Q1 as a point of departure, as the structural change of policy might have been occurred since early 1990s when the CBI began to adopt indirect methods of conducting monetary policy immediately after the launching privatisation and structural adjustment programmes in the early 1990s. The sources of data are the IFS and databases available on CBI and CBE websites.[12]

4.1. The stability of demand for money function in Egypt 2002-2013

To check the stability of the demand for money function in Egypt, we firstly estimate the long-run money demand function, and secondly check the stability of the long-run relationship. The demand for money function in Egypt incorporates the following variables:

$$m = f(y, P_c, P_c^e, RP_e, Ti) \tag{8}$$

Where, real demand for money, m, is the nominal money supply, M2, divided by the GDP deflator. Real income, y, is GDP with fixed prices (2010:Q1=100). The purchasing power of money in terms of prices of goods and services, P_c, is the inverse of the CPI. The expected purchasing power of money in terms of goods and services prices, P_c^e, is the lagged value of P_c, i.e., $(P_c^e = (P_c)_{t-1})$ where expectations are assumed to be adaptive.[13] The price of a monetary unit spent on equities relative to the price of a monetary unit spent on goods and services, RP_e, is the ratio of CPI divided by the share-price index, i.e. RP_e = CPI/share-price index. Because quarterly data on bond prices covering the period 2002-2013 are not available, the three-month treasury bill rate, T^i, is used as a proxy for the price of a monetary unit spent on bonds. The expect-

ed signs of the explanatory variables included in the equation 8 are $f1$ and $f3 > 0$, and $f2$, $f4$ and $f5 < 0$.

All variables included in equation 8 are in logs and are seasonally adjusted except for the three-month treasury bill rate, *Ti*.[14] The unit root tests (see Table 1) indicate that all variables are integrated of order one, or I~(1), except for treasury bills, which are integrated of order zero, or, I~(0).

Table 1: ADF Test Results for Unit Roots - Egypt

Variable	*Without trend*	*With trend*	*Lag length*
m	-2.39*	-2.30*	(4)
Y	-1.05*	-1.42*	(4)
P_c^e	0.48*	-2.64*	(1)
RP_e	-0.79*	-1.72*	(1)
Ti	-3.11	-3.93	(0)

Notes:
1. An asterisk indicates significance at the 5 per cent level
2. The lags of the dependent variable used to obtain a white-noise residuals are determined using AIC.

The demand for money function in Egypt can be written as:

$$m_t = \beta_0 + \beta_1 y_t + \beta_2 P_c^e + \beta_3 RP_e + \beta_4 T_i + \varepsilon_t \quad (9)$$

To estimate equation 9, where the integrated variables with different orders are included, a cointegrated relationship has to exist.[15] We apply stability tests in the framework of an Error Correction Model (ECM) for testing the stability of the demand for money in the two countries under study. Error Correction is a formation in which the long run equilibrium relationship between money demand and its determining factors is embedded in the equation that captures short-term dynamics (Kole and Meade 1995). One possible justification for using ECM models is that various significant structural changes come in the form of a changing causal structure, so major changes may happen while the basic long-run relationships remain stable.

Following Hansen's (1992a) approach, we estimated the parameters of equation 9 using Phillips and Hansen (1990) Fully Modified Ordinary Least Square (FM-OLS), then Hansen's (1992b) test of the null of cointegration, applied to the cointegrating residuals of FM-OLS. In the second stage, we take the residuals from the FM-OLS regression (i.e., equation 11) to estimate the ECM equation 10 by OLS, where all variables are I(0), and test for structural changes.

$$\Delta m_t = c_t + \lambda u_{t-1} + \gamma_1 \Delta y_t + \gamma_2 \Delta P_{c\ t}^e + \gamma_3 \Delta RP_{e\ t} + \gamma_4 \Delta T_t + \omega_t \quad (10)$$

Where,

$$u_t = m_t - \beta_0 - \beta_1 y_t - \beta_2 P_c^e - \beta_3 RP_e - \beta_4 T_t \quad (11)$$

FM-OLS was used to estimate equation 9 with trend, which resulted in the coefficient of treasury bills being insignificant. The treasury bills variable was then removed and the model was estimated with a constant and deterministic trend (Table 2).

