THE ROLE OF FINANCIAL ASSETS IN THE QUANTITY THEORY

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ABSTRACT

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The purpose of this study is to expand the quantity theory of money, and the equation of exchange, to include credit market assets in the monetary transmission mechanism. This expansion will help instructors of college-level economics to present the transmission mechanism more in line with the current research in monetary economics.

Three alternative groups of financial assets are constructed for the 1959:1-1994:2 period, and compared with the current definitions of money (M1 and M2). The Engle-Granger cointegration procedure is employed to determine if any of these variables has a stable long-run equilibrium relationship with nominal income and interest rates. The results suggest that one variable, namely total credit market assets held by private domestic nonfinancial sectors, has a stable long-run relationship with short-term interest rates and nominal GDP.

The empirical findings have several implications for monetary policy. First, credit market assets explain the monetary transmission mechanism better than money. Second, if the monetary authority can control credit market assets, then it can control the level of nominal GDP. Third, the monetary authority can influence the supply of credit market

assets by using open market interest rates or capital requirement ratios, though capital requirements hold more promise.

Several recommendations emerge from this study for class presentations of the monetary transmission mechanism. First, the change in credit market assets of the domestic private nonfinancial sectors induces a diversification into real assets. As with the traditional view of the quantity theory, this induces a change in nominal GDP. Second, the markets for bank loans and for marketable securities can be used to present the influence of open market interest rates on credit market assets, a process akin to the Keynesian view of the monetary transmission mechanism. Third, capital requirement ratios can be employed by policy makers to influence the level of credit market assets in the economy.

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CHAPTER I

INTRODUCTION

Quantity theorists regarded money as unique, and they believed that there was a transmission mechanism from money to the general level of prices. These theories based the uniqueness of money on its two important functions: a store of value function, embodied in the asset demand for money, and a medium of exchange function, which explained the transactions demand for money.

For the early quantity theorists, money was gold and other precious metals, which did not lose their value in time, and therefore were an excellent store of wealth. This characteristic was one of money's most important features, and served to make money unique. After the development of paper money, and the banking system and financial markets, different forms of financial assets appeared as alternative money substitutes in which wealth could be stored.

As a medium of exchange, money was regarded as the means of final payment in transactions of the public, financial institutions, and governments after the transition from a barter system to a more sophisticated financial system. As financial innovations evolved into the 20th century, accompanied by developments in the payments system, converting other financial assets into money balances became easier.

For quantity theorists, money was not only unique, but also the sole determinant of the general level of prices in the long run. In other words, the general level of prices would vary directly and proportionally with the stock of money, leaving real output constant at the full employment level. Fisher (1911) identified this relationship with the equation of exchange:

$$M V = P Q$$

where M = the stock of money, V = velocity of circulation of money, P = average level of prices, and Q = real output.

According to the assumptions of the quantity theory, the economy operates at the full employment level in the long run, so that real output is constant and is not influenced by monetary policy. The velocity of circulation was behaviorally constant in the long run, so that changes in the money stock would create proportional changes in the level of prices. These interpretations give the equation of exchange its economic meaning and convert the equation into the quantity theory of money.

Another assumption upon which quantity theorists relied is the exogeneity of the nominal stock of money. The nominal stock of money is supply determined, and the supply of money is under the strict control of the central bank via its control over the narrowly defined base or so-called high powered money. This assumption implies that money is a powerful tool enabling the central bank to influence economic activity. To state it differently, because the monetary authority can control M, it can control P Q as well, given that velocity is constant or predictable.

These assumptions have been challenged over time by the critiques from the Anti-Bullionists, the Banking school, and the Keynesian-Postkeynesian schools. The strongest anti-quantity theory view was expressed in the late 1950's by the English monetary commission known as the Radcliffe Committee. According to the committee, "money is a practically indistinguishable component of a virtually continuous spectrum of financial assets." (Humphrey, 1974). Moreover, the committee could not discover any tight relationship between the supply of money and the level of national income (Makinen, 1977).

In general the critiques can be classified as follows (Humphrey, 1974):

Exogeneity of money stock: The money supply is an endogenous variable that responds passively to the shifts in the demand for it. There is not a transmission mechanism running from money to prices. On the contrary, causation flows from prices and income to money.

Stability of the velocity of circulation: The velocity of circulation is an unstable and unpredictable variable because of expectations, uncertainty, and the changes in money substitutes. If the variations in velocity dominate the variations in money stock, some serious policy errors may arise from any attempt to control P Q.

Neutrality of money: Monetary changes may have permanent effects on real output, interest rates, and other real variables if unemployment and excess capacity exist.

Monetary control: Even if the supply of money is controllable, the availability of an endless array of substitutes would make such control useless.

Despite these challenges and critiques, the quantity theory of money has survived and the equation of exchange has been the main framework of textbook explanations for monetary transmission. Moreover, the Federal Reserve still uses the traditional definitions of money as its primary tools in policy making.

Section 1: Purpose of the Study

In this study, the role of money in the quantity theory will be critically examined. This inquiry was promoted by a number of questions. In the current financial environment, is money the sole financial asset which performs the functions of medium of exchange and store of value? Does the central bank control the money supply? Is money demand or the velocity of circulation stable, so that the monetary authority can rely on money as a policy tool? If the answers for these questions are negative, is there a suitable variable which may help to explain monetary transmission? If other financial assets are important in the transmission of monetary policy, then is it possible for the central bank to control them? These are the problems which are analyzed in this study. The conclusions affect the presentation of the transmission of monetary policy when teaching economics.

Section 2: Organization of the Study

The course of this study will be as follows. In Chapter II, a brief literature review on the quantity theory is presented. From early formulations of the quantity theory to modern monetarism, the arguments about velocity and money demand are discussed in this chapter.

Chapter III presents the previous empirical research on M1 and M2 demand, as well as research on credit as a financial variable.

In Chapter IV an alternative model will be presented which includes different definitions of financial assets (i.e., credit market assets, credit market debt, and total financial assets) in the quantity theory in place of money, and compares these with money. The theoretical justification of the model, the econometric methodology used, and the empirical testing are all described in this chapter. The chapter's critical hypothesis tests whether credit market assets have a stable long-run relationship with nominal income and short-term interest rates.

The interpretations of the conclusions of the econometric tests in terms of monetary policy are discussed in Chapter V. The transmission of monetary policy through credit market assets and the controllability of credit market assets are the issues analyzed in this chapter.

In Chapter VI, the importance of the findings of this study is discussed in terms of economics education. In this chapter, a presentation of an alternative transmission mechanism will also be developed as a contribution to the teaching of monetary transmission in the college-level economics classes.

Chapter VII presents a general summary, conclusions, and suggestions for further research.

CHAPTER II

LITERATURE REVIEW

Section 1: The Mercantilist Era

1.1. Jean Bodin:

The first concern about the quantity of money in a particular economy can be found in Europe, in the writings of the 16th century economic thinkers. The primary importance of the theory of money in the economic writings of this period is explained by the emergence of price increases during these years (Spiegel, 1991). During the discovery of the New World, a never ending stream of treasure arrived in Spain and was diffused over the whole of Europe. Prices rose without there being any debasement of currency, and these new conditions called for a new theory to explain the relationship between prices and the quantity of money. In 1568, the French philosopher Jean Bodin (1530-1596) first attributed the price inflation of this period to the abundance of monetary metals imported from the Spanish colonies in South America (Humphrey, 1974; Spiegel, 1991).

The development of mercantilist thought in this period also contributed to the emphasis on money. Mercantilist thought, with its emphasis on national liberalism, full employment, and a prosperous economy, discussed the role of the quantity of money in achieving these objectives (Vickers, 1959). Mercantilists sought an increase in the supply of money, because they thought more money meant not only nominal increases in money but also physical increases in trade or capital. In that sense, their theory was different from any theory of the value of money which views the value of money as varying inversely with its quantity (Viner, 1965). From the mercantilist standpoint, the definition of money included only the precious metals, specifically gold and silver, because these were the most readily exchangeable for all things, and were durable. Viner (1965) explains the reasons that Mercantilists desired increases in the quantity of money. According to him, money was regarded as: 1) the sole constituent of the wealth of a nation, 2) an emergency reserve by the state treasure, 3) a store of wealth, 4) a measure of increased savings, 5) a means to increase prices, and 6) a means for more trade.

1.2. William Petty:

Although Thomas Locke has been credited as the first economic thinker to formulate the quantity theory of money, actually William Petty (1623-1687) stated for the first time a velocity function in verbal form in his 1662 and 1664 writings (Humphrey, 1993). His purpose was to estimate the amount of money (consisting solely of gold coin) necessary to support a certain level of employment and trade. He thought this amount depended on the ratio of money to trade.

Petty also suggested that some institutional variables might determine velocity. These included: 1) the frequency of payments, 2) size of payments, 3) income, 4) income distribution, and 5) development of banking system. Among those, the first, third and last variables had positive relationships with velocity, and the second variable had a negative relationship. Petty focused on the income velocity of money, and by using agricultural income as a proxy for national income, estimated money's annual income velocity.

1.3. John Locke:

John Locke (1632-1704) made substantial contributions to monetary theory in the 17th century. First, he introduced a new variable, the interest rate, into the velocity function (Humphrey, 1993). He viewed the interest rate as the opportunity cost of holding money, and proposed that the relationship between the interest rate and the quantity of cash balances was negative. Second, Locke was the first writer to relate the velocity of money to money demand. The ratio of money to trade depended not only on the quantity of money, but also on the "quickness of its circulation" (Locke, 1691). Locke's quickness of circulation was related to the need of people to hold a certain amount of money in order to conduct transactions in one income period. Vickers (1959) interprets this rate of circulation of money as income velocity of money.

Third, he asserted that the change in average price level was always proportional to the change in the quantity of money (Humphrey, 1974). Fourth, he questioned coinage and the rise of paper money. He made a distinction between the function of money as a measure of value and its function as a claim to goods. For him, no gold or silver was needed to serve these functions, paper money could serve the same needs. In international transactions though, gold and silver were required (Spiegel, 1991). Last, like Petty, Locke also stressed the significance of the money supply for the level of trade and employment, and defined velocity as the ratio of a country's money stock to its trade. As a whole, his argument favored the mercantilist idea of a positive balance of trade.

Section 2: 18th Century: Hume and Cantillon

Cantillon (1680-1734) and Hume (1711-1776), both writing in the 18th century, have emerged as the main contributors to the quantity theory of money. Their studies were perhaps the earliest examples of applications of dynamic analysis to the quantity theory of money (Humphrey, 1974; Vickers, 1959; New Palgrave, 1987). They made the distinction between long-run stationary equilibrium and short-run movements toward equilibrium. Before them, static analysis was prominent among economic thinkers, including Locke. Cantillon and Hume described the sequence of steps by which the impact of a monetary change spreads from one sector of the economy to another, until all prices have changed in equal proportion to the money stock and all quantities have returned to their pre-existing levels. According to their approach, the dynamic adjustment path would be influenced by the source of the stimulus to change, and by the different dispositions of money income (Cantillon, 1730). This would be followed by, what Keynes was to call "the diffusion of price levels", that is, the fact that monetary changes do not affect all prices in the same way, in the same degree, or at the same time (Spiegel, 1991). These non-neutral effects were expected to vanish in the long run, however.

There was also interdependence between the supply of money and the demand for it on the loans market. Cantillon explained this interdependence with reference to the influence of economic activity on the demand for loan money, whereas Hume mainly focused on the influence of economic activity on the supply of loan money.

Cantillon was in the soundest traditions of the metallists. In his essays, metallic monies, i.e., gold and silver, were referred to as real money, and bank money as fictitious or imaginary money. However, he did not make any distinction between them in terms of the functions they serve. Money was basically a medium of exchange.

Like the previous economic thinkers Petty and Locke, Cantillon viewed the "rapidity of circulation" as the determinant of the volume of money which would be required to finance and facilitate any given or desired level of transactions (Vickers, 1959). Cantillon added some new variables to the velocity function. Some of these, namely, urbanization (monetization), hoarding, uncertain expectations of the future, and minimum denomination restrictions on asset purchases, tended to reduce velocity. In contrast, the use of trade credit, barter, and other substitutes for money tended to increase velocity (Humphrey, 1993). His analysis of the role of money substitutes in determining the level of velocity lent itself to empirical studies in later periods (Wicksell, 1936; Bordo and Jonung, 1987).

Much later Knut Wicksell (1936) employed this perspective of money substitutes as the primary determinants of velocity. In his study, the substitution between financial assets was based on changes in institutional factors. According to his institutional approach, the rise in velocity was determined by financial sophistication. Financial sophistication meant: 1) the emergence of a large number of close substitutes for money that reduced the demand for money as an asset, 2) the development of various methods of economizing on money balances, such as the use of credit cards and modern cash management techniques. These reduced the transactions demand for money (Bordo and Jonung, 1987), because new substitutes for money induced portfolio holders to switch out of money into the new assets.

Written in the era of full-bodied money, the Cantillon and Hume analysis had relied solely on the direct mechanism of monetary transmission to raise the prices. In their analysis, an arbitrary influx of gold coin would induce an increase in the rate of spending until all incomes and prices had risen in proportion to the monetary injection. This explanation no longer sufficed after gold coin had given way to bank notes in the 19th century, because it failed to explain how bank notes and other forms of paper money were injected into the system. In his 1802 book, *The Paper Credit of Great Britain*, Thornton introduced the indirect mechanism which took account of the commercial banking system's role in monetary transmission.

Section 3: 19th Century

3.1. Henry Thornton:

Among 19th century thinkers, the most important contributions came from Henry Thornton (1802). He provided the first exposition of the indirect mechanism explaining the linkages between money and prices (Humphrey, 1974; Makinen, 1977). According to Thornton, the new money created by banks increases bank assets through loans, which pushes the interest rate on loanable funds below the expected yield on new capital projects (the rate of mercantile profit), stimulates investment spending, and then drives up prices of investment goods. When investment goods become more expensive, investors increase their demand for loans to finance their new investments. This bids up the loan rate of interest until it becomes equal to the rate of mercantile profit. This mechanism, first put forward by Thornton, was accepted by subsequent quantity theorists and became an integral part of classical analysis.

Thornton also expressed the velocity function in a more sophisticated way by including within the determinants of velocity inflationary expectations, the state of business confidence, the composition of payments media, and financial innovations (Humphrey, 1993). He defined money broadly as the total stock of circulating media, consisting of coin, bank-notes, and bills of exchange, each circulated with a speed that varied inversely with the opportunity cost of holding it. This cost was the differential between the instrument's own rate of return and the prevailing market rate. Thus, coin and bank-notes, which yielded no interest, circulated faster than interest bearing bills of exchange. Since each of these instruments had a different velocity, the aggregate velocity would change whenever there was a change in any one of the components (Thornton, 1802). This structure, together with the effects of the changes in expectations, caused the aggregate velocity of circulation to be unstable (New Palgrave, 1987).

According to Thornton's analysis, a high state of confidence increases velocity by lowering the precautionary money demand; high inflationary expectations increase it by causing a flight from cash; and financial innovations increase it by economizing on the use of money (Thornton, 1802).

