

A survey of the demand for money in Asian developing countries: Error correction models and autoregressive distributed lag models

Ahmed Y. Abdulkheir

Department of Economics and Finance, Qassim University, Al Qassim 51422, Saudi Arabia.

Accepted 13 January, 2014

ABSTRACT

The concept of money demand looms large in the formulation and decision making of monetary policy. Thus, it has been the focal point of considerable economic research. This paper surveys some of the more recent research on the demand for money and the policy implications for Asian developing countries. By and large, the error correction model approach is the dominant methodology in most researches but the autoregressive distributed lag (ARDL) approach appears to be on the rise. Expectedly, the significant explanatory variables were found to be the income variable as the scale variable and domestic interest rate as the opportunity cost variable. In some cases, additional variables had to be included in the money demand function such as the exchange rate, the inflation rate and some external interest rate. Generally, the demand for money was found to be stable and the money supply can be used as a tool of monetary policy aimed at influencing the macroeconomic variables of the economy.

Keywords: Monetary aggregates, cointegration, Asian countries, money demand stability.

E-mail: aalkheir@hontmail.com.

INTRODUCTION

The demand for money is a very important element in the formulation and decision making of monetary policy. This probably explains why the demand for money has received considerable research attention both at the theoretical and empirical levels. In particular and with the advent of financial reforms and liberalization in both developed and less developed countries alike, empirical research in the demand for money received a big impetus first in the United States and the United Kingdom with the attention spreading subsequently to other developed countries and incidentally to less developed countries.

At the heart of the studies on the demand for money is the issue of the stability of the demand function. As stated by Poole (1970), the ability of central banks to use monetary aggregates effectively as tools of monetary policy turns on the issue of the stability of money demand. If the demand for money is stable, then the central banks should use the money supply as the tool for monetary policy. The use of interest rate to conduct monetary policy in this case will only result in instability.

On the other hand, if the demand for money is unstable, then the interest rate will be the proper tool for the central banks to use in conducting monetary policy. The use of the money supply as a policy tool will increase instability. Consequently, a major theme in the studies on the demand for money was the stability of money demand. Many of the studies on the demand for money in developed countries have concluded that money demand in those countries is turning increasingly unstable due to the financial reforms and innovations that took place in those countries. Those reforms and innovations had tended to heighten competition, increase the volume of money and near moneys, greatly popularize credit card use and electronic money transfers and increase the extent of capital mobility (Rao and Kumar, 2009). This raises the question of whether or not less developed countries have also gone through a similar experience due to the financial reforms witnessed by those countries.

Testing for the stability of money demand is a rather roundabout process. Of crucial importance in this regard

are the two processes of variable selection and specification on the one hand and the modeling framework on the other.

In the literature of monetary theory, it is common to present the basic equation of the demand for money as follows:

$$M/P = f(r, Y)$$

Where M/P denotes the demand for real balances which is a function of some measure of economic activity (Y) and the opportunity cost of holding money (r). M represents the relevant monetary aggregate and P the general price level. However, pioneer works on the demand for money have given this general framework a specific functional form which came to be known in the literature as the partial adjustment model (PAM) (Chow 1966, Goldfeld (1973). The PAM basically represents an equilibrium approach to the demand for money as agents are assumed to constantly adjust their holdings of real balances to their long run values stipulated by the determinants of money demand. Although this approach was widely used in the 1970s and early 1980s, it was criticized firstly for implicitly assuming what came to be known in the literature as the short run overshooting of the interest rate. For instance, the interest rate must rise to a higher level in the short run to ensure money market clearance, but to a lower extent in the Long run (Milbourne, 1988). Secondly PAM was also criticized for implicitly assuming an unreasonably long lag of adjustment for the money variable (Boughton, 1992). But as always, it takes a new theory to overcome an old one. This new theory, the buffer stock models (BSMs) emerged in the 1980s. Unlike the (PAMs), agents in this approach are not assumed to strive to equilibrate their portfolios on a continual basis. Instead, they may choose to hold more balances than they desire if their money holdings rise unexpectedly.

Likewise they may temporarily settle for less than optimal balances should their holdings fall unexpectedly. Money holdings are thus looked upon as shock absorber to even out unforeseen fluctuations in receipts and expenditures.

