

An Investigation on the Transaction Motivation and the speculative motivation of the demand for money in Sri Lanka

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Abstract: The main objective of this study is to empirically investigate the transaction (income elasticity) and speculative motivations (interest rate elasticity) of the demand for money in the Sri Lankan context and to examine its stability. The study employed the use of cointegration test over the 1977 to 2009, to estimate long run relationship between money demand and its determinants: real income and interest rate. The study found out that money demand function is stable in Sri Lanka for the sample period. The income is the most significant factor of the demand for money, and it makes a powerful positive impact on real money demand. Interest rate is positively related with real money demand and significant, but not consistent with existing theories. Demand for Money on transaction motivation is larger than its speculative motivation in the Sri Lankan context.

Keywords: real money balance, income elasticity, interest elasticity, transaction motivation, speculative motivation, cointegration methodology.

Introduction

The importance of the demand for money has become a prominent research topic in economics due to its role in monetary policy formulation. Income elasticity¹ and interest elasticity² of money demand affect the channels of the transmission mechanism³³. The monetary transmission mechanism describes how policy-induced changes in the nominal money stock

or the short-term nominal interest rate impact real variables such as aggregate output and employment. (Ireland, 2005) of monetary policy. Empirical interest in demand for money functions arises because a stable and predictable money demand function is a prerequisite for the use of targets for monetary aggregates as an objective of monetary policy. Interest elasticity of such functions is crucial for the relative effectiveness of monetary and fiscal policy. (McMorrow, 1998)

Among developing countries, it is accepted that interest rate is an unsatisfactory measure of the opportunity cost of holding money. First, financial markets have not well developed in the developing countries, and due to this situation, possibilities of substitution between money and other financial assets are limited. Secondly, a more practical objection is that the interest rates are often determined by the government and remain constant for long periods, and there wouldn't be sufficient variation to enable its influence on the demand for money. As a developing country, Sri Lanka has experiences of low economic growth with high inflation for a long time period. (Central Bank Reports. Sri Lanka). There is a research space to examine whether interest rate transmission mechanism is effective in the Sri Lankan context. For the good performance of interest rate transmission mechanism, interest rate elasticity of money demand function is crucial.

¹ The percent change in money demand caused by a one percent change in income.,

² The percent change in money demand caused by a one percent change in interest rate.

Theoretical and empirical background

The Theory of demand for money called that the **liquidity preference theory**⁴ hypothesized by John Maynard Keynes' (1936)⁵, describes that why people hold money. Keynes postulated that there are three purposes for holding money by adding the precautionary⁶ and asset (speculative)⁷ motives to the classical transactions motive. Keynes also took the transactions component of the demand for money to be proportional to income because like classical economist he believed that these transactions are proportional to income. (Mishkin,2004).

In addition to holding money to meet current transactions, people hold money as a cushion against an unexpected need. Keynes suggested that the amount of money balances for precautionary purpose that people want to hold is determined by the level of transactions that they expect to make in the future and that these transactions are proportional to income. Therefore, Keynes (1936) emphasized that the demand for precautionary money balances is proportional to income.

$$M1 = M_T + M_P = L_1(PY) = L_1(Y)$$

Where

M1- Money demand on both transactions-motive and the precautionary-motive

M_T - Money demand on transactions-motive

M_P - Money demand on precautionary-motive

L₁ - functional tendency, which fixes the quantity of money which the people willing to hold money on both transactions-motive and the precautionary-motive

PY - Nominal income (Y)

Keynes considered the view that money as a store of wealth and called this reason for holding money the speculativemotive. Keynes analyses the factors that affect the decisions regarding how much money to hold as a store of wealth: especially interest rates.

Various financial assets except money, gain a positive interest rate plus a capital gain⁸. According to Keynes, long term government bonds are the only alternative monetary assets for money asset. People have to make choice between government bonds⁹ and money. If expected return of holding money is greater than the expected return from holding bonds, individuals decide to hold their wealth in the form of money rather than bonds. The expected return in holding money is zero because in Keynes' view money is the most liquid asset and through holding that asset in hand no one can earn interest. But for the bonds have positive expected returns or negative expected returns.

If people expect interest rates to rise, expect the price of the bond to fall and therefore suffer a negative

⁴ Liquidity-preference is a potentiality or functional tendency, which fixes the quantity of money which the public will hold when the rate of interest and national income is given; so that if r is the rate of interest, M the quantity of money and L the function of liquidity-preference, we have $M = L(Y, r)$. This is where, and how, the quantity of money enters into the economic scheme.

⁵ "The General Theory of Employment, Interest and Money"

⁶ The desire to keep extra money in case an unforeseen situation requires a capital outlay. For example, one may wish to save extra money to pay for medical bills in case of an accident. According to John Maynard Keynes, people keep savings accounts, as well as some stocks and commodities, with a precautionary motive in order to cover unexpected events.

