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EFFECT OF FINANCIAL INNOVATIONS ON DEMAND FOR MONEY IN PAKISTAN: AN ARDL APPROACH

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ABSTRACT

An increasing array of development of banking system of Pakistan, through the use of information technology and modernization of products and services has led to financial innovations to be considered as important determinant of demand for money. This paper investigates the relationship of financial innovations and demand for money in Pakistan using Pesaran and Shin (1995) ARDL approach for long run and ECM for short run determination using yearly observations from 1957 to 2008. Using the ARDL coefficient estimation approach financial innovations demonstrates positive relationship, not found to significant but highly elastic and does not have deterministic trend for long run estimation whereas positively significant and deterministic trend for money demand function in short run in case of Pakistan.

Keywords: Financial Innovations; Demand for Money; Autoregressive Distribution Lag Model; Error Correction Model; Rate of Interest; GDP; Rate of Inflation.

INTRODUCTION

Modern capitalist society's specialized institutions of the financial system called the financial intermediaries took over the role of attracting excess savings of people in the form of money and redistributing them to those that needed excess finances for enhanced consumption and investment purposes (Rothbard, 2008). Modern banking system has gone towards financial innovations in order to produce monetary instruments both to attract more of people savings as well as to induce greater amount of lending and investment in the

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society. Still sole purpose of banks remains to earn profits. As defined by Merton (1992) "The primary function of the financial system is to facilitate the allocation and deployment of economic resources, both spatially and across time, in an uncertain environment." Commercial bank (itself an innovation) has always been the sole institution legally allowed to create credit which affects the supply of and demand for money in an economy (Sylla, 1982). Banks over the years have gone through new technological revolution and have been drawn by the drastic innovations in information technology (Tufano, 2003). This has totally changed the scenario of banking in the modern world (Mayer, 1986). Information technology has made banking more dynamic and combined with the innovative services and products of the credit sector have enabled them to keep their competitor advantage. The business of making money from money has grown more operational and revolutionary, which is necessary for the growth and development. The agile flow of money and improved services and innovative products are considered to be "financial innovations" in modern financial economics (Chen & Tsou, 2007), and in this research work. Modern banking and financial structures have shown that banks in order to enhance their own asset base and investment potential have started lending from each other adding to the bubble of money supply in the financial system (Klinz, 2008). According to Luckett (1984) the prime source of earning is by providing value added services and by keeping money in banking sector for maximum time period with bulk of quantity, so that they could earn money in shape of interest. The question still arise, "does the demand for money increase with the same level as that of supply of money when financial instruments are created when according to the ledgers of the banking system all liabilities are transformed into the assets?". This research covers demand for money in Pakistan with extended variable for demand for money estimation i.e. financial innovations. Financial sector particularly addressed in this paper is the banking system of Pakistan and, like any other business has a motive which is wholly and solely to earn profits in a perfectly competitive environment. According to researchers, innovation in financial market revived up to a considerably significant level, because of theoretical financial developments and econometric applications and is building a number of questions for consideration of financial innovations for the policy makers in order to maintain financial stability (Plosser, 2009).

LITERATURE REVIEW

As according to the literature and its development in this field of economics, this area has become more popular theoretically and empirically and is considered important by econometric scientists over the recent times. Due to its critical role in the effectiveness regarding monetary policy, rate of interest, inflation, and other important aspects of macroeconomic policy, as far as the demand for money is discussed crucially amongst the economists and considered by them as a matter of empirical debate. Relationship between the demand for money and its determinants has been assessed by several studies i.e. Hafer and Jansen (1991), McNown and Wallace (1992), Adam (1991), Hoffman and Rasche (1991), Bahmani-Oskooee and Bohl (2000), Darrat and Al-Sowaidi (2009) considering Gulf region, Darrat and Al-Mutawa (1996) modelled the demand of money for UAE, Hansen and Kim (1995), Karfakis and Parikh (1993), Dekle and Pardhan (1997), Tan (1997), Bahmani-Oskooee and Shabsigh (1996), Miyao (1996), Ahmed (2001) and in Pakistan, Akhtar (1974), Abe, Fry, Min, Vongvipanond, and Yu (1975), Khan (1980, 1982a, 1982b), Nisar and Aslam (1983), Ahmed and Khan (1990) Khan (1994), Qayyum (2000, 2005, 2006), Mangla (1979), Hussain, Awan, Hussain, Farhan and Haq (2006) have estimated and examined the stability of demand for money functions by using alternative specifications. According to the researches done by the above mentioned researchers, rate of interest, inflation, level of income are used as exogenous variables, moreover due to changes in the financial sector and reforms in the banking sector because of liberalization and innovations a new variable named financial innovations has been introduced which is considered to have significant impact on the money demand. The question for "stable and predictable demand function stems from results proving that traditional models for demand for money function in many industrialized countries showed instability over time in the 1970s" (Hoffman, Rasche, and Tieslau 1995) . Friedman (1986) revealed that "money demand function assumes that there are a stationary long-run equilibrium relationship between real money balances, real income, and the opportunity cost of holding real balances". Commonly asked question that whether demand for money is stable or predictable, which has been enquired by Ireland (1992) taking financial innovation as endogenous variable, whereas Mayer and Colin (1986) discussed the