Table 2: Fully Modified OLS Estimates (equation 9) - Egypt

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
y	0.411827	0.178738	2.304079	0.0264
P_C^e	0.851427	0.210694	4.041059	0.0002
RP_e	-0.047845	0.020649	-2.317039	0.0256
C	15.86990	4.752072	3.339575	0.0018
@TREND	0.020182	0.003637	5.549401	0.0000
R^2 = 0.755687				

The estimate yields reasonable coefficients which are also significant, with a reasonably strong R-squared. The significant results of FM-OLS are reflected in the long run relationship estimates by Hansen (1992b). The results in Table 3 show that the L_c statistic is 0.482936 and that the null hypothesis of cointegration is not rejected at the 5 per cent level of significance.

Table3: Hansen Cointegration test - Egypt

Lc statistic	*Stochastic Trends (m)*	*Deterministic Trends (k)*	*Excluded Trends (p2)*	*Prob.**
0.482936	3	1	0	> 0.2

Note: *Hansen (1992b) Lc(m2=3, k=1) p-values, where m2=m-p2 is the number of stochastic trends in the asymptotic distribution

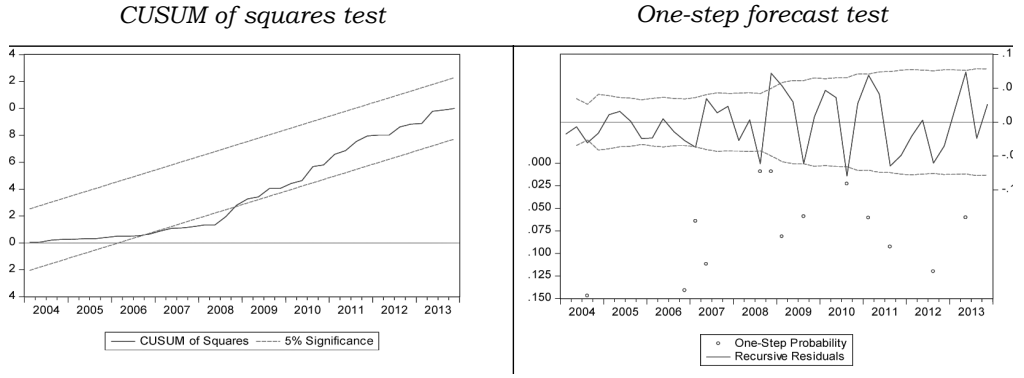
Table 4: Estimates of the ECM of demand for money (equation 10) - Egypt

Variable	*Coefficient*	*Standard error*	*t-statistic*	*Prob.**
Δy_t	0.418089	0.318328	1.313392	0.1965
$\Delta P_{c\,t}^{e}$	0.957523	0.428253	2.235881	0.0310
ΔRP_{et}	-0.032627	0.057187	-0.570537	0.5715
u_{t-1}	-1.025362	0.166292	-6.166022	0.0000
C	0.022633	0.011080	2.042681	0.0477
R^2 = 0.49; σ = 0.03				
DW = 2.02				

We then estimate equation 10, to examine the adjustments that take place to restore long run equilibrium of money demand, in response to short term disturbances. As expected, the results in Table 4 show that the error correction term is negative and significant, confirming the long run relation detected by the cointegration analysis. The negative sign on the error correction term indicates that money demand adjusts in the succeeding period in response to disequilibrium in money balances. The error correction model's error correction term ensures that the long run relationship established by the cointegration analysis holds in the steady state.

Moreover, recursive least squares tests are used to check the stability of the parameters reported in Table 4. The recursive residuals test uses the one-step-ahead forecast error resulting from the last estimate of *b* vector using *k* coefficients observations in succession.