⁷ A strategy in which one holds cash apart from any other investments just in case an attractive investment opportunity arises. This allows the investor to take advantage of the opportunity without closing any other positions.

⁸ A capital gain is a profit that results from a disposition of a capital asset, such as stock, bond or real estate, where the amount realized on the disposition exceeds the purchase price. The gain is the difference between a higher selling price and a lower purchase price. Conversely, a capital loss arises if the proceeds from the sale of a capital asset are less than the purchase price.

⁹ A government bond is a bond issued by a national government, generally promising to pay a certain amount (the face value) on a certain date, as well as periodic interest payments. Bonds are debt investments whereby an investor loans a certain amount of money, for a certain amount of time, with a certain interest rate, to a company or country.

capital gain (negative expected return on bonds) that is a capital loss. In this case, people would store their wealth as money because expected return of money (zero expected return) is higher than the expected return on bonds (negative) vice versa. According to Keynes, the demand for money is negatively related to the level of interest rates. Amount of money demanded on speculative-motive is a function of interest rate.

$$M_2 = L_2(r)$$

Where

- M₂ - Money demand on speculative-motive
- L₂ - functional tendency, which fixes the quantity of money which the people willing to hold on speculative-motive
- r - Nominal interest rate.

$$M_s = M = L_1(Y) + L_2(r)$$

People make a choice between money and bonds. The traditional money demand models hypothesize that the demand for real money balances is negatively related with the yield (interest rate) on financial assets such as treasury bills and bonds. The domestic interest rate represents the opportunity cost of holding money and public would prefer to hold more financial assets during times with higher interest rates. If agents in the market expect the nominal interest rate (the return on bonds) in the future to be lower than the current interest rate and then they reduce their holdings of money and increase their holdings of bonds. If the interest rates fall in the future, then the price of bonds increase and the agents have capital gain on the bonds they purchased previously on lower prices. This means that the demand for money in any period depends on both the current nominal interest rate and the expected future interest rate. If agents reduce the demand for money when increase the current nominal interest rate, it means that the demand for treasury bills in the financial market would be increased.

Many studies are available in the literature which estimates money demand function, using various time series econometrics methods. In the earlier stage, the studies employed the Ordinary Least Squares (OLS) method to estimate the money demand function and the Chow test to ascertain the stability of money demand. These studies do not take into account the time series properties and Chow test is low powered when the break point is unknown. Due to these reasons, studies in the earlier stage may have suffered from the spurious regression problem. The introduction of cointegration test has solved this problem, and many studies have employed this methodology to test the presence of stable long-run money demand function. The rationale is that if money demand and its determinants are cointegrated, this implies that the money demand function is stable as the cointegrated variables will never move too far apart, and will be attracted to their long-run equilibrium relationship. (*Haghighat, 2011*).

The study done by *Hossain and Younus, (2009)* investigates the sensitivity of money demand to interest rates on treasury bills in Bangladesh, using quarterly data for the period from quarter four in 1997 to quarter four in 2006. A standard money demand function is examined with real output and the interest rate on treasury bills¹⁰. The result of the study shows that there is a well-behaved and stable money demand function. The results have proved that the demand for money is sensitive to interest rate on treasury bills and relatively longer – maturity has given better results as they expected.

The paper done by *Hwang, (2002)* shows that there exist a long term equilibrium relationship between demand for broad money (M₂) and, its determinants; real income (Y/P) and long term interest rate in Korea. According to Hwang the long term interest rate is a better proxy to measure the opportunity cost of holding money, than short term interest rate.

¹⁰ Treasury bill is a short term investment issued through auctions conducted by the Central Bank of the country, on behalf of the Government. Treasury Bills are issued at a discount and the face value is paid at maturity with interest paid up-front.

Tahir (1995) described that among developing countries, it is accepted that interest rate is an unsatisfactory measure of the opportunity cost of holding money. First, financial markets outside the banking system have not well developed in the developing countries. Due to this situation in these countries, possibilities of substitution between money and other financial assets are limited. Secondly, a more practical objection is that the interest rates are often determined by the government and remain constant for long periods. There is no sufficient variation to enable its influence on the demand for money. However, according to Tahir's survey of theory and evidence with reference to Arab countries, in developing countries, interest rates are tools of development strategy rather than stabilization policy¹¹. Developing countries set their interest rates on financial assets below market equilibrium level, to stimulate investment and growth. The formulation of targets in economic and price stabilization and structural programs are constructed assuming existence of stable demand for money function. Tahir further described, Stability tests have found that the demand function is relatively stable over time. Such stability proved in the demand for money function indicates that effects in changes of money supply on other macroeconomic variables such as growth and price level are adequately predictable. Results of empirical studies on demand for money function in developing countries support this conclusion.

