Determinants Of Money Supply In The Palestinian Economy

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Abstract

This research studies the demand for money and its stability in Palestine, the autoregressive distributed lag (ARDL) method was adopted to explain the cointegration framework using time series data over the period 2009Q3- 2020Q4. The bounds testing result show that only a short-run relationship exists between money demand and its explanatory variables: real income and nominal interest rate. The error correction model (ECM) reveals the sign of each variable, the coefficient of real income appears to be negatively inelastic not as expected, while real interest rate coefficient is negatively inelastic; this indicates that households fear to invest in this course of economy, where precautionary motive for holding money is very high.

Keywords: Money demand, stability, ARDL, Palestine

1. Introduction

One of the most researched macroeconomic relations is the money demand function, intended to help the monetary authority understand what motivates financial agents. Therefore, the monetary authority can decide under specific economic conditions which monetary objectives and policies are recommended. The money demand stability function indicates that the supply of money has a potential effect on both economic activity and inflation. A stable demand for money here demonstrates the efficiency with which monetary aggregates are used when carrying out monetary policy.

Monetary policies are set by the central banks to control the money supply in an economy; they could do so by increasing or decreasing the interest rate, required reserves and open market operations, thus they will be able to control the price level, inflation, exchange rates and the business cycle, but this could not be achieved without the integration between money supply and money demand, where the demand for money is the desire of households to hold money in the form of cash so they can exchange goods and services easily, therefor, Keynes in his book "The General Theory of Employment and Money (1937)" gives another term for money demand called liquidity preference as he viewed that money has a ready purchasing power and can be converted into any commodity when desired.

Keynes established three main motives for why money is demanded , the first primary reason is the transaction motive where money is demanded to meet the daily needs of goods and services , second is the precautionary motive believing that every individual has to save some money for unexpected expenses or future obligations in which he or she won't have to sell an asset to meet his commitments, and finally the speculative motive, which is to hold money to exploit from upcoming investment opportunities regarding the interest rate.(Keynes, 1937).

Dritsakis (2010) inspected the demand for money in Hungary using (ARDL) cointegration framework, where the results showed a stable and cointigrated long run relationship between money demand and it determinants : inflation rate, real income and nominal exchange rate , the empirical study indicates that the real income coefficient is positively related to the demand for money while the inflation rate and nominal exchange rate are negative, which mean that the depreciation of the domestic currency decreases the money demand.

Singh (2010) analyzed narrow money (M1) demand functions for the Pacific Island countries using time series data from (1974 to 2004) , he used Johansen maximum likelihood (JML) technique to estimate the demand for money function, the results suggest that the real income, nominal interest rate and real narrow money are cointegrated, where the stability test results show that money demand function for Pacific Island countries are stable, thus monetary authorities are able to target money supply in applying their monetary policies.

Halicioglu and Ugur (2005) studied the stability of money demand function by considering narrow money (M1), the research was applied in Turkey using annual data over the period 1950-2002, as they used cointegration technique proposed by Pesaran et al. (2001) along with the CUSUM and CUSUMSQ stability tests to achieve their objectives, finally they proved that there is a stable money demand function , in which monetary policies can be applied efficiently in Turkey.

1.1 Purpose of the study

The purpose of this research is to estimate money demand model in Palestine, and investigate the economic relationship among variables, hence this examination helps to choose a monetary policy appropriately where instable money demand is a major factor in the preference of liquidity .Secondly, a stable demand for money implies a stable money multiplier that guarantees a correct prediction of the effects on aggregate income from money supply shocks. Finally, money demand stability provides valuable information about the link between money and inflation.

The first objective is to determine the variables that affect the demand for money in Palestine, the second objective is to use a scientific method to estimate the money demand function, the third objective is to test the stability of money demand functions, the fourth objective is to show the effect of GDP on the demand for real money and the fifth objective is to show the effect of real interest rate on the demand for real money.

1.2 Hypothesis of the study

The study suggests that money demand will depend positively on the level of real GDP due to the demand for transactions. In respect of the 2nd variable, money demand will depend negatively on average interest rates due to speculative concerns (Johansen, 1988).