pros and cons of financial innovation, and a historical investigation of financial innovations conducted by Miller (1986, 1992), Chirinko and Farr (1996), Taylor (1987), Dotsey (1984), Hye (2005), Friedman (1959), Akhtar (1983), Bordo and Jonung (1981), Siklos (1993), Klovland (1983) and Hafer and Kutan (2003) employing dummy variables in order to assess the function of demand for money while considering the financial innovations as a variable and is found by them to be highly correlated Miller (1991), Hoffman and Rasche (1991), Taylor (1987). Pakistan is no exception in the conditions of structural adjustments considering financial deregulations, liberalization and innovations amongst many countries in recent years.

METHODOLOGY

This research considers M2 as a function of demand for money (M_D) according to Friedman's definition of M2. Whereas, prices are shown by the percentage change in price level (INF), call money rate (CMR) is used as interest rate and GDP is used to show the level of income and M2/M1 is used as a proxy variable to show financial innovations in order to estimate the multiple coefficients of different demand relationships. To justify the use of $M2/M1$ as a proxy variable for financial innovations denoted as (FI) in our model we can find that M2 money supply is more than M1 money supply. In other words $M2/M1$ does not remain constant over time resulting from increased velocity of money and credit creation process, showing a proportion of change in M2 and M1 which is assumed to be due to financial innovations and supposed to have positive impact on demand for money as observed by Augustine (1990) an Merton (1992). Due to absence of any direct measure of financial innovations, $M2/M1$ has been used as a proxy variable as used by Siklos (1993), Klovland (1983) and Akhtar (1983). According to M2 definition of money, money is not just medium of exchange. It is also as storage of value or as Friedman calls it a "temporary abode of generalized purchasing power". Money demand is intensively studied due to the relevance of precise estimation of its parameters to better analyze a number of crucial economic policy decisions. There is an agreement amongst economists reviewed in the literature that the money demand function is estimated in log linear form. Variables used in

this study are: money demand (M_2), inflation (INF), interest rate as opportunity cost for holding the money (CMR), level of output (GDP) and financial innovations used as proxy variable (FI) and scale variables. The data for the study is taken from 1957 to 2008 on yearly basis consisting of 52 observations and has been taken from the International Financial Statistics. On preliminary analysis the variables are tested through ADF unit root test is applied to all the variables to test the stationarity of variables. The test is applied to both the original series and to the second differences.

Problem Statement

The problem statement of this study can be written as: "Whether there is any Significant Impact of Financial Innovations on Money Demand in Pakistan or not?"

Objectives

The study has the following objective: To assess the effect of financial innovations on demand for money in Pakistan.

Hypothesis

This study has the following hypothesis:

H_0: Financial Innovations has no significant relationship with the Demand for Money in Pakistan.

H_1: Financial Innovations has positive and significant relationship with the Demand for Money in Pakistan.

The hypothesis of existence of stationary long-run money demand function for Pakistan is tested by using co-integration and autoregressive distribution lag model (ARDL) method. If money demand function shows a stationary long-run relationship among real income and opportunity cost of holding money, then it means that the stochastic trend in real money balances is related to the stochastic trend in real income and opportunity cost of holding money. Therefore, by co integrated variables, the demand function will converge to equilibrium relationship in the long-run. Thus various hypotheses are tested for unit root in order to ascertain the stationarity of the time series variables used in the model and co integration between them. Here the researchers have taken into account recent econometric

advances relating to cointegration i.e. ARDL by Pesaran and Shin (1995), Pesaran, Shin and Smith (2001) and which normally does not require knowledge of the order of integration of variables, and error correction model (ECM) for the determination of short and long run dynamics. These techniques are used due to stationarity problem in the time series data.

Selection of variables and Model Formulation

The researchers investigate the money demand relationship using recent advances econometrics of co integrated system and "the structural stability of estimated money demand functions which are important for drawing meaningful policy inferences" (Thornton, 1983). Various factors are considered as determinants of money demand function in the formulation of demand for money in any country, it is a common practice to include scale variable such as income and a measure of opportunity cost of holding money such as an interest rate. The following variables were taken into consideration to express the general form of money demand function estimated for Pakistan:

Where

$M2_t$ = Money demand

GDP_t = Level of income

CMR_t = Call money rate proxy variable for cost of holding money

FI_t = Financial innovation (M2/M1)

INF_t = Consumer price index percentage change

ε_t = Error term

Since the money demand is not directly observable, M2 in (Rs. in millions) as dependent variable is used as money demand; considering money supply is exogenous having an assumption that money market is always in equilibrium. M2 according to the definition "M2 equal to M1 plus retail money market mutual fund saving and small time deposits plus over-night repurchase agreements" (Miles & Scott, 2003).