Objective of the study

The objective of the estimation of money demand function is to investigate the transaction (income elasticity) and speculative motivations (interest rate elasticity) of the demand for money in the Sri Lankan context.

Methods

The study investigates the Income elasticity and interest elasticity of money demand. Annual data in the period of 1977 -2009 are used for the study. All the data series that used for the study are non-stationary¹² and, integrated of order one¹³. (I(1) series). If multiple individual time-series variables are non stationary integrated of order one (I(1) series), cointegration¹⁴ test is appropriate to determine whether there is a long-term relationship among the variables. Cointegration tests indicate the presence of such stable long-term relationships exists among the variables. Study employed a cointegration¹⁵ test to determine whether there is a long-term relationship among the variables.

Data Description

The sources of data are the Central bank Of Sri Lanka and International Financial Statistics (IFS) of International Monetary Fund. Demand for real Money

¹¹ A macroeconomic strategy enacted by governments and central banks to keep economic growth stable, along with price levels and unemployment. Ongoing stabilization policy includes monitoring the business cycle and adjusting benchmark interest rates to control aggregate demand in the economy. The goal is to avoid erratic changes in total output, as measured by Gross Domestic Product (GDP) and large changes in inflation; stabilization of these factors generally leads to moderate changes in the employment rate as well.

¹² Non-stationary data, as a rule, are unpredictable and cannot be modeled or forecasted. The results obtained by using non-stationary time series may be spurious in that they may indicate a relationship between two variables where one does not exist. In order to receive consistent, reliable results, the non-stationary data needs to be transformed into stationary data. In contrast to the non-stationary process that has a variable variance and a mean that does not remain near, or returns to a long-run mean over time, the stationary process reverts around a constant long-term mean and has a constant variance independent of time.

¹³ Order of integration, denoted I (d), is a summary statistic for a time series. It reports the minimum number of differences required to obtain a stationary series.

¹⁴ Cointegration is a statistical property of time series variables. Two or more time series are cointegrated if they share a common stochastic drift.

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Balances (RMd2) is used as indicators for money demand and RMd2 function is estimated on the income and interest rate. Central Bank Rate (CBR) is used as an indicator of short term interest rate and real gross domestic product at (RGDP) is used as income aggregate. The description of annually time series that used for this study is contained in the following Table 01.

Table 01:

Time series of	Denotation	Units	Data span	Note
Demand for Real Money Balance (RMd2)	RMd2	Rs. Millions	1978 - 2009	M2/CPI =RMd2 Annually
Real Gross domestic product (at constant price)	RGDP	Rs. Millions Base (2002)	1978 - 2009	Annually RGDP
Central bank rate	CBR	% Per Year	1978 - 2009	annually

VAR method does not capture non-linear elements that existing certainly in level variables (RMd2, RGDP,) because a VAR is a linear model. The better way to respond to this problem is linearize the data by taking the logs of the levels. For this testing purpose, the original data were transformed to logarithms, and the transformation form and the new variables are described in the Table 2.

Table 02:

Time series of	Denotation	Units	Data span	Note
Log of Demand for Real Money Balance (RMd2)	LRMd2	Rs. Millions	1978 - 2009	Annually Log(RMd2)
Log of Real Gross domestic product	LRGDP	Rs. Millions Base(2002)	1978 - 2009	Annually Log(RGDP)
Log of Central bank rate	LCBR	% Per Year	1978 - 2009	annually

The Model

The long run relationship between real money demand and other related endogenous variables is implied by the following equation. Income elasticity of money demand is expected to be positive and interest elasticity of money demand would be a negative value.

$$LRMd2 = \varphi_0 + \varphi_1LRGDP - \varphi_2LCBR + \mu_3\varepsilon_{t-1} \quad (1)$$

Where,

LRMd2 – Log of real money demand.

LRGDP – Log of real GDP

LCBR – Log of central Bank Rate

φ_0 – Autonomous money demand

φ_1 – Income elasticity of money demand (Expected to be positive)

φ_2 – Interest rate elasticity of money demand (Expected to be negative)

$\varepsilon_{(t-1)}$ – Deviation of money demand from the long run equilibrium in the previous year

Hypothesis:

Income elasticity is to be positive and interest elasticity is to be negative according to existing theories.

