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An Empirical Exercise of Money-Output Relationship of Bangladesh Economy

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Abstract

The relationship between money and output is one of the important topics in macroeconomic research. There are so many variables that affect this relationship that neither theory nor econometric analysis gives any conclusive result. The current study investigates this relationship for Bangladesh. Using cointegration method and Granger causality we have found that for Bangladesh money causes output. This result is valid for different definitions of money like M1, M2, Cash outside bank and total bank credit. We also found that total bank deposit does not have any relationship with real GDP. This however portrays an economy that is predominantly cash based with financial system suffering from inefficiency.

1. Introduction

The relationship between Money circulated and Gross Domestic Product (GDP) of a country is one of the most important topics of Macroeconomic research. Researchers take different positions on this issue according to their empirical findings and motivations. In one side, there are neoclassical economists who do not give much importance to the presence of money in the economy and in the other side there are monetarists who strongly argue that the money is one of the most important instruments to control macroeconomic targets. Other schools take their position somewhere in the middle of these two extremes. Although

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Economics now has become sufficiently quantitative with strong Mathematics and Econometrics, still empirical analysis cannot determine this relationship conclusively. The procedures of econometrics are not sufficiently strong to test the direction of causality and when the method is strong it suffers from theoretical ambiguity, which tells that the relationship between money and output is country and time dependent. Friedman and Schwartz (1963), Anderson and Jordan (1968), Sims (1972) among others strongly argued for non- neutrality of money. They argued that change in monetary measure can affect the real output. But the association was weakened in the 1980s. Among others, Christiano and Ljungqvist (1988), Friedman and Kuttner (1992, 1993) have documented that including data from the 1980's sharply weakens the post-war time-series evidence indicating significant relationship between money and real income. However, the relationship is still there in the sense that Stock and Watson (1989), Becketti and Morris (1992), Feldstein and Stock (1994), Hafer and Kutan (1997), and Swanson (1998) among others found significant predictive component in money for real and nominal output. This relationship between money and GDP is not only important from theoretical sense but also from policy perspective as output is the prime concern of any macroeconomic policy and government need some steering mechanism for that.

This paper tries to identify the relationship between money and national output for Bangladesh. As mentioned earlier, Macroeconomy of every country is unique and they need to be treated after considering their peculiarities. It is expected that fundamental relationships between different macroeconomic variables may follow certain common theories but local preferences are also crucial in determining their behavior. The rest of the paper is organized as follows. Section 2 presents the review of literature. Section 3 discusses the methodology and attributes of data. Econometric results and their discussion follow in Section 4 with concluding remarks.

2. Literature Review

There are at least three different competing ideas in contemporary literature apart from the initial theoretical motivation of non-neutrality of money. They are given below.

Lucas (1973), Sargent and Wallace (1975) argued in their respective version of monetarism that the unanticipated component of movements in the money stock produces non-neutrality. Anticipated changes in aggregate demand policy have no output response; thus, deterministic feedback policy rules do not help in achieving

policy targets [(Barro 1977, 1978), Barro and Rush (1980), Gordon (1982), Mishkin (1982)].

Friedman (1988) and Handa (2000) in their theories argued that the breakage of link and non-neutrality of money is due to the distortion of the traditional definition of money as a medium of payments. Improper financial aggregation and inappropriate choice of the opportunity cost of money were sources of the controversy on non-neutrality of money. Among others, Belongia (1996) documented that inferences about the effects of money on real output depend importantly on the choice of financial index because simple-sum aggregates cannot internalize pure substitution effects.

Another line of argument largely ignores money both in the analysis of the macroeconomy as well as in the formation of monetary policy. For instance, Taylor-like policy rules model the interest rate as determined by movements in the output gap and inflation: monetary aggregates play no direct function in the formulation of policy in such a setup. Empirically, the findings of Rudebusch and Svensson (1999, 2002) are often cited as evidence supporting such a money-free model.

