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Estimation of Money Demand Function in Somalia: Cointegration and Vector Error Correction Model

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Abstract: We used vector error correction model to estimate money demand function in Somalia using time series data covering 1970-2010. Data was collected from world development indicators and the Fred Economic Data.

Ordinary least square was used to measure the coefficients of the money demand determinants. Real money supply was the dependent variable where GDP, inflation rate, exchange rate, purchasing power and the foreign interest rate, were the explanatory variables of this study. Augmented Dickey-Fuller test was used to examine the unit root of the data. Intercept and the trend were used while testing the unit root. Johansen Cointegration was employed to determine if the variables are cointegrated in the long run and move together. Vector Error Correction was used to study the causality between the study variables.

The study found that five out of the six variables were different from zero, meaning that they are statistically significant. Purchasing power tends to be negative, indicating that the decrease of the money value leads the money demand to increase.

The unit root of the data in the all variables was tested and the variables happen to be none stationary at the level, but, stationary at the first difference I(1). The null hypothesis of no cointegration was rejected using Johansen Cointegration.

Key words: money demand; scale variable; permanent income hypothesis; granger causality
JEL codes: E41

1. Introduction

The estimation of money demand has been given paramount consideration in the existing economic literature. Money demand is the building bricks of the macroeconomic theories and the stepping stone to the shrewdness of the monetary policy. So far a number of daunting issues in the money demand estimation were resolved. These issues include; measurement of the expected income and the treatment of the money lags. Adaptive expectation is used to measure permanent income. The adjustment of the money balance leads lag adjustment of the actual to the desired money balance.

Benefiting from these achievements, determinants of money demand were plentifully securitized in the

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developed and the developing countries in the quest to achieve economic stability and the monetary policy effectiveness. The active monetary policy stabilizes the country's economy by stimulating the economy in the period of the recession and eliminating the inflation when the economy heats off (Jagdish, 2000).

Somalis economy is counted to be one of the lowest performing economies in the continent, with GDP 6.2 Billion in 2016 and GDP per capita $450. The poverty rate in the home is as much as half of the population, 51.6%. Consumption accounts for the largest share of the GDP where investment turns to be only 8%. The country is importing dominant as a share of the import of the GDP is two thirds, leading trade deficit that is to be financed by international donors and the remittances. The economy exports few agricultural goods those hold only 14% of the GDP (IMF, 2017).

Somalis Economy is projected to grow and sustain donors' grant, foreign direct investment from the Diaspora and remittance capital inflow. Economic growth was 3.4% in 2016 and expected to slow down to 2.5% by 2017. Economic deceleration is due to the drought that savaged the agriculture sector and offsets the mounting activates of construction and the service sector. Inflation was 1.5% in 2016 and will accelerate to 2.7% in 2017. Budget grants and the tax revenue fell shorter than expected, which restricts fiscal position of the country and government actions to reform the economy (IMF, 2016).

Monetary policy stands as a viable option to reform the Somalis aching economy. The ultimate goal of the monetary policy is to realize certain national goals in which historically; are included full employment, full employment of output, traget rate of inflation and stable exchange rate (Milton, 1964). These variable are usually labelled to the monetary policy goals. However, these goals can be reached directly by central bank instrument (Goldfeld and Sichel, 1990).

Effective monetary ploy requires stable money since quantity of money is predictably linked to the small set of variables that relate money variable to the real forces of the economy (Jud and schadding, 1982). Monetary policy makers need to know the stability of the money by estimating money demand and the supply dynamics of money (Feige and Pearce, 1977). So, it will be easier for policy makers to predict the effect of the monetary policy to various aggregate variables such output, inflation and the employment (Martins & Latifa, 2013).

Findings of this study will help central bank policy makers achieve their goals of price stabilization and subduing the inflation to the target rate. The study will also benefit policy makers to achieve monetary policy objectives which require meticulous identification of the money demand determinants.

The rest of this text is structured as follows; second section presents the related literature, third section is bout the theoretical framework and the methodology. Fourth section provides results and the discussion. The last section gives conclusion and policy implications.