$$H_0, \varphi_1 \leq 0$$

$$H_1, \varphi_1 > 0$$

And

$$H_0, \varphi_2 \leq 0$$

$$H_1, \varphi_2 < 0$$

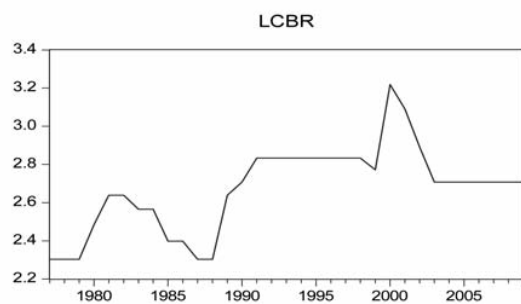
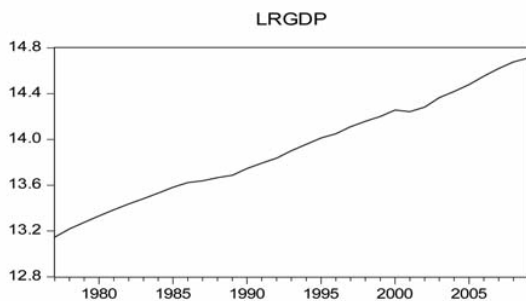
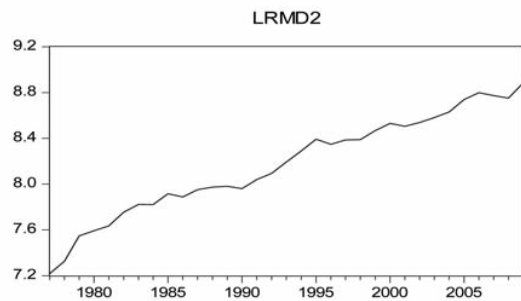
Results

Unit root test¹⁶

When plotting the levels and differences of the three series the implication is that the data are non-stationary in levels, but stationary in differences. (See graph 01)

¹⁶ A unit root test tests whether a time series variable is non-stationary using an autoregressive model. A well-known test that is valid in large samples is the augmented Dickey–Fuller test. .

Graph 01:



According to the Akaike information criterion (AIC) and Schwartz Bayesian criterion (SBC), the optimal lag length is selected as lag one and Stationarity of each series was tested using the Augmented DickyFuller (ADF) unit root test including a constant. Table 03 and table 04 report the results on 1%, 5% and 10% significant levels. According to this test, all variables are non-stationary.

**Table 03:
ADF test results (level- Intercept)**

Variable	ADF Test statistics	Critical values 1%	Critical values 5%	Critical values 10%
LRMd2	-1.641173	-3.6576	-2.9591	-2.6181
LRGDP	0.465676	-3.6576	-2.9591	-2.6181
LCBR	-2.322567	-3.6576	-2.9591	-2.6181

**Table 4:
ADF test results (1st difference- Intercept)**

Variable	ADF Test statistics	Critical values 1%	Critical values 5%	Critical values 10%
LRMd2	-5.1448**	-3.6661	-2.9627	-2.6200
LRGDP	-3.6249*	-3.6661	-2.9627	-2.6200
LCBR	-4.131461**	-3.6752	-2.9665	-2.622

* denotes rejection of the hypothesis at the 0.05 level, and ** denotes rejection of the hypothesis at the 0.01 level

Cointegration test:

Likelihood statistics methodology is conducted to test whether there are any long run relationships among the above set of non-stationary variables. Since likelihood statistic of is 32.42 and it is larger than the critical value of 29.68, the null hypothesis is rejected at the 5% significance level. This test confirmed that the variables are cointegrated and there is one cointegrating equation in the system. (at the 0.05 significant level) (see table 05)

Table 05:

Hypothesized No of CE(s)	Eigen value	Likelihood Ratio	5 Percent Critical value	1 Percent Critical value
None *	0.559636	32.42862	29.68	35.65
At most 1	0.195056	7.003853	15.41	20.04
At most 2	0.008908	0.277385	3.76	6.65

* denotes rejection of the hypothesis at the 0.05 level

**Estimated Long Run Model;
(Money Demand function)**

The long run equilibrium equation of money demand (LRMd2), which is estimated by the cointegration methodology, is given below. T values are given in the parentheses below.

$$LRMd2 = -4.22 + 0.86LRGDP + 0.16LCBR + \mu\beta_{t-1}$$

Conclusion

In the long run model of money demand, interest rate (CBR) is positively related to real money balances (RMd2). It means that interest rate elasticity of money demand is greater than zero and this coefficient is significant but inconsistent with the hypothesis. When the policy rate is increased, people would prefer to keep their money as savings and time deposits considering liquidity of money for transactions. They would not be attracted to financial assets such as bonds. The less developed financial market would be the reason for this inefficiency.

The elasticity of Real Gross Domestic Product (RGDP) is statistically highly significant and consistent in the long run money demand model. The estimated results show that the RGDP makes a powerful positive impact on the Real money demand. In the Sri Lankan context, demand for money is highly depended on transaction purpose.

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