To determine the demand for money GDP (Rs. in millions) is used as an independent variable depicting the level of output by Pakistan. Call money rate is used as opportunity

cost for holding money. "Yet, however difficult it may be to measure the effects empirically, the scope for financial innovations to modify the demand for money, in various contradictory ways, is considerable (Bain & Howells, 2003)."Due to absence of any direct measure of financial Innovations (FI), FI is used as proxy variable (M2/M1) to capture the impact of financial innovation on demand for money in Pakistan as used by Hye (2005), and Muscatelli and Papi (1990) and inflation (INF). Data for the purpose is taken from the International Financial Statistics and Fifty Years Data Book of State Bank of Pakistan. According to results all the series are non-stationary at level, that they are random walk series. Variables are found to be stationary at different levels. So, at the second step unrestricted co integration rank test (Trace) is applied to determine linear deterministic trend. In applying any co integration technique is applied to determine the order of integration of each variable. Moreover, depending on the power of unit root tests, different tests yield different results. Due to this uncertainty, Pesaran and Shin (1995) introduce a new method of testing for cointegration. The approach named as autoregressive distributed lag (ARDL) approach has the advantage of avoiding the classification of variables into I(0), I(1).There are several tests of unit root but π(tau) statistics or Dickey-Fuller (DF) test is used to determine the stationarity of variables.

Co-integration

Two variables are co-integrated if they individually follow a unit root process, but jointly move together in the long run. Individually, movements appear random and unpredictable, but the location of one can give information about the other,

If $Yt = Yt{-}1 + \varepsilon yt$ and $Xt = Xt{-}1 + \varepsilon xt$,

X and Y have a unit root. If there is no unit root in the error term from the regression $Yt = b_0 + b_1X_t + U_t$, then Y and X are co integrated. i.e., if the prediction error of Y regressed on X are stationary, there is evidence of co integration. If co integration exits then it is not enough to simply difference the variables to run a regression between X and Y. One must take the long-run relationship between the variables. When Y is above the level indicated by X, we would expect Y to decrease and vice versa. Therefore an error-correction model

includes deviations from long-run relationship as an explanatory variable. First the long-run relationship is estimated

$$et = Yt - \beta_0 - \beta_1 X_t$$

are the deviations from long-run relationship these differences are included as an additional variable

$$\Delta Y_t = C_0 + C_1 \Delta X_t + C_2 et - 1 + \mu_t$$

The regression of co integrated variables is known as co integrating regression and the slope parameters are known as co integrating parameters. There are numbers of methods for testing co integration. e.g; (i) the DF or ADF unit root test on the residuals estimated from the cointegrating regression (Hassler & Wolters, 2006). Note that, there is a difference between test for unit roots and tests for cointgration. Test for unit roots are performed on univariate time series while cointgration leads with the relationship among a group of variables, where (unconditionally) each has a unit root. So, keeping in mind the above give methodology following model is prepared in log linear form as follows:

$$M2_t = \alpha + \beta_1 lnGDP_t + \beta_2 lnCMR_t + \beta_3 lnFI_t + \beta_4 lnINF_t + \varepsilon_t$$

Moving onwards depending upon the nature of data the following model to test long term cointegration using ARDL is as follows:

$$\Delta lnM2_t = \alpha_0 + \sum_{j=1}^{n} \alpha_j \Delta lnM2_{t-j} + \sum_{j=1}^{n} \mu_j lnGDP_{t-j} + \sum_{j=1}^{n} \delta_j lnCMR_{t-j} + \sum_{j=1}^{n} \theta_j \Delta lnFI_{t-j} + \sum_{j=1}^{n} \pi_j \Delta lnINF_{t-j} + d_1 lnM2_{t-1} + d_2 lnGDP_{t-1} + d_3 lnCMR_{t-1} + d_4 lnFI_{t-1} + d_5 lnINF_{t-1} + \epsilon_t$$

Furthermore, to determine the short term based upon EC Model is as follows:

$$EC_{t-1} = d_1 lnM2_{t-1} + d_2 lnGDP_{t-1} + d_3 lnCMR_{t-1} + d_4 lnFI_{t-1} + d_5 lnINF_{t-1}$$

DATA ANALYSIS & EMPIRICAL RESULTS

TABLE 1

Augmented Dickey-Fuller (ADF) Test of Stationarity of Time Series Data

Description	Variables	Lags	t-statistics	P-Value
At Level				
Money Demand	$LM2_t$	*0*	12.471	1.0000
GDP per Capita	$LGDP_t$	*8*	3.558	1.0000
Call Money Rate	$LCMR_t$	*0*	-2.403	0.1461
Financial Innovation	LFI_t	*1*	-1.761	0.3944
Rate of Inflation	$LINF_t$	*5*	5.158	1.0000
At 1st Difference				
Money Demand	$\Delta LM2_t$	*6*	3.276	1.0000
GDP per Capita	$\Delta LGDP_t$	*3*	0.931	0.9951
Call Money Rate	$\Delta LCMR_t$	*0*	-6.829	0.0000
Financial Innovation	ΔLFI_t	*0*	-9.710	0.0000
Rate of Inflation	$\Delta LINF_t$	*9*	1.847	0.9997
At 2nd Difference				
GDP per Capita	$\Delta LGDP_t$	*2*	-5.054	0.0001
Rate of Inflation	$\Delta LINF_t$	*0*	-4.676	0.0004
Money Demand	$\Delta LM2_t$	*1*	-7.110	0.0000

Note. ADF ô<–3.44 at the 5 percent level of significance, L is for log and ' shows first difference.