2. Lertaure Review

A large number of empirical studies had examined the demand function of the money. These studies were undertaken in various regions in the world. Developing countries extensively examined money demand, for instance, Suliman and Hala (2011) examined the money demand function in Sudan in the period 1960-2010. Study applied Contingration and error Correction model. They studied real money balances, real GDP, inflation and the real exchange, to estimate money demand. The study found that the money demand in Sudan is stable and that the narrow aggregate of money can be the target of monetary policy in Sudan. In Nigeria, Martins and Latifa (2013) estimated money demand function. Utilizing Autoregressive Distributed Lag and cointegration test, they examined

real income, real expected exchange rate and, short term interest rate, expected inflation and the foreign interest rate. The study found that real income is the most significant variable. The study also found that Nigeria is subject to the external shocks due to the real exchange rate and the foreign interest rate. Jordan (2013) examined determinants and the stability of money demand in republic Macedonia. Study applied Cointegration and Vector Error Correction Model. The study examined interest rate, exchange rate and the inflation. The study found that the interest rate is significant in the short run. The study concludes that central bank should pay attention to the inflation and the exchange rate in the monetary policy making, because they are significant in the short and the long run.

Kallon(1992) observed stability of money demand in Ghana during 1966-1986. The study found that the foreign interest rate is not a significant determinant of the money demand in Ghana. Simmon(1992) studied narrow money demand in five African countries and focused on the opportunity cost variables such domestic interest rate and the inflation. The result showed that the domestic interest rate is the most determinant of the money demand in three out of the five countries. Where other two, external opportunity cost was significant. Maravić and Palić (2005) examined the short and long run demand of the money during the period 1996-2005. The study utilized the Johansen cointegration and found that inflation and the exchange rate are the most significant determinants of the money demand.

Qayyum (1998) tested factors that determine money demand in Pakistan. The study found income, inflation rate and the bond rate are the reliable determinants of the money demand in Pakistan. Christopher (2000) investigated money demand in Chile in the period 1986-2000. The study utilized Johansen Integration vector Error Correction Model. The result presented in the model evidenced long run stability of the money demand in Chile. Nachega (2001) explored the behavior of money demand in Cameroon. The study found that income, currency substitution and the foreign exchange rate are negatively related to the broad money in Cameroon. Mohsen (2002) applied autoregressive Distributed Lag to examine long money demand in Hong Kong. The study found that real income, foreign interest rate and the nominal exchange rate are positively related to money demand, where the deterministic interest rate is negatively related to the money demand. CUSUM and CUSUMQ showed stability of the model in long run equilibrium. Jae-Kwang Hwang (2002) studied money demand in South Korea using Johansen and Jeselius maximum Likelihood method of Cointegration. The study found that M2 money aggregate is long run cointegrated with real income and interest rate. The study suggested that broad money (M2) should be given special care in the monetary policy formulation. Harb (2003) examined money demand in six countries by narrow money and broad money alternatively as the dependent variable. Where GDP, expected exchange rate and the interest rate were independent variables. The study found that expected exchange rate and interest rate are negatively related to the money demand. GDP is positively related money demand. Cointegration showed that all variables are integrated for order one cointegration. Akinlo (2006) measured money demand in in Nigeria for a period of 1970-2000. The study examined broad money (M2) and inflation, interest rate, real income and the foreign interest rate. The result came to that inflation and all kinds of interest rate are negatively related to the money demand. Only real income is positively related to the money demand. Altınkemer (2004) investigated long run stability of money demand function in Turkey. The study examined the real base of money and the endognity of the inflation. A study supported inflation targeting rather than monetary targeting. The study argues that inflation targeting cannot be achieved in the absence of the sustainable growth money base. Sober (2013) examined real money demand in Pakistan during 1973-2010. The study used Bound test based cointegrated to study money demand determinants. Real income, exchange rate and short run and long run interest rate were

included in the model. The study found a positive relation between money demand and real income, interest rate and the exchange rate. The study concludes that broad money should be used in the monetary policy.

3. Theoretical Framework and Methodology

3.1 Theoretical Framework

Freidman (1956) defined money demand to the money as real asset held as an alternative in the other forms of the asset. According to the Milton Money demand is how much wealth individuals demand to keep as forms of money. Milton definition states that money demand is determined by the permanent income or the wealth instead of current income (Friedman, 1968, pp. 12-16).

3.1.1 Friedman's Basic Functional Form of Money Demand

Economic theories specify the variables that determine money demand, but does not provide specific functions of the money demand. Milton theory tells us that money demand depends on the wealth variable which is sometimes called to the scale variable and the rate of the returns on the alternative assets. Using actual income in the form of the scale variable, money function is specified as:

$$\boldsymbol{M^d = M^d(y, R)} \tag{1}$$

Where

$M^d =$ Real balance

Y= actual income

R = Nominal Interest rate

There is no theoretical condition that form money demand should be linear or log linear, so for simplification. Log linear will be used. Equation (1) assumes that money demand is dependent on the current income and the nominal interest rate. We compare this function to the other function of money demand. To start with we assume that the elasticity of the money demand with respect to the nominal income, price and real income are unity and ϵ is the error term, so the money demand function will be:

$$\boldsymbol{\frac{M}{Y} = \beta_0 + \beta_r R + \varepsilon} \tag{2}$$

We skip the assumption of the unity, and money demand function is specified

$$\boldsymbol{M = \beta_0 + \beta_r R + \beta_y y + \beta_P P + \varepsilon} \tag{3}$$

This equation tells that money demand depends on the nominal interest rate, real income and the price level. With the economy where commodity and the money are substitutes.

