Relationship of Fiscal Discipline and House hold Income on Money Demand Function in Sri Lanka

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Abstract. This paper attempts to find those determinants stirring the function of money demand in Sri Lanka during 1975-2013. The empirical analysis starts from applying the unit root tests i.e. Ng-Perron. We apply ARDL bound testing approach of co-integration to scrutinize the co-integration in variables. We select independent variables like per capita GDP, interest rate, exchange rate, fiscal deficit, urban population and rural population to determine money demand function. The findings revealed that income, interest rate and fiscal deficit effect money demand significantly and positively. The exchange rate affects negatively and significantly upon money demand. The stable money demand function is found over time applying CUSUM and CUSUMSQ stability test. The model of our study strongly recommends the real demand for M2 is vital monetary aggregate in terms of policy implication including the appropriateness of model in Sri Lanka.

Keywords. Sri Lanka, Money demand, Income, Interest rate, Exchange rate, Fiscal deficit, Urban and Rural Population

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1. Introduction

Regardless of a great number of studies on demand for money function in Sri Lanka, the subject of dependability of demand for money function was disregarded. Without joining stable money demand, the financial strategy can't work logically. The oddity of this study originates from the use of co-integration strategy to Sri Lankan yearly information during 1975-2013. The empirical findings are additionally not quite the same as prior studies on money demand in Sri Lanka.

The intermediate targets and appropriate instruments of monetary policy work with stable money demand function. A stable money demand function witness the effective monetary policy in developed and developing countries. In this study we examine the stable money demand function utilizing ARDL approach to discover co-integration in variables. The variables must be co-integrated at I(0) and I(1). This methodology likewise gives consistent estimates of long run coefficients (Pesaran et al. (2001)).

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We use per capita GDP, real interest rate, exchange rate, fiscal deficit, urban and rural population as independent factors to determine money demand function in Sri Lanka keeping in perspective a few of examination papers have found these determinants impact money demand function significantly. The connection between exchange rate and interest rate has delivered blended results in both created and creating nations. So to keep away from the perplexity, different exploration papers justify the negative and additionally positive method of reasoning of exchange rate with money demand (M2). Additionally diverse examination papers justify the both positive and negative method of reasoning of fiscal deficit with demand for money (M2).Three noteworthy methodologies like Classical, Keynesians and the post-Keynesians present money demand function. At first, Fisher (1911) presented quantity theory of money which is commonly called transaction demand for money. He simply focused on income as fundamental determinant of money demand and completely overlooked interest rate in his hypothesis. The general form of this theory can be stated as,

$$MV=PT \qquad\qquad (1)$$

Keynes (1936) introduced another methodology of demand for money in his book, "The General theory of employment, interest and money". He said three intentions in his book named as, motive of transaction money demand, motive of speculative money demand and motive of precautionary money demand. Keynes hypothesis is otherwise called liquidity preference theory. Inverse to Fisher, He asserted that interest rate assumes significant part in deciding money demand alongside income. Portfolio theories explore that the primary capacity of money is store of value. Friedman (1956) and Tobin (1958) contended that the money which individuals hold is fundamentally a piece of their portfolio assets. Baumol (1952) and Tobin (1956) gave foundation to inventory theoretical approach or transaction theories of money demand. They contended that money is utilized pretty much as medium of trade. They essential part of money was just to fill the role of medium of exchange.

The central target of our study is to deal with principle determinants influencing money demand function in long run for Sri Lanka. For short run estimation, the Error Correction Modeling (ECM) is normally embraced by specialists. For implementing successful monetary policy, both intermediate targets and right choice of tools are required. In Pakistan numerous studies have been done to assess the function of money demand by different techniques of co-integration see (Khan and Sajjid, 2005; Sarwar et al., 2013; Mall, 2013).

Conclusively, investigation of demand for money function is additionally getting fame in Sri Lanka and to deal with those variables like income, interest rate, exchange rate, fiscal deficit and rural and urban populace; decide monetary movement hazardously. With the end goal of estimation, this study chooses data of time series over the period from 1975 to 2013. To deal with the long run and short run appraises at the same time, the methodology of ARDL is being used. Here we utilize the above methodology of co-integration to observe the association between money function and its determinants.