3.2. Bullionist Controversy:

Thornton was also famous for his standing in the "Bullionist Controversy", one of the most important monetary policy debates of the 19th century (Mints, 1945). The debate took place in England between 1797 and 1821, and reflected the policy stance of quantity theorists in the face of the depreciation of Bank of England bank-notes. In the first phase (1797-1803), which was characterized by inflation, the Bullionists, led by David Ricardo, argued that the depreciation of currency was caused by excess issue of the paper pound (Viner, 1965). According to them, whenever the stock of money increased at a faster rate than real output, internal prices would rise and make imports more attractive relative to domestic goods and services. Under a convertible currency regime, the rise in imports and decline in exports would lead to an outflow of gold. Under an inconvertible currency regime, it would lead to a depreciation of the currency. Thus, the heavy outflow of gold which forced suspension of convertibility in 1797, and the subsequent depreciation of the pound were all taken as evidences of an overissue of Bank of England notes. The prescription was the contraction of the note issue. The Bullionists assumed that the reduction in the money supply would lower internal prices, remove the trade deficit, and eliminate the premium on bullion.

Bullionists also criticized the Real-Bills doctrine. The Real-Bills doctrine, first formulated by Adam Smith, held that so long as paper bank-notes or money was advanced in discount of sound short-term commercial paper, they could never be issued in excess of the needs of businesses (Makinen, 1977). Thus, if bank lending were restricted to self liquidating commercial paper (non-speculative lending), the volume of notes would expand in pace with the transactions. This idea became the standpoint of first Antibullionists, and later the Banking School. Since money creation would be limited to the expansion of real output, no inflation could occur. This is the origin of the contra-quantity theory notion that the stock of money is solely demand-determined, and therefore cannot have any independent influence on spending and prices (Humphrey, 1974).

Antibullionists also argued that the suspension of gold convertibility in 1797, and subsequent depreciation, were not caused by currency overissue, but by the huge outlays made abroad to support the British military, and by the necessity of making extraordinary imports of grain following a period of bad harvest in England (Makinen, 1977). In brief, they indicated that the economic disturbances stemmed from non-monetary causes and required non-monetary cures.

The Bullionists led to a long lasting debate whose importance in the development of the quantity theory was outlined by Humphrey (1974). First, they viewed the Central Bank and excess quantity of money as determinants of higher prices. Second, they were the first to develop the idea that the stock of money, or at least its currency component, could be effectively regulated via the control of a narrowly defined monetary base.

3.3. The Currency School - Banking School Controversy:

The second important debate in the development of the quantity theory was the Currency School-Banking School controversy over the question of the regulation of the bank-note issue, which was discussed in detail by Viner (1965), Mints (1945), and

Makinen (1977). After returning to the gold standard in England in 1821, the Currency School, following the Bullionist tradition, proposed that the issue of bank-notes should be expanded and contracted one for one with variations in gold reserves, and this would be achieved by strict regulation of the volume of bank notes. For Bullionists, convertibility alone was a safeguard against overissue, but members of the Currency School regarded convertibility as an insufficient check, and in modern terminology, proposed a marginal gold reserve requirement of 100 percent.

The contributions of the Currency School to the quantity theory lie in their sharp delineation between money and other liquid assets, and their concern with the control of the money supply (Humphrey,1974). According to them, money could be defined to include only coins and notes as mediums of exchange, and the entire superstructure of near money (bank deposits, commercial bills of exchange, notes of "country banks" and open book credit) could be regulated effectively by controlling the bank-note base. Similar to Thornton's argument, they suggested that the low circulation velocities of other money substitutes made them insignificant relative to the notes as an exchange media. They went further to propose that these assets were poor substitutes in terms of final payments, especially in times of financial crisis, so they could be excluded from theoretical analysis. For them, if notes were regulated, near money could be controlled via a stable link between exogenously determined money and endogenous near money. This regulation would also bring an ultimate constraint on the creation of deposits without any explicit control over them.

At the opposite side there was the Banking School. Following Antibullionists, they contended that currency overissue was impossible as long as banks restricted their loans to self-liquidating commercial or agricultural paper. The supply of money was determined by the needs of trade and thus could never exceed demand. They could not see any link between the stock of money and the volume of credit or of money substitutes. Contrary to the Currency School, they tended to emphasize the overall structure of credit. They argued that the ready availability of bank deposits, bills of exchange, and other forms of credit instruments that could circulate in lieu of money would defeat the Currency School's efforts to control the entire credit superstructure via the control of the bank-note base (Humphrey, 1974). The volume of credit that could be erected on a given monetary base was large, variable, and unpredictable. It was argued that the total volume of credit was independent of, as well as more significant than, the money stock, and could influence aggregate demand and prices. They denied that the central bank could control the money stock, since money was a demand determined variable, and the supply of money was infinitely elastic (Makinen, 1977).

Like their Antibullionist predecessors, the Banking School claimed that there was not a direct or indirect transmission mechanism running from money to prices, but causation was from prices and income to money (Tooke, 1844). Since the price level was governed by the relationship of aggregate demand to aggregate supply, only by influencing demand could Bank of England notes affect the price level.

Section 4: The 20th Century

Despite the criticisms of the Banking School, the quantity theory became prominent for the remainder of the 19th century and into the 20th century. During this period, the most important contribution was the mathematical restatement of the quantity theory by neoclassical economists. This mathematical framework took two alternative forms. The first was Irving Fisher's *Equation of Exchange* (Fisher, 1911):

$$M\ V = P\ T$$

where M is the quantity of money, V is the number of times it turns over (i.e., its transactions velocity of circulation), P is the price level, and T is the physical volume of market transactions. The second mathematical formulation was the *Cambridge Cash Balance Equation* (Pigou, 1917):

$$M = k\ PY$$

where M is the stock of money in circulation, k is the ratio of the nominal money supply to nominal income (desired or actual cash balance ratio), P is the price level of national product and Y is the real national income.

Cambridge k was numerically equal to the reciprocal of Fisherian V, and both approaches shared the same view that, it was possible to control the money supply via control of an exogenously determined stock of high-powered money (monetary base).

However, they approached money and its functions from different perspectives, and this led to emphasis being placed on different variables and analytical techniques.

4.1. Fisherian Approach:

In a money economy, for the act of purchase to be separated from the act of sale, there must be something that everybody will accept in exchange as "general purchasing power" (Fisher, 1911). This aspect of money is emphasized in Fisher's transactions approach, and makes it natural to define money in terms of whatever serves as a medium of exchange (New Palgrave, 1987). Demand for money arises as a result of individuals' needs to trade with one another. Hence, the variables that influence the payments process, such as payments practices, financial and economic arrangements affecting transactions, and the speed of communication and transportation are emphasized as the determinants of velocity. Since these variables do not change rapidly, the velocity of circulation is relatively fixed. Fisher, in *The Purchasing Power of Money* (1911), lists the short-run determinants of velocity as: the rate of interest, expected changes in the general level of commodity prices, and the degree of confidence in the future course of events. However, relying on an extensive elaboration of long-run technological factors, Fisher never sufficiently emphasized these short-run determinants (Makinen, 1977). Even Don Patinkin (1965) alleged that Fisher did not recognize the influence of the rate of interest on velocity. Fisher also viewed both velocity and real income as independent of each other and of the supply of money in the longer run. He concluded that any change in the stock of money produces a proportional change in the general level of prices only.

Although Fisher and his followers were concerned with the behavior of transactions velocity, due to problems in its measurement they adopted income velocity for empirical studies (Bordo and Jonung, 1987). This approach gave rise to the so-called "inventory theoretic" models (Baumol, 1952; Tobin, 1956).

4.2. The Cambridge Approach:

In contrast to Fisher's approach, Cambridge economists A. C. Pigou (1917) and Alfred Marshall (1923) suggested that there must have been something that could serve as a "temporary abode of purchasing power" in the interim between sale and purchase. Therefore, they found it reasonable to include in the definition of money such temporary abodes of purchasing power as demand and time deposits not transferable by check (M2) (New Palgrave, 1987). Their question was, how much money would people or enterprises want to hold on average as a temporary abode of purchasing power?

In this view, individuals' desires to hold money and wealth were considered more significant than the institutional or income constraints. Therefore, the Cambridge equation could be interpreted as a demand for money equation, and velocity as the income velocity of money (Laidler, 1969).

Another difference between the two views is that Cambridge economists approached money as an asset providing some important services or utility for its owners, and stressed the store-of-value function of money. This had some implications. First, they were involved in the composition of balance sheets, or asset portfolios. Second, as determinants of velocity or money demand, they emphasized the variables affecting the usefulness of money as an asset. These were: the wealth or budget constraint, the opportunity cost of holding money instead of other assets, the expected rate of inflation, and financial innovations including the development of money substitutes. The velocity of circulation could be considered as stable in the long run, but in the short run *k* could fluctuate, depending on the expected returns on money and other assets (Mishkin, 1992). Last, Pigou and Marshall viewed the desired stock of money as dependent partly on the relative size of the stock of nonmonetary assets. Thus, in the short run, when the supply of money changes, depending on the stock of nonmonetary assets and their expected yields, the price level may not change in the same proportion as money (Makinen, 1977).

This approach later gave rise to the so-called "capital theoretic", or portfolio approach (Friedman, 1956; Tobin, 1958).

4.3. The Keynesian Revolution:

Like the Bullionist controversy of the 17th century, and the controversy between the Currency and Banking schools in the 19th century, the 20th century was dominated by the Keynesian attack on the classical economists (Keynes, 1936). Keynes, a late Cambridge economist, expanded the Cambridge approach in such a way that his liquidity preference theory reached very different conclusions. The important parts of his critique in terms of this study are outlined as follows. First, the classical formulation of near constant velocity was not acceptable. Keynes contended that velocity in the Fisher equation was extremely unstable, influenced by expectations, uncertainty, and changes in the volume of money substitutes. Therefore, any change in M might be absorbed by an offsetting change in V, and not transmitted to P (Humphrey, 1974). Second, he criticized the classicals because of the rigid links they assumed existed among money, spending, prices, and nominal income. A monetary expansion might be ineffective in the monetary transmission for at least two reasons: the new injections of cash balances might be absorbed into idle hoards, so that interest rates might not respond, or spending might be interest insensitive, so that changes in interest rates might not affect spending. Finally, Keynes recognized only two types of financial assets: money and bonds. Money was regarded as an asset, a specific substitute for bonds, and relative returns on each asset, it was argued, would determine the demand for money.

In his analysis of the demand for money, Keynes treated the stock of money as if it were divided into two parts. One part was held to satisfy the transactions and precautionary motives, and was a function of income, and the other part was held to satisfy the speculative motive, and was a function of interest rates (Keynes, 1936). He suggested that the expected return on money or riskless assets would determine what would be held in the portfolio (Mishkin, 1992). His analysis implied that no one holds a diversified portfolio of money and bonds at the same time as a store of wealth, since expected returns were not likely to be the same.

Later, following him, Tobin (1958) developed a model of speculative demand for money, and explained the rationale behind holding money and other financial assets together in the portfolio. According to his model, people may divide their wealth between different financial assets, or may hold money even when other assets have higher yields to diversify or totally avoid risk.

4.4. The Modern Monetarism:

The most prominent modern monetarist is Milton Friedman, with his restatement of the quantity theory. When he published *The Quantity Theory of Money-A Restatement* in 1956, his reformulation not only expanded the quantity theory in compliance with the Cambridge tradition, but also responded to some of the Keynesian critiques as well (Laidler, 1969). First, the quantity theory was reinterpreted as a theory of the demand for money rather than as a theory of the determination of the level of prices and real output or nominal income (Friedman, 1956). Second, he regarded velocity as a predictable functional relationship rather than a near-constant variable. In his interpretation, fluctuations in velocity were perfectly consistent with the idea of a stable functional relationship, because those fluctuations might be predicted by the variations in the independent variables of the velocity function. For him, the random fluctuations were small, and the velocity was highly predictable. Thus, he confronted the Keynesian contention that the theory was a mere tautology (Makinen, 1977). Third, his restatement utilized the latest developments in capital or wealth theory, and incorporated the Keynesian-Hicksian asset or portfolio approach to the demand for money, and thus facilitated statistical estimation and testing. He stressed the role of money as one kind of asset, and distinguished between ultimate wealth holders, to whom money is one way of holding their wealth, and enterprises, to whom money is a capital good (Friedman, 1956). In his analysis, not only money and bonds, but a wide array of financial assets, were included in the money demand function. Finally, by applying the general principle of the diminishing marginal rate of substitution to money, he argued that the more money that was held, the less valuable were the services flowing from money relative to those of other assets.

Applying these principles, the ultimate wealth holders' demand for money was expressed as (Friedman, 1956):

$$M^d = f(P, r_b, r_e, r_p, w, Y/r, u)$$

In this expression M^d is the demand for money, P is the general level of prices, which represents the real return on money, r_b, r_e, and r_p are the real returns on bonds, equity, and physical assets respectively, w is the fraction of wealth in nonhuman form, Y/r is wealth or permanent income, and u is the random variable representing tastes and preferences which determine the utility attached to the financial assets.

Business enterprises' demand function has some differences from that of wealth holders. They hold money as a productive resource, and they are not subject to a wealth constraint, because they can acquire additional capital through the capital markets. In addition, for business enterprises, u represents the set of variables affecting the productivity of money balances.

Friedman's definition of money emerged from the specification of money's economic function as a temporary abode for generalized purchasing power. In contrast to Keynes, his approach suggests that the changes in interest rates should have little effect on the demand for money. The main determinant of money demand is, therefore, permanent income (Mishkin, 1992).

Section 5: Summary

The question of whether the demand function for money is stable has been one of the most important recurring issues in the theory and application of macroeconomic policy. If money has a predictable influence on the rest of the economy, it can be a useful instrument of economic policy for the central bank.

In general the assumptions of quantity theorists are as follows (Humphrey; 1974):

1) The transmission is from quantity of money (defined either narrowly or broadly) to income and spending, and the supply of money is determined by three distinct variables: the monetary base (controlled by monetary authority), the reserve / deposit ratio (determined by commercial banks), and the currency / deposit ratio (determined by nonbank individuals). The monetary base provides a stable instrument to control the money stock.

2) Money substitutes do not have an independent stimulating effect in the transmission mechanism.

3) The velocity of money is predictable, so money demand is stable.

Late quantity theorists describe the monetary transmission mechanism as operating through balance sheets (New Palgrave, 1987). After an increase in the quantity of money, the prices of balance sheet assets increase and interest rates decline. This encourages spending on production of new assets and on current services rather than the purchase of existing assets. In this way an initial effect on balance sheets gets translated into an effect on income and spending. This resulting increase in spending tends to raise the prices of all goods and services, and in turn lowers the real value of money.

CHAPTER III

PREVIOUS EMPIRICAL RESEARCH

Section 1: M1 Definition of Money

Stability of money demand has been at the center of the discussion about monetary policy. Postwar money demand theories fall into two broad classes:

1- Transaction theories, epitomized in the inventory theoretic models (Baumol, 1952; Tobin, 1956), emphasized money's role as a medium of exchange. They suggested the transaction costs of switching between money and other liquid financial assets as the determinants of money demand. Another version of these models (Miller, 1966; Orr 1968) emphasized the uncertainty of cash receipts and disbursements as the main determinants of money demand.

2- Asset or portfolio theories, as represented, for example, by Friedman (1956), viewed money and other assets as alternative ways of holding wealth, each yielding some explicit or implicit utilities.

Differences between these two sets of theories have created discussion on several empirical issues (Judd and Scadding, 1982). The first is the proper definition of money. Transactions theories imply that money should be defined as a means of payment. Portfolio theories adopt a broader definition to include in money other liquid substitutes, such as savings deposits. The second issue is the choice of an appropriate scale variable in the money demand function. The argument is whether some measure of transactions is appropriate as the scale variable, as the transactions theories argue, or some measure of wealth or permanent income (as a proxy for wealth), as the portfolio theories suggest.

