CHAPTER VI

SUMMARY AND IMPLICATIONS

Developments in economic aggregation theory and statistical index number theory have, of late, influenced monetary economists to look at the issue of an appropriate money stock measure as a fundamental problem of aggregation. The main architect of this new school of thought is William A. Barnett whose established theoretical results are popularly known as the microeconomic monetary aggregates. He suggests adoption of Divisia monetary services indices at the central bank level instead of conventional simple sum aggregates. The research efforts from various countries and the resultant evidences from some countries in support of these aggregates have enthused Barnett to conclude that "Under no circumstances should the simple sum monetary aggregates be used to measure either the flow or stock, except perhaps in investigating the distant economic past, when money maybe did not yield interest. The simple sum monetary aggregates are an anachronism" (1991, pp. 238-239). The decade long campaign by Barnett and his collaborators for these indices are based on strong theoretical foundations. However, results across countries have been sensitive to the existing financial environment, institutional set up, structure of financial services supply, and payments technology. A Bank of England study conducted in the recent past pointed out that, "A Divisia measure of money appears to have some leading indicator properties for predicting both nominal output and inflation. . . . a case can clearly be made for including Divisia in the range of indicators analyzed by the authorities when forming their judgments on monetary conditions" (Fisher, Hudson and Pradhan, 1993, p. 63).
In view of the above, the present study tries to explore the feasibility of empirical implementation of such aggregates in the Indian context for two reasons. First, for the last several years the Indian monetary policy has veered around monetary targeting. The \textit{raison d'\'etre} has been well documented in the literature. It has also been pointed out in the annual report of the Reserve Bank of India 1996-97 that "As an alternative to monetary targeting, interest rates are often considered as an intermediate target in developed economies where interest rates play an important role in equilibrating markets. The various segments of the financial markets are closely integrated in developed economies, with interest rates in various markets mutually influencing one another. This is not the case in India yet, even though the beginning of such an integration of markets is discernible in recent years. With the demand function for money reasonably stable, the quantity of money plays an important role in determining prices in India. Under these circumstances, it is better to target money than interest rates" (pp 136-137). Second, the Indian financial environment has been experiencing financial innovations in terms of (i) introduction of new money market instruments like Certificates of deposits, Commercial papers, Money Market Mutual Funds etc., (ii) changes in payments technology by way of introducing Automated teller machines and use of credit cards etc.

The present study applies Barnett's(1982) three step procedure to optimal monetary aggregates to Indian data to search for some optimal monetary groupings and studies the relative performance of Divisia versus Simple sum monetary aggregates. The first step of this three step procedure warrants empirical application of a rigorous theoretical criterion known as weak separability to ensure that a set of monetary components chosen for aggregation form a weakly separable block. In the second stage, one has to choose a statistically good index number (for example the Divisia index or the Fisher Ideal index of Diewert's superlative class) to construct what may be known as economic monetary aggregates. The third stage involves evaluation of these aggregates'
performance with respect to the real macro economic variables such as gross domestic product, prices etc,

To fulfill the first step of Barnett's three step procedure, the present study applies Varian's (1983) nonparametric test for the first time in the Indian context. Though in the previous studies parametric tests have also been employed, we use the nonparametric tests due to two main reasons viz., (i) the parametric approach involves specification of a particular functional form and estimation of parameters which may result in parameters that are not robust, (ii) there is less scope for aggregation error when we use separable groupings obtained from this test since the nonparametric tests ensure rationalisation of a well behaved utility function over the data set. On the other hand results from a parametric separability test may be deceptive because the functional form may not be consistent with all the neoclassical consumer behaviour axioms leaving thereby scope for aggregation error.

