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PREVIEW

DIVISIA MONETARY AGGREGATES: AN EMPIRICAL INVESTIGATION  
OF THEIR USEFULNESS FOR TURKEY

by

Sadullah Celik

A DISSERTATION

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DISSERTATION TITLE

Divisia Monetary Aggregates: An Empirical Investigation of  
Their Usefulness for Turkey

BY

Sadullah Celik

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# DIVISIA MONETARY AGGREGATES: AN EMPIRICAL INVESTIGATION OF THEIR USEFULNESS FOR TURKEY

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University of Nebraska, 1999

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Money plays an important role in the economic health of a nation. The amount of money in the economy matters because it affects real variables (output, employment) and/or nominal variables (price level). Monetarist view suggests that a target growth rate for a narrow definition of money be set so that a stable (and low) rate of inflation could be achieved. This is possible if the demand for money is stable and changes in the monetary base have a predictable impact on money supply. Therefore, the performance of a monetary aggregate is examined through a money demand specification and/or as an effective monetary target in the conduct of monetary policy.

Empirical work in the 1970s showed that broad monetary aggregates like M2 were closely correlated with such potential policy target variables as output, unemployment and inflation. Several countries such as Germany, the United Kingdom and the United States declared monetary aggregates as intermediate

targets. By mid-1980s however, the stability of money demand relationship was questioned and the target growth rates of monetary aggregates became unpredictable. Monetary authorities were forced to abandon monetary targeting or monitor monetary aggregates as economic policy indicators along with other variables like inflation and interest rates. The poor performance of monetary aggregates and the instability of money demand functions were attributed to financial innovations, inadequate econometric methodology and restrictive conventional framework of the analysis.

Under such circumstances, Barnett (1980) suggested the microfoundations approach and his subsequent work has shown that weighted monetary aggregates could outperform simple-sum monetary aggregates. The theoretical framework of the microfoundations approach derives from monetary aggregation theory and statistical index numbers. This approach constructs new monetary aggregates and compares their performance with simple-sum monetary aggregates.

This dissertation empirically investigates the microfoundations approach for four of the G-7 countries (Germany, Japan, United Kingdom and United States) and a developing country (Turkey), using cointegration analysis, stability test and Granger-causality. My results indicate the superiority of microfoundations approach in all of the countries.

## **CONTENTS**

### **CONTENTS**

### **ACKNOWLEDGEMENTS**

### **CHAPTER 1: INTRODUCTION**

- 1.1 The Purpose and the Approach
- 1.2 The Outline of the Study and Summary of the Major Findings

### **CHAPTER 2: A SURVEY OF MONETARY AGGREGATION THEORY**

- 2.1 Introduction
- 2.2 Monetary Aggregation Theory
  - 2.2.1 Origins of Monetary Aggregation Theory
  - 2.2.2 Theoretical Framework of Monetary Aggregation
    - 2.2.2.1 Consumer's Choice Problem
    - 2.2.2.2 Weak Separability and Aggregator Functions
  - 2.2.3 Statistical Index Numbers
  - 2.2.4 Barnett's Contribution
- 2.3 Formulation of New Monetary Aggregates
  - 2.3.1 Divisia Monetary Aggregates
  - 2.3.2 Currency Equivalent Indices