H0: there is negative relationship between real money demand and real GDP but positive relationship with interest rate.

Ha: there is positive relationship between real money demand and real GDP but negative relationship with interest rate.

Since no prior related research was made regarding the Palestinian economy, this study aims to give some recommendations that will help policy makers to take effective decisions, and hence maintain a stable economy especially in light of not having domestic currency.

The rest of the paper is organized as follows, Section 2 describes the demand for money model & bounds testing approach. Section 3 presents the empirical results and Section 4 provides the conclusion.

2. Demand for money model & bounds testing approach

This research follows Keynes work, as it interprets the determinants of money demand conveniently, by analyzing the relationship between the demand for real balances ($\frac{Md}{P}$) as dependent variable, and the volume of transactions (Real income) plus the opportunity cost of holding money for households as independent variables.

An equation that specifies a linear relationship among the variables gives an approximate description of economic behavior related to the function model, for that a log-linear model is used to illustrate the linear relationship between real money balance and its determinants.
Based on the above specification the function model can be formulated as:

$$\text{Log} \left(\frac{Md}{P} \right) = \log (\text{real GDP}) + (\text{nominal interest rate}) + e$$

The quantity of money demand at current price levels is chosen to represent the demand for real money balances, symbolized as the fraction of money demand over the price level, which means that the model incorporates an assumption of price homogeneity assuming that money is neutral in the long run, where the desire to hold nominal money balances is proportionally to any changes in price level.

The scale variable (Real GDP) in the demand for money function is used as a measure of transactions for being most comprehensive indicator of general economic activity (Friedman, 1970), where both GDP and price level are united to same base year of 2015.

The opportunity cost is the interest rate forgone on alternative assets (Friedman,1987), where nominal interest rate on deposits is considered to be an adequate proxy of the opportunity cost of holding money, hence the weighted average of all currencies is taken into account.

To start with, the research examines the stationary of the data, as to choose the best model that can show significant regression analysis.

Using Augmented Dickey-Fuller test, the non- stationary variables are detected when the computed Z(t)-statistic is smaller in magnitude than critical value at 5%, or when p value exceeds the 5% level of significance (Dickey and Fuller, 1979).

Afterwards bound testing is applied to examine the existence of long run relationship.

H0: there is no cointegration among variables ($\beta1 = \beta2 = \beta3 = 0$)

H1: there is cointegration among variables ($\beta1 \neq \beta2 \neq \beta3 \neq 0$)

The lower critical bound assumes all the variables are I(0) meaning that the data is stationary, while the upper bound assumes that all the variables are I(1) meaning that the data is stationary at level 1. So when F-statistic (Wald test) is greater than the upper bound critical value, H0 is rejected, while if the F-statistic is below the lower bound critical value, then H0 cannot be rejected, and finally when the F-statistics falls between the lower and upper bound, then the results are uncertain, (Pesaran, Shin and Smith, 2001).

3. Empirical Results

The study used data from Palestine Monetary Authority (PMA) and the Central Bank of Jordan, the sample taken covers the period 2009Q3-2020Q4 using quarterly data.

After applying ADF test using Schwarz criterion (SIC), it turns out that none of (Log M1/P, Log M2/P, LOG Real GDP) variables are in stationary form except for Interest rate which is stationary at level I(0), Refer to Appendix A. Hereupon ARDL model retains the usual interpretation under stationary even if the variables are I(1) and I(0), (Pesaran and Shin, 1997).

The autoregressive distributed lag (ARDL) model introduced originally by Pesaran and Shin (1999) and further developed by Pesaran (2001), has the advantage to deal with (non-stationary variables); diverging away from their mean over time, suggesting that there is a single long run relationship between the lagged dependent variable and its determinants, also it can estimate the short and long-run dynamic simultaneously.