The third issue concerns the correct measure of the opportunity cost of holding money. The transactions theories imply that a short term security is the closest alternative to holding money, therefore its yield is the proper opportunity cost of money. The portfolio theories, on the other hand, include the yields on longer term financial assets or even on equities and physical capital as the opportunity costs of holding money, since these are substitutes for money. A fourth issue is the incomplete adjustment of money demand in the short run, and whether lagged values of money should be included in the function as a proxy for the adjustment process.

In 1973, Stephen M. Goldfeld examined these issues, and proposed a specification which became the standard formulation of money demand (Judd and Scadding, 1982). The form of the equation is:

$$\ln (M1_t / P_t) = a_0 + a_1 \ln GNP_t + a_2 \ln RMS_t + a_3 \ln RSAV_t + a_4 \ln (M1_{t-1} / P_{t-1})$$

where $M1$ = currency plus checkable deposits; P = the aggregate price level: GNP = real gross national product; RMS = a short term market rate of interest: $RSAV$ = rate of interest on savings deposits.

According to his specification, the most stable money demand equation exhibited four features (Judd and Scadding, 1982). First, it used the narrow definition of money.

Second, it employed long-term interest rates and the rates on savings deposits as measures for the opportunity cost of holding money. Third, it used income rather than wealth or permanent income as the scale variable. Fourth, it lagged money to allow for incomplete adjustment. The out of sample dynamic simulations of Goldfeld's model, however, overpredicted real money balances after 1973.

Subsequent research drifted into two lines of inquiry. One line of inquiry interpreted the rise of velocity in the mid-1970s, and its subsequent sharp decline in the 1980s, as evidence of instability in the demand for money. These studies abandoned M1, and reformulated the money demand function to incorporate the financial innovation of these episodes. The second line of inquiry scrutinized the pre-1973 period, using a new and different body of data, and focused on the correct specification of the demand for M1.

In terms of this second line of inquiry, the research on money demand prior to 1973 cast doubts on the Goldfeld specification. It was suggested that there were some episodes of instability prior to 1973 (Laidler, 1977), and it was not possible to distinguish empirically, with any degree of precision, between the competing hypotheses about the demand for money (Judd and Scadding, 1982). Apart from the equation of Hamburger (1977), these studies were not able to find a reliable specification. Hamburger included a broader range of rates of return (the commercial bank savings deposit rate, the U.S. government bond rate, and the dividend-price ratio on equities) in the money demand function, and explained the shifts during the 1974-76 and 1979-80 periods. His equation is:

$$ln\ (M1 / Y)_t = a_0 - a_1\ ln\ R_t - a_2\ ln\ BR_t - a_3\ ln\ DR_t + a_4\ ln\ (M1 / Y)_{t-1}$$

where $M1$ = demand deposits plus currency in the hands of the public; R = rates of return on time deposits; BR = rates of return on government bonds; DR = dividend-price ratio on equities; Y = contemporaneous nominal income.

However, his specification was also criticized as having some shortcomings. By expressing the dependant variable as the ratio of money to nominal income, and omitting real income as one of the arguments, he restricted the real income elasticity of money to unity (Judd and Scadding, 1982). Other studies suggested that the coefficient of real income was significantly different from unity when the restriction was removed. In addition to this, it was argued that when the commercial paper rate was added to the equation, it was statistically significant, and robbed the government bond rate of its significance (Hafer, Hein 1979). However, when Hamburger's specification was corrected for both of these shortcomings, the root-mean-squared error for dynamic forecasts exceeded that of the Goldfeld equation. Thus, it was concluded that the ability of Hamburger's equation to forecast well out of sample data rested on restrictions not supported by the estimation of the sample data (Judd and Scadding, 1982). In conclusion, this line of inquiry became futile.

The other line of inquiry, which became more popular, addressed how financial innovation might have affected the demand for money, and what were the implications for macroeconomic policy. M1 as a monetary policy instrument was regarded as inadequate in the face of rapid strides in deregulation and innovations after 1970. Deregulation and innovations were blamed for the apparent instability between money and other sectors of the economy (Poole, 1991). Moreover, after the reserve requirements were set to zero on personal time deposits and savings deposits in the 1980s, the control of the Federal Reserve over the money supply through reserve requirements weakened.

The biggest change in the public's M1 demand took place in the aftermath of the Depository Institutions and Control Act of 1980 and the Garn St. Germain Act. The former aothorized nationwide NOW accounts in December 1980 and required a phased elimination of interest rate ceilings on saving and personal time deposits (Roth, 1990). The latter authorized Money Market Deposit Accounts (MMDAs) in 1982. These accounts paid explicit market rates and were easily converted into checkable deposits. The addition of NOWs to M1 caused M1 to behave as a saving as well as a transaction instrument. MMDAs were convenient substitutes for money, and their inclusion in M2 may have been the primary contributor to the demise of M1's relationship with nominal GDP. M1 became substantially more variable with no clear trend (Carlson and Byrne, 1990).

In conclusion, the behavior of the public's demand for real money, using the M1 definition of money, has been empirically found to be unstable.

Section 2: M2 Definition of Money

M2 was proposed as an alternative to M1, because empirical findings suggested that it was fairly stable during the period when M1 was not (Hetzel, 1989; Hetzel and Mehra, 1989). However, the M2 monetary aggregate has been unusually weak over the past few years compared to the level of nominal economic activity. Around 1989, an apparent break occurred in the relationship between M2 velocity and the opportunity cost of money, where the opportunity cost is defined as the difference between the market interest rate and the rates paid on M2 instruments (Carlson and Byrne, 1990; Collins and Edward, 1994). This breakdown has brought into question the reliability of this measure as a guide for policy.

Estimated money demand functions divide the variability of the public's demand for real M2 into random and systematic components. If the random changes to M2 demand tend to average out over time, although they may be large for individual years, the stability condition is considered to be satisfied for this component. On the other hand, if random errors accumulate over time, the series is nonstationary.

In terms of systematic components of variability, if the changes in the opportunity cost of holding money systematically create proportional changes in M2 demand, it is considered that the series is stable. Hetzel (1989), in his study of the behavior of M2 velocity for the period from 1914 to 1988, concluded that, despite greater variation in velocity before 1950, the series was stationary after 1950. In terms of the opportunity cost of M2, he considered two alternate measures: the commercial paper rate as the interest foregone by holding money, and the inflation rate as a proxy for holding physical assets. Theoretically, it was expected that the velocity of M2 would move in the same direction as its opportunity cost, measured as either of these variables. Empirically, for the 1950-1988 period both measures gave the expected results. Also, considering the effects of random disturbances, M2 velocity was concluded to be stable.

More recent studies, however, did not favor all of the conclusions that Hetzel had reached, especially when the sample period was extended beyond 1988. For example, Moore, Porter and Small (1990) used an error-correction model, and suggested that a reasonably stable M2 demand specification could be estimated, at most, up until 1988. After that date, however, their model overpredicted M2 growth.

Other studies, which have focused on the behavior of M2 velocity for a variety of time spans, concluded that the M2 demand function has not been stable. Wenninger (1988) compared M1 and M2 monetary aggregates for the 1915-1987 period, and suggested that the estimated money demand equation for M2 was more stable in the long run, due to its lower interest rate sensitivity. However, he found some subperiods when M2 was unstable. On the other hand, Friedman and Kuttner (1992) extended the period to 1990, and concluded that for M2 to be cointegrated with income, the sample period had to begin in the more tranquil 1960s. For the 1970-1990 period, they applied the Augmented Dickey-Fuller test, and could not reject the null hypothesis of "no cointegration" even at the 0.01 level of significance. This means that money and income are not cointegrated and that there is no long-run relationship between them when the sample period starts from 1970.

Mehra (1991), on the other hand, also estimated an error correction model for M2 demand, and concluded that M2 demand had a stable long-run relationship with real GNP. He used real consumer spending as a short-run scale variable for real GNP, and attributed the unexpected decline in M2 growth in 1989 to the deceleration of real consumer spending. Therefore, he concluded that the long-run equation, which included real GNP, was stable.

Another study on M2 demand (Hendry and Ericsson, 1991) criticized the estimated money demand function for the United Kingdom in *Monetary Trends in the United States and the United Kingdom* (Friedman and Schwartz, 1982) in terms of econometric model design criteria. According to them, the stable money demand equation, as suggested by Friedman and Schwartz, was misspecified due to parameter nonconstancy and the nonexogeneity of money, and did not explain the phase-averaged data. Instead, Hendry and Ericsson constructed an error-correction model for the annual data for the 1878-1970 period in the United Kingdom. In their model, nominal money was endogenously determined by demand factors, and was conditional on prices, income and interest rates.

These studies suggest two things: First, M2 velocity has been more stable than M1 velocity. Second, in terms of long-run stability, M2 velocity is not stable when the sample period is extended to the 1990s.

Another line of inquiry has been to redefine M2 to capture the effects of financial innovation. Poole (1991), redefined monetary aggregates on the grounds that financial innovation blurred the functional distinctions between the various monetary aggregates. In his study, one definition was based on the function of money as a "temporary abode of purchasing power" (Friedman and Schwartz, 1970). According to this definition, all instruments available with zero maturity were included in M1. A second definition expanded M2 to include Money Market Mutual Funds available only to institutions. According to his results, expanded M2 appeared to have a more consistent relationship with its opportunity cost than did M2.

Another study that redefined monetary aggregates was undertaken by Wenninger and Partlan (1992). Searching for an explanation for the weakness of M2 growth in 1991, they concluded that the small time deposits component of the aggregate caused M2 to be unstable after the1980s. This study related the instability of small time deposits with some demand and supply side factors, and suggested that leaving small time deposits out of the M2 definition would help the aggregate to regain its short-run stability in this period. Nevertheless, redefining M2 in this way made the series unstable in the long run. It was assumed that M2 was the only monetary aggregate which had a stable long-run relationship with GDP in the 1959-1991 period.

More recent studies on the redefined M2 tried to explain the weakness in M2 growth after the 1990s with reference to improvements in the stock and bond market. Collins and Edwards (1994) suggested that the shift of demand to bond and equity mutual funds was induced by decreasing yields on M2-type assets relative to the yields of these long-term assets. After 1990, the rising prices in stocks and bonds attracted capital inflows to these capital market instruments, and a large portion of these funds came from M2-type assets. In their explanation, the increased liquidity of long-term mutual fund shares was also emphasized as a cause of higher demand for long-term assets. If mutual fund shares could be converted into transaction balances easily, they might be preferred by individuals because of their higher yields. Collins and Edwards concluded that these funds were very close substitutes for money, and therefore could be included in M2. They constructed a monetary aggregate (M2+) by including net assets of bond and equity funds in M2, and excluding all institutional holdings of these funds as well as IRA and Keogh components of these funds.

Another empirical study estimated money demand equations using this new aggregate (M2+) as the money variable (Orphanides, Reid, and Small, 1994). The results of the study suggested that even this new aggregate was not powerful enough to estimate a stable long-run money demand function. Two money demand functions were estimated separately for two sub-periods because of the structural shift occurring in 1990. The new aggregate outperformed M2 only for the second period starting after 1990.

Duca (1994) adopted a similar approach by adding bond and equity funds to M2. His approach was to analyze alternative M2 variables as indicators of nominal GDP growth. He concluded that the addition of bond and equity funds to M2 created a better variable to predict nominal GDP growth than M2, especially after the 1990s.

In conclusion, these studies show that M2 can be redefined to capture the changes induced by financial innovation. However, change in financial markets never ceases, and this may require these monetary aggregates to be redefined constantly. Thus, even these redefined variables are vulnerable to future changes, and this causes them to be weak in terms of long-run stability.

Section 3: Credit Financial Variable

Another recent discussion has been the role of credit as a money substitute. Is there a stable link between the credit aggregate and economic activity? Is credit demand more stable than money demand, and is it possible for the central bank to control credit growth?

Credit is a financial asset on the books of those who extended it. Technology and innovations have been increasing the liquidity of those assets in recent years. In that sense, the level of credit / financial assets in the economy also meets the requirements of "moneyness", and can be considered as an aggregate which explains the transmission of monetary policy (Dreyer, 1994).

The studies which give credit a special role can be classified into two groups: 1) Those which emphasize the nonsubstitutability of bank credit, and 2) those which stress the role of total credit, including the nonbank intermediaries' loans.

According to the studies emphasizing bank credit, the uniqueness of bank loans are based either on financial market imperfections (Gertler and Gilchrist, 1993; Morgan, 1992), or informational asymmetries (Bernanke, 1993; Blinder and Stiglitz, 1983). According to the financial market imperfections thesis, when there is a monetary contraction, large firms may smooth the effect of declining cash balances by borrowing in the capital markets. Small firms, however, cannot borrow in the commercial paper market because of their higher riskiness, and have to restrict their economic activity. The literature on informational asymmetries, on the other hand, emphasizes the information gathering and transmitting functions of banks. Due to economies of scale, economies of specialization, and economies of scope, banks gather information about customers, evaluate projects, and monitor borrowers more efficiently than other lenders (Bernanke, 1993). Since this information is critical to the customers' ability to obtain loans, if banks do not lend, other potential lenders, not possessing the same information about the customers, will not make loans either. However, some empirical studies could not find any independent role for bank lending in the monetary transmission mechanism (Romer and Romer, 1990). Others concluded that lending responded to GDP growth rather than the other way around (Carlson and Byrne, 1990).

For the studies emphasizing total credit, the relative decline of commercial banks and increase of nonbank intermediaries called for the invalidation of the distinction between commercial banks and other financial institutions (Gurley and Shaw, 1960). Demand for bank loans became more interest sensitive in the face of the rise of other substitutes (commercial paper, nonbank financial institutions, international markets, and foreign financial institutions) (Kahn, 1991). Considering this fact, Bernanke and Blinder (1988) estimated credit and money demand equations for the 1974:1- 1985:4 period, and found that credit demand is more stable than money demand after 1979, because money demand shocks became more important after the 1980s relative to the pre-1980 period. Their credit variable was total intermediated credit, and their money variable was M1.

Today, however, the intermediated credit makes up only one fourth of total borrowing. Clearly, there is an unexploited area of research in terms of the macroeconomic role of total borrowing.

In terms of controlling credit growth, two mechanisms are proposed. Keeton (1993) proposed that open market interest rates can control credit growth. In his hypothetical model, the interest sensitivities of credit demand and deposit demand are the two factors which determine how credit growth will change in the face of an open market transaction.

The second option is the control of credit growth by capital requirements imposed on financial institutions. Some studies found that the increase in effective capital standards, and the actual decline in capital positions of some banks, contributed to the slow loan growth in the 1990-1991 period (Furlong, 1992), and that bank capital helps to explain variation in loan growth across banks (Moore, 1992).

However, lending which does not flow through financial institutions cannot be controlled by capital requirements. This is the main shortcoming of this control mechanism.

CHAPTER IV

EMPIRICAL ANALYSIS

Section 1: Credit Market Assets as a Financial Variable

Change in financial markets has been used to explain the change in demand for money. This perspective first was used to analyze changes in M1 money demand. The literature concluded that financial innovation and deregulation caused M1 demand to be unstable. The introduction of Repurchase Agreements (RPs) after 1974 can be seen as the starting point of this structural change. It continued with the introduction of Money Market Mutual Funds (MMMFs), Money Market Deposit Accounts (MMDAs), and legalization of NOW Accounts and ATS Accounts in the 1980s. The result was the availability of more money substitutes. In addition, computerization lowered the transaction costs of converting other assets into money, allowing money holders to keep smaller money balances, and to meet transactions needs by more frequent transfers of funds from higher yielding alternatives (Baumol, 1952; Tobin, 1956).