## **CHAPTER 3: ECONOMETRIC METHODOLOGY AND EMPIRICAL ASSESSMENT FOR DEVELOPED COUNTRIES**

### **3.1 Introduction**

### **3.2 Econometric Methodology**

#### **3.2.1 Unit Root Tests**

#### **3.2.2 Cointegration Analysis**

##### **3.2.2.1 Cointegration Tests**

##### **3.2.2.2 Estimators of Cointegrated Systems**

##### **3.2.2.3 Structural Instability in Cointegrating Relationships**

#### **3.2.3 Causality Tests**

### **3.3 A Survey of the Studies Testing the Empirical Validity of the New Monetary Aggregates**

### **3.4 Empirical Assessment for Developed Countries**

#### **3.4.1 Germany**

#### **3.4.2 Japan**

#### **3.4.3 United Kingdom**

#### **3.4.4 United States**

### **3.5 Inferences from Empirical Assessment**

## **CHAPTER 4: NEW MONETARY AGGREGATES FOR TURKEY**

### **4.1 Introduction**

### **4.2 Historical Performance of the Turkish Economy**

#### **4.2.1 1980 Stabilization Program**

#### **4.2.2 Liberalization and Financial Markets since 1980**

### **4.3 Divisia Monetary Aggregates and Currency Equivalent Indices for Turkey**

### **4.4 Empirical Assessment of Divisia Monetary Aggregates and Currency Equivalent Indices for Turkey**

#### **4.4.1 The Empirical Analysis for the Full Sample**

#### **4.4.2 The Empirical Analysis for the Sub-sample**

### **4.5 Inferences from Empirical Assessment**

## **CHAPTER 5: SUMMARY AND CONCLUSION**

## **REFERENCES**

## **APPENDIX 1: DATA**

## **APPENDIX 2: TABLES**

## **APPENDIX 3: GRAPHS**

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## CHAPTER 1 INTRODUCTION

### 1.1 The Purpose and the Approach

One of the distinguished topics of monetary economics is the analysis of the relationship between money and other economic variables. Among these variables are real output, prices, wages, and interest rates. The crucial role of money in economic activity was recognized long ago. Adam Smith (1776) wrote,

“Money has become in all civilized nations the universal instrument of commerce, by the intervention of which goods of all kinds are bought and sold, or exchanged for one another.”

Economists have sought the proper definition of money to reach a better understanding of economic concepts like the stability of money demand and the effects of monetary policy. The historical practice has been either to 1) distinguish between money and non-money assets on a priori considerations or 2) employ a convenient definition of money according to the particular problem at hand. The first approach believes that money is a medium of exchange so money should be defined as currency plus demand deposits (Angell 1936). This view of money derives from the conditions of the supply side. Therefore, while determining a total that can be regarded as economically significant, this version argues that the total amount of money is unaffected by the actions of the public. On the other hand, the second version builds its definition of money on the notion of liquidity. The proponents of this version argue that money should be defined

as a wide concept of liquid assets (Gurley and Shaw 1955, 1956). Hence, the main theme of this version is that the internal composition of the total amount of money is unimportant, but its size relative to other assets and to the level of spending matters. Thus, this approach considers the conditions of the demand for money.

In essence, these two approaches derive from different versions of the quantity theory of money.<sup>1</sup> The approach which considers an asset as money or non-money builds on the transactions version of quantity theory of money. Popularized by Fisher (1911), the elementary event of transactions version is an exchange in which one economic agent transfers to another economic agent goods or services or securities and receives a transfer of money in return. The famous equation for transactions approach is

$$MV = PT \quad (1.1)$$

where  $M$  is the money stock,  $V$  is the velocity of circulation of money,  $P$  is the price level, and  $T$  is the volume of transactions. The right-hand side of the equation corresponds to the transfer of goods, services, and securities, and the left-hand side to the matching transfer of money. It is important to note that this version of quantity theory treats money as a stock, not a flow or a mixture of flow and a stock. Moreover, this version advocates a narrow definition of money that possibly includes currency and demand deposits.

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<sup>1</sup> It is well known that there are four different versions of the quantity theory of money: the Irving Fisher transactions version, the income version of the quantity theory, the Cambridge cash-balances approach, and the Friedman restatement (Friedman 1971).

On the other hand, the approach that considers the conditions of the demand for money builds on the Cambridge cash-balances version of the quantity theory of money. In this version of the quantity theory of money, the emphasis shifts from mechanical aspects of the payments process to the qualities of money as an asset. The main theme is expressed by Keynes (1936) who stresses the role of money as one among many assets, and the role of interest rates as the relevant cost of holding money. The Cambridge cash-balances equation is

$$M = kPy \quad (1.2)$$

where  $M$  is money supply,  $k$  is the ratio of money stock to income,  $P$  is the price index implicit in estimating national income at constant prices, and  $y$  is the national income in constant prices. In this formulation,  $k$  is numerically equal to the reciprocal of the  $V$  in equation (1.1).