The error correction version of the ARDL model is stated as below:

$$\Delta(\text{Log M/P}_t) = B_1(\text{Log M/P})_{t-1} + B_2(\text{Log GDP})_{t-1} + B_3(\text{Log IR})_{t-1} + \sum_{i=1}^{p} \boldsymbol{B}_4\, \Delta(\text{Log M/P}_t)_{t-i} + \sum_{i=1}^{q} \boldsymbol{B}_5\, \Delta(\text{Log GDP})_{t-i} + \sum_{i=1}^{r} \boldsymbol{B}_6\, \Delta(\text{Log IR})_{t-i} + \varepsilon_t$$

The second step is to see if there is a single long run relationship between variables, so bounds testing (Wald test) is applied.

Table(1) Bounds Test Results

Dependent Variable	F - Statistic	5% Critical value Bounds	
		Lower Bound I (0)	Upper Bound I (1)
Log M1/P	5.748755	4.87	5.85
Log M2/P	4.463141		

Both Hossain (1994) and Khan (1992) documented the stability of the demand for money in Pakistan, they interpreted the results of cointegration as a sign of stable long-run relation, based on the bound testing procedure, the results confirm the theory of null hypothesis, where money demand is not stable in Palestine.

The third step is estimating the error correction model (ECM) from which the short-run coefficients can be obtained. The study used Akaike Information Criterion (AIC) for the determination of optimal lags, since it has superiority over any other criteria (Enders 2010).

The ECM results for the short-run reveal that money demand in form of M1 is affected by the lagged value of the dependent variable(log M1/P), Real GDP and interest rate, with lag length of (1,0,0) respectively, considering M2 as form of money the model depends exactly on the same lag order as the previous model. Refer to Appendix B.

Table(2) Error Correction Representations of ARDL (M1 Model) (1,0,0)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LOG_M1_P(-1)	0.740814	0.087204	8.495207	0.0000
LOG_REAL_GDP	-0.154911	0.061901	-2.502545	0.0165
IR	-0.014606	0.006226	-2.345970	0.0240
C	1.030648	0.331525	3.108813	0.0035
@TREND	0.003671	0.000871	4.214700	0.0001
R-squared	0.993209	Mean dependent var		2.075761
Adjusted R-squared	0.992530	S.D. dependent var		0.113598
S.E. of regression	0.009818	Akaike info criterion		-6.304750
Sum squared resid	0.003856	Schwarz criterion		-6.104010
Log likelihood	146.8569	Hannan-Quinn criter.		-6.229916
F-statistic	1462.606	Durbin-Watson stat		1.922467
Prob(F-statistic)	0.000000			

Table(3) Error Correction Representations of ARDL (M2 Model) (1,0,0)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LOG_M2_P(-1)	0.809043	0.073979	10.93611	0.0000
LOG_REAL_GDP	-0.117730	0.057939	-2.031961	0.0488
IR	-0.011426	0.005596	-2.041660	0.0478
C	0.791328	0.310360	2.549709	0.0147
@TREND	0.002767	0.000715	3.871757	0.0004
R-squared	0.994051	Mean dependent var		2.169902
Adjusted R-squared	0.993457	S.D. dependent var		0.108207
S.E. of regression	0.008753	Akaike info criterion		-6.534403
Sum squared resid	0.003065	Schwarz criterion		-6.333663
Log likelihood	152.0241	Hannan-Quinn criter.		-6.459569
F-statistic	1671.085	Durbin-Watson stat		2.072335
Prob(F-statistic)	0.000000			

The real GDP in both models has a significant relationship with real money demand, but without a positive sign, and according to Keynes theory any increase in real income would have a positive effect on the demand for real money balances, and hence giving the consumer a higher purchasing power.

According to ECM results, the sign of real GDP in both models are wrongly signed, with $p < 0.05$, the interpretations for such result present that the Palestinian market is in-efficient, hence available data has sort of distortion, and secondly, this also refers to not having a domestic currency where the demand for money is dependent on the supply of variant foreign currencies that are incontrollable.

Additionally, the study used limited data due to lack of currency circulation component, thus it used estimated CC based on Jordanian trend to proceed with the analysis, Nevertheless, the demand for money can be inform of various assets that households can hold instead of money, this refers to money demand dependency on both risk and return.

Moreover, Palestinian is an open economy, so other limitations are related to other variables that affects the real money demand like cost of living, wealth and inflation.