Today, substitution between all credit market assets and different types of deposits in intermediaries is easier than before (Hubbard, 1994). This is because financial and technological innovations allow funds to move easily from less liquid forms of financial assets to more liquid forms, and vice versa. Therefore, the liquidity of money has lost some of its importance (Hubbard, 1994). The velocity of M2 is increasing, since the public can even more readily switch its demand from money into other financial assets not included in M2. In the 1990s, the back and forth movements of demand for money caused M2 to be unstable. Change in financial markets and the ease of substitution between monetary and other financial assets, therefore, can be an important source of unstable money demand.

If there is instability in the demand for money aggregates, they are not well suited as tools for policy purposes. Is there a financial aggregate which may serve policy purposes better? Is it better to expand the equation of exchange to include other sorts of financial assets instead of including only money? This is the subject of this chapter.

Money is one kind of asset in which value or wealth can be stored (Friedman, 1956). All financial assets serve this function. However they are not fully liquid, so they do not perform the function of money as a means of payment (or a medium of exchange). In recent years their liquidity has increased and it is now easier to convert them into cash balances. This improvement in liquidity increases their power as money substitutes. Thus, both the non-M1 portion of M2 and broader classifications of financial assets can be converted into transaction accounts. The challenge is to find a stable link between a controllable and stable financial aggregate and economic activity.

The total supply of funds, when injected into the system, can take the form of either direct purchases of loans and securities, or can flow through the intermediaries in the form of deposits. The holdings of cash balances or the portfolio allocation decisions are partly determined by relative yields on each asset as well as by their liquidity and riskiness. Through whatever channel they flow into the system, they affect economic activity in the same way. Therefore, instead of using bank liabilities, which represent only one form of fund supplied, it may be more meaningful to consider other types of financial assets which are the liabilities of all sectors.

Previous research has been dominated by studies about bank liabilities and bank credit. However, financial assets of all sectors in the economy are the financial liabilities of other sectors, and they have a role in the transmission of monetary policy. In this study, instead of bank liabilities, the financial assets of different sectors are used as alternative variables. These alternative variables are constructed as proxies for financial assets, and compared to two money variables, M1 and M2. The question is if there is a stable long-run relationship between credit market assets and economic activity. If credit market assets outperform money, then the quantity theory of money can be modified to consider this variable in the transmission of monetary policy.

Section 2: Methodology

The hypothesis of this study is that credit market assets have a stable long-run relationship with nominal income and interest rates. A long-run stable relationship can be interpreted in terms of cointegration (Hendry and Ericsson, 1991). If a long-run relationship can be expressed as X = k Y, where *X* is the financial variable, *Y* is nominal income, and *k* is a constant, to test for cointegration is to test for a long-run equilibrium relationship between *X* and *Y*. According to this approach, if a nonstationary variable is integrated of order *d*, [I(d)], it must be differenced *d* times to make this variable stationary [I(0)]. For two I(1) variables, *x* and *y*, arbitrary linear combinations $x_t + a\,y_t =$

u_t are also I(1). If there exists a value of a, such that u_t is I(0), then x_t and y_t are cointegrated, and do not drift too far apart. If instead of two variables, a cointegrating vector of more than two variables is considered, then it is required that all variables are I(1) individually, but their linear combinations are I(0) (Dickey, Jansen and Thornton, 1991).

There are alternative ways of testing for cointegration. First is the Engle-Granger two-step procedure (Engle and Granger, 1987). Other, somewhat more complicated, ways of estimating cointegrating vectors are explained by Stock and Watson (1993), and Johansen and Juselius (1992). According to the Engle-Granger two-step procedure, first a long-run equilibrium equation is fit to the levels of the variables. The long-run equation is:

$$X_t = a_0 + a_1 Y_t - a_2 R_t + u_t \qquad (1)$$

where all variables are expressed either in levels or in the natural logarithms of levels, and where X_t = the financial variable, Y_t = nominal income, R_t = a short-term interest rate, and u_t = the long-run random disturbance term.

The equation of exchange can be interpreted within this framework. The equation of exchange can be expressed in the Fisherian form (Fisher, 1911):

$$M\ V = P\ Q$$

where M is money, V is the velocity of money, P is the average level of prices, and Q is real output. In this form, the equation of exchange is an identity, so it requires some modifications to test for a long-run equilibrium relationship. We can write it as:

$$\log M = \log Y + \log \frac{1}{V}$$

In the expression above, *1/V* is the Cambridge cash-balance ratio *k*. Neither velocity nor the cash balance ratio are directly observable, but are instead determined by some variables (opportunity costs, risk, liquidity, payment practices, etc.). Interest rates which show the opportunity costs can be used as a proxy for velocity or the cash balance ratio. In this case we can rewrite the above equation as:

$$\log M = \log Y + \log R$$

It is possible to test the equation of exchange in this form for the presence of a cointegration relationship among M (or another financial aggregate), Y, and R.

According to the Engle-Granger cointegration test, after estimating the long-run equilibrium equation (1) for each financial variable, the residuals obtained from these regressions are tested for stationarity. This is done with the Dickey-Fuller unit root test (Dickey and Fuller, 1981). If a unit root is rejected, then we can assume that the residuals are stationary, and the variables in equation (1) are cointegrated, i.e., they move together in the long run without drifting apart.

Section 3: The Analysis of the Variables

All estimations are done using quarterly data for the 1959:1 - 1994:2 period. The two money variables are M1 and M2. The data for other financial assets are derived from the flow of funds accounts (Board of Governors, 1994). The definitions of the financial variables are presented in Table 1.

The interest rate variable is the 6 month treasury bill rate on a coupon basis. The nominal income variable is nominal GDP. All series are seasonally adjusted.

Figure 4.1 plots the velocity of M1, defined as nominal GDP / M1, for the period 1959:1-1994:2. Figure 4.2 shows the velocity of money defined as nominal GDP / M2 for the same period. The horizontal bar shows the mean of the series. As can be seen, the observations are consistently taking on larger values in the 1990s, and deviating further from the mean.

In Figure 4.3, the situation is seen more clearly. The lower-most bar is the series' mean for the 1959:1-1993:1 period. The latter is the date when the observed velocity moved above its previous peak level. The middle horizontal bar lies two standard deviations from the mean, while the uppermost bar shows three standard deviations. The figure suggests that the observations after 1993:1 were not drawn from the same population as the earlier velocity measures. A t-test is applied to the largest observation (dated 1994:2), to test the hypothesis that it was drawn from the same population as the earlier velocity measures. The test is conducted as follows. The null hypothesis is that the largest observation in the series (β) is equal to 1.6515 (population mean, X), and

Table 1

Definitions of the Financial Variables

M1: Currency in circulation
+ travelers checks of nonbank issuers
+ demand deposits at all commercial banks (less cash items in the process of collection and Federal Reserve float)
- demand deposits due to depository institutions, the U.S. government, foreign banks, and foreign official institutions
+ other checkable deposits.

M2: M1
+ savings deposits (including money market deposit accounts)
+ small-denomination time deposits
+ overnight and continuing contract RPs issued by all depository institutions
+ overnight Eurodollars issued to U.S. residents by foreign branches of U.S. banks worldwide
+ balances at general purpose and worker / dealer money market mutual funds
- IRA/Keogh balances at depository institutions and money market mutual funds.

C1: Total credit market assets held by private, domestic, nonfinancial sectors (households, nonfarm noncorporate business, nonfinancial corporate business, state and local governments)
+ estimated stock of corporate equities *

C2: Credit market debt owed by domestic nonfinancial sectors (U.S. government treasury securities, budget agency securities and mortgages, private sector tax-exempt securities, corporate bonds and mortgages, consumer credit, bank loans, commercial paper and other private sector credit market debt)
+ estimated stock of corporate equities *

C3: Total financial assets
+ estimated stock of corporate equities *

* Stock is approximated by time aggregating quarterly flows of corporate equities (not seasonally adjusted) from the Federal Reserve Flow of Funds database. No adjustment is made for the initial stock of equities prevailing in 1959:1. Effects of the missing initial stock is assumed to be captured in the constant term of regressions utilizing this variable.