The difference between these two versions of quantity theory of money is crucial in understanding the importance of this study in the role of money and the demand for money. The transactions approach makes it natural to define money in terms of whatever serves as the medium of exchange. In contrast, the cash-balances approach emphasizes the function of money as a temporary abode of purchasing power. Hence, it becomes natural to include such stores of value as demand and time deposits into the definition of money. Therefore, the proper definition of money constitutes one of the major differences between these two versions of the quantity theory of money. This dissertation searches for the

proper definition of money and uses both narrow and broad monetary aggregates as money. Moreover, there is considerable emphasis on the role of the interest rate in helping provide a better definition of money. Therefore, it is possible to argue that the dissertation is an empirical study that analyzes a mixture of the two versions of the quantity theory discussed above. Not only narrow and broad monetary aggregates are considered but also the role of the interest rate is examined in detail. In this sense, this dissertation is an empirical study that investigates the possibility of a reconciliation of the two versions of the quantity theory of money.

Not surprisingly, different versions of the quantity theory of money have many fallacies including the lack of sound theoretical backgrounds, insufficient empirical considerations, and the unwillingness of the literature to follow their guidelines. The main contribution of these approaches has been that economics has noticed the necessity of a solid theoretical framework for the proper definition of money, and thus, the monetary aggregates.

Recent experiences in developed economies show that the stability of the aggregate price level acts as the driving force behind economic growth and prosperity. Consumer prices increased only 15.1 percent in the United States and 16.1 percent in the United Kingdom between January 1993 and December 1998, a period of continuous growth and expansion. In contrast, during the supply shocks of the 1970s, consumer prices increased 58.9 percent in the United States and 128.3 percent in the United Kingdom between January 1973,

and December 1978. There is a wide range of literature that analyze the relationship between economic growth and monetary policy (Lucas 1988, Summers and Heston 1988, King and Rebelo 1990, Rebelo 1991, Mankiw *et. al.* 1992, Barro and Sala-i-Martin 1995, Romer 1996).

Over the last two decades, a consensus has been emerging in the economics profession that activist monetary policy to stimulate output and reduce unemployment beyond their sustainable levels leads to higher inflation but not to persistently lower unemployment or higher output. Hence, the commitment to price stability as the primary goal for monetary policy has been spreading throughout the world. A goal of price stability requires that monetary policy be oriented beyond the horizon of its immediate impact on inflation and the economy. However, a central bank's commitment to price stability over the longer term does not mean that the monetary authorities can ignore the short-term impact of economic events. It is important to realize that, even if the economy is on the path to price stability and even if, as a result, price expectations are contained, all sources of potential inflationary shocks would not be eliminated. Thus, as Friedman (1968) stresses, monetary policy can never put the economy exactly where it is desired to be.

Price stability is both important and desirable because a rising price level-inflation-even at moderate rates, imposes substantial economic costs on society. Some of these are increased uncertainty about the outcome of business decisions and profitability, negative effects on the cost of capital resulting from



the interaction of inflation with the tax system, reduced effectiveness of the price and market systems, and distortions that create perverse incentives to engage in nonproductive activities. The adverse effects of inflation have been outlined by several different studies (Cagan 1956, Friedman 1976, Fischer and Modigliani 1978, Fischer 1981, Barro 1995). Furthermore, economic agents are more likely to make decisions in a manner consistent with macroeconomic theory in price-stable economies (Shiller 1996). Therefore, central banks use monetary policy as a means of achieving price stability (Barro and Gordon 1983, Rogoff 1985, Feldstein 1996, Friedman and Kuttner 1996, Bernanke and Mishkin 1997).

It is a common belief in macroeconomics that the demand for and supply of money is the primary long-run determinant of an economy's price level. This means that the aggregate quantity of money plays an important role in economic decision-making and the overall economic performance. Hence, the question "What is the proper definition of money?" becomes crucial. Before proceeding with the introduction of a contemporary approach to the proper definition of monetary aggregates, it is important to note the two sources of interest in monetary aggregates: First, with respect to the analysis of the demand for money, and second, with the relationship between the demand for money and the monetary aggregates in the conduct of monetary policy.

Money is demanded in an economy for at least two reasons: as an inventory to smooth differences between income and expenditure streams, and as one among several assets in a portfolio (Goldfeld and Sichel 1990). Hence,

economic agents face the decision of demanding a certain amount of money as a daily activity. On the other hand, the widely held view in economics is that monetary policy has an impact on the economic life of a nation. Monetary expansions are predicted to increase output (temporarily) and the price level (permanently). Several studies have supported this proposition (Bryant *et. al.* 1988, Dornbusch and Giovannini 1990, Taylor 1993). Thus, it is no wonder that the monetary authorities keep track of changes in monetary aggregates.

