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Money Demand Relation in India

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Testing for Multiple Endogenous Breaks in the Long Run Money Demand Relation in India\textsuperscript{1}

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\textbf{Abstract}

This article uses the Bai-Perron multiple endogenous breaks test to examine the parameter stability of the long run money demand relation in India. We find two breaks in the Indian money demand relation; in 1961 and 1971. The income and semi-interest rate elasticities (in absolute terms) drifted temporarily upwards following the first break but reverted back after the second. This temporary phenomenon is attributed to the uncertainties surrounding the war period in India which made the financial systems less efficient. Nonetheless, the results confirm that demand for money is stable and well determined in India.

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1.0 Introduction

Estimating and evaluating the stability of demand for money is important particularly in light of the recent innovations in the financial markets which has instigated concerns that demand for money (M1) in the less developed economies, as in the developed economies, has become unstable. Therefore, monetary authorities in the former have resorted to targeting the rate of interest as opposed to the quantity of money supply without sufficient evidence that the money demand has become instable.

In empirical works, CUSUM tests were commonly used for testing temporal stability of the underlying relationships. However, with advancements in econometric methods, it is now possible to test for unknown breaks dates in the sample and determine the stability of estimated equations. The Gregory-Hansen's (1996) procedure, for example, proposes a cointegration procedure that is based on the Engle-Granger method with the null of no cointegration. However, it only accommodates for a single endogenous break in the underlying cointegrating relationship. This test has been applied by Rao and Kumar (2007a and 2007b) to test the stability of demand for money in Bangladesh and Fiji, respectively. In both these studies, they found that specifications with level shift gave the best and plausible results and that demand for narrow money is well determined and stable for both the countries.

In this paper, we apply the Bai and Perron (2003) test of multiple endogenous breaks to test and re-estimate the income and semi-interest rates elasticities of demand for money using annual data from 1953 to 2005 for India. This paper is an extension over Rao and Singh (2006) who have found a stable and well determined demand for narrow money in India for the period 1953-2003. However, while they show awareness of the possibility of structural breaks and applied the CUSUM tests, our present paper explicitly tests for multiple breaks which to the best of our knowledge is not done in any other studies for

\[\text{Also see their classic (1998) paper for a discussion of endogenous break test.}\]
India. For this reason, we shall only discuss the results obtained by Rao and Singh here but a list of studies on demand for money in India is found in their paper.

Rao and Singh (2006) used the popular but demanding Johansen (1988) procedure and estimated two cointegrating demand for narrow money equations for India. Only their preferred estimates are reported below\(^3\). Their cointegrating vector normalized on log of real money is:

\[
\ln \left( \frac{M_t}{P_t} \right) = 1.1886 \ln Y_t - 0.023i_t
\]

\((1)\)

The income and semi-interest rate elasticities are well determined and highly significant. Using the lagged residuals from this regression, they obtained a parsimonious dynamic equation and found it to be temporarily stable. Thus their conclusion was that the monetary authorities in India should target the level of money supply as opposed to the rate of interest.

Our paper has two objectives. First, is to test for multiple endogenous breaks in the long-run money demand relationship of India as estimated in Rao and Singh and second to evaluate the stability of the estimated elasticities. The rest of the paper is structured as follows: Section 2 discusses data and empirical results and section 3 concludes.

### 2.0 Data and Empirical Results

In this section, we detail the Bai-Perron test results on Rao and Singh's estimated money demand equation. While we agree that the two important determinants of demand for money are real income and nominal rate of interest, we also include a deterministic time trend in our specification. Real exchange rate is ignored because domestic residents in
India are not allowed to hold foreign currency. Details of data, sources and construction are in Rao and Singh.