In relation to the economic importance of the obtained coefficients, the modeling of narrow and broad money results reveal that the coefficient of real GDP is inelastic, where money is treated as a necessity and not as a commodity (store of value), this suggests that the demand for real money in both models serve for transaction purposes and not considered as an asset. This is also in align with the study of "Demand for money in Macedonia", (Petrevski and Jovanovski, 2010).

Estimation results of the ARDL model show that interest rate has a negative relationship with both (M1) and (M2) money demand as expected; in other words this relation shows the forgone opportunity of holding money, where any increase in interest rates gives the money holder the motive to invest for additional returns, furthermore, the research results are statistically significant with p value < 0.05.

Regarding interest rate variable, the coefficient value gives indication about liquidity preference for money demand, where as in both models, the money demand is inelastic to changes in interest rate, hence economic agents are not much affected by the change of interest rate; households don't tend to economize on their money holdings.

This means, that both precautionary and transaction motive overtakes the speculative motive for holding money inform of M1 & M2; in other words money is preferably held to cover daily transactions plus securing enough money for contingencies or unforeseen circumstances arising in the course of economy.

Next, the ECM gives 99% of R^2 value, meaning that 99% of the changes in the dependent variable are explained by the influence of the independent variables . Furthermore, all coefficients in the regression models are statistically significant with p-value less than 5%.

Finally, the study uses the CUSUM and CUSUMSQ tests; introduced by Brown et al. (1975) for the study of structural change using the cumulative sum of recursive residuals or the cumulative sum of OLS residuals to determine whether there is a structural break.

These tests are applied to the residuals of each model to test for the stability of the short-run and long-run parameter estimates. In short, CUSUM is used to test the randomness of a sequence series, the graph of CUSUM shows whether the series behaves as ARDL hypothesis has predicted or not.

In Figures (1.1 and 1.2) show that the blue line (CUSUM) is within the two red lines (at 5% of significance), therefore the null hypothesis is rejected, indicating stability of M1 & M2 demand functions, without a structural break.

Figure 1.1 Cumulative Sum of Recursive Residuals (M1/P)

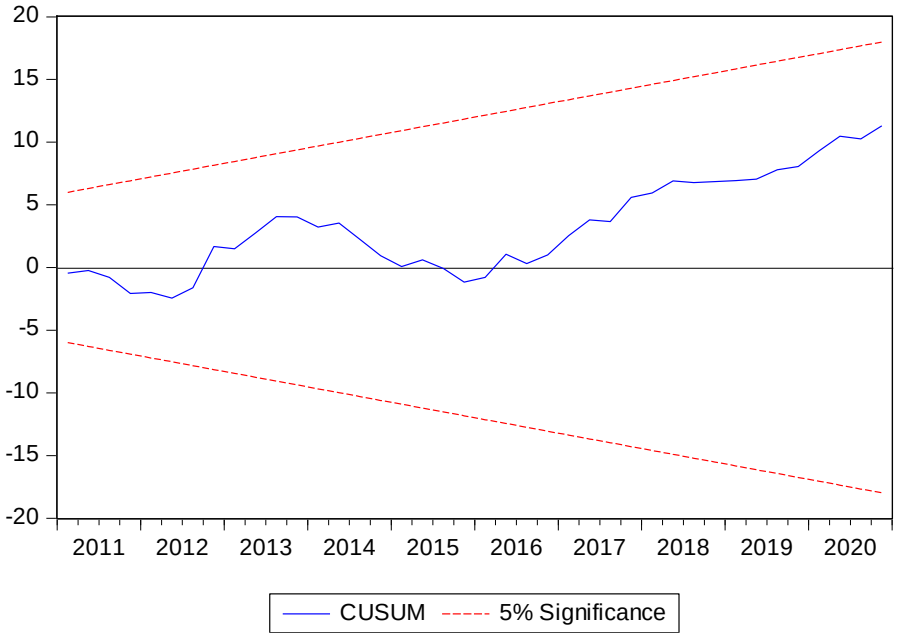
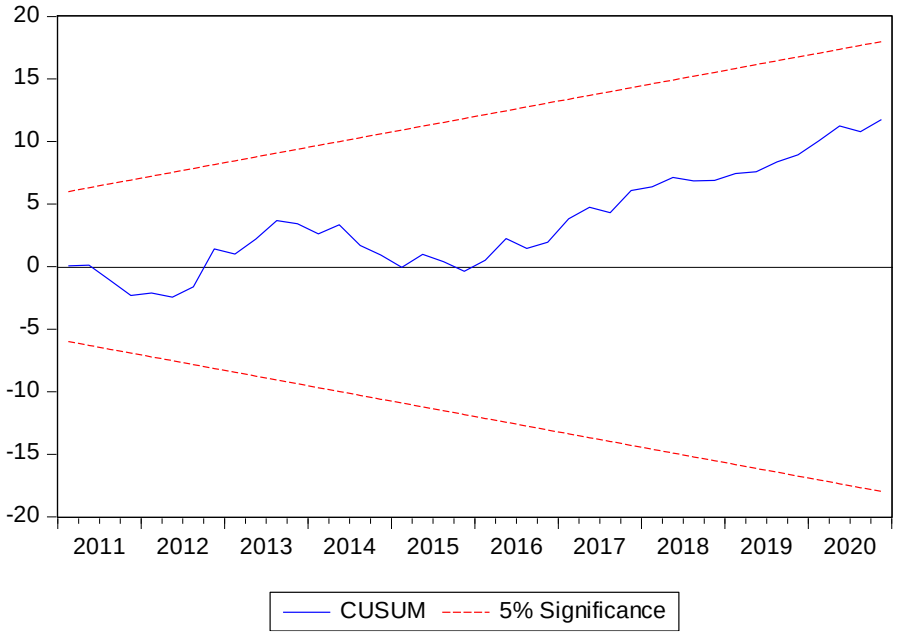