On preliminary analysis the variables are tested through ADF unit root test is applied to all the variables to test the stationarity of variables. The test is applied to both the original series and to the second differences. The results reported in Table 1, indicate that all the series are non-stationary at level as depicted from P-Values, that they are random walk series as CMR and FI are stationary at first difference and rest of the variables are stationary at

second difference. Variables are found to be stationary at different levels where the lag length is estimated using AIC using maximum lag length of 10.

TABLE 2

Cointegration with no intercepts or trends in VAR

Null	Alternative	Statistic	95% Critical Value	90% Critical Value
r = 0	r = 1	41.5589	29.9500	27.5700
r<= 1	r = 2	29.1919	23.9200	21.5800
r<= 2	r = 3	19.5347	17.6800	15.5700
r<= 3	r = 4	11.3059	11.0300	9.2800
r<= 4	r = 5	1.0078	4.1600	3.0400

Cointegration LR Test Based on Maximal Eigenvalue of the Stochastic Matrix

According the theory of econometrics if the variables are not stationary at the same level then autoregressive distribution lag model ARDL is used for cointegration analysis as the preliminary analysis of unit root test shows that variables are not stationary at same level then we have to use the ARDL for cointegration analysis. If all variables are non-stationary at level but stationary not event at their 1st difference, simply speaking are having random walk, allows us to proceed further for implementation of Pesaran and Shin (1995) ARDL cointegration test depending upon the power of the unit root tests, moreover there is no need to classify variables into *I*(0) or *I*(1). This section brings into being the results of second step of the methodology. This section consists of two parts, that the cointegration test and estimation of long run money demand function where likelihood Ratio tests based on trace and maximum eigenvalue statistics are applied.

TABLE 3

Cointegration with no intercepts or trends in VAR

Null	Alternative	Statistic	95% Critical Value	90% Critical Value
r = 0	r>= 1	102.5991	59.3300	55.4200
r<= 1	r>= 2	61.0403	39.8100	36.6900
r<= 2	r>= 3	31.8484	24.0500	21.4600
r<= 3	r>= 4	12.3137	12.3600	10.2500
r<= 4	r = 5	1.0078	4.1600	3.0400

Cointegration LR Test Based on Trace of the Stochastic Matrix

Different combinations of variables and different orders of VAR are also used. As the results are shown in Table 2 for cointegration with no intercept or trend in VAR on maximal Eigenvalue of stochastic matrix shows significant results on first three levels where statistic value is greater than critical value as at r = 0 the statistic value is 41.5589 and critical value at 5% level of significance is 29.9500 so as in the next four levels up to r<= 3 rejecting the null hypothesis. On the other hand in Table 3 vector autoregressive test Based on Trace of the Stochastic Matrix at 5% level of significance null hypothesis is rejected at first three levels based on the trace value higher than the critical value. Thus the co-integration relationship exists among the five variables of money demand, interest rate, level of output, inflation and financial innovation.

Long Run Dynamics

In the first stage, we test for co-integration using the T-Ratio with new critical values. According to Bahmain-Oskooee and Brooks (2003), the lag length is important for the results of each differenced variable. According to error correction version of auto regressive distribution model is as follows:

$$\Delta lnM2_t = \alpha_0 + \sum_{j=1}^{n} \alpha_j \, \Delta lnM2_{t-j} + \sum_{j=1}^{n} \mu_j \, lnGDP_{t-j} + \sum_{j=1}^{n} \delta_j \, lnCMR_{t-j} + \sum_{j=1}^{n} \theta_j \, \Delta lnFI_{t-j}$$
$$+ \sum_{j=1}^{n} \pi_j \, \Delta lnINF_{t-j} + d_1 lnM2_{t-1} + d_2 lnGDP_{t-1} + d_3 lnCMR_{t-1}$$
$$+ d_4 lnFI_{t-1} + d_5 lnINF_{t-1} + \epsilon_t$$

The null hypothesis of the cointegration: $H_0: d_1 = d_2 = d_3 = d_4 = d_5 = 0$ Tested against: $H_1: d_1 \neq d_2 \neq d_3 \neq d_4 \neq d_4 \neq 0$ Only appropriate lag length selection criterion could be able to identify the true dynamics of the model. We employ akaike's information criterion (AIC) in selecting the lag length on each second differenced variable where the recommended lag length for ARDL estimation was two as shown in Table 4.