Figure 1: The recursive residual tests - Egypt



According to the residuals recursive test, parameters are unstable when the residuals are outside the standard errors bands. The CUSUM of squares test is based on the cumulative sum of recursive residuals. In this test, parameters are stable if the CUSUM does not go outside the area between the two critical lines. Figure 1 shows the recursive residuals test and the CUSUM of squares test. Clearly, it shows instability in the parameters of the demand for money function in Egypt.

4.2. The stability of demand for money function in Iran during the period 1991-2007

Similar to Egypt, the long-run demand for money function in Iran incorporates the following variables:

$$m_t = \beta_0 + \beta_1 y_t + \beta_2 P_c^e + \beta_3 RP_e + \beta_4 D_i + \varepsilon_t \qquad (12)$$

The variables in equation 12 are measured in a similar way to the case of Egypt, with some minor exceptions: (i) real income, *y*, is GDP with fixed prices (1997:Q1=100), (ii) the expected purchasing power of money in terms of prices

of goods and services, P_c^e, is the lagged value of P_c ($P_c^e = (P_c)_{t-1}$. P_c, the purchasing power of money in terms of prices of goods and services, is the inverse of GDP deflator, (iii) the price of a monetary unit spent on equities relative to the price of a monetary unit spent on goods and services, RP_e, is the ratio of GDP deflator divided by share-price index, i.e. RP_e = *GDP deflator*/share-price index, (iv) because quarterly data on *sukuk* (Islamic bonds) prices are not available the short-term deposit rate, D_i, is used as a proxy for the price of a monetary unit spent on *sukuk*. The expected signs of explanatory variables included in the equation 12 are $\beta 2$ and $\beta 3 > 0$, and $\beta 4$, and $\beta 5 < 0$. All variables included in equation 12 are in logs and seasonally adjusted, except for short-term deposit rate, D_i.[16]

The unit-root tests (see Table 5) indicate that all variables are integrated of order one at the 5 per cent significance level, except for RP_e, which is integrated of order one at the 1 per cent significance level.

Table 5: ADF Test Results for Unit Roots - Iran

Variable	*Without trend*	*With trend*	*Lag length*
RdM2	-2.04*	-2.06*	(1)
Y	-2.10*	-1.95*	(3)
P_c^e	-2.41*	-1.89*	(0)
RP_e	-3.11**	-4.57	(2)
D1	-1.92*	-1.30*	(0)

Notes:
1. An asterisk indicates significance at the 5 per cent level
2. The lags of the dependent variable used to obtain a white-noise residuals are determined using AIC

FM-OLS was used to estimate equation 12 without trend, which resulted in the coefficient of RP_e being insignificant and the coefficient sign of *Di* being inconsistent with the expected sign. RP_e and *Di* were then removed and the model was estimated with a constant (Table 6).

Table 6: Fully Modified OLS Estimates - Iran

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
y	1.268693	0.127767	9.929711	0.0000
P_C	0.138848	0.028325	4.901955	0.0000
C	29.04769	0.572680	50.72238	0.0000

$R^2 = 0.89$

The estimate, as in the case of Egypt, yields reasonable coefficients which are also significant with a very strong R-squared. The results of the FM-OLS estimation are also reflected in the long run cointegration relationship estimates of Hansen (1992b). The results in Table 7 show that the L_c statistic is 0.228416 and that the null hypothesis of cointegration is not rejected at 5 per cent level of significance.

Table 7: Hansen Cointegration test - Iran

L_c statistic	*Stochastic Trends (m)*	*Deterministic Trends (k)*	*Excluded Trends (p2)*	*Prob.**
0.228416	2	0	0	> 0.2

Note: *Hansen (1992b) Lc(m2=2, k=0) p-values, where m2=m-p2 is the number of stochastic trends in the asymptotic distribution

We then turn to the estimates of equation 13, to examine the adjustments that take place to restore the long run equilibrium of the money demand in response to short term disturbances.

$$\Delta m_t = c_t + \lambda u_{t-1} + \gamma_1 \Delta y_t + \gamma_2 \Delta P_{c\ t} + \omega_t \qquad (13)$$

The results in Table 8 show that the error correction term is negative and also significant, as expected, which confirms the long run relationship detected by the Hansen (1992b) cointegration test.