Individual demand of money will be dependent on the real balance rather than nominal variables, so the demand function will be:

$$\boldsymbol{M = \beta_0 + \beta_r R + \beta_y y + \varepsilon} \tag{4}$$

Demand of the money will also be dependent to the inflation rate (π^e) So the equation (3) can be modified to:

$$\boldsymbol{M = \beta_0 + \beta_r R + \beta_y y + \beta_\pi \pi^e + \varepsilon} \tag{5}$$

In the open economy, expected exchange rate depreciation determines money demand as it accounts currency substitution. To capture this effect exchange rate variable is included in the equation (4) and we get: where ρ is exchange rate

$$\boldsymbol{M = \beta_0 + \beta_r R + \beta_y y + \beta_\pi \pi^e + \beta_\rho \rho + \varepsilon} \tag{6}$$

In equation (5) demand of money will be function of real interest rate, inflation rate, real income and the exchange rate.

The demand function of money is always estimated in the log linear form. If we apply to the log in equation (1) we get

$$\ln M = \ln \beta_0 + \beta_r \ln R + \beta_y \ln y + \ln \varepsilon \quad (7)$$

R is always between 0 and 1, so its logarithmic value will negative, as a result we will use (1+R) in the place of R and the value will be positive. And will be

$$M = \beta_0 R^{\beta} Y^{\beta-1} \varepsilon \quad (8)$$

The function of the equation (7) is well known Cobb-Douglas functional form and it implies constant returns to scale. This function implies transaction demand of money and cannot estimate precautionary and speculation demand of money. In equation (5) and (6) elasticity of the real balance (M) is β_0 Where the elasticity of interest rate (R) is β_r. What happens if don not take log in the for the interest rate and specify the money demand function as:

$$\ln M = \ln \beta_0 + \beta_r \mathrm{R} + \beta_y \ln y + \ln \varepsilon \quad (9)$$

The value of the of R will be negative when the value of R is between 0 and 1.

3.1.2 Scale Variable in the Money Demand Function

A linear function of money demand is real balance and current income with the scale variable, is specified as:

$$M_t^d = \beta_0 + \beta_y y_t + \beta_r R_t + \varepsilon_t \ , \quad \beta_0 \ , \beta_y > 0 \ , \beta_r < 0 \quad (10)$$

In log form, all variables, including error terms will be taken to log.

3.1.3 When the Expected Income is the Scale Variable

Another commonly used demand function is replacing real income to the expected income. Demand function is this argument is:

$$M_t^d = \beta_0 + \beta_y y_t^e + \beta_r R_t + \varepsilon_t \ , \quad \beta_0 \ , \beta_y > 0 \ , \beta_r < 0 \quad (11)$$

In the beginning period, M_t^d is the real balance planed for the period ahead and y_t^e is the expected income. The practice of estimation, expected income is done through rational expectations hypothesis proposed by Friedman Milton.

3.1.4 When Permanent Income is Scale Variable

Friedman's (1956) analysis of money demand points the demand of the money is dependent to the wealth as a proxy of permanent income and interest rate. Hence, the basic form of a demand function for real balance with permanent income will be:

$$M_t^d = M^d\left(y_t^p, R^t\right) \quad (12)$$

In equation (12) y_t^p Is permanent income which that is interpreted to as average expected income in the future. In the simplified linear form demand function will be:

$$M_t^d = \beta_0 + \beta_y y_t^p + \beta_r R_t + \varepsilon_t \ , \quad \beta_0 \ , \beta_y > 0 \ , \beta_r < 0 \quad (13)$$

Equation (12) is interpreted as average expected for the desired real balance. Since the data of y_t^p Does not exist, Friedman, Milton used adaptive expectation hypothesis to establish a permanent income hypothesis. A rational expectation hypothesis can be used in this estimation, but adaptive expectation is more preferred since permanent income is interpreted as average expected income in the future.