Figure 4.1. Income Velocity of M1

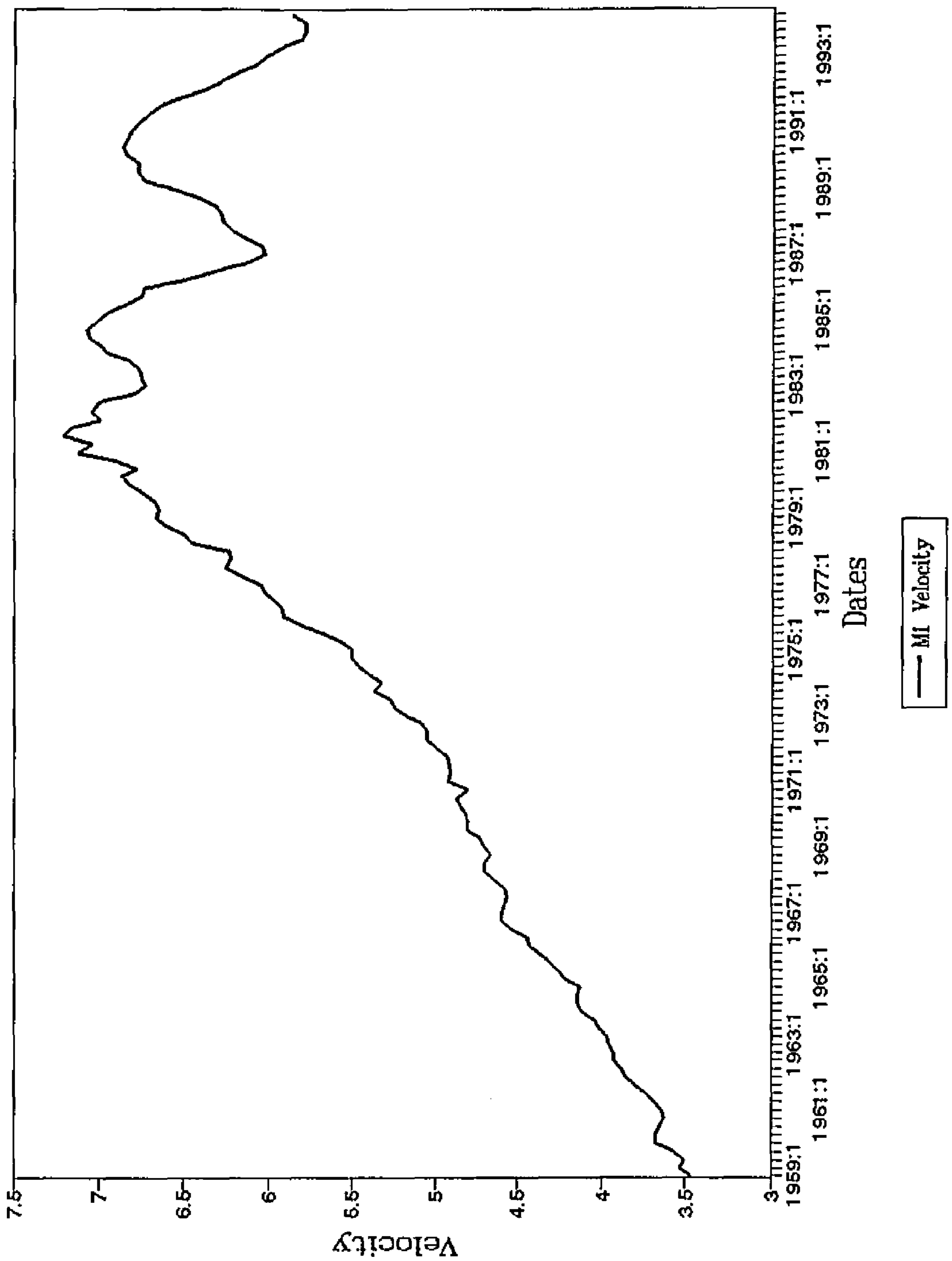


Figure 4.2. Income Velocity of M2

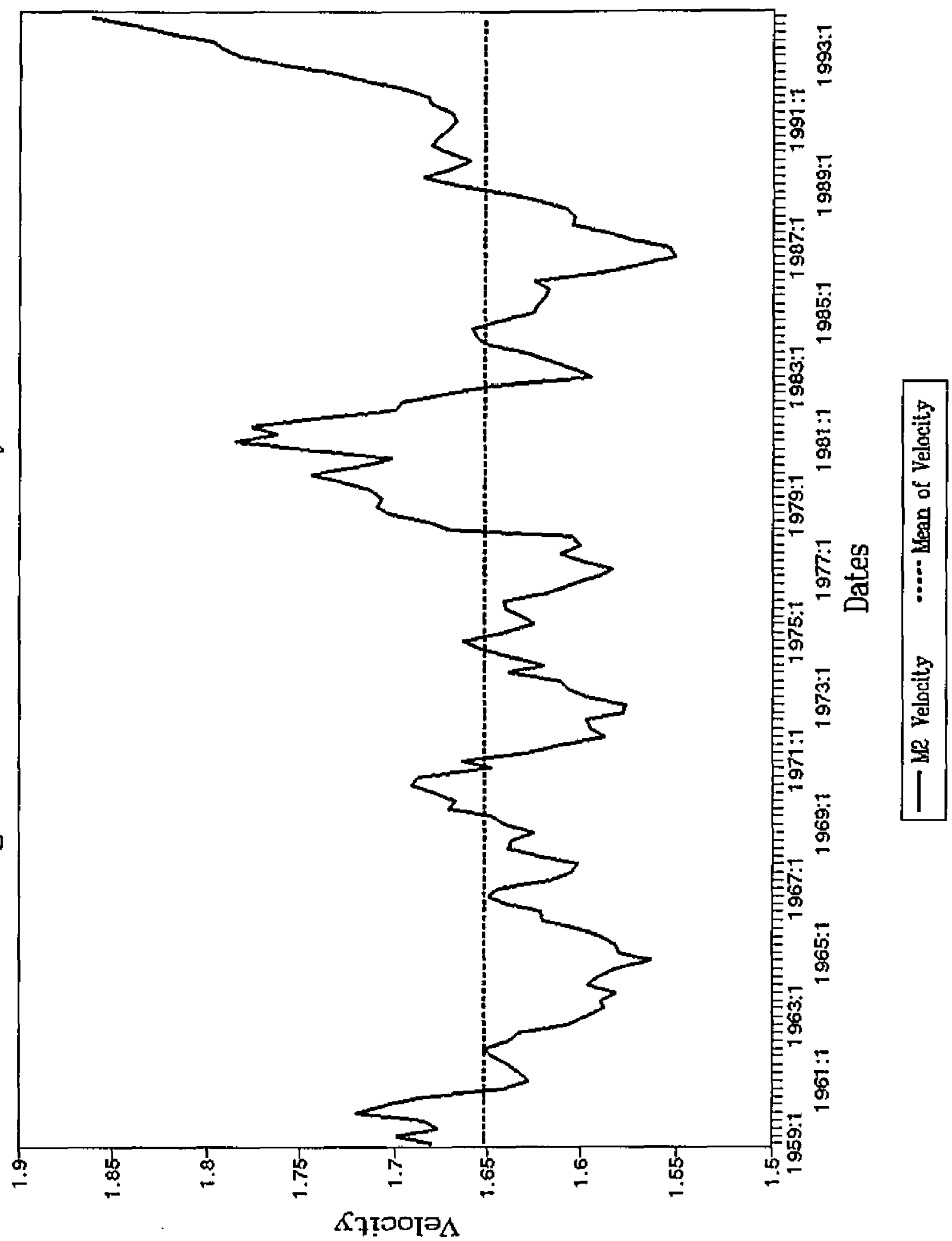
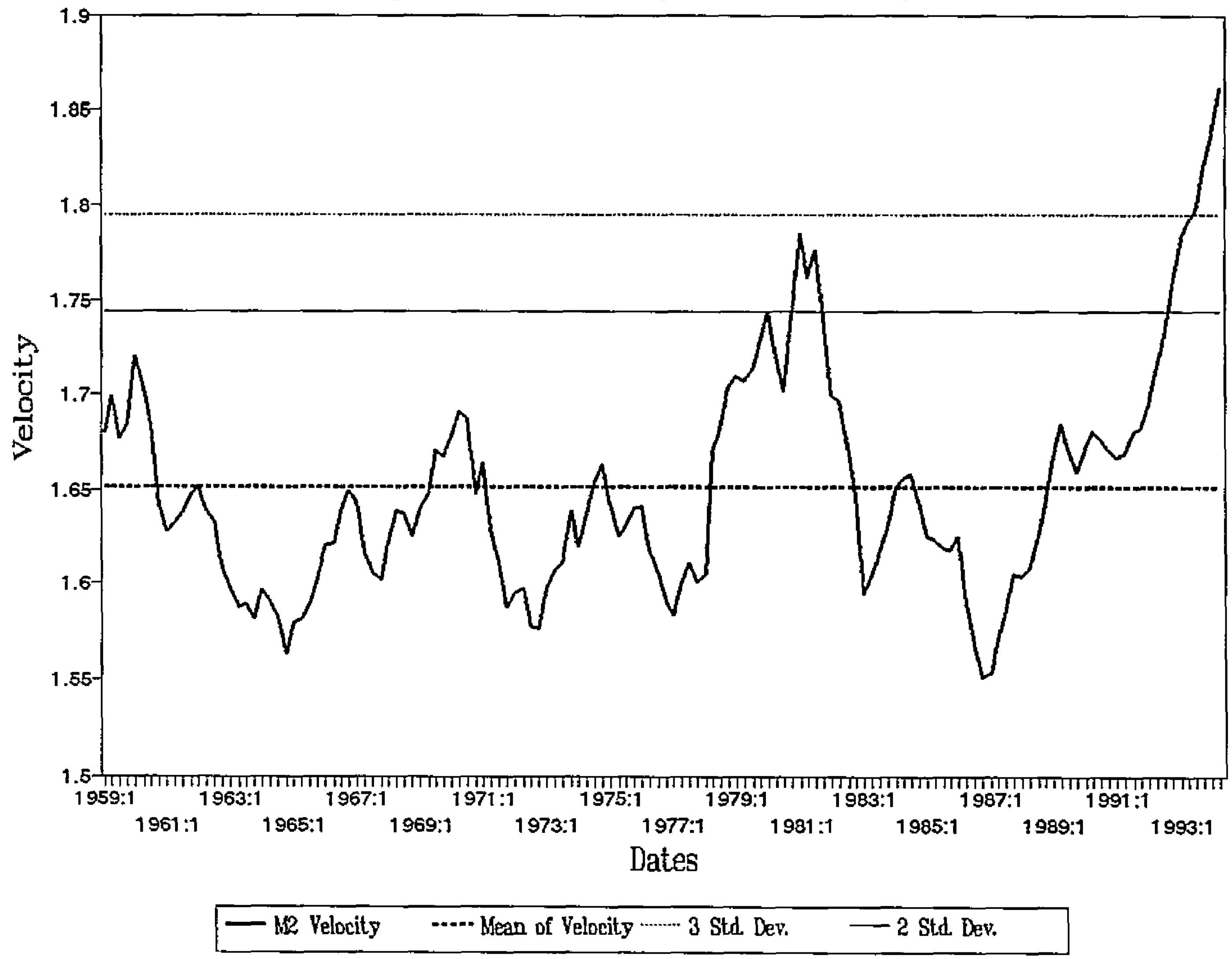


Figure 4.3. Stability of M2 Velocity



$t = \beta - X / SE(\beta)$. The t-value for this observation is equal to 4.316, which is significantly different from the mean at the 0.05 level, leading to a rejection of the null hypothesis.

In conclusion, there is doubt about the stability of demand even for M2, especially when data from the 1990s are included in the sample.

Figure 4.4 shows the velocity of C1, defined as nominal GDP / Credit Market Assets (C1). As seen from the chart, the velocity of C1 has an upward trend until the 1970s, it fluctuates until the 1980s, and then follows a downward trend until 1983. Over the 1983-1994 period it is relatively stable. If these upward and downward deviations are not significant, it can be considered stable in the long run.

Figure 4.5 shows the velocity of C2, defined as nominal GDP / Credit Market Debt (C2). In contrast to C1's velocity, C2's velocity stays relatively stable until the early 1980s, and then follows a downward trend. One difference between the two variables is that C1 shows the asset side of credit market borrowing, while C2 shows the liability side. Also, government sector debt is included in C2, but not in C1. It seems credit market borrowing is more stable when the government sector is not included.

Figure 4.6 shows the velocity of C3, defined as nominal GDP / Total Financial Assets (C3). This variable is derived from the credit market assets of all domestic nonfinancial individuals. The velocity of C3 seems to fluctuate more than C1 velocity. Until the mid-seventies it fluctuates around a constant mean, but then increases. Between the mid-seventies and early 1980s, it seems to fluctuate around a constant mean again,

Figure 4.4. Velocity of C1

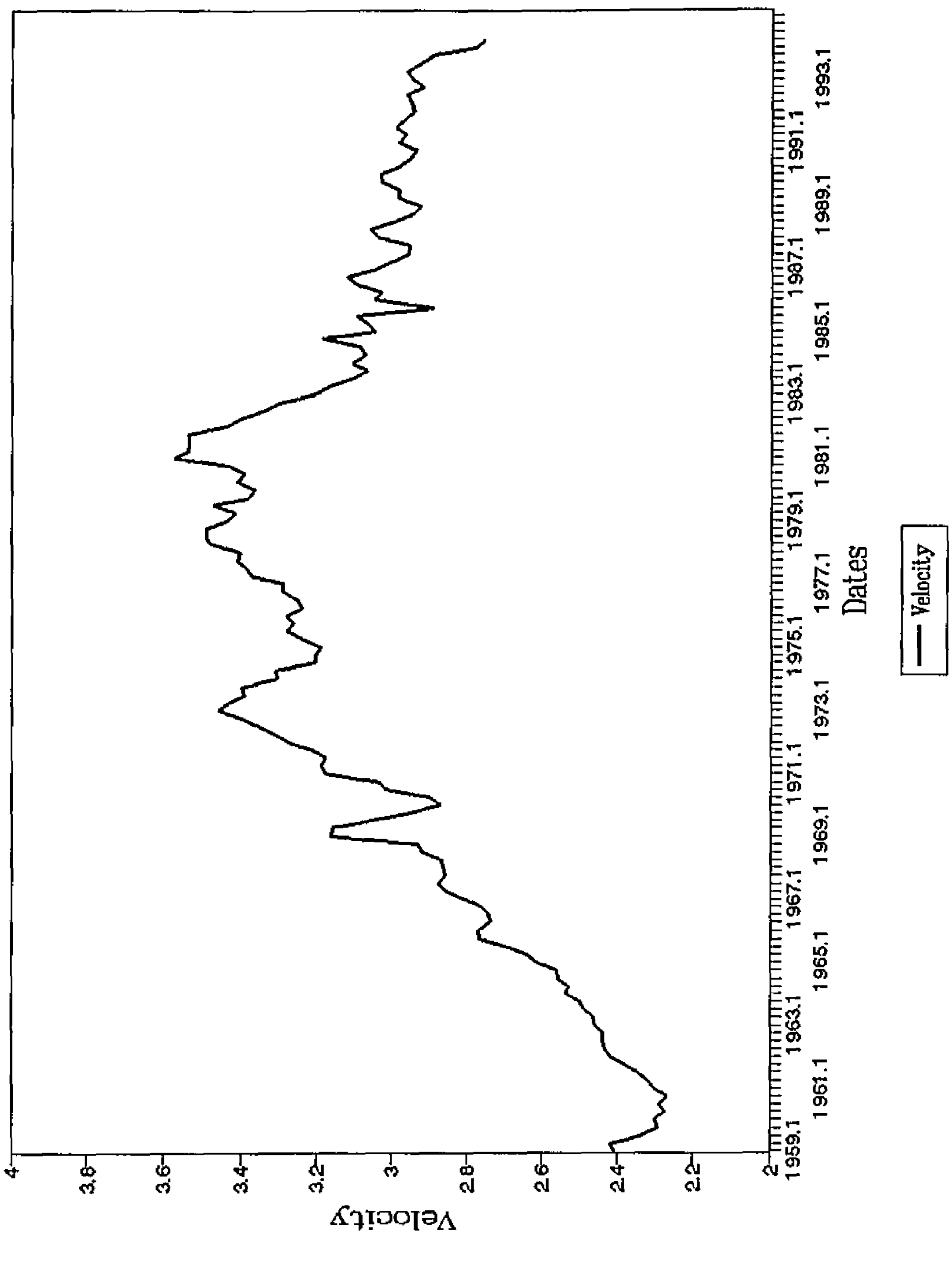


Figure 4.5. Velocity of C2

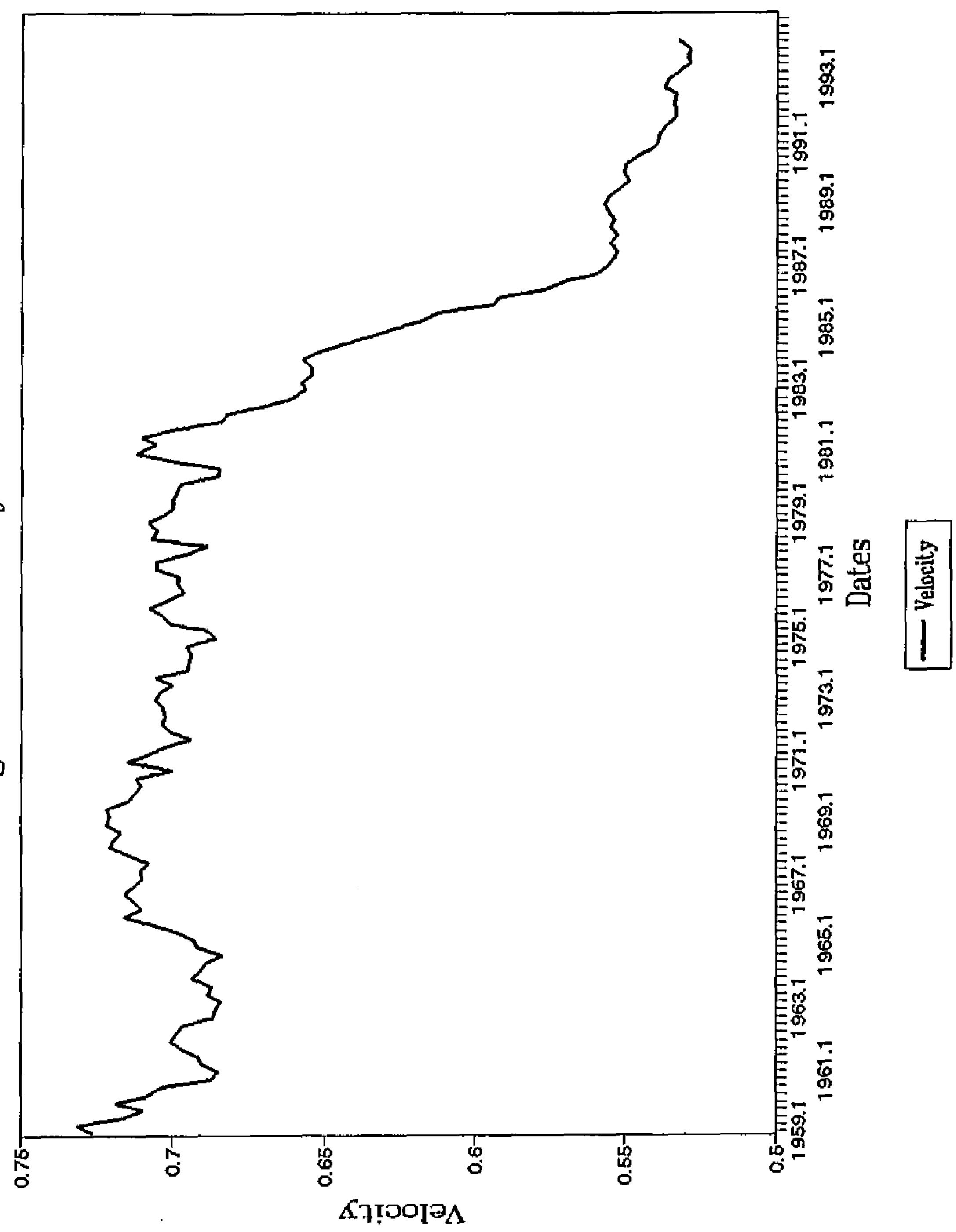
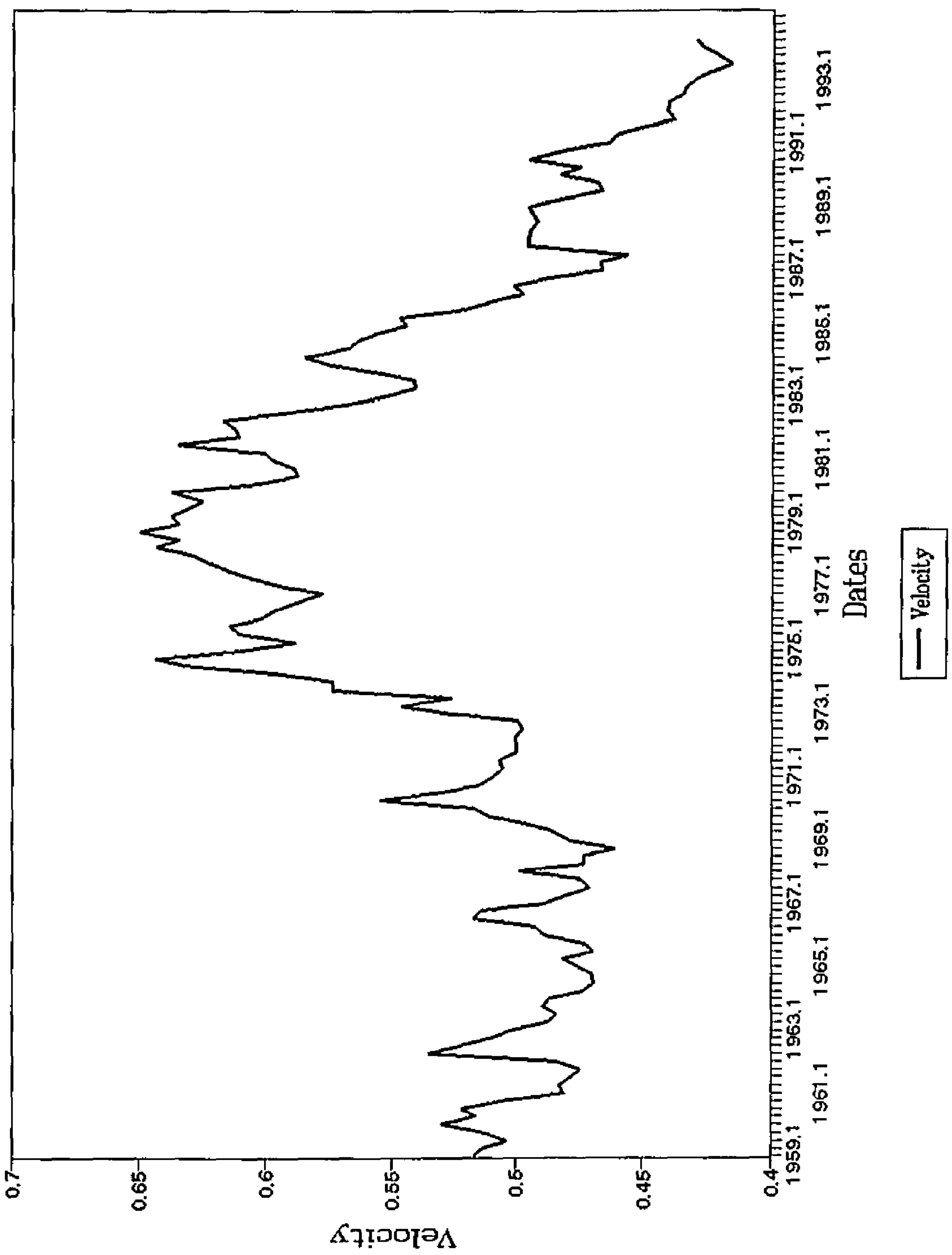


Figure 4.6. Velocity of C3



but relatively higher than the previous sub-period. From the early 1980s through the 1990s, it follows a downward trend.