Although the BSMs did overcome the shortcomings associated with the PAMs, they nevertheless suffered from other shortcomings of their own notable among which are the restrictive nature of their short run dynamics and the widely disputed assumption that the money supply is exogenous. Incidentally, because of these and other limitations, the BSMs gave way to a new generation of models, namely the error correction models (ECMs) and their closely related variants the Autoregressive distributed lag (ARDL) models.

This paper surveys the relatively recent demand for money studies that have used the ECM and ARDL approaches to analyze the demand for money in Asian countries. Because of the rising importance of Asian

countries in the world economy, this paper aims at surveying money demand studies in those countries in particular to analyze and evaluate evidence on such highly relevant issues as the stability of the demand for money and what lessons, if any, might be learnt in this respect from model specification and choice of variables. It is hoped that this survey of the literature on the demand for money in Asian countries will highlight the latest trends in the demand for money and its stability in Asian countries and the efficacy of monetary policy which may be a major factor in developmental efforts. It may also help point the direction for further research in this area.

The rest of the paper is organized as follows: an outline of the ECM and ARDL models which have been largely used in the studies surveyed; discussion on the demand for money studies selected to be surveyed; and the conclusions.

ECMS AND ARDLS

By and large, the more recent research work on the demand for money has utilized the ECMS and ARDLS both for the developed and developing countries alike. The ECMS approach may be characterized basically as representation in which money demand is linked up to its basic determinants by means of an equation that postulates a long-run equilibrium relationship between money and its dependant variables and that also embodies short-run variation and dynamics (Kole and Ellen, 1995). As it turned out from the experience of many researches in the field, focusing solely on setting up the theoretical framework and articulating empirical estimation methods can be fruitless.

It is imperative also to pay due attention to the dynamics of the model and possible appropriate specifications. In the post BSMs era, it became clear from on-going research that the way PAMs and BSMs handled the dynamic aspect of the adjustment process was in fact gross oversimplification. Indeed, as alluded to earlier, a major drawback of the PAMs and BSMs is their very restrictive treatment of the lag structure because of their concentration solely on economic theory and their almost total lack of appreciation as to the dynamic structure of the model which could be properly specified only by carefully studying the data. In contrast, the ECMS approach is blessed with the twin advantages of giving economic theory the role of specifying long-run equilibrium while short run dynamics is derived directly from the data. As shown by Granger (1986), a stable long-run equilibrium is equivalent, statistically speaking, to co integration. ECM leads the endogenous variables to eventually converge to their co integrating relationships but also giving room to short adjustment dynamics. This co-integration term is what is called the error correction term which signifies that should the variables differ from their long-run equilibrium values, they will be driven back

to equilibrium by a series of partial short run adjustments. In other words, co-integration implies that a certain dynamic error-correction form exists in relation to the endogenous variables of the model (Engle and Granger, 1987).

The ECMs approach has several advantages. One thing that has worried students of the demand for money is that strongly trended variables in the demand function may be spuriously correlated. The ECMs approach seems to avoid this possibility. In addition, it is commonly feared that differencing of variables to stationarise them may result in the loss of long-run relationships. In ECMs such relationships are retained by the lagged levels of the variables encompassed in the ECMs specification. Thirdly and as pointed above ECMs, by and large, disentangle short-run dynamics from long-run effects. Lastly the ECMs approach does not unduly restrict the specification of the lagged variables allowing more room for structuring them as appropriate. Many authors have contributed to the ECMs approach notable among which are Granger (1986), Engle and Granger (1987), Johansen (1988) and Johansen and Juselius (1990).

In order to apply any cointegration technique, it is necessary to start by testing for the stationarity of the variables involved. This involves conducting one or more unit root tests. However, it was pointed out that cointegration results are not insensitive to the type of test used. More powerful tests yield different results than the less powerful ones. Because of this uncertainty, Pesaran and Shinn (1995) developed a new method of testing for cointegration. This approach is known as the autoregressive distributed lag (ARDL) approach. It is renowned for it's by passing the problem of classifying the variables into $I(1)$ variables- those integrated of degree one- and $I(0)$ variables- integrated of degree zero. Consequently and unlike standard cointegration tests, there is no need for unit root pretesting. It may also be worth mentioning that the ARDL approach has the added advantage that it enjoys desirable small sample properties which enhances its usability in developing country cases where data is often hard to obtain. The most recent articles on the demand for money function, such as the ones we survey in the next section on Asian developing countries largely used these two twin approaches, namely the ECMs and ARDL approaches.