On empirical side the role of money and its effects on national output have generated a voluminous amount of literature [Blanchard (1990), Lucas (1996), Sargent (1996)].

Friedman and Schwartz (1963) in their seminal paper argued for strong effect of money on output. Numerous studies since then have aimed to characterize and establish the interactions between money and output. Sims (1972), using a better technical way reported strong evidence of money causing output. However, the monetary effect vanishes when short-term interest rates are included as a control variable (Sims (1980), Litterman and Weiss (1985)). Mishkin (1982), using data for the US, has provided support for the proposition that monetary shocks have real short-run effects. Since then many studies have tested this proposition using US data and now it is widely accepted that these two variables are associated with each other (Cecchetti (1995), Svensson (2001)). Evidences from other courtiers are not widely confirmed and correlation may be weaker in one historical data set than in another (Robert Lucas, 1995). Poirier (1991) discovers that money is neutral in some countries, but not in others. McCandless and Weber (1995) analyze data for 110 countries over a 30 year period and discovered that there is no correlation between growth rates of money and real output. This holds for all definitions of money, but not for the OECD countries in their sample. (Correlations range between and)

Sophisticated empirical models have been devised to examine the implications of anticipated and unanticipated (Barro (1977)), positive and negative (Cover (1992) Thoma (1994)), and large and small monetary shocks (Ravn and Sola (1996)) on output movements. The set of controlling variables has been expanded to include, for example, monetary policy regimes (Bernanke and Mihov, 1998), commodity prices (Sims, 1992), and credit rationing (Galbraith, 1996).

We have some counterintuitive findings as well. Kormendi and Meguire (1985) find that the average rate of growth in the money supply and the standard deviation of money shocks are both negatively associated with real GDP. Dwyer and Hafer (1988) find that money growth is negatively related with the level of real output, but uncorrelated with the growth of real output.

3. Methodology and Data Set

We tested the existence of unit root to check the stationarity of the variables. Financial and macro variables are well known for their non-stationarity. We performed augmented Dickey Fuller test to test the existence of unit root. We found that the variables are non stationary and thus can not be regressed without making them stationary. Then we ran cointegration test to find out possible linear combination of the variables that can be considered stationary. If co-integration is found then we ran Granger Casualty test to check the possible direction of causality.

In time series analysis, non-stationary data may lead to spurious regression unless there exists at least one Cointegrating relationship. The Johansen procedure is applied to test for cointegration. This method provides a unified framework for estimation and testing of cointegration relations in the context of Vector Autoregressive (VAR) error correction models. For this approach one has to estimate an Unrestricted Vector of Autocorrelation of the form:

$$\Delta x_t = \alpha + \theta_1 \Delta x_{t-1} + \theta_2 \Delta x_{t-2} + \theta_3 \Delta x_{t-3} + \cdots\cdots + \theta_{k-1} \Delta x_{t-k+1} + \theta_k \Delta x_{t-k} + u_t$$

where Δ is the difference operator, x_i is a (n x 1) vector of non-stationary variables (in levels) and u_i is also the (n x 1) vector of random errors. The matrix θ contains the information on long run relationship between variables. If the rank of $\theta = 0$, the variables are not cointegrated. On the other hand if rank (usually denoted by r) is equal to one, there exists one cointegrating vector and finally if, $1<r<n$, there are multiple cointegrating vectors. Johansen and Juselius (1990) have derived two tests for cointegration, namely the trace test and the maximum Eigen value test. The trace statistic evaluates the null hypothesis that there are at most r

cointegrating vectors whereas the maximal Eigen value test evaluates the null hypothesis that there are exactly *r* cointegrating vectors in x_t.

According to co-integration analysis, when two variables are cointegrated then there is at least one direction of causality. Granger-causality, introduced by Granger (1969, 1980, 1988), is one of the important issues that has been much studied in empirical macroeconomics and empirical finance. Engle and Granger (1987) have indicated that the existence of non-stationary, can give misleading conclusions in the Granger causality test. It is only possible to infer a causal long run relationship between non-stationary time series when the variables are co-integrated.