3.2 Econometrics Methods

Time series models need to be stationary to avoid the problem of the spurious regression. It occurs when the

result found is statistical significance with higher R^2 And the fact is that all found is a contemporaneous correlation that does not have meaningful economic relationships. So time series needs to be tested for unit root.

Cointegration is also necessary since nonintegrated variables appear to move to gather that makes Granger causality inaccurate. Then, variables will have common trend. Granger causality is also tested to identify which variables causes to another.

3.2.1 Unit Root

Dickey-Fuller-DF-(1981) method is utilized to test unit root test. For this purpose, Dickey and Fuller used three equations to test the unit root.

$$\boldsymbol{\Delta y_t = \gamma y_{t-1} + \varepsilon_t} \quad (14)$$

$$\boldsymbol{\Delta y_t = \alpha_0 \gamma y_{t-1} + \varepsilon_t} \quad (15)$$

$$\boldsymbol{\Delta y_t = \alpha_0 \gamma y_{t-1} \alpha_2 t + \varepsilon_t} \quad (16)$$

The above three equations are in different by the presence of the deterministic element, α_0 and α_2. The first equation is a pure walk model. The second as intercept while the third equation has intercept and the linear time trend. In the case where $\gamma = 0$ the sequence has unit root. DF test uses Ordinary Least Square to estimate the value of γ and the standard error. Hence it is possible to compare the value of the test to the value obtained from DF table.

Augmented Dickey-Fuller (ADF) is different from the tequation (14-16). ADF employs in higher order equations. To get ADF equation, first add $\alpha_\rho \gamma y_{t-\rho+1}$ and then Subtracts $(\alpha_{\rho-1}\alpha_\rho)\gamma y_{t-\rho+2}$. We continue this process till we get

$$\boldsymbol{\Delta y_t = \alpha_0 \gamma y_{t-1} + \sum_{i=2}^{\rho} \beta_i y_{t-i+1} + \varepsilon_t} \quad (17)$$

Where $\boldsymbol{\gamma = (1 - \sum_{i=1}^{\rho} \alpha_i)}$

$\boldsymbol{\beta_i = \sum_{i=1}^{\rho} \alpha_i}$

If $\gamma = 0$ equation is in first difference and has unit root.

3.2.2 Cointegration Test

Cointegration test is used for Johansen (1991) method. In this method variables are first presented and checked their lag length to evaluate their order of integration. A common measure to estimate lag length vector Auto regression that uses un-different data. After variables are presented and checked the second step is to estimate the value π that shows the number of the nonintegrated variables. This can be done by using Vector Error Correction Model (VECM):

$$\boldsymbol{\Delta x_t = \alpha_0 \prod x_{t-1} + \sum_{i=1}^{\rho} \prod \Delta x_{t-1} + u_t} \quad (18)$$

Where x_t Is (n× 1) vector of I (1) variables and u_t? Is error term. ρ is the optimal lag length in Var (ρ) model.

3.2.3 Granger Causality Using Error Correction Model (VECM)

Granger causality for testing the causality between two variables can be presented as:

$$\boldsymbol{x_t = \beta_0 + \sum_{i=2}^{\rho} \beta_{1i} x_{t-i} + \sum_{i=2}^{\rho} \beta_{2i} y_{t-i} + u_{t-1}} \quad (19)$$

$$\boldsymbol{y_t = \beta_0 + \sum_{i=2}^{\rho} \beta_{1i} x_{t-i} + \sum_{i=2}^{\rho} \beta_{2i} y_{t-i} + v_{t-1}} \quad (20)$$

Granger causality for the variable when the model has cointegration is employed Vector Error Correction Model (VECM)

$$\boldsymbol{\Delta x_t = \beta_0 + \alpha_x ECT_{t-1} \sum_{i=2}^{\rho} \beta_{xi} x_{t-i} + \sum_{i=2}^{\rho} \gamma_{xi} \Delta y_{t-i} + u_{t-1}} \quad (21)$$

$$\Delta y_t = \gamma_0 + \alpha_y ECT_{t-1} \sum_{i=2}^{\rho} \beta_{yi} \Delta x_{t-i} + \sum_{i=2}^{\rho} \gamma_{xi} \Delta y_{t-i} + v_{t-1} \quad (22)$$

X and Y are two stationary series with non-zero mean. The above two equations tell us that Y is causing x while β_2 Is not zero. And x is causing Y given that β_1 Is not zero. u and v are two uncorrelated white noise series.