DEMAND FOR MONEY STUDIES

There is a considerable amount of literature on the demand for money in Asian developing countries. However, our survey will be confined to the relatively recent writings on the subject since we are interested in recent developments and trends in this area which will presumably come to bear on the conduct and efficacy of monetary policy and perhaps also economic growth in this part of the world whose economic conditions are apt

to contribute appreciably to the progress or otherwise of the world economy. In his study on India, Padhan (2011) postulates a demand for money function in which he uses real income as a scale variable and the short term interest rate as the opportunity cost of real money balances in addition to the real exchange rate and real stock price. He departs from Friedman (1987) by including real income, rather than permanent income, as the scale variable. This can be justified by availability of data considerations. However, he follows Friedman (1987) in including the real rate of interest as the opportunity cost of money. Some scholars have argued that because of the weakness of financial markets in less developed countries, it may be more appropriate to consider real assets rather than financial assets as alternatives to holding money. This argument implies that the rate of inflation may be a more appropriate reflection of the opportunity cost of holding money.

In his empirical analysis using the ECMs approach and quarterly data from 1996Q2 to 2009Q2, Padhan found a long-run cointegration relationship between a number of money demand aggregates, real income, real interest rate and real exchange rate. ECM also supports the short-run dynamic properties of the money demand functions. On the important issue of the stability of the demand for money function, it was found that all alternative definitions of money used gave stable demand functions for money using the CUSUM and CUSUMSQ tests. This implies that it is possible for monetary authorities to target the money supply by way of conducting monetary policy to motivate the economy. These results agree with other earlier studies conducted within the Indian context such as Mohanty and Mitra (1999), Das and Mandal (2000) among others.

A chsani (2010) examined the M_2 demand for money function in Indonesia using both the ECM and ARDL approach of cointegration. Quarterly data for the period 1990:1 to 2008:3 were used to investigate the queries of the research. The author follows Miyao (1996) and Bahmani-Oskooee (2001) in postulating that the M_2 demand for money function is determined by real income and real interest rate. Use of M_2 money aggregate was criticized at times because the M_2 money aggregate, which is the broad definition of money, emphasizes the store of value function of money whereas it has been reasonably argued that in developing countries such as Indonesia, money is used mainly for transactions purposes and thus M_1 which is the narrow definition of money may be more appropriate. Moreover and as explained earlier, the inflation rate may be a more realistic measure for the opportunity cost of holding money. The results of the study indicated that M_2 was cointegrated to real income and interest rate in Indonesia during the period of the study. But not surprisingly real income was more significantly related to M_2 than real interest rate. This result probably highlights the fact that people demand money mainly as a means of exchange

rather than a store of value. Additionally, the results of the ARDL model showed a stable M_2 money demand function whereas the ECM model was unstable. The author criticizes the ECM model on account of the fact that the danger of misspecifying the lag-order constantly attending ECM may lead to faulty results. Earlier studies on the Indonesian case by Price and Insukindo (1994) and Dekle and Pradhan reached mixed results.

The case of Bangladesh was investigated by Hossain (2010). He used the ECMs approach and annual data over the period 1973 to 2008 to study the behavior of broad money demand in Bangladesh. He incorporated as determinants of broad money demand real GDP as the scale variable, the time deposit rate of interest along with the US treasury bill rate as measures of the cost of holding money and the nominal effective exchange rate of the local currency to capture wealth effects. All the variables were included in natural logarithmic form. It may be noteworthy that this study covered a period in which some financial reforms were introduced in Bangladesh whereby a pegged exchange rate system was replaced in 2003 by a "managed floating" exchange rate regime. The study concludes that there is a long-run cointegration relationship between broad money and the arguments included in the demand function. Both the scale and opportunity cost variable had significant coefficients. In addition, the demand for money function was found to be quite stable, perhaps corroborating to the general contention that financial reforms in developing countries are either ineffective or take a long time to go into effect. Hossain concludes, with some qualifications, that the conduct of monetary policy by targeting the money supply remains viable in Bangladesh.