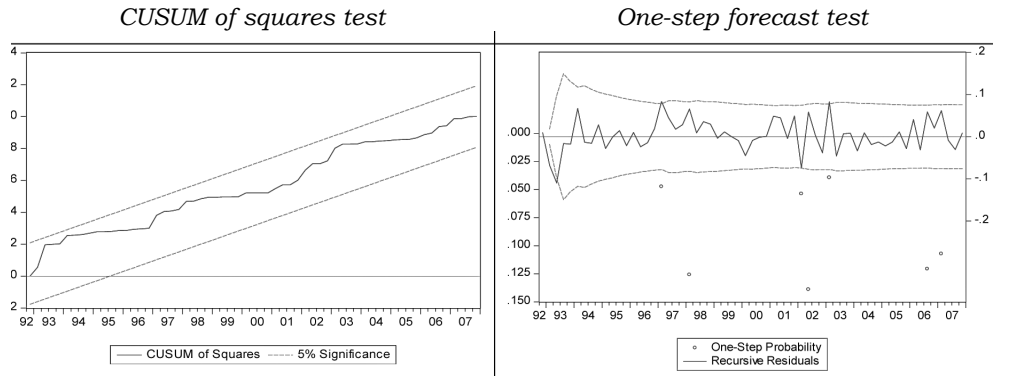
Table 8: Estimates of the ECM of demand for money (equation 13) - Iran

Variable	*Coefficient*	*Standard error*	*t-statistic*	*Prob.**
Δy_t	0.413511	0.171465	2.411638	0.0189
$\Delta P_c^{e}{}_t$	0.275023	0.129895	2.117266	0.0383
u_{t-1}	-0.350009	0.094613	-3.699396	0.0005
C	0.012274	0.008231	1.491255	0.1410
$R^2 = 0.22$; $\sigma = 0.03$				
DW = 2.15				

In addition, Figure 2 shows the recursive residuals test and the CUSUM of squares test. Clearly, it does not detect instability in the parameter of the demand for money function in Iran.

To sum up, the findings at the 5 per cent level of significance are rather interesting in that they indicate that the income coefficient (income elasticity of money demand) in Iran (the impact value 1.26 - Table 6) is higher than for Egypt

Figure 2: The recursive residual tests - Iran



(the impact value 0.41 - Table 2). One possible explanation as to why the income coefficient in Iran is higher is the fact that, in Iran, economic agents engage in more Islamic financial transactions that comply with *Shariah*, which prohibits the use of some financial instruments (e.g. short and long term debt) present in conventional interest rate-based banking systems like in Egypt. Income elasticity of money demand has also implications for monetary policy conduct in both Egypt and Iran. How elastic money demand for change in income affects the stability of the demand for money and hence increasing the possibility of putting in place and implementing an effective monetary policy.

5. Conclusion

A stable demand for money enables central banks accurately to predict the demand for money and hence manage the money supply using monetary policy instruments, in order to achieve the primary goals of monetary policy, such as price stability. This paper examines the stability of demand for money function in a fully-fledged Islamic banking system and a conventional (interest-based) banking system. The paper adopts a restructured form of Friedman's (1956), model which considers real demand for money as an extension to the theory of demand for (durable) goods. Real demand for money is determined by real income, the price of money, the expected price of money, and the relative prices of other alternatives to money (bonds and equities).

In this study, the Iranian banking system is regarded as an Islamic banking system, and the Egyptian banking system as a conventional banking system. The stability of the demand for money function under the two systems has been investigated in two steps. Firstly, we estimate the long-run demand for money function. Secondly, we apply stability tests of the demand for money in the framework of ECM.

Based on the results of the statistical analysis, the study concludes that the demand for money function is stable under the Islamic banking system

and unstable under the interest-based banking system. However, the results of the statistical analysis should be interpreted cautiously, since it is limited to the cases considered by the study and the time horizon of each case. Generalising the above conclusion, however, should be based upon additional investigations in the countries that follow Islamic and non-Islamic banking systems.