3.3 Data Source

Data of this study are collected from World Development Indicators and Fred Economic Data. Time series that covers the period from 1970-2010, is used. The study focuses on the factors that effects money demand in Somalia. For this purpose, real money supply is used as the dependent variable. GDP, exchange rate, inflation rate, Purchasing power parity and foreign interest rate are used as independent variables. USA interest is utilized as proxy of foreign interest rate. Foreign interest is used to measure the effect of the international capital outflow.

3.4 Model

Monetarist approach explained in the theoretical framework is used to specify the model of this study. Ordinary Least Square (OLS) is used to estimate the model parameters. Log form is used to money demand function to measure the elasticity of the each variable. The model is specified as follows:

$$\ln MPS_t = \beta_0 + \beta_{GDP} \ln GDP_t + \beta_{INF} \ln INF_t + \beta_{EXC} \ln EXC_t + \beta_{PPP} \ln PPP_t + \beta_{FOIN} \ln FOIN_t + \varepsilon_t \quad (23)$$

Where

MPS is real money supply

GDP is Gross Demotic Product

INF is Inflation Rate

EXC is Exchange rate

PPP is Purchasing Power Parity

FOIN is Foreign Interest Rate

4. Results and Dsicusion

4.1 Summary of the Descriptive Statistics

Descriptive statistics of the variables are calculated to get a sight towards the nature of the variables. The below table summarizes the descriptive statistics of the variables.

Table 1 Descriptive Statistics of the Variables

	MSP (Billion)	GDP (Billion)	EXC (Shill.)	INF (%)	PPP (Shill.)	FOIN (%)
Mean	1.6505	2.20	5,955.00	51.35	589.00	8.34
Maximum	5.344	2.67	31,900.00	104.17	835.42	18.87
Minimum	0.390	1.67	6.28	19.89	451.61	3.25
STD	1.96	3.02	7718.3134	28.92679	123.6272	3.16

*Money supply, and GDP are measured to the dollar Terms. Purchasing power parity and EXC are measured to Shilling. Inflation and interest rate are measured to percentage.

The result shows that the average stock of money was 1.65 billion dollar where the maximum amount of money economy ever gained is 5.3 billion. The minimum amount of the money supply came to be 3.90 Billion. GDP averaged to 2.20 billion as the highest GDP growth was 2.67 and the lowest 1.67 billion. Lower GDP does not always mean lower productivity. GDP will be lower if it is quoted in dollar terms and the domestic currency depreciation as was common in Somalia after 1990s.

The exchange rate was in 5,955 shillings per dollar, the highest value of the domestic currency achieved was 6.28 per dollar and the lowest value was 31,900 shillings per dollar. Inability of the central bank to monitor the exchange rate left the foreign exchange market to be self regulating that increases or decreases in regard of the supply and demand mechanism. Inflation averaged to 51%, which is higher compared to the other countries in the region. The highest rate of inflation was 104% at the lowest was 19.89%

Inflation is linked to the money supply that is controlled by private rather than the public. The purchasing power parity that compares currencies of the different countries in the world was also calculated. It shows that the value of the Somali shillings is weak where the average of the PPP was 589 shillings, which means the price of the goods are 5 times higher than the USA. The foreign interest rate was also presented in the table with an average of 8.34%. If the international interest rate rise capital outflow also increases.

The following Figures (Figures 1-6) show the trends gone through by each of the variable.