Perhaps prompted by its shift to inflation targeting as a major monetary objective in 2000, Raksong (2012) set out to study the demand for money function in Thailand. The cointegration technique and the ECMs approach were used to analyze quarterly data for the period 2001: Q1 to 2010: Q1. The study was done for both M_1 and M_2 and also as in the case of Bangladesh, it included as explanatory variables real GDP, the real exchange rate and the real interest rate all expressed in logarithmic forms. Not unlike Bangladesh, the study covered a period in which some reform measures were going into effect whereby the exchange rate regime moved from a basket currency regime to a managed floating currency system and the country eventually adopted inflation targeting as a monetary framework. The results show that both M_1 and M_2 are co-integrated in the long-run with their determinants: real GDP, exchange rates and foreign interest rates. Money demand is stable for both definitions but M_1 appears to be preferable to M_2 in the conduct of monetary policy which is quite in agreement with the notion that money serves as a means of transactions in developing countries rather than as a store of value. The finding regarding stability of money demand also appears again to indicate that reforms in

developing countries are not strong enough to destabilize money demand behavior.

In his study of money demand in Pakistan, Sarwar et al. (2011) used the ARDL approach to analyse the demand for money in the Pakistani case. The study attempted to use Divisia indices ($Div M_1$, $Div M_2$) of monetary aggregates rather than the usual simple sum aggregates in his estimations. Annual data for the period 1972 to 2007 were used in the study. In addition to the usual scale and opportunity cost arguments, the authors introduced a measure of financial innovation in their demand for money function. Both long-run co-integration and short-run error correction were tested for along with the stability of money demand. The results of the study indicated the existence of a long-run integration between both the broad and narrow Divisia indices ($Div M_1$, $Div M_2$) and the independent variables in the demand for money function, namely real GDP, the price dual of Divisia (or opportunity cost of money demand) and financial innovation. All the independent variables had the sign predicted by theory a priori. Short-run dynamics showed that disequilibrium in one period would be fully corrected in the following period. As for the issue of money demand stability, the broader Divisia aggregate ($Div M_2$) was found to be the stable money demand function for Pakistan. The study carries the very important policy implication that monetary policy remains effective in Pakistan but the authors suggested that the Central Bank of Pakistan should abandon the simple sum monetary aggregates and switch over to Divisia aggregates. This conclusion does not address the question of the controllability of Divisia indices. In other words, it is pertinent to ask whether Divisia indices are susceptible to control the same way that simple sum aggregates are.

Tang (2002) analysed demand for M_3 in Malaysia using a version of the ECMs approach proposed by Pesaran et al. (2001) which is the unrestricted error correction model (UECM). Annual data for the period 1973 to 1998 were used. The study concluded that there was a long-run cointegration relation between the demand for M_3 and its postulated determinants in the model, namely the income expenditure components (aggregate consumption, investment and exports), the real exchange rate and interest rate. The demand for M_3 was also found stable in Malaysia using the usual CUSUM and CUSUMSQ tests. The study does not justify the replacement of real income by its components contrary to the basic theoretical formulation of money demand which treats income as the scale variable for money demand.

Jyh-Lin Wu and Yu-Hau Hu (2007) studied the demand for money in the case of Taiwan by applying a non-linear error correction model. The study emphasizes the crucial role of the real exchange rate in reflecting the effect of currency substitution in money demand and the stability of the demand for M_2 . Data covering the period between 1962:q1 and 2003:Q4 were used. The results of the study indicate the existence of a long-run cointegrating relation

Table 1. Salient Features of Results on Money Demand.

Author	Country	Monetary aggregate	Method	Significant variables	Major conclusions
Padhan (2011)	India	M ₁ , M ₃ , L ₁ , L ₂ , N M ₃	ECM	GDP, interest rate, stock price	Money demand stable, stock price influences money demand
Achsani (2010)	Indonesia	M ₂	ARDL	GDP, interest rate	Money demand stable, ARDL more appropriate for Indonesia
Hossain (2010)	Bangladesh	Broad money (BM)	ECM	GDP, interest rate, exchange rate	Money demand stable, nominal exchange rate should be stabilized
Raksong (2012)	Thailand	M ₁ , M ₂	ECM	GDP, foreign interest rate, exchange rate	Money demand stable. exchange rate more important than local interest
Sarwar et al. (2011)	Pakistan	Divisia Indices (Div M ₁ , Div M ₂)	ARDL	GDP, money price, financial innovation	Money demand stable, central bank should switch to Divisia aggregates.
Tang (2002)	Malaysia	M ₃	UECM	Real GDP, Components, interest rate, exchange rate	Money demand stable, M ₃ most appropriate intermediate target to control inflation
Wu et al. (2001)	Taiwan	M ₂	Nonlinear ECM	GDP, interest rate, real exchange rate	Money demand stable, real exchange rate particularly important in Taiwan money demand
Abdullah et al. (2010)	Singapore	M ₁ , M ₂	ARDL	GDP, inflation rate, interest rate,	Money demand stable, M ₂ is more predictable compared to M ₁
Abdullah et al. (2010)	The Philippines	M ₁ , M ₂	ARDL	GDP, inflation rate, exchange rate, interest rate.	Money demand stable, M ₂ is more predictable compared to M ₁
Bhatta (2011)	Nepal	M ₁ , M ₂	ARDL	GDP	Money demand stable, inflation rate and interest rate not significant