Section 4: Estimation

A cointegrating regression can be estimated either on the levels of the variables, or in logarithmic form. The test procedure developed by MacKinnon, Davidson and White (1983) can be used as a suggestion to choose between linear or logarithmic forms. In this procedure there are two null hypotheses:

$$H_0\text{: } Y = \textit{linear function of } X\text{'s}$$

$$H_1\text{: } \log Y = \textit{linear function of logs of } X\text{'s}$$

where *Y* is the dependent variable and *X* is the set of independent variables. This procedure is employed as follows. First, the equation under consideration is estimated in both the linear and log-linear forms, and fitted values are obtained from each estimation. Then, the linear equation is estimated again, but this time including the difference between the log of the fitted values from the linear regression and the fitted values of the log-linear regression among the regressors. If this variable has a statistically significant t value, H_0 is rejected. Finally, the logarithmic equation is estimated including the difference between the exponent of the fitted values of the logarithmic regression, and the fitted values of the linear regression among the regressors. If this variable is statistically significant, then H_1 is rejected. For the cases when both hypotheses can be rejected, the choice between the two is made according to the level of significance. In other words, the coefficient which has a higher t value is considered as the one which is statistically significant. The t and p values obtained from the long-run equilibrium regressions are very approximate due to autocorrelation in the underlying equations. Therefore, the results should only be considered as the suggestions for this selection problem. The estimation results are presented in Table 2.

The test results suggest that M1 and C1 can be estimated as linear functions of Y and R, and the other variables can be as logarithmic functions of Y and R. Therefore, in the rest of the study, the cointegrating regressions for M1 and C1 are estimated in the linear form, whereas for the other variables the regressions are estimated in the logarithmic form.

According to the Engle-Granger cointegration test, all the variables in the cointegrating regression are expected to be integrated of order one [I(1)] individually. The order of integration is determined by performing Dickey-Fuller unit root tests on the variables. This is done by estimating the representative equation (2) below for all variables:

$$\Delta X_t = a_0 + a_1 t + a_2 X_{t-1} + \sum_{i=1}^{n} a_{3_i} \Delta X_{t-i} \qquad (2)$$

In equation (2), X is the variable under consideration, t is a time trend, Δ is the first difference operator, and i is the number of lags which are statistically significant at the p

Table 2

Linearity Versus Log-Linearity

	Hypothesis Tested			
	H_0		H_1	
Dependent Variable	t-test	p-value	t-test	p-value
M1	-2.77	0.006	-4.31	0.000
M2	-3.12	0.002	2.23	0.030
C1	-5.59	0.000	-9.13	0.000
C2	-4.35	0.000	-2.09	0.040
C3	-2.86	0.005	-0.33	0.740

Notes: All equations are estimated by OLS. The null hypotheses are:

H_0: Y = Linear function of Xs
H_1: Y = Log-linear function of Xs

where Y represents the dependent variable, X represents the independent variable. Independent variables are R (interest rate) and Y (Nominal GDP) in all equations. Time period is 1959:1- 1994:2. A significant t-statistic ($p \leq 0.05$) rejects the respective null hypothesis.

= 0.05 level. The estimations are done by OLS. The null hypothesis for the unit root test is $a_2 = 0$ versus $a_2 < 0$. If the null hypothesis cannot be rejected (i.e., the absolute value of the t-statistic for a_2 is significantly lower than the Dickey-Fuller critical values), then the series has a unit root. The same test is also applied on the first differences of variables. This time, the tested equation is:

$$\Delta^2 X_t = a_0 + a_1 t + a_2 \Delta X_{t-1} + \sum_{i=1}^{n} a_{3_i} \Delta^2 X_{t-i} \qquad (3)$$

where Δ^2 is the second difference operator. The null hypothesis is same as above. If the null hypothesis can be rejected, then the series is I(1), i.e., it has a single unit root. The results of the Dickey-Fuller tests are reported in Table 3. According to the test results, all series are I(1), implying that the levels of these variables are nonstationary, but their first differences are stationary.

In the next step, the cointegrating vector is estimated. The results of the Engle-Granger test can change with the variable chosen as the dependent variable. Because a cointegrating vector implies a stable long-run relationship among jointly endogenous variables (Dickey, Jansen and Thornton, 1991), the tests were performed with each variable on the left-hand side. The residuals are obtained from each regression, and the cointegration test is applied to the residuals in the form of equation (4) below:

$$\Delta U_t = \alpha_1 U_{t-1} + \sum_{i=1}^{n} \alpha_{2_i} \Delta U_{t-i} + \varepsilon_t \qquad (4)$$

Table 3

Unit Root Test Results

Dependent Variable	$t\ (h_0: a_2 = 0)$	p-value
M1	0.236	0.998
M2	0.343	0.998
C1	1.045	0.999
C2	-2.292	0.488
C3	-2.001	0.665
Y	-0.988	0.962
R	-1.473	0.882
ΔM1	-5.080	0.001
ΔM2	-4.860	0.010
ΔC1	-11.520	0.000
ΔC2	-24.170	0.000
ΔC3	-10.957	0.000
ΔY	-8.590	0.000
ΔR	-5.570	0.000

Notes: Estimations are done by OLS. The p-values show the probability of $t <$ Dickey Fuller critical values (Fuller,1976) with the presence of a time trend.

where U_t represents the residuals obtained from equation (1), Δ is the first difference operator, and i is the lag length, which is long enough to make ε_t a white noise series.To test for cointegration is to test for a unit root. Therefore, the Dickey-Fuller test is performed. The null hypothesis is $\alpha_1 = 0$, i.e., that the residuals are I(1) and that there is "no cointegration." The rejection of the null hypothesis means that the residuals do not have a unit root, and that they are stationary [I(0)]. This implies that those variables in the cointegrating regression, from which the residuals are obtained, are cointegrated. The test results for the estimated cointegrating vectors are reported in Table 4. The R^2 and DW values for each cointegrating regression are also provided in the table.

According to the results, when the financial variables are estimated at the left-hand side, the null hypothesis of no cointegration (presence of a unit root) cannot be rejected at the 0.05 level of significance for any of the variables, except C1. For C1, the null hypothesis can be rejected even at the $p = 0.04$ level of significance. When nominal GDP (Y) is the dependent variable, the result is the same. That is, only when C1 and R are the regressors can the null hypothesis of "no cointegration" be rejected at $p = 0.05$ level of significance. When the interest rate variable (R) is chosen as the dependent variable, the independent variables should either be Y and C1, or Y and M1, for the equation to pass the cointegration test. For Y and C1, the null hypothesis can be rejected at the $p = 0.05$ level of significance, for Y and M1 at the $p = 0.01$ level.

For the presence of a cointegration relationship among a set of jointly endogenous variables, each equation including a different member of the set as the left-hand side variable should pass the cointegration test (Dickey, Jansen and Thornton, 1991). This

Table 4

Cointegration Test Results

Dependent Variable	Cointegrating Vector							R^2	DW	t (H_0:α_1=0)
	Y	R	M1	M2	C1	C2	C3			
M1	0.15	-9.86						0.992	0.16	-3.21
	(30.97)	(-10.57)								(0.21)
M2	1.00	0.00						0.998	0.11	2.06
	(19.14)	(-0.27)								(0.82)
C1	0.39	-10.25						0.998	0.60	-3.96
	(72.11)	(-9.73)								(0.04)
C2	1.14	-0.13						0.998	0.17	-2.40
	(18.58)	(-13.04)								(0.66)
C3	0.59	-0.17						0.993	0.16	-2.42
	(5.08)	(-8.91)								(0.65)
Y		44.60	-0.89					0.993	0.10	-1.90
		(6.44)	(30.97)							(0.87)
		0.03		0.72				0.999	0.11	-2.84
		(4.02)		(19.14)						(0.39)
		22.82			2.50			0.999	0.56	-3.84
		(7.98)			(72.11)					(0.05)
		0.11				0.63		0.999	0.21	-2.24
		(17.91)				(18.58)				(0.74)
		0.13					0.27	0.997	0.10	-1.45
		(10.47)					(5.08)			(0.95)

Table 4 (Continued)

Dependent Variable	Cointegrating Vector							R^2	DW	t (H_0:α_1=0)
	Y	R	M1	M2	C1	C2	C3			
R	0.01		-0.05					0.675	0.29	-4.44
	(6.44)		(-10.57)							(0.01)
	3.73			-0.02				0.470	0.11	-2.16
	(4.02)			(-0.27)						(0.78)
	0.01				-0.04			0.651	0.50	-3.86
	(7.98)				(-9.73)					(0.05)
	6.31					-4.15		0.762	0.27	-3.00
	(17.91)					(-13.04)				(0.31)
	3.48						-2.12	0.663	0.19	-2.38
	(10.47)						(-8.91)			(0.67)

Notes: The estimations are done with OLS. Each row reports coefficients, R^2 and Durbin-Watson statistics (DW) from each regression. The values in parentheses are the t-values of their respective coefficients. The last column reports the t-statistic for the cointegration tests on the residuals of each regression, and their p-values for t > the critical value. Critical values are for the Dickey- Fuller unit root test (Fuller, 1976) with the presence of a time trend.

requirement is met only by C1, Y and R. Therefore, it is concluded that only C1, Y and R are cointegrated, and a stable long-run equilibrium relationship exists among them.

According to this conclusion, the OLS results for the cointegrating equation (1) are:

$$C1_t = \underset{(14.13)}{89.58} - \underset{(-9.42)}{2.50\, t} + \underset{(72.11)}{0.39\, Y_t} - \underset{(-9.73)}{10.25\, R_t}$$

$$R^2 = 0.998 \quad DW = 0.60 \quad F(3,138) = 23368.7 \quad LL = -676.3$$

The t-values are included in parentheses below the respective variables. All coefficients have the expected signs. Again the t-values are not completely reliable due to the heavy autocorrelation in the equation, and they cannot be used for statistical inference. However, the results are sufficient to conclude that the three series are cointegrated.

The cointegration tests are somewhat surprising. Ordinarily, one would expect that nominal GDP and some collection of financial assets would be cointegrated. However, this did not happen. Nominal GDP lack a stable long-term relationship with all the combinations of financial assets as well as with all of the conventional definitions of money. A stable long-run relationship was not identified until a short-term rate was added to the cointegrating equation. Even then, only financial assets held by the private domestic nonfinancial sector were founded to be cointegrated with nominal GDP and the short-term rate. The other financial variables still lacked cointegration with nominal GDP.

Other interest rates did not matter. For example, the spread between short and long-term rates has been used to account for short-run shifts in velocity. However, the use of spread did not produce a cointegrated relationship. This is not surprising for two reasons. First, the spread is stationary and therefore cannot help explain the nonstationary residuals from the cointegration equation involving only nominal GDP and financial assets or money. Second, the cointegration is a long-term relationship, and the spread is typically used to capture or explain short-run movements in velocity.

At this point, there is no unambiguous explanation for the appearance of a cointegrated relationship between private domestic nonfinancial assets and short-term rate. However, two possible explanations have been identified. At the very least, the short-term rate could simply be a proxy for a missing information within nominal GDP. For example, imported prices are subtracted in the calculation of the GDP deflator, since GDP is equal to domestic demand plus exports less imports. This produces diverse movements between the GDP deflator and other measures of inflation, such as the CPI, that include the effects of imported prices. Thus, short-term rate could be a proxy for the missing effect of foreign prices in the GDP deflator.

Alternatively, the weights on the GDP deflator could be part of the problem. This study uses the current-weight deflator, rather than the fixed weight deflator. This was done because the weights do evolve significantly over a thirty-five year period. Yet use of current weights allows the mix of GDP to have a potentially heavy influence the observed implicit price level. While fixed weights may be too rigid, current rates may be too flexible. That is a rapid shift in the composition of GDP could understate the economy's true underlying inflation rate. In which case, a stable relationship between nominal GDP and financial assets might be masked by the distortive effects of current weights in the calculation of the deflator.

Whatever the explanation, it should not deflect from the main finding. Namely, there is a stable long-term relationship between financial assets held by the private domestic nonfinancial sector and nominal GDP once a short-term rate is added to the function. The explanation for the precise role played by the short-term rate is a matter for subsequent research.

The long-run interest rate and income elasticities of credit market assets cannot be derived from these estimation results. There are three ways to derive the long-run elasticities. The first is to estimate the long-run equilibrium equation by excluding time trend (t) from the equation. In this case, the estimated parameters for Y and R would be their respective long-run elasticities. The second way is to estimate the long-run equilibrium equation as combined with the short-run dynamic error-correction presentation, and to derive the long-run elasticities from the estimated parameters. The last way is to estimate an auto distributed lag model (ADL) of C1 on Y and R, and compute the long-run elasticities by using the estimated parameters.

CHAPTER V

IMPLICATIONS OF FINDINGS

In the previous chapter, the cointegration test results suggested that credit market assets have a long-run stable relationship with nominal income and short-run interest rates, whereas M1 and M2 lack such a relationship. It should be noted, however, that the Engle-Granger cointegration test is sensitive to structural breaks in the tested series. In other words, although a set of variables are indeed cointegrated, if there has been a structural shift in one of the tested series, the cointegration tests fail to detect cointegration. In the light of this reservation, it is possible that money, measured either as M1 or as M2, may actually have a place in the quantity theory, but structural breaks during the tested sample period may have caused the cointegration tests to give negative results.

On the other hand, if a set of variables passes the tests for cointegration, it can be concluded without any reservation that these variables have a stable long-run equilibrium relationship. This means that when there are random shocks, these shocks do not have permanent effects on the series in the long run. In the short run, there may still be deviations from the trend, but these do not persist, but rather revert to the previous trend in the longer run. From this, it can be concluded that credit market assets, nominal income, and short-term nominal interest rates have a stable long-run relationship, and credit market assets can be used in the equation of exchange as a financial variable.