Figure 1.2 Cumulative Sum of Recursive Residuals (M2/P)



In (Figures 1.3 and 1.4) the blue lines are within the two red bounds (at 5% of significance), confirming that the parameters of both models are stable on the long-run, thus the study assures that both models are adequate and reliable to be used in forecasting.

Figure 1.3 Cumulative Sum of Squares of Recursive Residuals (M1/P)

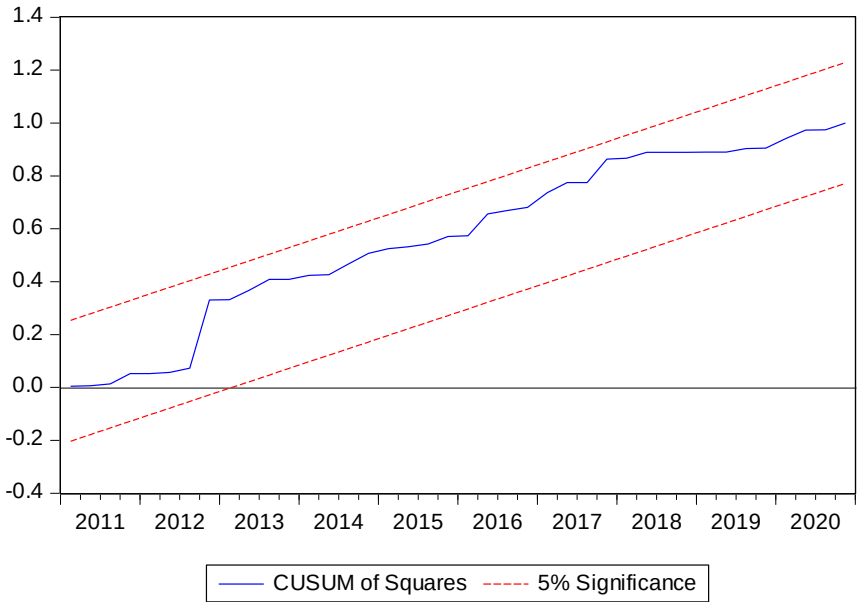
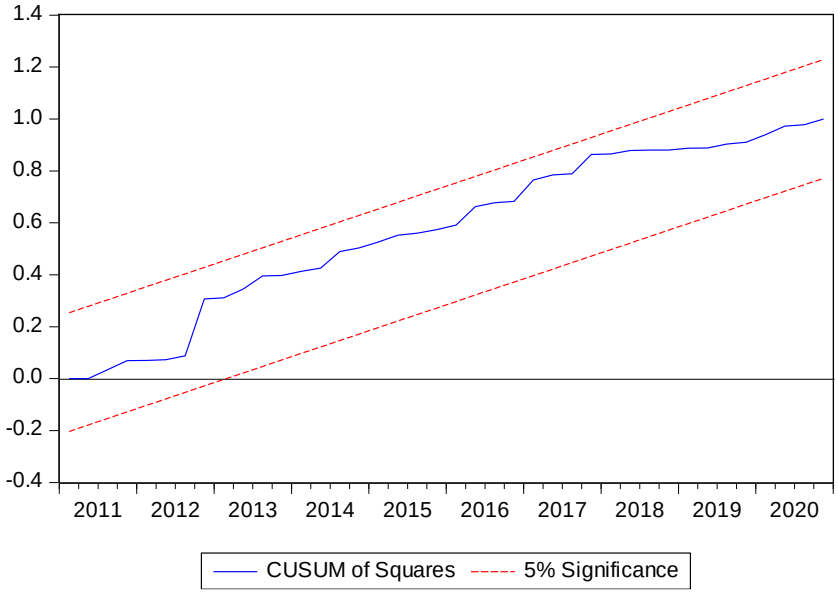