If *y* and *x* are the variables of interest, then the Granger causality test determines whether past values of *y* add to the explanation of current values of *x* as provided by information in past values of *x* itself. If past changes in *y* does not help explain current changes in *x*, then *y* does not Granger cause *x*. Similarly, we can investigate whether *x* Granger causes *y* by interchanging them and repeating the process. There are four likely outcomes in the Granger causality test: (1) neither variable Granger cause each other, (2) *y* causes *x* but not otherwise, (3) *x* causes *y* but not otherwise, (4) both *x* and *y* Granger cause each other.

In this study the causality test between GDP and Financial indicators will be conducted. For this the following two sets of equation are estimated:

$$x_t = \alpha_0 + \alpha_1 x_{t-1} + \cdots\cdots + \alpha_l x_{t-l} + \beta_1 y_{t-1} + \cdots\cdots + \beta_l y_{t-l} + u_t$$

$$y_t = \alpha_0 + \alpha_1 y_{t-1} + \cdots\cdots + \alpha_l y_{t-l} + \beta_1 x_{t-1} + \cdots\cdots + \beta_l x_{t-l} + v_t$$

For all possible pairs of (*x*,*y*) series in the group. The reported F-statistics are the Wald statistics for the joint hypothesis $\beta_1 = \beta_2 = \beta_3 = \cdots\cdots = \beta_l = 0$

As explained in the introduction this paper examines the long run relationship and the direction of causality between money and national output of Bangladesh. The measure of GDP can be considered as the indicator of economic development. For money we have used different Financial Indicators (FI) like Currency outside Bank (C_oB), Narrow money (M1), Broad money (M2), Total Bank Credit (TBC) and Total Bank Deposits (TBD) in our study to capture the greater picture of measure of money as well as financial development. However, we have not done much investigation on channels through which this possible effect can pass through. Mishkin (2006) has an excellent discussion on such possible channels.

The Data for all the variables have been drawn from the different issues of Economic Trends published by Bangladesh Bank. It is mentionable here that real

GDP has been considered in our study considering 1973 as the Base Year. In this regard the GDP data has been converted twice in 1987 and 1990 to make it compatible with the base year. It should be mentioned here that since Bangladesh got her independence in 1971, the article concentrates over the period 1976-2006 for which 31 observations are available at most. Small sample size might be problematic in finding the long run relationship. Eviews 5.0 have been used as statistical software packages for all the tests run in this study. All the econometric results are available on request.

Results

Unit root tests were conducted to determine the order of integration of the data series for each of the variables. Table 1 shows the ADF statistics and corresponding critical values of all the variables in their level and first differenced forms.

From the table above, the null hypothesis of unit root in levels of the variables and the first differences of the variables at 90%, 95% and 99% confidence level cannot be rejected. It is clear that all the concerned variables are non-stationary in their level and first differences. The above results also imply that the variables would

Table 1: Augmented Dickey Fuller Unit Root Test for Real GDP and FI

	ADF Statistics (Only Constant) Variables are in levels	Decision	ADF Statistics (Only Constant) Variables are in 1st difference	Decision
RGDP	12.69405	Non Stationary	3.110956	Non Stationary
M1	3.382743	Non Stationary	1.576244	Non Stationary
M2	0.756663	Non Stationary	1.921519	Non Stationary
TBC	16.94940	Non Stationary	4.284085	Non Stationary
TBD	-0.254779	Non Stationary	7.994556	Non Stationary
CoB	1.687791	Non Stationary	2.978176	Non Stationary

yield spurious results unless the variables are cointegrated. These results, however, allow to proceed the next stage of testing for cointegration.

Results of Johansen test for co-integration are given Tables 2 and 3.