1.1 Significance of the study

The issue of evaluating the function of money demand is currently the most essential issue in developing as well in developed countries. The question of stability of demand for money is getting popularity in terms of policy implications. Hence, the money demand comes from its capacity of being a unit of account, store of value and medium of exchange. In developing and developed countries, numerous studies uncovered the significance of money demand and different methods of estimation are used to observe the relationship between money demand and

its determinants. The monetary policy is used as an effective tool in handling the interest rate and inflation. This study will also cast a considerable impact in tracking the exchange rate, fiscal deficit and other macroeconomic variables. Moreover this research would give substantial knowledge to those who are interested to explore the determinants of money demand function in Bangladesh.

1.2. Theoretical Foundation of the Study

The relationship between money demand and its determinants are talked about by numerous economists. Some studies are given under:

Jegajeevan (2009) investigated the function of money demand for the period ranges from 1992-2008 in Sri Lanka. The empirical discoveries indicated positive relationship between money aggregate and income over the long run, while inflation and Treasury bill rate influences money demand contrarily over the long run. Dharmadasa and Nakanishi (2013) used time series data to research money demand function over the period from 1978-2010 in Sri Lanka. The strategy, which utilized to discover co-integration among variables, was, Autoregressive distributed lag (ARDL). Findings uncovered that money demand (M1) is co-integrated and having huge association with short term domestic and foreign interest rate, real GDP and real exchange rate.

Renani (2007) inspected money demand function for Iran utilizing ARDL bound testing methodology of co-integration over the period 1985-2006. The independent variables i.e. income, inflation and exchange rate affect money demand over the long run. Inflation influences adversely while income and exchange rate react decidedly to money demand. Padhan (2011) with the assistance of co-integration test and Granger Causality test dissected the money demand function and its determinants utilizing quarterly information amid the period from 1996-2009 in India. The findings revealed that interest rate, exchange rate, money stock and GDP growth effect money demand. Suliman and Dafaalla (2011) investigated the determinants of real money balance for the period ranges from 1960-2010 in Sudan. The empirical findings revealed the positive relationship between money aggregate and income, while inflation and exchange rate apply negative impact on money demand. Salha and Jaidi (2013) dissected money demand function utilizing ARDL bound testing approach for Tunisia over the period 1981-2011. The real income is viewed as a fundamental part in this study. The study unveiled the presence of co-integration between money demand and its determinants i.e. investment expenditures, final consumption expenditures and expenditures on exports and interest rate. Narayan et al. (2009) inspected the money demand function utilizing board DOLS and SUR strategies over the period from 1974–2002. South Asian Countries like Bangladesh, India, Pakistan, Nepal and Sri Lanka were decided for examination. Co-integration was found between M2 and its determinants both in an individual country and panel examination. The findings uncover positive and significant effect of income on money demand. While domestic interest rate reacts money demand altogether just in Bangladesh and India as it were. While the foreign interest rate influences money demand significantly with the exception of India. Abdullah et al. (2010) explored the money demand function utilizing ARDL bound testing approach for Asean-5 nations i.e. Indonesia, Malaysia, Singapore, Thailand and the Philippines. The findings showed the stable long run link among all the variables namely broad money, income, exchange rate, interest rate, inflation and foreign interest rate with empirical support. The coefficients of exchange rate and inflation are positive and negative respectively. The coefficient of interest rate spread is discovered critical having negative sign aside from the Philippines.

Arize and Nam (2012) utilizing error correction methods for short-run dynamics assessed money demand function for seven Asian nations. The nations were India, Malaysia, Pakistan, Korea,

Philippines, Thailand and Sri Lanka. After discoveries, the positive and noteworthy connection was found between exchange rate and money demand in each of the seven nations for short and additionally long run. The domestic interest rate reacts money demand fundamentally for all nations. This study accentuated that broad money must be used by the monetary authorities to get desire objectives.