Figure 1.4 Cumulative Sum of Squares of Recursive Residuals (M2/P)



Even though both models are stable, the study recommends to use the 2nd model which is more inclusive. This final conclusion corresponds with the study entitled " Is Demand for Money Stable in Pakistan" results (Anwar and Asghar, 2012), where broad money is recommended to be used in conducting monetary policies rather than narrow one.

4. Conclusion

In this research, the demand for money in Palestine has been estimated using the (ARDL) approach to cointegration, the ARDL bound test was used to examine the money demand stability in Palestine, whereby the empirical results show that there isn't a long-run relationship between money demand and its determinants.

The empirical analysis have shown a significant relationship exists between real money demand in both forms (M1, M2) and their determinants; (real income and real interest rate), the sign of real GDP coefficient in both models oppose Kynes theory, in which real income has a positive impact on the demand for real money, this case is similar to a developing country like Rwanda, that has weak financial system and reliant on imports for many of its consumables, Bambujijumugisha, T. (2016). In regard of interest rate as explanatory variable, it affects negatively on both dependent variables (M1/P) and (M2/P) for speculative concerns , (Steven, 2003).

Moreover, log-linear model results reveal that the demand for real money balances of M1& M2 is inelastic to any changes in the real GDP, which shows that money is a necessity good that people hold for both precautionary and transaction motive. Regarding the second variable, the study shows that in case of M1& M2 models, the demand for real money is inelastic to changes in the real interest rate, this justifies the consumer behavior of people as they don't tend to economize on their money holdings when interest rate increase, so the speculative demand for money is minor even after including time deposits account which bears interest.

Finally, by applying the CUSUM and CUSUMSQ tests, it appears that M1, M2 money demand functions are both stable in Palestine, however the respective monetary authorities may consider targeting (M2) monetary aggregate that is more inclusive with wider range of financial instrument in their conduct of monetary policy.

Recommendations:

1. Regarding money demand stability model, the research suggests to consider M2 money aggregate while conducting monetary policy, which is more stable and inclusive.
2. Since real money demand is interest inelastic, using monetary policies e.g. issuing governmental securities can enable the monetary authority to have more control over money supply beside her control over the required reserve rate, but the question here can the government commit the payback.
3. In respect of money demand determinants, the research recommends to study the purchasing power of money by considering: cost of living, inflation rate, wealth and tax rate as main measures.
4. With reference to monetary stabilization, additional research should be conducted to examine the issuance of a national currency, since it would enable the Monetary Authority to have a control over the interest rate. And to investigate whether the new currency should have a floating or fixed exchange rate.
5. In terms of liquidity management, additional research should be conducted to investigate whether the loans are given for investment or consumption purpose and its effect on managing money liquidity, monetary stability and economic growth.