TABLE 4

Autoregressive Distributed Lag Estimates

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
lnM2(-1)	1.2467	.036739	33.9332[.000]
lnINF	-3297.2	1024.5	-3.2183[.003]
lnFI	266990.4	25191.2	10.5986[.000]
lnFI(-1)	-275867.4	26648.4	10.3521[.000]
lnGDP	.047210	.019499	2.4212[.020]
lnCMR	-7785.6	2757.6	-2.8233[.007]
lnCMR(-1)	-751.7326	3752.1	-.20035[.842]
lnCMR(-2)	8937.5	3107.2	2.8763[.006]

Note.R-Squared = .99888, R-Bar-Squared = .99868, S.E. of Regression= 26802.5,
F-stat. F(7, 39)= 4965.8[.000], Akaike Info. Criterion = -549.5292, Schwarz Bayesian Criterion = -556.9298, Durbin's h-statistic = .061178[.951]
ARDL(1,0,1,0,2) selected based on Akaike Info. Criterion

It is revealed that long run demand for money is determined by rate of inflation, level of income, call money rate and financial innovations. Table 5 shows that financial

innovations (FI) has positive and statistically insignificant (at 1% level) effect on the money demand in long run as P-Value (.496) shows.

$$\ln M2 = 1.2467\ \ln M2_{(t-1)} + .047210\ \ln GDP - 7785.6 \ln CMR - 751.7326\ \ln CMR_{(t-1)}$$
$$(33.93) \qquad (2.42) \qquad (-2.82) \qquad (-.200)$$
$$+ 8937.5\ \ln CMR_{(t-2)} - 3297.2\ \ln INF + 266990.4\ \ln FI - 275867.4\ \ln FI_{(t-1)}$$
$$(2.87) \qquad (-3.21) \qquad (10.59) \qquad (-10.35)$$

The opportunity cost of holding money variable (CMR) according to theory, negative and statistically insignificant effect on the demand for money in long run. The above analysis shows the demand for money function in not stable in long run and financial innovations does not have significant relationship with the demand for money in long run. On the other hand price level changes (INF) is having a statistically significant and positive and level of income (GDP) relationship with the demand for money in long run have a significant P-Value as shown in Table 5. Summarizing we can say that for the assessment of long run money demand function ARDL is used for the estimated long run coefficient. According to which inflation and level of income are significant for the long run estimation of money demand in Pakistan. But on the other hand financial innovation and rate of interest are not long run determinants of demand for money with high p-values calculated according to autoregressive distributed lag model with the lag length based on AIC. Moreover, the relationship of GDP and INF implies that the demand for money function is not stable in long run in Pakistan. After obtaining the true information estimates of the error correction version of the ARDL equation, we used the estimates of parameters d_1 to d_5 to form the error correction term. To further check the cointegration for short run.

TABLE 5

Estimated Long Run Coefficients using the ARDL Approach

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
lnINF	13367.2	2726.6	4.9026[.000]
lnFI	35988.4	52340.6	.68758[.496]

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
lnGDP	-.19139	.074394	-2.5727[.014]
lnCMR	-1622.4	10768.1	-.15067[.881]

ARDL(1,0,1,0,2) selected based on Akaike Info. Criterion

$$EC_{t-1} = d_1 lnM2_{t-1} + d_2 lnGDP_{t-1} + d_3 lnCMR_{t-1} + d_4 lnFI_{t-1} + d_5 lnINF_{t-1}$$

Co-integral relationship establish between the demand for money, level of income, rate of interest, inflation and financial innovation the error correction model for the estimate could be applied. Here the equation is for the estimated model. Where EC(-1) is one period lagged residual of the cointegration regression of other stationary variables, considered to explain the dynamic behavior of demand for money for short term based on the ECM value of (6.71) as depicted from Table 6. According to ECM financial innovations is positively related to demand for money and significant (at 1% level) for the short term policy estimation and predictions and highly elastic in case of Pakistan according to coefficient value of (266990.4).

ECM = *ln*M2 -13367.2 *ln*INF -35988.4 *ln*FI + .19139 *ln*GDP + 1622.4 *ln*CMR

(-3.21) (10.59) (2.42) (-2.82)

TABLE 6

Error Correction Representation for the Selected ARDL Model

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
dlnINF	-3297.2	1024.5	-3.2183[.003]
dlnFI	266990.4	25191.2	10.5986[.000]
dlnGDP	.047210	.019499	2.4212[.020]
dlnCMR	-7785.6	2757.6	-2.8233[.007]
dlnCMR1	-8937.5	3107.2	-2.8763[.006]

ecm(-1)	.24666	.036739	6.7140[.000]

Note.R-Squared = .94649, R-Bar-Squared = .93688, S.E. of Regression = 26802.5,
F-stat. F(5, 41) = 137.9596[.000], Akaike Info. Criterion = -549.5292,
Schwarz Bayesian Criterion = -556.9298, DW-statistic = 1.9827
ARDL(1,0,1,0,2) selected based on Akaike Info. Criterion

The coefficients of financial innovations and level of income are positively and statistically significant in the short run. On the other side, the inflation, and rate of interest are negatively and statistically significantly with the P-Value of (-3.21) and (-2.82) respectively affect the demand for money function of Pakistan in short run. So, we can say the demand for money function is stable in Pakistan for short run considering financial innovations an independent variable in the estimation of demand for money.