If the quantity theory is changed so that credit market assets replace money, then it is possible to rewrite the quantity theory as:

$$C\ V = P\ Q$$

where C is credit market assets held by domestic private nonfinancial sectors (symbolized as C1 in the previous chapter), V is the velocity of credit market assets, P is the average level of prices, and Q is real output. This expression can be interpreted in line with the assumptions of the quantity theory of money. If we assume that the velocity of credit market assets is stable, then the changes in credit market assets will affect nominal income. For the monetary authority this means, by controlling the volume of credit market assets (or their growth rate), it is possible to control nominal income (or the growth rate of nominal income). To state differently: if C V = Y, where C and V are as defined above, Y is nominal income (Y = P Q), and if the velocity is stable, then the monetary authority can use credit market assets as a tool to determine the level or growth rate of nominal income (Y).

According to the cointegration test results, velocity is stable in the long run. How, then, can the monetary authority use credit market assets to hit its long-run targets? This question brings the discussion to the conduct of monetary policy, i.e., the transmission of monetary policy, and the controllability of credit market assets. For a financial variable to be used as a monetary policy tool, two important requirements must be met (Poole, 1974): first, it should have a stable link with economic activity, and second, it should be possible for the monetary authority to control this variable. Monetarists (who adopt the quantity theory of money) interpret the link through portfolio adjustment decisions. In this framework, interest rates are not very important, because they tend to move together. In the Keynesian interpretation, interest rates are the main vehicle carrying monetary changes to changes in nominal output, and by controlling interest rates nominal GDP can be altered. The cointegration tests show that a stable link exists between credit market assets and nominal income. The implications of this finding can be explained by both the Monetarist and the Keynesian approaches. In this chapter, first the monetarist transmission mechanism is discussed, then a Keynesian approach is employed to explain the transmission mechanism.

Section 1: Credit Market Assets and the Quantity Theory

1.1. Transmission Mechanism:

If there is a transmission mechanism such that the volume of credit market assets affects the level of economic activity, how does this mechanism work? Portfolio adjustment decisions can help to explain this mechanism.

The quantity theory of money assumes that when the monetary authority increases the money supply, total financial assets held by the public increase. Portfolio adjustment decisions cause new financial assets to diversify into real assets. In other words, the increase in money stock induces the purchase of real assets. New spending on real assets is reflected as an increase in nominal GDP. Eventually, however, prices respond so that in the long run real output remains constant at its full employment level.

Today, converting money into financial assets and moving back to money is easy and relatively costless due to financial and technical innovations. As a result, money is no longer unique as an asset because of the existence of many substitutes and because of the ease in moving back and forth between money and non-money financial assets. In other words, it is possible to use many other financial assets as "near money".

This study confirmed that the public behaves as if all assets are "near money", because credit market assets have a stable long-run relationship with nominal GDP. Thus, the same portfolio adjustment process within the quantity theory can be used to explain the transmission from credit market assets to nominal GDP.

When the level of credit market assets in the economy rises, total spending on real assets is stimulated as economic agents attempt to diversify into real assets. As a result, all financial assets increase and are diversified into different types of real assets. The purchase of new real assets increases total spending, and therefore nominal GDP, in the short run. In the long run, however, the average level of prices rises and real output returns back to its previous level.

The next question is if the Federal Reserve can control credit market assets to start this process and influence economic activity. This issue is rather complicated, because there are many suppliers of financial assets in the market, and there is not a single reserve requirement ratio applicable to all financial assets. The best channel is probably through the capital requirements imposed on the suppliers of credit market assets (i.e., borrowers), and the lenders (i.e., financial institutions and other nonfinancial sectors) where possible. The next section discusses this possible channel of influence of the stock of credit market assets.

1.2. Capital Requirements:

Capital requirements can be analyzed in terms of borrowers and lenders. Among lenders in the economy, there are bank and nonbank financial institutions, as well as nonfinancial sectors. Among these, the nonfinancial sectors are not subject to any legally binding capital requirements.

The capital requirements imposed on financial institutions have been studied, and it has been suggested that the increase in effective capital standards and the actual decline in the capital positions of some banks contributed to slow loan growth in the 1990-1991 period (Furlong, 1992; Akhtar, 1993; Moore, 1992). Therefore, bank capital helps to explain the variation in loan growth across banks. The weakened bank capital positions were suggested to be responsible for at least part of the reduced credit supply over 1990-1991, because poorly capitalized banks reduced their lending more than the well capitalized ones during this period.

Capital positions are important for nonbank financial institutions as well. For example, business credit extended by finance companies was lower among those with weaker balance sheets during the 1990s (Akhtar, 1993). The capital positions affect the level of financial assets that can be held by lenders, and thus the volume of lending to borrowers. Capital requirements imposed on depository institutions are under the control of various regulatory agencies, but their use to assure a certain level of loan growth is open to discussion. Any change in minimum capital requirements will have a huge and potentially disruptive effect on a depository institution's lending capacity.

To illustrate the draconian effect of changes in minimum capital requirements, consider a hypothetical depository institution with $1 billion in assets. Also, suppose that the regulatory agencies have set the minimum capital ratio to meet the definition of an adequately capitalized bank at 4% of assets. This hypothetical depository institution is assumed to meet this minimum requirement and holds $40 million in primary or Tier 1 capital. Should the regulatory agencies raise the minimum capital requirement to 5%, this institution's available capital could support an asset base on only $800 million, a cut of 20%. Alternatively, should the regulatory agencies lower the minimum to 3%, the $40 million in capital could support $1.333 billion in assets, or more than under a 4% capital requirement.

In terms of borrowers, if their capital position is weak, they can be downgraded by the rating agencies, and may not be able to sell credit market assets they issued. Weakened demand for their credit market assets may be a factor which diminishes the volume of assets sold in the market. In credit market lending. for example, there is evidence that downgraded borrowers have more difficulty borrowing in the credit markets because of their high riskiness (Akhtar, 1993).

From an operational perspective it is unlikely that the setting of capital ratios can be coordinated across the entire economy. Thus, it is more likely that another channel of control must be used. This raises the importance of the Keynesian approach discussed in the next section.

Section 2: The Transmission of Monetary Policy through Interest Rates

2.1. The Role of Interest Rates in Monetary Transmission:

The Keynesian-Hicksian IS / LM framework explains the transmission of monetary policy through interest rates (Bernenke, 1993). According to this framework, LM represents equilibrium in the money market, IS in the goods market. When both are in equilibrium, the interest rate and corresponding level of output are determined. If monetary policy aims to increase the level of output, increasing the money supply by buying securities in the open market serves this goal. The reserves of banks increase, more deposits and loans can be made, and the money supply increases. This policy action is shown as a rightward shift of the LM curve, which lowers the equilibrium rate of interest relative to the return on capital, and stimulates aggregate spending. An increase in output occurs as the result of higher spending.

This framework can also be applied to total credit, or credit market borrowing. The role of interest rates on loans and other marketable securities has been used to explain how credit affects economic activity (Bernanke, 1988). According to this explanation, banks' decisions to hold either loans or securities on the asset side of their balance sheets partly depend on the spread between the interest rates on loans and securities. When there is a decrease in open market rates, for example, banks, seeing that the yield on securities is lower relative to loans, increase the supply of loans. Borrowers (especially the large firms), on the other hand, reduce their demand for bank loans, because they can issue bonds in the open market with a lower cost. This excess supply of loans depresses the rates on loans and brings them to an equilibrium with bond rates. Lower interest rates stimulate total spending because of these lower costs of borrowing.

According to this mechanism, the initial effect on open market rates spreads through the economy by affecting the interest rates on bank loans and other marketable securities, and thus increasing total spending. This explanation is in line with the findings of this study. In the empirical work of the previous chapter, credit (C1) is defined as credit market assets held by the private domestic nonfinancial sectors. There is a negative relationship between the level of credit market assets and the short-term interest rate, which was the proxy for the factors influencing the velocity of credit market assets. This means that when bond rates are lowered, for example, credit market assets held by the domestic private nonfinancial sectors increase; i.e., borrowing from the credit markets increases because of lower borrowing costs. The level of economic activity is expected to increase at this higher level of borrowing if there are no leakages into other assets. This means that the relationship between the level of credit market assets and the level of GDP is expected to be positive. According to the estimation results, this kind of relationship is valid in the long run.

The next question is whether economic sectors are sensitive to interest rate changes. This is discussed below.

2.2. The Controllability of Credit Market Assets Through Interest Rates:

Interest rate sensitivity is important for two reasons. First, if the interest rate sensitivities of the supply and demand for credit market assets fluctuate too much, the long-run stable relationship will not be valid anymore, because the velocity of credit market assets (Y / Cl) will not be stable. Second, if the interest rate sensitivities are low, or there are rigidities in the market, then a monetary policy action may not be translated into a change in aggregate spending (Keynes, 1936). Therefore, the short-run effectiveness of interest rates requires analysis of the demand and supply side determinants and empirical testing of the slopes of the demand and supply curves (Keeton, 1993).

The factors which may affect the interest sensitivity of total credit demand and supply have been discussed since the credit slowdown of the 1990s (Akhtar, 1993; Cantor and Wenninger, 1993; Bernanke, 1993).

On the demand side, there is the need of borrowers for funds. The level of their economic activity is the main determinant of demand for loans. But there is also a body of borrowing which is induced not by economic activities of businesses and households, but by their speculative activities.

Speculative activities may be influenced by international interest rate differentials, exchange rates, and inflationary expectations. For example, if the cost of borrowing is low in the domestic market, to borrow in the domestic market and invest in another country may affect the volume of domestic borrowing. Similarly, if there are expectations about exchange rate appreciation in another country, and the cost of funds is low domestically, it is possible to borrow domestically and hold these funds as foreign currency or invest them in foreign currency denominated assets. Also, if there are expectations of a higher inflation rate, there may be larger spending on the purchase of physical assets, which is done by borrowing. In sum, there are many demand side considerations which may affect the level of domestic borrowing and change the responsiveness of the demand for funds to interest rates.

Since short-term interest rates have been used to explain the monetary transmission mechanism from money to economic activity, there are some studies which analyze the interest rate sensitivity of different sectors in the U.S. (Mauskopf, 1990; Kahn, 1989; Friedman, 1990). According to these studies different sectors have different interest rate sensitivities. For example, business fixed investment has a reduced interest rate sensitivity due to innovations in the financial markets (Kahn, 1989). Interest rate swaps and junk bond markets allow businesses with limited access to the commercial paper market (because of their lower credit ratings) to borrow in the junk bond market or to convert floating rate bank credit to fixed rate debt instruments. In these ways, those businesses protect themselves from changes in market interest rates, and their interest rate sensitivity declines.

On the other hand, the increased indebtedness of households and businesses may make these sectors more sensitive to changes in the interest rates (Kahn, 1989). They may need to reduce their borrowing and spending due to the fact that higher interest rates will increase their interest payments and decrease their disposable income. However, the indebtedness of borrowers may have an opposite effect on the sensitivity of demand. If there is a desired debt-to-income ratio among borrowers, a decrease in the opportunity cost of borrowing may be ineffective at attracting those borrowers who have high indebtedness (Akhtar, 1993). If a borrower already has a high debt-to-income ratio compared to the desired ratio, his/her demand for credit is expected to be less sensitive to changes in interest rates on loans.

In terms of the supply of funds, we see financial institutions and other sectors of the economy as the suppliers of loans in the domestic or international markets. The factors which influence the supply of funds may be credit rationing by banks, higher capital requirements, or the yields on loans.

Credit rationing helps financial institutions to examine the balance sheets and the riskiness of borrowers, and helps to determine their supply of loans. The supply of funds was explained above by using interest rates as the main determinant. Under this assumption, if interest rates on loans are lower than the interest rates on bonds, banks prefer to increase the securities they hold as assets, and reduce the supply of loans. This low level of lending affects the businesses who cannot borrow in the bonds market because of high interest rates, and causes a slowdown in economic activity. This mechanism works when supply is interest sensitive. In the case of credit rationing, if banks restrict the size of loans to firms which have low ratings, even if the interest rates on loans are higher than those on bonds, the interest rate channel may not work. When firms are credit rationed, they may not be able to borrow in the bond market either, due to low credit ratings. Therefore, credit rationing may be a factor which reduces the interest rate sensitivity of financial institutions. This factor has been used to explain the so-called "credit crunch" of the 1990s. In general, a sharp reduction in the supply of credit at any given rate of interest is defined as a credit crunch (Akhtar, 1993).

Higher capital requirements imposed on lenders is another factor which may affect the supply of credit by financial institutions. In this case, even if interest rates on loans are higher than those on securities, and there is a sufficient demand for loans, the financial institutions' own balance sheets may reduce their ability to lend. If they cannot meet the required minimum capital standards, their willingness to lend will not translate into increased loans to borrowers. This factor therefore also reduces the interest rate sensitivity of the supply of loans.

The nonfinancial sectors are also influenced by factors other than the yields on different capital market instruments. An investor faces the alternatives of investing in the domestic market, in the international market, or buying physical assets. In a situation of lower interest rates, for example, investors have two alternatives. First, they could increase consumption, purchase physical assets, and reduce savings. Second, they could invest in international capital markets. Therefore, international transactions, exchange rates, and inflationary expectations are the other factors which affect the decisions of suppliers of funds in the market. The perceived riskiness of the credit market instruments also influences the investors' supplies of funds in the credit market (Cantor and Wenninger, 1993). Changes in these factors may affect the interest rate sensitivity of supply of loans, and therefore the strength of a transmission mechanism through interest rates.

If the demand for and the supply of credit market assets are sensitive enough to changes in interest rates, then the monetary authority can control credit market borrowing in the short run by using open market interest rates (Keeton, 1993). In this control mechanism the analysis focuses on interest rates, and on the way in which the monetary authority changes interest rates. The demand and supply side factors discussed above may cause some rigidities in the market which reduce the sensitivity of demand and supply, or cause the velocity of credit market assets to fluctuate too much. However, these short-run fluctuations may not persist in the longer run. According to the estimation results, the long-run relationship is stable enough to pass the cointegration tests. In other words, it was concluded that the velocity of credit market assets was stable in the long run. From here, it follows that the interest rate sensitivities of supply and demand are stable in the long run, even if not in the short run.

CHAPTER VI

THE EDUCATIONAL ASPECTS OF THE STUDY

This study expands the quantity theory of money to include a broad group of credit market assets in the equation of exchange, and to discover their role in the monetary transmission mechanism. Traditionally, economics education emphasizes the role of the money stock in monetary transmission, and ignores the role of other financial assets. However, today all financial assets have become more important in the transmission process because of changes in financial markets. This role is increasingly discussed in the literature. However, it has not made its way into basic textbooks on principles of economics or money and banking.

The educational importance of the study lies in the introduction of this recent discussion to economics education. Is it best to present monetary transmission by focusing only on the role of money? If the quantity theory of money is expanded to include other financial assets, how can monetary transmission be presented in economics classes? This chapter analyzes these problems.

Section 1: The Traditional Presentation of Monetary Transmission

The quantity theory's initial presentation first occurs in the principles of economics classes. In general, the discussion starts with the definition of money and the functions it serves. In the textbooks, it is common to find the definition of money as the medium of exchange, unit of account, and store of value (Baumol and Blinder, 1990; Shiller, 1991). After this theoretical definition, M2 and M3 are also defined as money even though they include components which do not serve as media of exchange. It is not clear if money should include only the most liquid financial assets (M1), or the ones easily converted to money too. This problem arises because of the Federal Reserve's use of M2 as money although it does not match the theoretical definition.