The results show that the annual sample 1970-1996 and the monthly sample 1985 04 1996 09 rationalize well behaved utility functions. Subsequently, six groupings are discovered for annual data as theoretically admissible groups known as weakly separable groups. For monthly data the test yields only two separable groups. On the whole the separability evidences are inclined towards broader aggregates. The official money supply measures M3 and M4 as compiled by the RBI are found to be theoretically admissible groups, both for annual and monthly specifications whereas M2 emerges as a separable group for annual specification only. Experimenting with a new asset called Certificate of deposit for which data is available also yields some encouraging separable groupings. Using these separable groups, both Divisia and Simple sum aggregates are
constructed The performance of these aggregates are evaluated in terms of information content test, non-nested hypothesis testing and stability of demand for money functions

The results of the above tests for annual data are mixed in nature. The information content test shows slight dominance of Divisia aggregates over their sum counterparts whereas the J-test results are mixed in nature. However, the Divisia money demand is found to be stable except in two cases (Divisia aggregates) namely DM2 and DM7. All simple sum money demand relationships, however, are found to be stable.

The monthly results give a clear edge to the Divisia aggregates over their simple sum counterparts in all the tests. Especially, the CUSUM square plots indicate structural breaks for simple sum monetary aggregates around the year 1991 whereas no such break is observed in the Divisia money demand relationships. This change in the simple sum money demand may be attributed to financial innovations taking place in the Indian money market during the past few years. The stability of Divisia money demand may be due to the ability of the aggregate to capture the entire liquidity services available in the economy and also to account for the substitution effects due to compositional shifts in the financial portfolio.

The long run equilibrium relationships underlying the monthly money demand relationships are studied by employing the Johansen-Juselius multivariate cointegration procedure. The test results in terms of the Trace statistics and λ max statistics reject the null hypothesis of zero cointegrating vectors against the alternative of one or more cointegrating vectors. This implies that there is a long run equilibrium relationship
between real money balances, interest rate (user cost aggregate in case of Divisia aggregates) and real income

Results of extended Divisia and sum aggregates with CU, DD and CD (as an additional candidate of money) show money demand to be stable for Divisia specifications and unstable for sum specifications. In terms of information content, however, sum aggregates are found to be better performers. These extended sets are based on the separability results obtained in chapter three. They do not include time deposits as the data on time deposits published by the RBI include certificate of deposit.

In addition to the Divisia aggregates as discussed above the present study also endeavours examination of a relatively new aggregation theoretic aggregate called as the Currency equivalent monetary aggregate (CEMA) by considering the same four assets viz. CU, DD, TD, PD for the sample 1985 04 1996 09. CEMA represents the stock of currency that would be required by the households to obtain the liquidity services that they get from a broad spectrum of financial assets. Currency is assigned a weight of one in the construction of this aggregate and the weight assigned to other assets is smaller depending upon their rate of return. The higher the rate of return viz., the higher the investment services provided by the asset, the lower the weight assigned to it. This aggregate represents the total monetary capital stock of an economy and has a preference theoretic foundation as has been proved by Rotemberg et al (1995). The Divisia monetary services indices on the other hand measure the flow of transaction services in the economy. Our experimentation with this new aggregate results in a stable money demand function for this aggregate, as clearly indicated by the CUSUM square plots whereas that of the simple sum equivalent of this aggregate is unstable around the year 1991. CEMA also performs better in the J-test and the information content test.
Though there is no doubt about the theoretical superiority of the new monetary aggregates, empirically they have not been able to outperform their simple sum counterparts *in toto*. However, in some of the tests like money demand stability the superiority of the new monetary aggregates is clearly established.

In light of the above discussion some suggestions may be given in the Indian context. The Reserve Bank of India has recently set up a working group to judge the appropriateness of the existing money stock measures in view of the ensuing financial sector reforms. One of the objectives of the working group is to examine the adequacy of the present measures in reflecting liquidity in the economic system and to consider the feasibility of possible inclusion of some additional financial assets in the existing money stock measures. The evidences of the present study encourage addition of some of the potential candidates of money to the existing money stock measures. At the same time retaining the practice of simple sum measures may lead to bad measurement. It is therefore suggested that a proper data base be developed with corresponding interest rates earned on the assets to construct Divisia monetary indices. The indicator properties of the Divisia aggregates can then be studied and these aggregates can be monitored along with the simple sum counterparts in order to see the plausibility of their implementation as intermediate targets in the conduct of monetary policy.