The stability of demand for money is necessary for the effectiveness of monetary policy. The results presented in this paper provide evidence of the positive impact of an interest free monetary system on financial and economic stability. The findings are in line with Siddiqi's (1982) argument that the introduction of the profit sharing ratio to replace interest rates will not destabilise the economy. The findings should be of interest to both policy makers and monetary economists, as they provide further evidence of the potential role that the profit sharing ratio can play as a monetary policy tool to stabilise the demand for money function. Substituting the interest rate by the profit sharing ratio will not affect financial markets only, but will also result in significant changes in the real economy.

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ENDNOTES

1. Ibrahim L. Awad: Corresponding Author. Assistant Professor in Economics, Department of Finance and Economics, College of Business and Economics, Qatar University. Senior Lecturer in Economics, Department of Economics, Faculty of Commerce, Zagazig University, Egypt. Email; ibrahim.ibrahim@qu.edu.qa; ibrahim-phd@yahoo.com

2. Alaa M. Soliman: Senior Lecturer in Economics, Leeds Beckett University, Faculty of Business and Law, 520-Rose Bowl, Leeds LS1 3HB, United Kingdom. Email: a.soliman@leedsbeckett.ac.uk

3. According to the IMF report (2013) on exchange arrangements and exchange restrictions, 26 adopt monetary aggregate targeting, and 34 countries adopt inflation-targeting framework. The de-facto classification sees the Central Bank of Egypt (CBE) and Central Bank of Sudan (CBOS) as conducting monetary policy based on no explicitly stated nominal anchor, whereas the Central Bank of the Islamic Republic of Iran (CBI) follows a composite exchange rate anchor, where the exchange rate serves as an intermediate target of monetary policy.

4. By generalising the standard IS-LM model to study the effect of monetary policy on macroeconomic variables in an Islamic economy, Khan and Mirakhor (1989) conclude that there is no fundamental change in the way monetary policy affects economic variables.

5. A *Mudarabah* (trust finance) contract meets short-run businesses where funds are provided by the Islamic bank to an investor, in return for a predetermined profit-shar-

ing ratio. If a loss is incurred, an Islamic bank bears it exclusively and the investor loses the reward for his/her time and effort. In contrast to *Mudarabah*, a *Musharakah* (joint venture finance) contract meets long-run businesses where an Islamic bank is engaged in a contractual relationship with equal or variable shares in an investment project. The distribution of profits is determined either upon agreement or upon the ratio of contribution of each part in the principal, whereas the losses are distributed upon the ratio of contribution of each part in the principal. It is important to distinguish between a *Mudarabah* investor who is considered an important stakeholder and a *Musharakah* investor who is considered a shareholder. In the case of bankruptcy, the *Mudarabah* investors will have a priority claim on the remaining assets, whereas *Musharakah* investors may lose their investments. Also, it is important to distinguish between *Musharakah* investors and equity investors, where the former receive dividends limited to a predetermined time period and profit ratio. In addition, *Musharakah* investment is less liquid than equity investment, since there is no trading in a *Musharakah* investment (Wilson, 2008).

6. Islamic central banks have plenty of monetary policy instruments that can be employed to manage monetary policy. For more details see Awad (2015).

7. It should be noted that the introduction of nominal interest rate, i, in the demand for money function as an explanatory variable would make it unstable, other things being equal. That can happen when the short-term nominal interest rate is used as a monetary policy instrument, or because of the deregulation of interest rates (Awad, 2010). In contrast, the use of commercial banks' profit-sharing ratio, g_b, as a monetary policy instrument does not necessarily destabilise the demand for money function when Islamic CB moves g_b, to offset undesirable movements in the expected rate of profits, R^e, i.e., the client's share in the expected return, α_c, as an explanatory variable in the demand for money function does not undergo high fluctuations.