References

1. Anwar, S. Asghar, N. (2012), “Is Demand for money stable in Pakistan”, Pakistan economic and social review, vol 50, pp 1-22.
2. Bahmani-Oskooee, M. Gelan, A. (2009) "How stable is the demand for money in African countries? Journal of Economic Studies, Vol. 36 Issue: 3, pp.216-235.
3. Barnett, A. And Fisher, D. (2000), *The Theory of Monetary Aggregation Contributions to Economic Analysis, Volume (245)* Emerald Group Publishing Limited, pp.389 – 427
4. Bambujijumugisha, T. (2016). The Relationship between GDP and Money Demand in Rwanda. Available at SSRN 2973088.
5. Brown, R. L., J. Durbin, and J.M. Evans (1975), “Techniques for testing the constancy of regression relations over time”, Journal of the Royal Statistical Society, 37: 149-192.
6. Dickey, D. And Fuller, W. (1979), “Distributions of the estimators for autoregressive time series with a unit root”, Journal of American Statistical Association, 74: 427- 431.
7. Dritsakis, N. (2010). “Demand for money in Hungary: An ARDL approach”, Unpublished manuscript, University of Macedonia.
8. Enders, C. K. (2010). *Applied missing data analysis*. Guilford press.
9. Friedman, M. (1970). "A theoretical framework for monetary analysis," Journal of Political Economy, 78(2): 193-238.
10. Friedman, M (1987). "Quantity theory of money", *The New Palgrave: A Dictionary of Economics*, v. 4, pp. 15–19.
11. Halicioglu, F. and Ugur, M. (2005). “On stability of the demand for money in a developing OECD country: the case of Turkey”, Global Business and Economics Review, 7(2-3): 203-213.
12. Hossain, A. (1994). The search for a stable money demand function for Pakistan: An application of the method of cointegration. The Pakistan Development Review, Volume 33, No. 4 (II), pp. 969-983.
13. Johansen, L. (1988). Empirical Economics, North-Holland, Amsterdam
14. Khan, I. (1992). The demand for money in Pakistan and India. Pakistan Economic and Social Review, Volume 30, No. 2, pp. 181-190.
15. Keynes, J. (1937). “The general theory of employment”. The quarterly journal of economics, 51(2), 209-223.
16. Pesaran, M. And Shin, Y. (1997). "Testing for unit roots in heterogeneous panels". Unpublished manuscript, University of Cambridge
17. Pesaran, M. And Shin, Y. (1999). “An autoregressive distributed lag modeling approach to cointegration analysis”, In: Strom, S., Holly, A., Diamond, P. (Eds.), Centennial Volume of Rangar Frisch, Cambridge University Press, Cambridge.
18. Pesaran, M. And Shin, Y, and Smith, R. (2001). “Bounds testing approaches to the analysis of level relationships”, Journal of Applied Econometrics, 16: 289-326.
19. Petrevski, G. And Jovanovsk, K. (2010). “Demand for money in Macedonia”. SEER: Journal for Labour and Social Affairs in Eastern Europe, Vol. 13, No. 1, pp. 121-136.
20. Singh, R. And Saten, K. (2010) "Some empirical evidence on the demand for money in the Pacific Island countries", Studies in Economics and Finance, Vol. 27 Issue: 3, pp.211-222.
21. Steven, L.(2003). Microeconomics policy (2 nd ed.). Edward Elgar Publisher, New York.