Our unit root tests conducted with the standard ADF procedure imply that real money, real income and the rate of interest are I(1) in levels and I(0) in first differences. These are also the findings of Rao and Singh. Details are avoided here to conserve space. Next we examine the possibility of instability in the above long-run relationship, allowing it to occur at unknown dates. The Bai-Perron test offers various test statistics that can be used to test for break dates. These are briefly, the sup FT(k,q) test, an F-test for the null of no break against an alternative of a fixed number of breaks (ii) Dmax and WDmax tests with similar nulls against an unknown number of breaks with some upper bound and (iv) FT(k+1/k) a sequential test for k breaks against the alternative of k+1 breaks. The test results are given in Table-1 below.

| Table-1: Bai-Perron tests for multiple breaks in the money demand relationship |
|-----------------|-----------------|-----------------|-----------------|
| (M/P) = f(Y, i, T) | Z = {Y, i, T} | |
| p = 3 | q = 0 | h = 7 | m = 2 |
| SupFT(3) = 13.41 | SupFT(4/3) = 0.07 | Dmax = 13.41 | WDmax = 15.88 |
| (12.17) | (18.93) | (16.37) | (17.84) |
| Const. | 1.940 (0.46) | 0.074 (0.01) | 1.321 (0.44) |
| Trend | -0.001 (0.06) | 0.039 (1.86)** | 0.025 (1.78)** |
| βY | 0.693 (1.97)** | 0.851 (1.93)** | 0.702 (2.72)* |
| βi | -0.003 (0.20) | -0.106 (2.69)** | -0.012 (3.10)* |

Notes: z, p, q, h, and m denote the number of dynamic explanatory variables, the number of regressors, the number of corrections in variance-covariance matrix, the minimum number of observations in each segment and maximum number of breaks, respectively. * and ** denotes significance at 5% and 10%, respectively and 5% CVs of Bai-Perron tests and absolute t-ratios for the estimates are in brackets. m is determined by the BIC criteria using GAUSS software.

3 The only difference between the two was the inclusion of an insignificant trend term in the first, which
As is given in Table-2, all the tests, except for Sup FT(k) imply that \( k = 2 \) is the optimal order of break points selected with the BIC criteria. These 2 break dates are 1960 and 1971 giving the three regimes: 1953-1959, 1960-1970, 1971-2005.

The economic interpretation of these break dates could be linked to the war-era between India and Pakistan, although the actual war over Kashmir happened in the late 1971. During these 10 years tensions there are fear and uncertainties in both the economies. These might have caused the regime shift in demand for narrow money in India, although temporarily.

Also note from Table-1, the estimates of the income elasticity increased from 0.70 in the pre-1960 period to around 0.85 in 1960-1970 but reverted back to 0.70 after 1971. The raise in income elasticity implies financial sector inefficiencies which are to be expected during such times. Further, following the financial sector deregulation of the 1980s, it is expected that income elasticity would have declined as is observed in the results for this segment. Although the semi-interest rate elasticity has increased in 1960-1970 period there is no noticeable qualitative change. In fact, following 1970, it has gained statistical significance.

Both these elasticities are plausible and well determined. However, the point estimates of income elasticities are less than unity which is in contrast to earlier estimates for India and for several other studies in developing countries, see for example Sriram (1999). Nonetheless, we can conclude that the demand for money in India has remained stable over the review period.

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when deleted made no difference to the cointegrating coefficients as reported in (1) above.
3.0 Conclusion and Policy Implications

In this paper, we applied the multiple break point test of Bai and Perron (2003) to test the parameter stability of the long-run demand for money relation in India with annual data from 1953-2004. The test results show that there are two break points, in 1960 and 1971 and the income elasticity which was 0.70 in the pre-1960 increased to 0.85 after 1961 but declined to 0.70 following the break in 1971. The semi-interest rate elasticity which was low and insignificant in the pre-1960 increased (in absolute terms) between 1961-1970 and became significant. However, it also declined in the post 1971 period but remained significant. These results show that although there was temporal instability during 1960-1970, both the income and semi-interest rate elasticities have broadly remained stable. This supports the view that demand for narrow money is stable in India and targeting money supply is still a useful instrument for monetary policy.
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