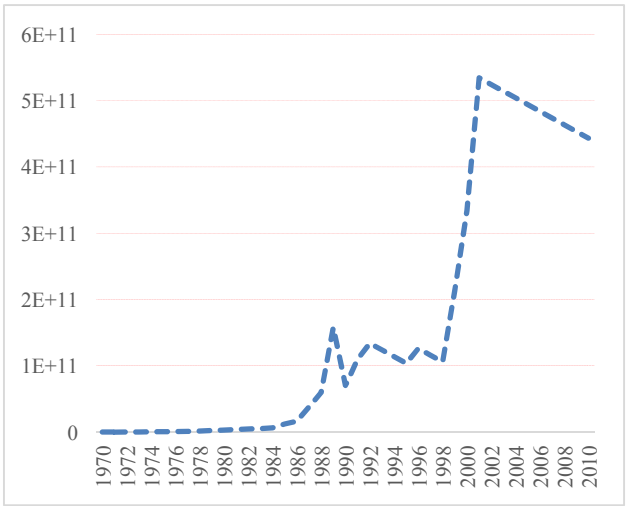

Figure 1 Money Supply

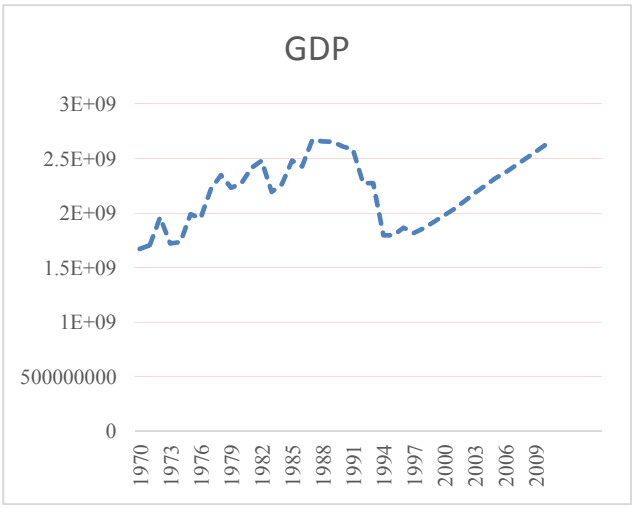

Figure 2 Gross Domestic Product

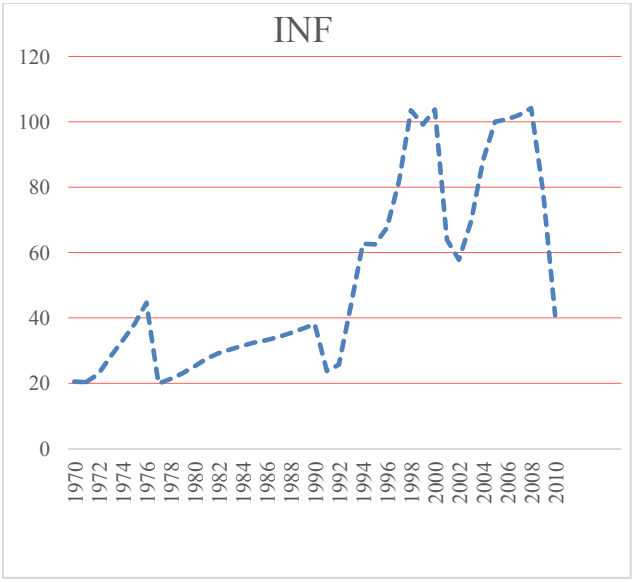

Figure 3 Inflation Rate

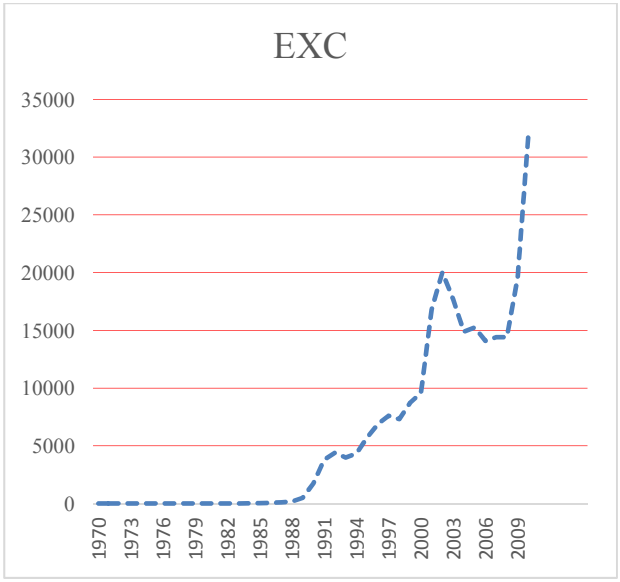

Figure 4 Exchange Rate

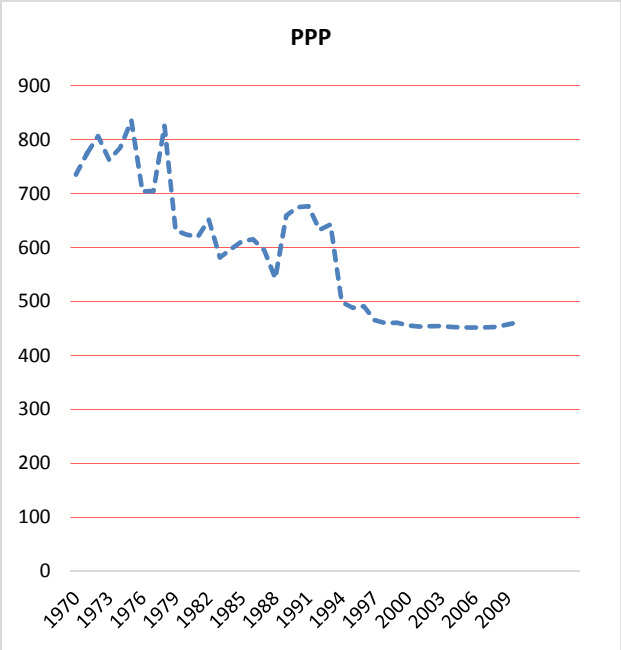

Figure 5 Purchasing Power Parity

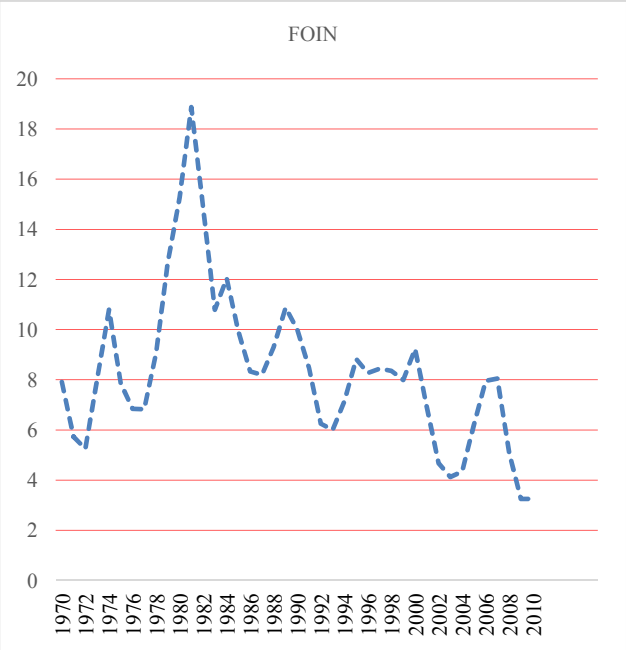

Figure 6 Foreign Interest Rate

Above figures show the trend of the variables over the time. Start with Figure 1 money supply has been constants for the first 15 years. Money stock of the country was minimal. This is because the economic system of the government in that era. The figure shows that the money supply has jumped in the 1997 and reached its climax. Figure 2 shows that GDP, which did not take a predictable trend, but peaking and busting for the time to time. GDP is negative affected by the political instability and the droughts that frequently sabotage the agriculture sector that accounts for 65% of the country's GDP.

Inflation rate, which an import variable for the macroeconomic performance measurement, shows that it has been increasing from the 1990 to the 2000. Inflation begins to decline from 2000 which is the time that economy started to dollarize. The dollar has been a formal tender in the demotic markets and in turn prices are set to the international level where inflation is controlled. The exchange rate had taken upward trend for the recent period which implies that domestic currency was losing value day after day. The loss of the currency's value led the purchasing power of the currency to be low. Finally, International interest rate was declining, this independent of the Somalis economy.