Table 2 : Johansen Test for Cointegration (Maximum Eigen value Test)

	Null Hypothesis	Alternative Hypothesis	Statistics	99% Critical Value	95% Critical Value	Conclusion
M1 and RGDP	None	At Most One	31.81 (0.12)	18.63 (6.65)	14.07 (3.76)	One Cointegrating Relationship
M2 and RGDP	None	At Most One	29.46 (2.79)	18.63 (6.65)	14.07 (3.76)	One Cointegrating Relationship
TBC and RGDP	None	At Most One	36.71 (0.31)	18.63 (6.65)	14.07 (3.76)	One Cointegrating Relationship
CoB and RGDP	None	At Most One	33.95 (2.50)	18.63 (6.65)	14.07 (3.76)	One Cointegrating Relationship
TBD and RGDP	None	At Most One	16.54 (3.97)	18.63 (6.65)	14.07 (3.76)	No Cointegrating Relationship

Table 3: Johansen Test for Cointegration (Trace Test)

	Null Hypothesis	Alternative Hypothesis	Statistics	99% Critical Value	95% Critical Value	Conclusion
M1 and RGDP	None	At Most One	31.94 (0.12)	20.04 (6.65)	15.41 (3.76)	One Cointegrating Relationship
M2 and RGDP	None	At Most One	32.25 (2.79)	20.04 (6.65)	15.41 (3.76)	One Cointegrating Relationship
TBC and RGDP	None	At Most One	36.71 (0.31)	20.04 (6.65)	15.41 (3.76)	One Cointegrating Relationship
CoB and RGDP	None	At Most One	36.45 (2.50)	20.04 (6.65)	15.51 (3.76)	One Cointegrating Relationship
TBD and RGDP	None	At Most One	20.52 (3.97)	20.04 (6.65)	15.51 (3.76)	No Cointegrating Relationship

The Granger causality test has been done and the results are reported in Table 4. The table shows that there is causal relationship running from RGDP to M1, M2 and TBC and CoB to RGDP.

Discussion on results obtained

Now summarizing the results that we have so far we see that non stationarity among financial and macroeconomic variables are somewhat expected. Test of

Table 4: Granger Causality Tests

Hypothesis	F-Statistics	P-Value	Granger Causality
RGDP does not Granger Cause M1	0.52170	0.59938	M1 causes RGDP
M1 does not Granger Cause RGDP	7.79578	0.00213	
RGDP does not Granger Cause M2	2.50953	0.10009	M2 causes RGDP
M2 does not Granger Cause RGDP	8.37772	0.00148	
RGDP does not Granger Cause TBC	0.81832	0.45222	TBC causes RGDP
TBC does not Granger Cause RGDP	7.83906	0.00217	
RGDP does not Granger Cause CoB	3.00248	0.00671	Bidirectional Causality
CoB does not Granger Cause RGDP	9.62075	0.00075	

cointegration tells that all the variables are cointegrated with real GDP except total bank deposit. This is little bit unexpected as the conventional economic theory tells that deposits (savings) are the unspent portion of income. This means that deposit is neither the significant portion of the saved income nor fuels the GDP. This probably indicates that there are other sources of deposit (income) than conventional channels. These possible "other sources" as they are not reflected in regular GDP, will be reflected in the unofficial economy. In that case we would expect that the underground economy of Bangladesh will be very high. In fact different measures of underground economy of Bangladesh have pointed out that the figure is at least 35% of official economy, which is a large value and sufficient enough to distort results (Schneider (2004)).

This effect is carried onto other results as well. Results of Granger causality test (which is the test of precedence) tell that all monetary and financial values precede real GDP. So statistically money does cause output in case of Bangladesh but output does not cause money. Three out of four money measures that were significant had a large component of cash in their measure. Credit causes GDP is a logical thing to expect but other measures of money causing output indicates that there is a source of money that is not reflected in GDP. This source may again be the unofficial economy that may distort numbers.