CONCLUSION

This paper investigates empirically the demand for money relationship in Pakistan using yearly data over 1957 to 2008 and concludes according to co-integration analysis the variables are found to be significantly correlated to each other based on vector autoregressive test on trace and maximal Eigenvalue of stochastic matrix at 5% level of significance. Long run coefficient estimation using the ARDL approach financial innovations demonstrates positive relationship and rate of interest are not found to significant but highly elastic and does not have deterministic trend for long run estimation of the demand of money in long run in case of Pakistan. Financial innovations affect money's own rate which is considered to be cost of holding money as evident from the results which shows highly elastic rate of interest. Secondly, the GDP function is also showing opposite direction in long run considering financial transactions relevant to the scale variable. Considering precautionary motives, reduction in borrowing costs has led to more use of debit and credit instruments. It is also very important point to be noted that closer money substitutes or innovative financial products and cheaper access to cash have led to increase in velocity of money and thus affecting the demand for money function positively in Pakistan. Moreover, the rate of elasticity of financial innovations which is highly elastic in case of Pakistan has led to frequent switching from one component of broad money to another due to interest rate

differentials in Pakistan. The results provide insights into the effects of financial innovations on monetary aggregates of concern to central bank. These findings suggest that consistently with money demand theory, the spread of financial innovations has the anticipated effect on currency holding, demand and time deposit components of M2. Hence, the possible effects of the innovations on the currency and demand deposit components of narrow monetary aggregates are relevant to assess the velocity of money. As evident from data analysis through error correction representation for the selected ARDL model with a ECM lagged value of 6.714, where financial innovations shows positively significant and deterministic trend for money demand function in short run in case of Pakistan. The total net effect is positive co-integrated and stable in short run as a deterministic variable for the formulation and implementation as a better monetary aggregate of monetary policy and central banks control. On the contrary financial innovations are highly statistically significant in long run but overall function for demand for money is not stable due to inverse relationship of percentage change in prices (INF) and GDP with dependent variable M2 demand for money. Based upon, the finding in empirical analysis researcher ***rejects the null hypothesis*** as the financial innovations are positively and significantly related to the demand for money function.

REFERENCES

Abe, S., Fry, M. J., Min, B. K., Vongvipanond, P., & Yu, T. (1975). The demand for money in Pakistan. *The Pakistan Development Review, 14* (2), 249-257.

Adam, C.S., (1991). Financial innovation and the demand for m3 in the UK (1975-1986). *Oxford Bulletin of Economics and Statistics* 53, 401-423.

Ahmed, M. A. (2001). Demand for money in Bangladesh: An econometric investigation into some basic issues. *Indian Economic Journal*, 84-89.

Ahmad, M., Khan, A. H. (1990). A re-examination of the stability of the demand for money in Pakistan, *Journal of Macroeconomics,12(2),* 307-321.

Akhtar, M. A. (1974). The demand for money in Pakistan. *The Pakistan Development Review* 13(1), 39-54.

Akhtar, M. A. (1983). Financial innovations and their implications for monetary policy: An international perspective. *BIS Economic Papers(9)*, 5-57.

Alvarez, F. E., & Lippi, F. (2007). Financial Innovation and the Transactions Demand for Cash. *National Bureau of Economic Research Working Paper Series* .

Arestis, P., Hadjimatheou, G., & Zis, G. (1992). the impact of financial innovations on the demand for money in the UK and Canada. *Applied Financial Economics*, 115-123.

Attanasio, O., Guiso, L., & Jappelli, T. (2001, May). The demand for money, financial innovation, and the welfare cost of inflation: An analysis with households' data. *Center for Studeis in Economics and Finance, Working Paper No. 3*.

Augustine, A.C. (1990).effects of financial innovation on the money demand function: evidence from Japan. *International Economic Journal, 4(1), 59-70.*

Bain, K., & Howells, P. (2003). *Monetary Economics:Policy and its Theoretical Basis*.(S. E. Services, Ed.*)* New York: Palgrave MacMillan.

Bahamani-Oskooee, M., & Brooks, T. J. (2003). A new criterin for selecting the optimum lags in johansen's cointegration technique. *Applied Economics, 35*: 875-880.

Bahamani-Oskooee, M. & Bohl, M. T. (2000). German monetary unification and the stability of the german m3 money demand function. *Economic Letters, 66,* 203-208.

Bahmani-Oskooee, M. (2001). How stabe is m2 money demand function in Japan? *Japan and World Economy, 13*, 455-461.

Bahmani-Oskooee, M., Pourheydarian, M. (1998). Exchange rate sensitivity of demand for money and effectiveness of fiscal and monetary policies. *Applied Economics, 22*, 917-925.

Bahmani-Oskooee, M., Shabsigh, G., (1996). The demand for money in japan: Evidence from cointegration analysis. *Japan and the Wrold Economy8*, 1-10.