4.2 Unit Root Test

Unit test for the variables was examined by using the ADF test. This equation $\Delta y_t = \alpha_0 \gamma y_{t-1} \alpha_2 t + \varepsilon_t$ Was used to test the unit root. If the Null hypothesis ($H_0: \gamma = 0$) is failed to reject, then equation has unit root. When tested the trend and the intercept, the result shows that null hypothesis could not be rejected at level implying the equation has unit root. At the firs difference with, intercept, the null hypothesis was rejected at the significance level 1%. This shows that all variables are stationary at the first difference, hence they are I(1) variables. Table below presents the result of the unit root.

Table 2 Unit Root Test

Variable	Test statistics	Lag length	Critical value 1% level
MSP	-1. 8128	(0)	-4.2050
ΔMSP	-4.6565	(0)	-4.2118
GDP	-1.7647	(0)	-4.5020
ΔGDP	-6.4451	(0)	-4.2118
INF	-1.5616	(0)	-4.2050
ΔINF	-3.6620	(0)	-4.2118
EXC	-0.05351	(0)	-4.5020
ΔEXC	-1.5549	(0)	-4.2118
PPP	-3.6804	(0)	-4.5020
ΔPPP	-8.3392	(0)	-4.2118
FOIN	-3.8420	(0)	-4.2050
ΔFOIN	-4.6669	(0)	-4.2118

Δ shows that variable is the first difference.

4.3 Cointegration Test

Cointegration test was undertaken by using Johansen test. Trace test was checked and the null hypothesis of the of no cointegration was rejected which means that variables are cointegration. The test evidence indicated 5 conintegrting factors. The result of the cointegration is presented in Table 3.