However the both way causality found between CoB and real GDP is interesting. This indicates that the cash money outside banks directly causes output and output also directly causes cash money. This however is expected in a mostly cash based economy. When this result is coupled with non-causality from GDP to M1 indicates that money generated through economic activities is trapped as cash and not entering into the banking system. Deposit as told earlier is not representative of real GDP. This gives somewhat an indication that the financial system in general is not as efficient as one would expect.

Conclusion

In the present study we have found that in Bangladesh money causes output, which is a standard economic phenomena. But we have also found some relationships that are not quite predicted by economic theories. Following existing literature we tried to explain them. But further research should be done especially investigating the reason behind existence of no long term relationship between bank deposit and real GDP. Official and private capital flow from foreign countries in Bangladesh is not overwhelming for last many years. So the fuel for GDP growth is expected to be within the country and in that case non-significance of bank deposit can be rationalized only by claiming Bangladesh economy as a cash based economy. While this may be the case but this needs to be proved.

Reference

1. Andersen, L.C. and J.L. Jordan (1968), "Monetary and fiscal actions: a test of their relative importance in economic stabilization," *Federal Reserve Bank of St. Louis Review*, vol. 50, no. 11, November, pp. 11-24.

2. Barro, R. J. (1977). `Unanticipated Money Growth and Unemployment in the United States', *American Economic Review*, Vol. 67, pp. 101-115.

3. Barro, Robert (1978). "Unanticipated Money, Output, and the Price Level in the United States", *Journal of Political Economy*, 86, pp. 549-80.

4. Barro, Robert and Mark Rush (1980). "Unanticipated Money and Economic Activity", *In Rational Expectations and Economic Policy*, ed. Stanley Fischer, pp. 23-48. Chicago: University of Chicago Press/National Bureau of Economic Research.

5. Becketti, S. and C. Morris (1992). "Does Money Matter Anymore? A Comment on Friedman and Kuttner", Working Paper, Federal Reserve Bank of Kansas City.

6. Belongia, Michael T. (1996). "Measurement Matters: Recent Results from Monetary Economics Examined." *Journal of Political Economy* 104, 5 (1996): pp. 1065-83.

7. Blanchard, O. J. (1990). `Why Does Money Affect Output? A Survey', in Friedman, M. and Hahn, F. H. (eds.), *Handbook of Monetary Economics*, Vol. 2, North-Holland, Amsterdam.

8. Cecchetti, S. G. (1995). "Inflation Indicators and Inflation Policy," in B.S. Bernanke and J.J. Rotemberg, eds., *NBER Macroeconomics Annual 1995*, Cambridge, Mass.: MIT Press, pp. 189–219.

9. Bernanke, BS., and Mihov, I., (1998), "Measuring Monetary Policy" The Quarterly Journal of Economics, Vol. 113, No. 3, pp. 869-902.

10. Christiano, L. and Ljungqvist, L. (1988). `Money Does Granger-Cause Output in the Bivariate Money-Output Relation', *Journal of Monetary Economics*, Vol. 22, pp. 217-36

11. Cover, J. P. (1992). `Asymmetric Effects of Positive and Negative Money-Supply Shocks', *Quarterly Journal of Economics*, Vol. 4, pp. 1261-282.

12. Dwyer, Gerald and R. Hafer (1988). "Is Money Irrelevant?" *Federal Reserve Bank of St. Louis Review,* 70 (May/June), pp. 3-17.

13. Engle, Robert F., and C.W.J Granger (1987). "Co-integration and Error Correction: Representation, Estimation, and Testing." *Econometrica* 55 pp. 251-76.

14. Feldstein, M. and J.H. Stock (1994). "The Use of a Monetary Aggregate to Target Nominal GDP", in G.N. Mankiw, (ed.), *Monetary Policy*, Chicago: Chicago University Press, pp. 7-62.

15. Friedman, B M. (1988). "Lessons on Monetary Policy from the 1980s." *Journal of Economic Perspectives 2*, pp. 51-72.

16. Friedman, B. M. and Kuttner, K. N. (1992). `Money, Income, Prices, and Interest Rates', *American Economic Review,* Vol. 82, pp. 472-492.