between the demand for real money balances, real income, interest rates and the real exchange rate. However, the findings indicate that for the case of Taiwan, it is crucial to include the real exchange rate and the relevant foreign interest rate for the co integration to exist and for money demand to be stable. This may be a reflection of the importance of the foreign sector in Taiwan economy, but other studies which included the stock market instead reached comparable results (Wu et al., 2001).

No recent country-specific research was found on the demand for money in the Philippines and Singapore. However, both countries were included in a study on a group of five Asian countries, namely the Philippines, Singapore, Indonesia, Thailand and Malaysia (Abdullah et al., 2010). Our concern here is with Singapore and the Philippines. The study used the ARDL approach to examine the relation between the dependent variables M₁ and M₂ on the one hand and real income, real interest rate, real exchange rate, foreign real interest rate and the rate

of inflation as determinants of money demand on the other. The ARDL test to verify the cointegration hypothesis among the variables of the money demand function revealed that as far as the two countries (the Philippines and Singapore) are concerned, M_2 is the more predictable monetary aggregate compared to M_1 . As far as Singapore is concerned, broad money demand M_2 was found to be positively and significantly affected by real income and the exchange rate but negatively affected by the inflation rate and the interest rate. For the Philippines, M_2 was found to be positively and significantly related to real income and inflation rate (unlike Singapore) as well as the exchange rate and interest rate. On the whole, the authors conclude that there is a unique cointegrated and stable long-run relationship between M_2 and its determinants in both countries. Clearly the policy implication is that monetary policy is an option which is open to the central banks in the two countries.

Bhatta (2011) studies the demand for money in Nepal using annual data for the period 1975 to 2009. Using the ARDL approach, his findings indicate the existence of a long-run cointegrating relationship between both narrow money M_2 and broad money M_2 on the one hand and the arguments included in the money demand function namely real GDP and the interest rate. Both had the correct sign stipulated by economic theory although the interest variable was insignificant. The coefficient of the error correction model indicates fast speed of adjustment to equilibrium following any short run shocks. CUSUM and CUSUMSQ tests support the stability and predictability of both narrow and broad money demands. Again the policy implication is that it is possible for the central bank to use the supply of money, however defined, as intermediate targets to pursue the objectives of macroeconomic policy. A summary of the important features of researches surveyed is provided in Table 1.

CONCLUSION

This paper has surveyed some of the more recent research on the demand for money and the policy implications for Asian developing countries. By and large, the studies were dominated by the ECM and ARDL approaches. Transition economies such as Vietnam, Cambodia and China were not included in the survey. One important pattern that is quite discernible in these studies is that the money demand function appears to be stable in Asian developing countries and more so for the broad monetary aggregate (M_2) than for the narrow aggregate (M_1). This seems to be an indication that financial reforms and innovations have not unraveled the demand for money process and the efficacy of monetary policy. Undoubtedly, the emergence of the ECM and ARDL approaches which made it possible to overcome the drawbacks of the PAMs and BSMs approaches have also facilitated the use of better articulated specifications

and perhaps a better informed selection of variables. Thus research quality and reliability of results may have improved considerably.

The fact that M_2 is the more stable demand monetary aggregate seems to suggest that money serves more as a store of value in Asia than as a means of exchange. Therefore M_2 should be the focus of monetary policy aimed at influencing the macroeconomic variables of the economy. Moreover, real GDP appears to be the appropriate scale variable to be used in money demand studies judging from its correct sign and significance at least in the studies surveyed. However, in many of the studies, interest rates did not perform adequately as the opportunity cost of holding money. It seems that data on the inflation rate which may be the best alternative are not sufficiently available. Future research will probably have to tackle this aspect more satisfactorily.