Banerjee, A., Dolado, J. J., Galbraith, J. W., & Hendry, D. F. (2003). *Co-integration, Error Correction, and The Econometric Analysis of Non-Stationary Data.* United States: Oxford Universtiy Press.

Baumol, W. (1952). The transactions demand for cash: An inventory theoretic approach, *Journal of Econometrics* 66, November, 545–56.

Bordo, M., & Jonung, L. (1981). The long-run behaviour of the income velocity of money in five advanced countries, 1879-1975: *An Institutional Approach, Economic Inquiry, 19*, 96-116

Chen, J. S., & Tsou, H. T. (2007). Information technology adoption for service innovation practices and competitive advantage: The case of financial firms. *Information Research, 12* (3), 314.

Chirinko, R. S., & Farr, D. D. (1996, October). Financial innovations, money demand, and disaggregation: Some Time Series Evidence. *Fedral Reserve Bank of Kansas City* , 96-06.

Columba, F. (2003). Transaction technology innovation and overnight deposits demand in Italy. *Bank of Italy Working Papers*, No. 468.

Columba, F. (2009). Narrow money and transaction technology: New disaggregated evidence. *Journal of Economics and Business, 56*, 312–325.

Darrat, A. F., & Al-Sowaidi, S. S. (2009). Financial progress and the stability of long-run money demand: Implications for the conduct of monetary policy in emerging economies. *Review of Financial Economics, 18* (3), 124-131.

Darrat, A. F. & Al-Mutawa, A. (1996).Modelling money demand in the United Arab Emirates, *Quarterly Review of Economics and Finance, 36(1),* pp. 65-87.

Dekle, R., & Pardhan, *M.* (1997). Financial liberalization and money demand in ASEAN countries: Implications for monetary policy. Washington: *International Monetary Fund. IMF Working* Paper No. WP/97/36.

Dotsey, M. (1984, October). An investigation of cash management practices and their effects on the demand for money. *Federal Reserrve Bank of Richmond* , 3-12.

Frame, W. S., White, L. J. (2002). Empirical studies of financial innovation: Lots of talk, little action? *Fedral Reserve Bank of Atlanta* .

Franks, J. & Sussman, O. (1999). Financial innovations and corporate insolvency, unpublished manuscript, London Business School.

Friedman, M. (1959). The demand for money: some theoretical and empirical results. *Journal of Political Economy* , 327-351.

Friedman, M. (1986). Demand for Money. *Proceedings of the Ameriacn Philosohpical Society, volume 105: 3*.

Hafer, R.W. & Jansen, D.W. (1991). The demand for money in the United States: Evidence from cointegration tests, *Journal of Money, Credit and Banking23*, 155-168.

Hafer, R. W., & Kutan, A. M. (2003). Financial innovation and the demand for money: Evidence from the Philippines. *International Economic Journal, 17* (1), 17-27.

Hansen, G., & Kim, J. R. (1995). The stability of German money demand: tests of the cointegration relation. *Weltwirtshaftliches Archive,131*; 286-301.

Hassler, U., & Wolters, J. (2006). Autoregressive distributed lag models and cointegration. 0-14.

Heinonen, T. (1992). Financial Innovation, Ph. D. dissertation, *Helsinki School of Economics.*

Hoffman, D. L., & Rasche, R. H. (1991). Long-run income and interest elasticities of money demand in the United States, *Review of Economics and Statistics73*, 665-674.

Hoffman, D. L., Rasche R. H &Tieslau M. A. (1995). The stability of long-run money demand in five industrial countries, *"Journal of Monetary Economics35*, 317-339.

Hussain, Z., Awan, H., Hussain, I., Farhan, M., & Haq, I. U. (2006). Demand for money in Pakistan. *International Research Journal of Finance and Economics(5)*, 209-218.

Hye, Q. M. (2005). Financial innovation and demand for money in Pakistan.

Ireland, P. N. (1992). Endogenous financial innovation and the demand for money. *The Journal of Money, Credit and Banking, 2(1),* 107-123.

Johansen, S., Juselius, K., (1990). Maximum likelihood estimation and inference on cointegration with application to the demand for money. *Oxford Bulletin of Economics and Statistics 52*, 169-210.

Johansen, S. (1988). Statistical analysis of cointegrating vectors. *Journal of Economics dynamics and Control12:2/3*, 231-254.

Karfakis, C. I., & Parikh, A (1993). A cointegration approach to monetary targeting a australia. *Australian Economic Papers,52*; 169-210.

Khan, A. H. (1980). The demand for money in Pakistan: Some further results. *ThePakistan Development Review* 21:1.

Khan, A. H. (1982a) Permanent income, inflation expectations, and the money demand function in developing countries. *The Pakistan Development Review* 23,4.

Khan, A. H. (1982b). Adjustment Mechanism and the money demand function in Pakistan. *The Pakistan Economic and Social Review* 23,4.

Khan, A. H. (1994). Financial liberalization and the demand for money in Pakistan. *Pakistan Development Review,33*, 997-1006.

Klinz, W. (2008). The International financial crises: Its causes and what to do about it? *Liberals and Democrats Workshop*, (pp. 5-105).