The stability of the demand for money is important because mainstream macroeconomic models depend on it. For many years, the central theme of monetarist models has been the proposition of a stable long-run aggregate demand for real balances (Friedman 1956). From a monetarist perspective, the view is that monetary growth causes inflation and has no influence on output and employment in the long-run, although there may be significant short-run influences on real variables (Friedman 1968, 1970, 1971). The monetarist prescription has been that a target growth rate for base money should be set at a fixed level designed to achieve zero or low (one-two percent) inflation after allowance for 'normal' productivity and output growth (Friedman 1968, 1977). Along with the monetarist arguments, the stability of money demand is an important element in the New Classical view of monetary effects (Sargent and Wallace 1975). In addition, it appears in some New Keynesian analyses (Mankiw 1991) and in some empirical real business cycle models that incorporate the aggregate price level and inflation (King *et. al.* 1991). While

discussing the microeconomic foundations for such a relationship, Lucas (1988) argues that the money demand function 'will be stable over time provided that preferences are and that trading technology is ... stable'.

Although the theoretical framework of money demand has been carefully built, the empirical work during the 1970s failed to find a stable and well-specified relationship between real money balances, interest rates and output. Goldfeld (1976) has called attention to the poor predictive performance of the standard function with his "missing money" puzzle. His analysis tested whether money demand functions estimated for 1952 Q2 - 1973 Q4 had forecasting power for the post-1974 period. The result showed that extrapolations of money demand for 1974-1976 significantly overpredicted the actual money demand. The quantity of money held was dramatically below model predictions. Goldfeld argued that a shift in the money-demand function was taking place in the United States economy. Economists responded to Goldfeld's study in a large literature that followed several different approaches to correct the arising problems. Judd and Scadding (1982) present a detailed survey of what proved to be an inconclusive literature.

During the 1980s, conventional money demand equations (employing M1 as the monetary aggregate) failed at least on two occasions. In 1982-83, they were unable to predict the large decline in M1 velocity, and in 1985-86, they missed the explosive growth in M1. Economists have sought to fix conventional money demand equations by focusing on specifications that pay adequate

attention to the long-run nature and short-run dynamics of the money demand function. These attempts can be classified in three categories. The first approach tried to reformulate money demand regressions (Rasche 1987, Mehra 1989, Hetzel and Mehra 1989). The second approach chose to apply recently developed econometric techniques (Hoffman and Rasche 1991, Miller 1991, Baba *et. al.* 1992, Mehra 1992, Norrbin and Reffett 1993, Hendry 1995, Hendry and Mizon 1998). The last category includes studies that use a different span of the data compared to the previous studies (Poole 1988, Ball 1998). The general conclusions emerging from these studies have been the documentation of long-run stationarity for money demand only in the case of broad-aggregated monetary measures (typically only M2, and occasionally M1). However, the stability of the long-run money demand is still considered as an unresolved issue in much of the current literature (Barnett 1997, Cuthbertson 1997, Mizen 1997, Ball 1998).

Before the breakdown of the money demand equations, the monetary aggregates were closely correlated with potential policy target variables like output, employment and inflation. This led the monetary authorities to adopt such monetary aggregates as leading indicators of the impact of monetary developments on the economy. However, the missing part of the analysis was that correlation did not imply causality.<sup>2</sup> Nonetheless, in the mid-1970s, a

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<sup>2</sup> Causality analysis considers the explanatory power of the past values (lags) of a variable. For variable X to cause variable Y, the lags of variable X should have explanatory power for variable Y. On the other hand, correlation examines the linear association between the two variables at a

number of developed countries (including the United States and Germany) started to use monetary aggregates as intermediate targets for monetary policy. The purpose was to use the often implicitly assumed, but not rigorously tested, stability of the money multiplier between base money and the chosen intermediate monetary target as a fulcrum for keeping the growth of the aggregate within a target range. Once this is achieved, given the stability of the linear demand for the targeted monetary aggregate, the ultimate policy goal of lower inflation would be accomplished. The United States and Germany preferred narrower monetary aggregates, Switzerland targeted the monetary base and M1, and the United Kingdom was using M2.