REFERENCES

- Abdullah, H., Ali, J., and Hylmee, L. (2010). Re-examining the demand for money in Asean-5 countries. *Asian Social Science*, 6(7):146-155.
- Achsani, N. A. (2010). Stability of money demand in an emerging market economy: An error correction and ARDL model for Indonesia. *Research Journal of International Studies*, 13:54-62.
- Bahmani-Oskooee, M. (2001). How stable is M_2 money demand function in Japan? *Japan and the World Economy*, 13:455-461.
- Bhatta, S. R. (2011). Stability of Demand for Money Function in Nepal: A Co integration and Error Correction Modeling Approach. Online at [http://mpru.ub.uni-muenchen.de/41404.\(1-15\)](http://mpru.ub.uni-muenchen.de/41404.(1-15)).
- Boughton, J. M. (1992). International comparisons of money demand. *Open Economies Review*, 3(3):323-343.
- Chow, G. C. (1966). On the long-run and short-run demand for money. *Journal of Political Economy*, 74:111-31.
- Das, S., and Mandal, K. (2000). Modeling money demand in India: testing weak, strong & super exogeneity. *Indian Economic Review*, 35:1-19.
- Engle, R. F., and Granger, C. W. J. (1987). Co-integration and error correction: Representation, estimation, and testing. *Econometrica*, 55(2):251-76.
- Friedman, M. (1987). The quantity theory of money. In J. Eatwell, M. Milgate and P. Newman (Eds.), *The new palgrave: A Dictionary of Economics*, Vol. 4. London: McMillan Press.
- Goldfeld, S. M. (1973). The demand for money revisited. *Brookings Papers on Economic Activity*, 3:577-638.
- Granger, C. W. J. (1986). Developments in the study of co-integrated economic variables. *Oxford Bulletin of Economics and Statistics*, 48(3):213-228.
- Hossain, A. A. (2010). Monetary targeting for price stability in Bangladesh: How stable is its money demand function and the linkage between money supply growth and inflation. *Journal of Asian Economics*, 21:564-578.
- Johansen, S. (1988). Statistical analysis of co-integrating vectors. *Journal of Economic Dynamics and Control*, 12:321-354.
- Johansen, S., and Juselius, K. (1990). Maximum likelihood and inferences on co-integration - with applications to the demand for money. *Oxford Bulletin of Economics and Statistics*, 52:169-210.
- Kole, L. S., and Ellen, E. M., (1995). German monetary targeting: A retrospective view. *Federal Reserve Bulletin*, 81(10):917-931.
- Milbourne, R. (1988). Disequilibrium buffer stock models: A survey. *Journal of Economic Surveys*, 2(3):187-208.
- Miyao, R. (1996). Does a cointegrating M_2 demand relation really exist in Japan? *Journal of the Japanese and International Economies*, 10:169-180.
- Mohanty, D., and Mitra, A. K. (1999). Experience with monetary targeting, *India Economic and Political Weekly*, 16-22/23-

- 29.34,3 & 4,123-32.
- Padhan, P. C. (2011). Stability of demand for money in India: Evidence from monetary and Liquidity Aggregates. *International Journal of Economics and Finance*, 3(1):271-282.
- Pesaran, M. H., and Shin, Y. (1995). An autoregressive distributed lag modeling approach to Co integration analysis. DAE Working Paper No. 9514, Department of Applied Economics (Cambridge University).
- Pesaran, M. H., Shin, Y., and Smith, R.J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, 16(3):289-326.
- Poole, W. (1970). The optimal choice of money policy instruments in a simple macro model. *Quarterly Journal of Economics*, 192-216.
- Raksong, S. (2012). The money demand behavior under the inflation targeting framework in Thailand. *International Research Journal of Finance and Economics*, 84:14-24.
- Rao, B. B., and Kumar, S. (2009). A panel data approach to the demand for money and the effects of financial reforms in the Asian Countries. *Economic Modelling*, 26:1013-1017.
- Sarwar, L., Hussain, Z., and Awan, M. S. (2011). Money Demand Functions for Pakistan (Divisia Approach) Online at <http://mpra.ub.uni-muenchen.de/34361>
- Tang, T. C. (2002). Demand for M_3 and expenditure components in Malaysia: Assessment from bound testing approach. *Applied Economics Letters*, 9:721-725.
- Wu, C-S., Lin, J-L., Tiao G., and Cho, D. (2001). Is Money Demand in Taiwan Stable? Online at www.karyiuwong.com/confer/taipei02/papers/lin.pdf.
- Wu, J. L., and Hu, Y. H. (2007) Currency substitution and nonlinear error correction in Taiwan's demand for broad money. *Applied Economics*, 39(13):1635-1645.