17. Friedman, B. M. and Kuttner, K. N. (1993). `Another Look at the Evidence on Money-Income Causality'. *Journal of Econometrics*, Vol. 57, pp. 189-203.

18. Friedman, Milton and Anna Schwartz (1963). *A Monetary History of The United States, 1867-1960.* Princeton: Princeton University Press.

19. Galbraith, J. W. (1996). `Credit Rationing and Threshold Effects in the Relation between Money and Output', *Journal of Applied Econometrics*, Vol. 11, pp. 419-29.

20. Gordon, Robert J. (1982). "Price Inertia and Policy Ineffectiveness in the United States, 1890-1980." Journal of Political Economy 90, December: pp. 1087-117.

21. Granger, C. W. J. (1969). "Investigating Causal Relations by econometric Models and Cross- Spectral Methods", *Econometrica*, 37, pp. 424-438.

22. Granger, C. W. J. (1980). "Testing for Causality: A Personal Viewpoint", *Journal of Economic Dynamics and Control, 2*, pp. 329-352.

23. Granger, C. W .J. (1988). "Some Recent Developments in a Concept of Causality", *Journal of Econometrics, 39*, pp. 199-211.

24. Hafer, R.W. and A.M. Kutan (1997). "More Evidence on the Money-Output Relationship", *Economic Inquiry*, (35), pp. 48-58.

25. Handa, Jagdish (2000). *Monetary Economics*, London: Routledge, 2000.

26. Johansen, S. and Juselius, K., (1990), "Maximum likelihood estimation and inference on cointegration with applications to the demand for money". Oxf. Bull. Econ. Stat. 52, pp. 169-210.

27. Kormendi, RL., and Meguire, PG., (1985), "Macroeconomic Determinants of Growth: Cross Country Evidence", Journal of Monetary Economics 16, pp. 141-163.

28. Litterman, Robert and Laurence Weiss (1985). "Money, Real Interest Rates, and Output: A Reinterpretation of U.S. Postwar Data." Econometrica 53 (January): pp. 129-156.

29. Lucus, R. (1973). Some international evidence on output-inflation tradeoffs, *American Economic Review*, 63, pp. 326-34.

30. Lucas, R Jr, (1995), "Nobel Lecture: Monetary Neutrality," *Journal of Political Economy*," pp. 661-682.

31. Lucas, R. E. Jr. (1996). "Nobel Lecture: Monetary Neutrality", *Journal of Political Economy*, Vol. 104, pp. 661-82.

32. McCandless, George, T. and Warren Weber (1995). "*Federal Reserve Bank of Monneapolis Quarterly Review*, Vol.19, No. 3, pp. 2-11.

33. Mishkin, Frederic S. (1982). "Does Anticipated Monetary Policy Matter: An Econometric Investigation." *Journal of Political Economy* 90, 1.

34. Mishkin, FS., (2006), "Monetary Policy Strategy: How Did We Get There?", Working paper 12515. Cambridge, Mass.: National Bureau of Economic Research.

35. Poirier, Dale (1991). "A Bayesian View of Nominal Money and Real Output through a New Classical Macroeconomic Window", *Journal of Business and Economic Statistics*, 9, pp. 125-148.

36. Ravn, M. O. and M. Sola, (1996). A Reconsideration of the Empirical Evidence on the Asymmetric Effects of Money-Supply Shocks: Positive vs. Negative or Big vs. Small?., *Centre for Nonlinear Modeling in Economics Working Paper* No. 1996-4, University of Aarhus.

37. Rudebusch, Glenn D., and Lars E.O. Svensson (1999). "Policy Rules for Inflation Targeting," in *Monetary Policy Rules*, edited by John B. Taylor, Chicago: Chicago University Press, pp. 203-246.