There are different macroeconomic variables which impact money demand function. These components can be interest rate, exchange rate, fiscal deficit, tax revenue, populace development, real income, inflation, financial innovation, public debt and so forth. Money demand in addition to money supply is fundamental in the execution of fiscal arrangement. The most punctual hypotheses concentrated on income and interest rate as major deciding variables of money demand. Numerous economists are currently worried to locate some new variables that would influence Money demand over the long haul. Mundell (1963) contended that exchange rate could likewise help in deciding Money demand function. The empirical examinations have demonstrated the solid relationship between exchange rate and money demand. The Keynesian proposition and Ricardian equivalence hypothesis have given the rationale for exploring the connection between fiscal deficit and Money demand. The population factor additionally contributes deciding money demand; see (Faridi and Akhtar, 2013). We incorporate real income, interest rate, exchange rate, fiscal deficit and urban and rural population in our model as autonomous variables to decide money demand function utilizing ARDL approach.

2. Method and Procedure of the Study

2.1 Model Specification
The functional relationship of variables is given under.
$$LMON_t = f(LFISCDEF_t, LGDPPC_t, LEXCR_t, LINT_t, LURB_t, LRUR_t)$$
Whereas,

LMON= log (Money demand (as a % of GDP))

LEXCR= log (Official exchange rate (LCU per US$))

LGDPPC= log (per capita GDP)

INT=   Real Interest Rate

LFISCDEF= log (Fiscal deficit (as a % of GDP))

LURB= log (Urban population (% of total population))

LRUR = log (Rural population (% of total population))

2.2. Data Source
The time series data on per capita GDP, real interest rate, fiscal deficit, official exchange rate, urban and rural population is obtained from World Development Indicators (WDI).
2.3 Estimation Techniques
2.3.1. Ng-Perron for Unit Root Problem
Ng and Perron (2001) form four sorts of tests, in light of GLS de-trended technique for ERS. They utilized this strategy as a part of request to create capable form of redesigned adaptation of Phillip Perron test. Similarly as with most different tests, the null hypothesis of unit root can't be rejected if the test measurements are higher than the critical value. This test is moderately simple

to apply and favored other option to the conventional ADF and PP tests. This test gives more vigorous results. The other capability of this test is having high power than Phillip Perron test, when the estimation of φ moves towards one.

2.3.2 *Estimating Co-integration using Autoregressive distributed lag model (ARDL)*

The autoregressive distributed lag (ARDL) model was reached out by Pesaran et al. (2001). The ARDL methodology is connected when variables are co-integrated at I(0) and I(1). In Johnson approach, all variables must be co-integrated at I(1). In ARDL approach it is not really. It is a bit much every one of the variables to be incorporated at I(1). This methodology is relevant when we have I(0) and I(1) variables in our set. However to maintain a strategic distance from the spurious connection among the money demand (M2) and its determinants, the economists considered Autoregressive distributed lag (ARDL) co-integration approach for solid results over the long run and in addition short-run balance. The general equation of ARDL for the proposed model is given below.

$$\Delta LMON_t = \alpha_{10} + \alpha_{11} LMON_{t-1} + \alpha_{12} INT_{t-1} + \alpha_{13} LEXCR_{t-1} + \alpha_{14} LFISCDEF_{t-1} + \alpha_{15} LGDPPC_{t-1} +$$

$$\alpha_{16} LRUR_{t-1} + \alpha_{17} LURB_{t-1} + \beta_{11} \sum_{i=1}^{p} \Delta LMON_{t-i} + \beta_{12} \sum_{i=0}^{p} \Delta LINT_{t-1} + \beta_{13} \sum_{i=0}^{p} \Delta LEXCR_{t-i} +$$

$$\beta_{14} \sum_{i=0}^{p} \Delta FISCDEF_{t-i} + \beta_{15} \sum_{i=0}^{p} \Delta GDPPC_{t-i} + \beta_{16} \sum_{i=0}^{p} \Delta LRUR_{t-i} + \beta_{17} \sum_{i=0}^{p} \Delta LURB_{t-i} + \eta_1$$