Contrary to the common belief, Driscoll and Ford (1980) demonstrated that the stability of the demand for money was not a necessary condition for the usefulness of monetary policy. Their analysis showed that while a stable money demand function might be essential for a fixed monetary growth rate rule to be effective, this was no longer the case if there was widespread parameter instability. This theoretical development underlined that the stability of the demand for money is overemphasized and monetary aggregates should not be rejected for monetary policy purposes if their demand functions are unstable. If the demand functions are stable, however, then it may well be sensible to choose a relatively simple rule, which has the advantage that it can easily be monitored

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contemporaneous level. The correlation coefficient measures the strength of the linear association between two variables. However, correlation does not determine which variable (if any) causes the other one.

by economic agents and thus enhance credibility, or make it easier to establish. Nonetheless, most of the countries, i.e., Canada, the United Kingdom and the United States abandoned monetary targeting by the mid-1980s or relegated (Germany, and Switzerland) monetary aggregates to the role of one, amongst a number, of leading economic indicators of economic activity such as future inflation and output (real GDP). In contrast, a developing country, Turkey, adopted monetary targeting in 1990 with the central bank money<sup>3</sup> as the intermediate target. The purpose of the policy action was to establish and sustain price stability. This was to be achieved through decreasing the size of the central bank balance sheet and changing its internal composition. However, the implementation of the monetary policy action was cut short due to its incompatibility with fiscal policy measures. Nonetheless, the success of such a monetary policy action was unlikely since broader aggregates (M2 and M3) are found to cause income more than the narrower aggregates (monetary base, central bank money). Currently, Turkey still targets narrow monetary aggregates (central bank money, reserve money).

The ongoing discussion shows that the monetary aggregates play an important role in the conduct of monetary policy and that the money demand functions rely on monetary aggregates to explain the behavior of economic agents. This means that economists should use a properly defined monetary

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<sup>3</sup> 1990 Monetary program defines central bank money as the sum of currency in circulation, required reserves, free deposits of the banking sector, deposits of public funds, deposits of non-bank private sector, open market operations (net), and public sector deposits.

aggregate rather than searching for possible explanations of the problems through arguments like the acceleration of financial innovation (Laidler 1977, Cuthbertson 1985, 1991) or circumventive innovation (Goodhart 1984). This is the point where we turn to the introduction of a contemporary approach to the proper definition of a monetary aggregate. This approach takes a different view of the proper definition of money by considering the monetary services provided by a monetary aggregate rather than imposing a definition of 'money'.

An emerging literature in economics attributes the instability of the money demand functions and the unsuccessful monetary policy actions to the methods of aggregation used in the calculation of the simple sum monetary aggregates (Barnett 1980, 1981, 1982, 1984). This approach is usually termed the "microfoundations approach" to the monetary aggregates and the money demand (Barnett *et. al.* 1992).

The simple sum monetary aggregates are constructed by the summation of dollar amounts of assets like currency, checking account deposits, money market mutual fund shares, and savings and time deposits. Hence, this procedure assumes that the owners of monetary assets value them as perfect substitutes. However, most economic agents hold a portfolio of assets that have different opportunity costs rather than a single asset with the lowest cost. Thus, it is hard to believe that economic decision-makers regard these assets as perfect substitutes. On the other hand, the microfoundations approach constructs monetary aggregates that are in accordance with the specifications of

the consumer demand and estimates the systems of financial asset-demand equations, incorporating the restrictions of consumer demand in a consistent manner with the optimizing behavior of economic agents. Therefore, the main difference of this approach from the simple summation procedure is the theoretical background that it builds upon in the construction of monetary aggregates.

The microfoundations approach depends on the theory of monetary aggregation and statistical index numbers to construct the monetary aggregates consistent with the consumer demand. It starts with a representative agent who maximizes utility subject to a full income (i.e. income reflecting expenditures on time as well as on goods and services) constraint. The economic agent's utility function includes consumption goods, leisure, and services of monetary assets. The purpose is to determine the total amount of services of monetary assets that the agent demands. This will be possible if the individual's utility function is weakly separable in the services of monetary assets. Weak separability means that the marginal rate of substitution between any two monetary assets is independent of the values of the consumption goods and leisure. Given weak separability, the consumer maximizes consumption of monetary services subject to the level of the total expenditure for monetary services. This total expenditure is equal to the product of the price and the quantity of the services of monetary assets. The construction of a monetary aggregate means, therefore, specifying an aggregator function for the total amount of services of monetary assets that