Klovland, J. T. (1983) The demand for money in secular perspective: the case of Norway 1867-1980, European Economic Review.

Laidler, D. (1966). The rate of interest and the demand for money: Some empirical evidence. *Journal of Political Economy*, *67*, 327–351.

Luckett, D. G. (1984). *Money and Banking.* Singapore: McGraw Hill.

Madan, D. and B. Soubra, B. (1991). *Design and marketing of financial products*, Review of Financial Studies 4(2):361-384.

Mangla, I. U. (1979) An annual money demand function for pakistan: some further results.*The Pakistan Development Review* 20,1.

Mayer, C. (1986). Financial innovations: Curse or a blessing?, *Oxford Review of Economic Policy,2*, 1-19.

McNown, R., Wallace, M. S., (1992). Cointegration tests of a long run relationship between money demand and effective exchange rate.*Journal of International Money and Finance11*, 107-104.

McCallum, B. T. & Goodfriend, M. S. (1987). Money: theoretical analysis of the demand for money, *NBER Working Paper* W2157.

Melnick, R. (1995). Financial services, cointegration, and the demand for money in Israel. *Journal of Money, Credit and Banking, 27*, 140-153.

Merton, R. C. (1992). Financial innovation and economic performance, *Journal of Applied Corporate Finance,4,*12-22.

Miles, D., & Scott, A. (2003). *Macroeconmics Understanding the Wealth of Nations.* (C. Rhoads, Ed.) New York, New York, USA: John Wiley & Sons, Inc.

Miller, M., & Orr, D. (1966). A model of the demand for money by firms. *Quarterly Journal of Economics, 80*, 413–435.

Miller, M. H. (1986). Financial innovation: The last twenty years and the next, *Journal of Financial and Quantitative Analysis* 21(4), 459-471.

Miller, M.H. (1991). *Financial Innovation and Market Volatility*, (Blackwell, Cambridge, MA).

Miller, M. H. (1992). Financial innovation: Achievements and prospects, *Journal of Applied Corporate Finance* 4, 4-11.

Miyao, R. (1996). Does a cointegrating m2 demand relation really exist in the United States? *Journal of Money, Credit, and Banking, 28*, 365–380.

Muscatelli, V.A., & Papi, L., (1990). Cointegraion, financial innovation and modelling the demand for money in Italy. *The Manchester School58*, 242-259.

Nisar, S., & Aslam, N. (1983). The demand for money and the term structure of interest rates in Pakistan. *The Pakistan Development Review 22(2),* 97–116.

Pesaran, M. & H, Y. Shin, (1995). An autoregressive distributed lag modelling approach to cointegration analysis. In: Strom, S., Holly, A., Diamond, P. (Eds.), *Centennial Volume of Rangar Frisch, Cambridge University Press, Cambridge.*

Pesaran, M. H, Shin, Y., Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics,16;* 289-326.

Phillips, P., & Perron, P. (1988). Testing for a unit root in time series regression. *Biometrica75*, 335-346.

Plosser, C. I. (2009). Financial econometrics, financial innovation, and financial stability. *Journal of Financial Econometrics, 7* (1), 3-11.

Qayyum, A. (Winter 2000). Demand for real money balances by the business sector: an econometric investigation. *The Pakistan Development Review, 4 Part II(39),* 857-873.

Qayyum, A. (Autumn 2005). Modelling the demand for money in Pakistan. *The Pakistan Development Review, 44,* 233-252.

Qayyum, A. (Summer 2006). Money, inflation and growth in Pakistan. *Pakistan Development Review, 12,* 203-212.

Rehman, H., & Bahmani-Oskooee, M. (2005). Stability of the money demand function in Asian developing countries. *Applied Economics, 37* (7), 773-792.

Rossi, J. W. (1989). The demand for money in Brazil: What happened in the 1980s, *Journal of Development Economics* 31, 357-367.

Rothbard, N. M. (2008). *The Mystery of Banking* (2 ed.). Auburn, Alabama: Ludwig von Mises Institute.

Siklos, P. L. (1993). Income velocity and institutional change: some new time series evidence. 1870-1986, *Journal of Money, Credit and Banking, 25* (3), 377-92

Sylla, R. (1982). Monetary Innovation in America. *The Economic History Association, 42* (1), 21-30.

Tan, E. C. (1997). Money demand and financial sector developments in Malaysia. *Applied Economics, 9*, 1201-1215.

Taylor, M.P. (1987). Financial innovation, inflation and the stability of the demand for broad money in the United Kingdom. *Bulletin of Economic Research* , 225-233.

Thornton, D. L. (1983). Why does velocity matter? *Federal Reserve Bank of St. Louis, Review,* 65, 5-13.

Tobin, J. (1956). The interest elasticity of transactions demand for cash, *The Review ofEconomics and Statistics* 38(3), 241–47.

Tufano, P. (2003). *Financial innovation. In G. M. Constantinides, M. Harris, & R. M. Stulz,* Handbook of Corporate Finance *(Vol. 1A, pp. 308-331). Elsevier.*