The equation below will estimate the short run dynamics

$$\Delta LMON_t = \beta_{10} + \beta_{11} \sum_{i=1}^{p} \Delta LMON_{t-i} + \beta_{12} \sum_{i=0}^{p} \Delta LFISCDEF_{t-i} + \beta_{13} \sum_{i=0}^{p} \Delta LINT_{t-i} + \beta_{14} \sum_{i=0}^{p} \Delta LGDPPC_{t-i} +$$

$$\beta_{15} \sum_{i=0}^{p} \Delta LRUR_{t-i} + \beta_{16} \sum_{i=0}^{p} \Delta LURB_{t-i} + \beta_{17} \sum_{i=0}^{p} \Delta LEXCR_{t-i} + \gamma_{11} ECM_{t-1} + \varepsilon_1$$

ARDL bound testing approach by Pesaran et al. (2001) is utilized for accomplishing vigorous results and super predictable evaluations of the long run coefficients in small sample case. The short run evaluations are additionally watched. We have three circumstances here

 i. All of the series are I (0), and subsequently stationary, here we basically utilize the OLS method in light of the fact that our information is stationary at level.
 ii. All of the series are integrated at first difference e.g. I(1) yet they are not co-integrated then we evaluate standard regression model with OLS.
 iii. All of the series are integrated of the same order and they are likewise co-integrated, here we utilize two sorts of model. To start with OLS regression model to watch the long run relationship among variables and second error correction model (ECM) to watch the short run dynamics.

What do we do in such circumstance in the event that we need to extricate both long and short run relationship utilizing statistical technique? This is the place the ARDL model enters the picture. That is the reason we like to utilize this way to deal with keep away from autocorrelation

and endeavor problems. Therefore, in this study we utilize ARDL bound testing approach rather than using panel data approach.

3. Data Analysis and interpretations

The consequences of descriptive statistics have been appeared for our model in table 1. The evaluated estimations of Kurtosis and Skewness show the normality of data. The Jarque – Bera test is further used to test normality of data series and insignificant values of this test exposed that data series is normally distributed except money demand.

Table 1. *Descriptive Statistics*

Series	LMON	INT	LGDPPC	LFISCDEF	LEXCR	LURB	LRUR
Mean	3.504260	3.645256	11.13971	-3.876664	3.805330	2.817637	4.421082
Std. Dev.	0.185329	4.183980	0.414201	1.444856	0.819258	0.087849	0.017970
Jarque-Bera	17.49020	0.179575	2.104850	3.163075	2.809071	3.422694	3.436597
Probability	0.000159	0.914126	0.349090	0.205659	0.245481	0.180622	0.179371

In the wake of checking the normality, the unit root test is employed to expose the issue of unit root in data series. There is one procedure utilized to observe the stationary in variables i.e. Ng-Perron unit root test. Subsequent to checking the stationary and non-stationary in all variables, mixed order of integration is observed. The results revealed that per capita GDP, interest rate, urban and rural population is witnessed as stationary at level but all other variables are witnessed as non-stationary at level. At first difference, all variables are witnessed as stationary. The outcomes are appeared in table 2.

Table 2. *Ng-Perron Unit Root Test*

		Ng- Perron Test Statistics		
		At Level		
Variable	**MZa**	**MZt**	**MSB**	**MPT**
LMON	-0.17791	-0.11799	0.66319	27.3044
LGDPPC	-6.38771	-1.48677	0.23275	4.75456
LFISCDEF	-3.59979	-1.08713	0.30200	6.81096
L EXCR	-2.51935	-0.92635	0.36769	8.79893
INT	-17.7522	-2.97616	0.16765	1.39148
LURB	-13.6336	-2.50877	0.18401	2.18233
LRUR	-7.73711	-1.84019	0.23784	3.62207
		At First Difference		
ΔLMON	-13.7670	-2.60802	0.18944	1.83942
ΔLGDPPC	-14.3005	-2.58763	0.18095	2.03750
ΔLFISCDEF	-18.4254	-3.03508	0.16472	1.33029
ΔLEXCR	-18.0548	-2.80229	0.15521	2.06725
ΔINT	-16.3577	-2.85209	0.17436	1.52668
ΔLURB	-57.8269	-5.31187	0.09186	0.57788
ΔLRUR	-16.6371	-2.74865	0.16521	1.96299
		Asymptotic Critical Values		
Level of Significance	1 percent		-13.8000	
	5 percent		-8.10000	

	10 percent	-5.70000

The mixed order of integration is confirmed by applying unit root test therefore, ARDL is applied to observe the long run relationship between money demand and its determining factors. The results expose that there is long run relationship between money demand and its determinants in Sri Lanka on the basis of the value of F-test. Moreover our results are robust to the diagnostics as serial correlation, functional form, normality and heteroscedasticity. The outcome of co-integration method is appeared in table 3.