8. The main reason that the description of the interest rate as the price of money is flawed is that it implies a simple relation between interest rate and money. That simple relationship between interest rate and money leads to the wrong belief that, for example, high interest rates are the results of a tight monetary policy by central banks. Money can be created by a central bank and then lent out to viable customers or investors. This will lead to an increase in the supply of loans, a reduction in the interest rate and an increase in the money supply. That is just one side of the story. What is affecting the interest rate is not the amount of money created by the central bank but the amount of loans granted in that money creation process. In that respect one could argue that a government could get the same effect by collecting more in taxes than it spends (e.g. running a budget surplus) and lending out the difference. The lending out of the budget surplus (e.g. the amount of loans granted to economic agents) affects the interest rate. The interest rate is the market price or the price paid for the use of capital. Central banks control interest rates in the same way an economic agent can control the price of a good or a commodity, by choosing to buy or sell some of it. The weak relationship between money and interest rates can be evidenced easily by the inability of the massive quantitative easing programmes (QE) in effectively lowering the rate of interest. It again goes back to the role that loans play in the process of money creation. The amount of loans that is influenced by many other microeconomic and macroeconomic factors, such as consumer and business confidence (i.e., inducing investment in the real sector) or labour market, plays an important role in determining the rates of interest.

9. Islamic bonds, or *sukuk*, represent an asset-backed paper with ownership claims on assets linked to investment. The face value of *sukuk* is based upon the market value of the underlying asset, where each *sukuk* represents a share in the asset. A *sukuk* holder receives a proportionate share in profits (or bears a proportionate share in losses). In contrast to conventional bonds, the *sukuk* holder may not get back the face value of *sukuk* at maturity because the market value of *sukuk* at maturity depends on the performance of the existing project. Most Shariah scholars believe that a promise by the issuer to repurchase *sukuk* with the face value at maturity date does contradict Islamic law.

10. Indeed we were seeking to investigate the stability of demand for money function in Sudan which instigated an Islamic banking system in the second half of the 1980s. Unfortunately, data on some variables in equation 7 are not available and some other data have breaks.

11. After the revolution in 1979, the Iranian government enacted a new law in 1983 that prohibited the payment or receipt of interest rates on banks' activities, except for the CBI's transactions with governmental and public institutions, and banks, as long as these institutions use their own resources. The new law came into effect on March 20th, 1984. Since then, banks have been allowed to pay a return on saving and time deposits based on their profitability (Hassani 2010).

12. IFS is Available at:
http://www.elibrary.imf.org/search?t100=urn:Series/041&type_0=booksandjournals&browsePage=series&sort=datedescending,
CBI database is available at:
http://www.cbi.ir/page/8020.aspx,
and CBE database is available at:
http://www.cbe.org.eg/English/Statistics/

13. Under the adaptive expectation hypothesis, expected inflation (π^*_t) takes the following form: $\pi^*_t = \pi^*_{t-1} + \gamma(\pi_{t-1} - \pi^*_{t-1})$ or, $\pi^*_t = \gamma\pi_{t-1} + (1-\gamma)\pi^*_{t-1}$. Under the assumption that the expectations factor (γ) = 1, or equivalently the expectations are instantaneously the lagged value of inflation, π^*_{t-1}, can be used as a measure of expected inflation.

14. The introduction of logarithmic form leads to the exclusion of P_c (= 100/*CPI*) from money demand specification, since the variable P_c is reflected by RP_e (= *CPI/share-price index*).

15. The econometric use of the term 'equilibrium' indicates any long run relationship. Any equilibrium relationship among a set of non-stationary variables implies that their stochastic trends must be linked, i.e. the variables cannot move independently of each other. This linkage among stochastic trends necessitates that the variables be cointegrated. Although Engle and Granger's (1987) original definition of cointegration refers to variables that are integrated of the same order, it is possible to find equilibrium relationships among group of variables that are integrated of different orders. This case is known as 'multicointegration' (Enders 2004 pp 319-323).

16. Similar to Egypt, the introduction of the logarithm form leads to the exclusion of P_c (= 100/*GDP deflator*) from money demand specification since the variable *Pc* is reflected by RP_e (= *GDP deflator/share-price index*).

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