Appendix A

Augmented Dickey–Fuller test

	Unit root I(0)			
Variable	**Log (M1/P)**	**Log (M2/P)**	**Log Real GDP**	**Real Interest rate**
T -Statistics at Constant	-1.780802	-1.740185	-2.421842	-3.566330
P Value	0.6974	0.7166	0.3639	0.0455
5% Critical Value	-3.513075	-3.513075	-3.513075	-3.523623

	Unit root I(1)			
Variable	**Log (M1/P)**	**Log (M2/P)**	**Log Real GDP**	**Real Interest rate**
T -Statistics at Constant	-6.921593	-6.977951	-6.526074	-8.028749
P Value	0	0	0	
5% Critical Value	-3.515523	-3.515523	-3.520787	-3.515523

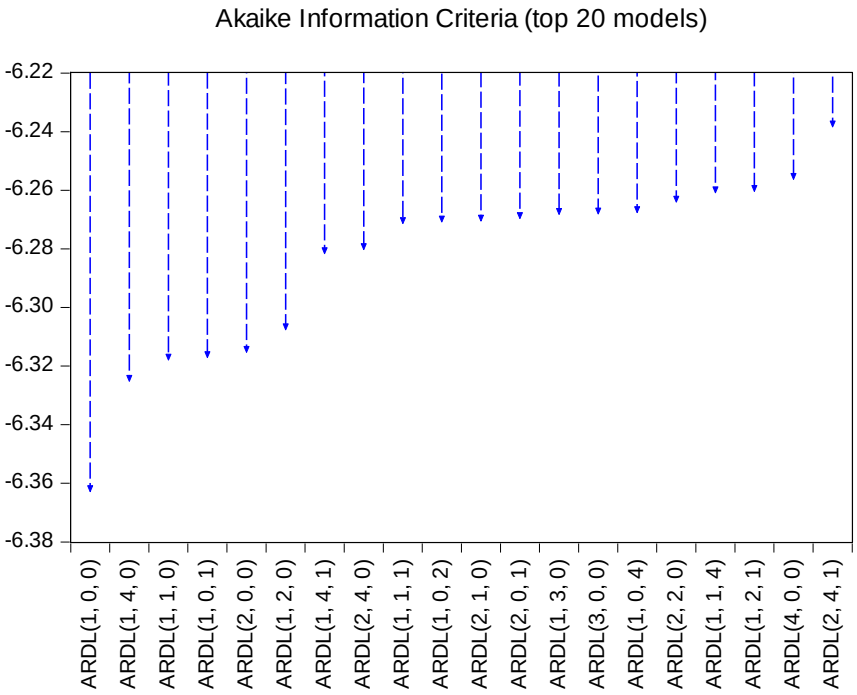
Notes:

1. The model for each variable was chosen based on significance level of 5%

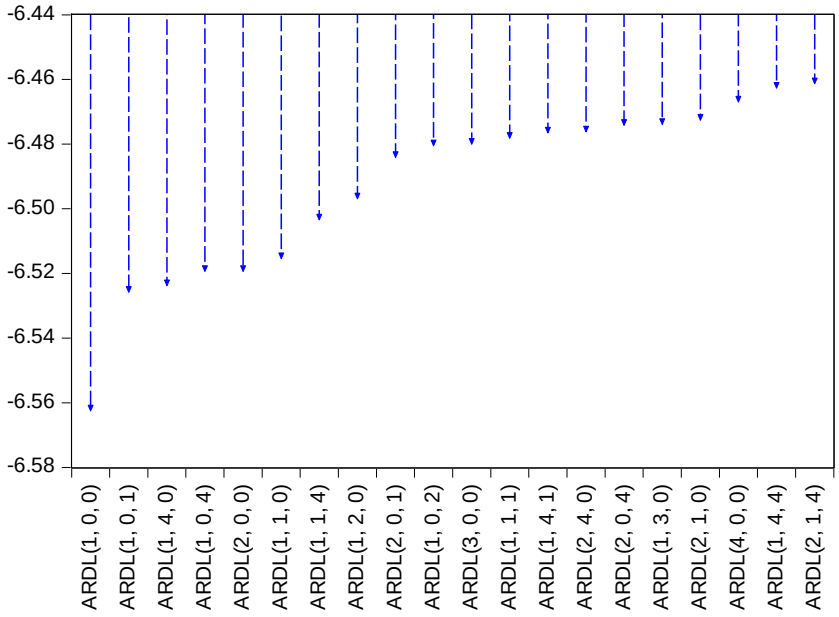
Source: Done by the Researcher

Appendix B

M1 lag length selection Criteria:



M2 Model lag length selection Criteria:



Source for Appendix D Figures: E-Views Program