Table 3 *Autoregressive Distributed Lag Estimates*

Estimated Model		LMONt= f (LGDPPCt, LFISCDEFt ,INTt, LEXCRt, LRURt, LURBt)		
F-statistic	95% Lower Bound	95% Upper Bound	90% Lower Bound	90% Upper Bound
12.0756	2.8234	4.2227	2.3669	3.6219
W-statistic	95% Lower Bound	95% Upper Bound	90% Lower Bound	90% Upper Bound
84.5292	19.7639	29.5586	16.5682	25.3532

Diagnostic Tests				
R-Bar-Squared	0.65404		Serial Correlation	0.47117 [.492]
F-Stat. F(8,29)	9.7434[0.000]		Functional Form	0.22607 [.634]
Akaike Info. Criterion	-96.5863		Normality	0.89279 [.640]
Schwarz Bayesian Criterion	-103.9554		Heteroscedasticity	0.039437 [.843]

The estimates of long run are appeared in table 4. The results explore that per capita GDP has positive and significant effect on money demand in long run. This finding is consistent with the work of Azim et al (2010). The above two studies concluded the same outcomes of per capita GDP as we have in Sri Lanka. Interest rate effects significantly effects upon money demand but the sign of coefficient is positive. The results of Narayan et al, (2009) and Abdullah et al. (2010) are consistent to our outcomes.

Table 4: *Long Run Coefficients using ARDL Approach*

Dependent variable is LMON				
Variables	**Coefficients**	**Standard Errors**	**T-Statistics**	**Prob. Value**
LGDPPC	0 .26530	0.11277	2.3526	0.026
INT	0.98218	0.35844	2.7401	0.010
LFISCDEF	0.72093	0.36032	2.0008	0.055
LEXCR	-0.16210	0.082509	-1.9646	0.059
LRUR	-0.88236	18.1883	-0.048513	0.962
LURB	- 0.16949	0.36233	-0.46778	0.643
C	650.8644	9036.0	.072030	0.943

While negative and insignificant link was found between rural population and money demand. One percent change in rural population makes -0.89 percent change in money demand. Urban population effects money demand negatively and insignificantly. The exchange rate affects money demand significantly and negatively in the long run. Anwar and ASghar (2012) and Mall (2013) concluded the same results for exchange rate. Moreover fiscal deficit affects money

demand positively and significantly in the long run. Vamvoukas (2010) and Khrawish et al. (2012) supported our results, their sign of coefficient of fiscal deficit was also positive.

After discussing the long run estimates, we next move to the outcomes of error correction representation for the selected ARDL model. The outcomes are appeared in below table 5.

Table 5: *Error Correction Representation for the selected ARDL model*

		Dependent variable is ΔLMON		
Variables	Coefficients	Standard Errors	T-statistics	Prob. Value
ΔLGDPPC	0.17807	0.064422	2.7642	0.010
ΔINT	-0.14639	0.12505	-1.1706	0.251
ΔLFISCDEF	0.48391	0.20050	2.4136	0.022
ΔLEXCR	-0.10880	0.061209	-1.7776	0.086
ΔLRUR	-0.59226	12.1734	-0.048652	0.962
ΔLURB	-0.11377	0.23717	-0.47969	0.635
ecm(-1)	-0.67122	0.11864	-5.6576	0.000
R-Squared	0.79808	R-Bar-Squared	0.74238	
S.E. of Regression	2.7763	F-Stat. F(7,30)	16.3747[.000]	
Mean of Dependent Variable	-.18922	S.D. of Dependent Variable	5.4698	
Residual Sum of Squares	223.5229	Equation Log-likelihood	-87.5863	
Akaike Info. Criterion	-96.5863	Schwarz Bayesian Criterion	-103.9554	
DW-statistic	1.7870			