38. Rudebusch, Glenn D., and Lars E.O. Svensson (2002). "Eurosystem Monetary Targeting: Lessons from U.S. Data", *European Economic Review* 46, pp. 417-442.

39. Sargent, T. J. and Neil Wallace (1975). "'Rational' Expectations, the Optimal Monetary Instrument, and the Optimal Money Supply Rule," *Journal of Political Economy* 83: pp. 241-254.

40. Schneider, F. (2004). The Size of the Shadow Economies of 145 Countries all over the World: First Results over the Period 1999 to 2003. IZA Discussion Papers, Institute for the Study of Labor (IZA).

41. Sims, C. A. (1972) "Money, Income, and Causality', *American Economic Review*, Vol. 62, pp. 540-52.

42. Sims, CA., (1992), "Money, Income, Causality", American Economic Review 62, pp. 540 –542.

43. Sims, C. A. (1980). `Macroeconomics and Reality', *Econometrica*, Vol. 48, pp. 1-48.

44. Stock, James and Mark Watson (1989). "Interpreting the Evidence on Money-Income Causality." *Journal of Econometrics* 40 (January): pp. 161-81.

45. Svensson, Lars E. O. (2001). "The Zero Bound in an Open Economy: A Foolproof Way of Escaping a Liquidity Trap," in *Monetary and Economic Studies* (Special Edition), vol. 19, no. 1, February 2001, pp. 277-312.

46. Swanson, N.R. (1998). "Money and Output Viewed through a Rolling Window", *Journal of Monetary Economics*, (41), pp. 455-473.

47. Thoma, M. A. (1994). `Sub sample Instability and Asymmetries in Money-Income Causality', *Journal of Econometrics*, Vol. 64, pp. 279-306.

48. Bernanke, BS., and Mihov, I., (1998), "Measuring Monetary Policy" The Quarterly Journal of Economics, Vol. 113, No. 3, pp. 869-902.

49. Johansen, S. and Juselius, K., (1990), “Maximum likelihood estimation and inference on cointegration with applications to the demand for money”. Oxf. Bull. Econ. Stat. 52, pp. 169-210.

50. Kormendi, RL., and Meguire, PG., (1985), “Macroeconomic Determinants of Growth: Cross Country Evidence”, Journal of Monetary Economics 16, pp. 141-163.

51. Mishkin, FS., (2006), “Monetary Policy Strategy: How Did We Get There?”, Working paper 12515. Cambridge, Mass.: National Bureau of Economic Research.

52. Sims, CA., (1992), “Money, Income, Causality”, American Economic Review 62, pp. 540 –542.

53. Sims, CA., (1992), "Money, Income, Causality", American Economic Review 62, pp. 540 -542.

54. Sims, C. A. (1980). `Macroeconomics and Reality', Econometrica, Vol. 48, pp. 1-48.

55. Stock, James and Mark Watson (1989). "Interpreting the Evidence on Money-Income Causality." Journal of Econometrics 40 (January): pp. 161-81.

56. Svensson, Lars E. O. (2001). "The Zero Bound in an Open Economy: A Foolproof Way of Escaping a Liquidity Trap," in Monetary and Economic Studies (Special Edition), vol. 19, no. 1, February 2001, pp. 277-312.

57. Swanson, N.R. (1998). "Money and Output Viewed through a Rolling Window", Journal of Monetary Economics, (41), pp. 455-473.

48. Thoma, M. A. (1994). `Sub sample Instability and Asymmetries in Money-Income Causality', Journal of Econometrics, Vol. 64, pp. 279-306.

Appendix A

	M1	M2	Real GDP	TBD	TBC	CoB
Mean	12174.60	45877.86	11486.51	39160.53	38909.67	5531.77
Standard Deviation	12870.67	55317.47	5160.10	45726.78	44150.00	5875.50
Maximum	50650.00	211986.20	23404.18	172453.40	162842.70	22862.10
Minimum	755.92	1292.43	5056.90	913.20	905.00	290.20

Graph: Time series