Table 3 Johansen Cointegration

Variables	Hypothesized	Trace	0.05
	No. of CE(s)	Statistic	Critical Value
MSP	$H_o: r = 0.\ H_1: r > 0$	95.75366	95.00909
GDP	$H_o: r = 0.\ H_1: r > 0$	69.81889	59.00377
INF	$H_o: r = 0.\ H_1: r > 0$	47.85613	37.35293
EXC	$H_o: r = 0.\ H_1: r > 0$	29.79707	19.91403
PPP	$H_o: r = 0.\ H_1: r > 0$	15.49471	8.292888
FOIN	$H_o: r = 0.\ H_1: r > 0$	3.841466	3.112766

Result in the Table 4 shows that all variables are integrating meaning that they have log run relation and they move together and don not apart from during the time. Cointegration test is emphasized in the time series data because cointegration relationship ensures variables to converge with their long steady state solution. In this case, all variables of the Study, MPS, GDP INF, EXC, PPP and FOIN are cointegrated which indicates that their relation is not spurious regression. The logic is that I(1) time series variable are long run association as evidenced by cointegrationand can not maintain equilibrium disparity long enough as economic forces restore equilibrium to them.

4.4 Vector Error Correction Model (VECM) causality Test

VECM is applied when the pair of variables show the existence of the cointegration. In this case five variables showed the evidence of the cointegration. Result reveals that money demand determinants have linear combination those are also cointegrating.

4.5 Estimation of the Coefficients of the Model Parameters

The results of the model developed in equation (21) are presented in the below table. OLS estimator is used to calculate the coefficients.

Table 4 Estimation of Model Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-49.41635	12.16194	-4.063196	0.0003***
ln(GDP)	3.750347	0.495880	7.563018	0.0000***
ln(INF)	0.103760	0.182155	0.569624	0.5726
ln(EXC)	0.597050	0.027015	22.10045	0.0000***
ln(PPP)	-1.924229	0.538220	-3.575173	0.0010***
ln(FOIN)	0.577461	0.210048	2.749185	0.0094***

Note: *** is 1 precent significance level

Five out of the six variables are significantly different from zero, which means they are statistically significant. R square is 0.98 which states that 98% of the Money supply variation is the result of the explanatory variables considered in this study. Hence goodness-of-fit is very higher in the model. To detect the multicolinearity; Variance Inflation Factor (VIF) is used, all variables are less than 5 which shows that problem of the multi colinearity does exist in the model.

To detect the existence of the autocorrelation in the model, this regression was developed $e_t = \rho e_{t-1} u_t$. e is the residual where t is the time. Null hypothesis ($H_0: \rho = 0$) was rejected at the significance level 5%. This implies the existence of the autocorrelation in the model. Hetroskedasticity was also tested by using the Breusch — Pagan method. The null hypothesis of homeskascitiy was rejected at the significance level 5%. To solve the problems of the autocorrelation and the hetroscedasticity, standard robust error was used to test the hypothesis.

The result of the variables is in accord with monetary theories. GDP, which is in the place of the real income comes up with a positive sign. It's consistent with economic theories that tell us positive elasticity of the real income of money demand. It means that people demand more money in the time of the income increment. Inflation is statistically insignificant which implies that it is not an important factor that effect money demand. Somalis economy is dollarized so inflation in the country is a universal issue rather than domestic factor, so it does not affect money demand. An exchange rate, which measures the value of the currency shows the positive relation meaning that the loss of the currency value leads an increased money demand.

Purchasing power which measures domestic prices showed a negative relation indicating that loss of the purchasing power of the money cause money demand to increase. The foreign interest rate is positively related to money demand. If the global interest rate increases people desire to invest foreign countries, so money demand in the domestic countries increases to facilitate capital mobility following out the country.

5. Conclusion and Policy Implications

This study measured money demand function of the Somalia. Data collected from World Development Indicators was used for the period 1970-2010. Real money balance, GDP, Inflation, Exchange rate, purchasing power and the Foreign Interest rate were used to measure money demand.

Cointegration, unit root and Vector Error Correction Model were applied to test a long run relation and the causality between the money demand variables. OLS estimator was used to estimate model parameters. Descriptive statistics of the variables were used to study the trends of the data.

The study found that all variables showed a positive relation except purchasing power which exhibited negative relation. Only Inflation variable come to be insignificant. Variables are stationary at first difference method. Cointegration test evidenced that all variables were cointegrated indicating that they don't drift far apart from the equilibrium and have a long run relationship. VECM showed that several variable cause others.

Monetary policy makers should take into account the significance of the exchange rate and the purchasing power those have a strong influence to the money demand. Inflation should not be put too much weigh as people give less consideration in the money demand decision.

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