The short run results which are estimated through ARDL Bound Testing approach are shown in table 5. For Sri Lanka, the estimated results disclosed that interest rate has insignificant effect on money demand and the sign of coefficient is negative. GDP per capita affects money demand positively and significantly. While negative and insignificant link was found between rural population and money demand. Urban population effects money demand negatively and insignificantly. In the case of exchange rate, the results reveal that there prevails negative and significant effect on money demand. Fiscal deficit affects money demand positively and significantly in the long run. After discussing short run estimates, we move to apply the stability test and our findings expose stability in data series. The graphical representation makes it clear. The money demand function (M2) remains stable over time for Sri Lanka after applying CUSUM and CUSUMSQ.

Figure 1. Stability test

Plot of Cumulative Sum of Recursive Residuals

The straight lines represent critical bounds at 5% significance level

Plot of Cumulative Sum of Squares of Recursive Residuals

The straight lines represent critical bounds at 5% significance level
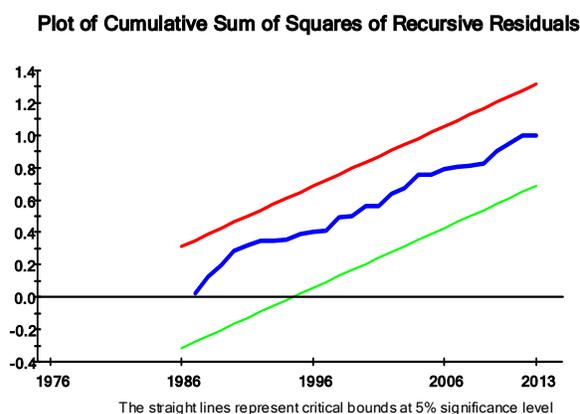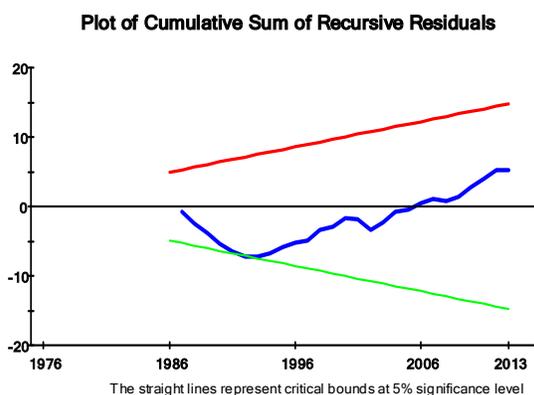
4. Conclusion and policy Recommendations

The prime objective of our study is to investigate the money demand function over the period from 1975 to 2013 in Sri Lanka. In this respects, time series information is used for analysis. The econometric technique used to inspect the presence of co-integration among variables is, autoregressive distributed lag (ARDL). We have utilized per capita GDP, real interest rate, exchange rate, fiscal deficit, rural population and urban population to determine demand for money function. Our findings are reliable with past discoveries; in this manner, the variables can be taken as determinants of money demand utilized as a part of this study. First money demand (M2) is co-integrated with exchange rate, interest rate, income and fiscal deficit. In this manner, these determinants can be taken in deciding money demand over the long run. The income, interest rate and fiscal deficit affects significantly and positively upon money demand. The negative relationship was seen between exchange rate and money demand. At the point when any domestic currency depreciates, then the demand for domestic currency would be declined. The CUSUM and CUSUMSQ test affirms the stability of money demand function in Sri Lanka.

The main points curtail from the above findings propose per capita GDP, interest rate, exchange rate and fiscal deficit are vital determinants of money demand in Sri Lanka. Our findings also suggest the money demand (M2) is useful monetary aggregate in implementing the monetary policy. The model utilized as a part of this study permitted us to fuse exchange rate, fiscal deficit, urban and rural population in addition to income and interest rate. Strategy planners can better comprehend to assess the fundamental determinants of money demand as far as policy implication. Another outstanding thing uncovered from our discoveries is presence of stable money demand function in Sri Lanka. Convincingly, money demand (M2) is better monetary aggregate in the execution of monetary policy.

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