The textbook explanations continue with the money supply and the creation of money. According to the common presentations, the central bank can affect money supply by changing bank reserves. A simple balance sheet of a commercial bank is seen in Figure 6.1.

Assets	Liabilities
Reserves	Deposits
Securities	Other Liabilities
Loans	Capital
Other Assets	

Figure 6.1. Bank Balance Sheet

When the central bank wants to increase money supply in the short run, it increases bank reserves by open market purchases of securities. This policy action initially reduces open market interest rates relative to the bank loan rates, and increases the excess reserves of the banks. In turn, banks having more excess reserves can increase loans. When a bank makes loans to the public, it supplies these funds as deposits, and makes a profit, because the rates on loans are higher than the interest rates it pays on the relatively liquid deposits issued.

The instruments used by the monetary authority to control the money supply are not limited to open market operations. The reserve requirement ratio and discount policy are also used for policy purposes. When the monetary authority wants to increase the money supply, it may also reduce the reserve requirement ratio, which means that banks will hold fewer required reserves and will have more excess reserves available for loans. Similarly, the central bank can reduce the discount rate on loans from the Federal Reserve discount window, and let banks borrow more, and increase their excess reserves to make loans.

In all three of these ways, the monetary authority uses bank reserves to influence the liability side of the banks' balance sheets, and an increase in bank liabilities means an increase in the money supply. When money supply is higher, it follows that the public will increase the total purchases of goods and services, so that the pace of economic activity will be faster. In this explanation, it is assumed that the monetary authority can control the money supply by using bank reserves. Actually, there are some leakages from the link between reserves and money which are not mentioned in the textbooks.

First of all, some types of bank deposits are not subject to reserve requirements. This allows banks to be more flexible in the face of a change in the reserves they hold. For instance, even if the monetary authority reduces bank reserves through increasing the reserve requirement ratio, banks can still have enough funds to make loans by switching to deposits for which the Federal Reserve does not require reserves. As a result, broader definition of the money supply may not be reduced by as much as desired. Second, an increase in excess reserves may not expand bank loans and result in higher money supply, because banks' decisions on making more loans are also affected by other factors. The banks may not increase their loans if they are expecting an economic downturn, or if they are pessimistic about the course of the economy. Therefore, the banks' decisions to make loans affect the supply of money in the economy.

Some textbook explanations which rely on the Federal Reserve System's strict control of the money supply present the monetary transmission by using the money market as shown in Figure 6.2.a and Figure 6.2.b (Shiller, 1991; Byrns and Stone, 1993).

In the money market diagram shown in Figure 6.2.a, the money supply is an exogenously determined vertical line (Ms), because it is determined by the monetary authority, and is not a function of interest rates. The negatively sloped line (Md) is money demand, which is a negative function of interest rates. This means that the public will increase their money demand and their spending when the interest rate on securities

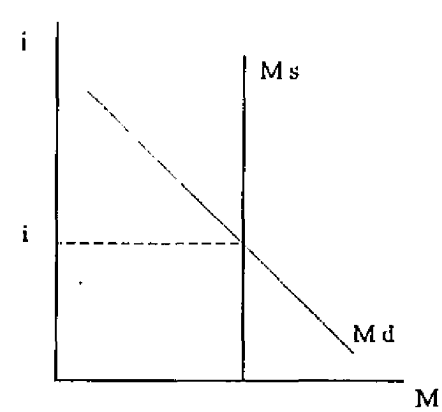


Figure 6.2.a. Supply and Demand of Money

is lower. The equilibrium rate of interest is determined by the interaction of the supply of money and the demand for it.

Figure 6.2.b shows how the equilibrium rate of interest and the total money stock change when the monetary authority makes an open market purchase. Bank reserves increase, and the interest paid on open market securities decreases. Banks increase the loans they make to the public by creating more deposits. If banks create more deposits than the public wants to hold at current interest rates, they can sell these deposits by offering loans at lower interest rates. The lower interest rates increase the amount of money the public holds, and the money market comes to a new equilibrium where interest rates are lower (i'), and the money stock is larger.

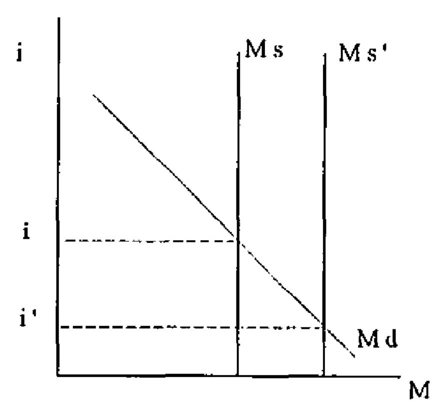


Figure 6.2.b. The Change in Money Supply

The diagrams above would be different if the control of the Federal Reserve System over the money supply is seen as limited by the currency holdings of the public, and banks' independent decisions to hold excess reserves and not to extend loans.

Banks' decisions to supply money depend on the interest rates on loans and their perceptions and expectations about economic conditions (Baumol and Blinder, 1990). The currency holdings of the public are also a function of interest rates and expectations. If these are taken into account, the money supply curve becomes a positively sloped line as shown in Figure 6.3.

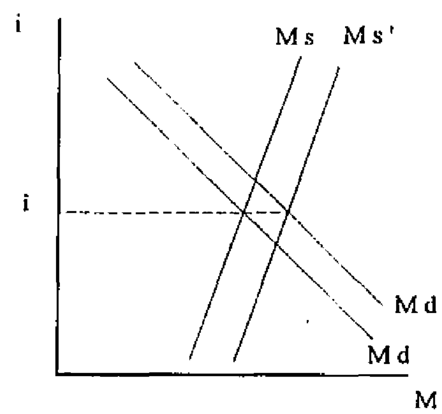


Figure 6.3. Money Market

In Figure 6.3, an increase in the money supply will first reduce the interest rates as a liquidity effect. This effect may be offset by the price, income, and expected inflation effects which cause money demand to increase. The resulting interest rate may be lower, higher or equal to the initial interest rate, depending on the magnitude of the shifts. Nevertheless, money stock increases.

Another aspect of this presentation about the transmission of monetary policy is the effects of monetary policy on economic activity. It is assumed that the monetary authority can use the money supply (in the Monetarist approach), or the interest rates (in the Keynesian approach) to change total spending, and therefore stimulate or restrict economic activity.

According to the Monetarist approach and the quantity theory of money, the most important way to influence economic activity is not interest rates but money supply. As stated in the quantity theory, if the velocity of money in the equation of exchange (M V=Y) is stable, and its behavior can be predicted by the monetary authority, then changing the supply of money (M) influences nominal GDP (Y). In this argument the velocity of money provides a base for the transmission of monetary policy to economic activity. The explanations in the principles textbooks fall short, because money defined as M1 does not have a stable velocity. M2 is presented as stable, but it does not meet the medium of exchange requirement in the theoretical definition of money. There is an inconsistency in the definition, controllability, and supply of money, and the transmission of monetary policy to economic activity. How, then, can these explanations about monetary policy help students comprehend the connection between money as defined theoretically, its supply and its effect on economic activity?

The more advanced presentations of the monetary transmission mechanism generally include the Keynesian-Hicksian IS / LM diagram in their explanations. Figure 6.4.a and Figure 6.4.b show the IS / LM diagrams as presented in economics courses.

In Figure 6.4.a, the IS curve shows the different combinations of interest rates and real GDP levels that keep the goods and services markets in equilibrium. It has a negative slope, because lower interest rates increase spending and therefore the total output of goods and services.

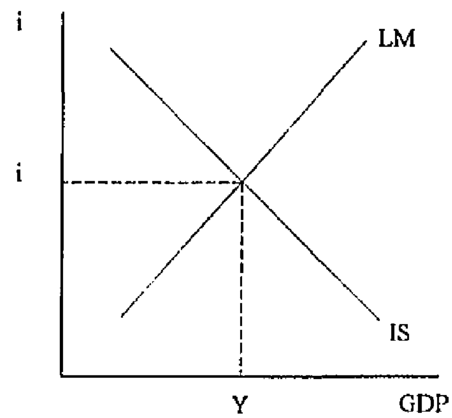


Figure 6.4.a. IS /LM

The LM curve reflects equilibrium in the money market. It shows the different interest rate and output combinations which keep the supply and demand for money in equilibrium for given real balances. The positive slope of the LM curve shows that when spending is higher, the demand for money increases and interest rates rise to equate demand with the supply of money (Bernanke, 1988).

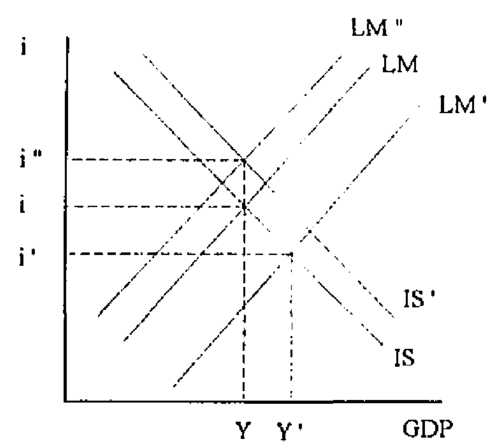


Figure 6.4.b. Monetary Policy in IS/LM

Figure 6.4.b shows how monetary transmission works. If there is an increase in bank reserves by a monetary policy action, money supply increases. Open market rates

should decrease to induce the public to hold more money and increase their money demand. Therefore, the LM curve shifts to the right, setting the equilibrium at a lower interest rate (i') and a higher output (Y'). However, from the monetarist perspective, this liquidity effect is transitory. When prices rise as a consequence of higher money balances, the LM curve shifts back, leaving real output constant at its long-run equilibrium level. If expectations of inflation develop, the IS curve may also shift to the right to increase the interest rate to i" and compensate for the loss of purchasing power (Makinen, 1977).

In this explanation, it is assumed that monetary policy cannot change real output, and that interest rates cannot be used as a guide to monetary policy (Friedman, 1970). In these explanations, in general, the roles of financial assets are ignored.

Section 2: The Presentation of Monetary Transmission Using Credit Market Assets

The theoretical definition of money can be extended to include credit market assets and bank loans since they can easily be converted to cash. Then, money would consist not only of cash and checkable deposits (M1), but also of other financial assets which can serve money's functions because of their ease of liquidation and check writing privileges. This broader definition would help students to understand the transmission of monetary policy to the rest of the economy through all financial assets. The explanations developed here are based on the finding of this study that credit market assets are a negative function of short-term interest rates.

Instead of focusing only on bank liabilities, using the asset side of a bank balance sheet can be a more insightful way to start the discussion on monetary transmission. A simple bank balance sheet can be presented as shown in Figure 6.5.

Assets	Liabilities
Reserves	Deposits
Securities	Other Liabilities
Loans	Capital
Other Assets	

Figure 6.5. Presentation of a Bank Balance Sheet

At the asset side of a bank balance sheet there are bank reserves (consisting of excess and required reserves), loans banks make to households and businesses, holdings of open market securities, and other assets. Banks are free to manage their assets of loans and securities. When they have excess reserves, they can increase either loans or securities, which increases deposits, according to their relative yields (Bernanke, 1988). In other words, when the monetary authority increases bank reserves, an increase in excess reserves does not force banks to increase their deposits by increasing loans, but instead compels them to choose between loans and securities. This decision depends on the difference between the relative yields on securities and the loans banks can sell. This perspective can be presented by using the markets for the securities, and bank loans, since loanable funds flow from suppliers to demanders from these two channels.

2.1. Securities Market:

In Figure 6.6, the securities market represents the equilibrium of supply and demand for financial assets. Public and private credit market assets are traded in this market. On the supply side, there is government and other public and private sector firms which can issue bonds and other marketable securities. The supply of government bonds is assumed to be insensitive to the market interest rate, depending only on the required level of government borrowing. This component of supply is presented as a vertical, perfectly inelastic line. However, the supply of private sector securities are assumed to be interest sensitive, because the securities market is not the only source of private sector borrowing. If interest rates in this market are too high relative to bank loans, firms can borrow from banks. The interest rate considerations of the private sector suppliers lends itself to a downwardly sloped supply curve. The higher the interest rate in the market, the less would they borrow from this market. This means they reduce their supply of securities at higher interest rates. When two types of suppliers in the market are taken into account, the resulting supply curve would not be perfectly inelastic, but downwardly sloped.

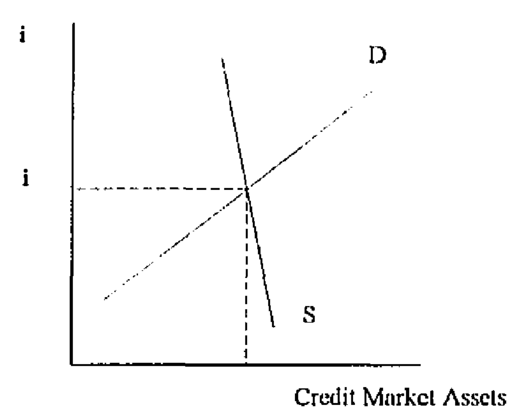


Figure 6.6. Securities Market

On the demand side, there are investors, i.e., households, public and private sector businesses, and financial institutions, who want to lend in this market, and in return earn a positive yield on their holdings of securities. Their demand for securities is presented as an upwardly sloping line, because the higher the interest paid on securities, the higher the demand for them. In other words, investors are sensitive to the relative yields on securities.

The intersection point of the demand and supply lines gives the equilibrium open market interest rates.

2.2. Bank Loans Market:

In Figure 6.7, the market for bank loans is seen. The loans market represents the equilibrium of the supply and demand for financial liabilities (bank loans). In this market, the level of bank loans extended is dependent on the supply and demand for bank loans. On the supply side we see banks. Their decision to supply more loans depends on the relative yields they can earn by supplying loans. Given that other credit market

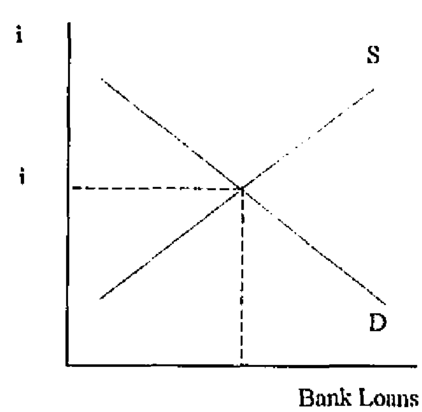


Figure 6.7. Bank Loans Market

conditions are constant (credit rationing, the economic environment, etc.), they will extend their supply of loans when the interest rate on loans is high relative to securities. Therefore, their supply has a positive relationship with the loan rates.

On the demand side, there are borrowers of loans. The borrowers are households who desire to increase their spending on goods and services, and the public and private sector businesses who want to finance their business spending. Their decision to borrow from banks depends on the cost of borrowing, i.e., on the interest rates for loans. The higher the rates on loans, the less would be the amount of loans demanded, and vice versa. This relationship is reflected in the negative slope of the demand for bank loans.

The interaction of the demand and supply for bank loans determines the equilibrium interest rate on loans, which is shown on the vertical axis.

2.3. How Policy Works:

The transmission of monetary policy is presented by focusing on the asset side of the bank balance sheets, and by employing the markets introduced above. In the following example, the monetary policy goal is assumed to be the stimulation of economic activity.

When the monetary authority wants to stimulate the economy, it buys government securities in the open market. The effects of this policy action are shown in Figure 6.8.a, and Figure 6.8.b. below.

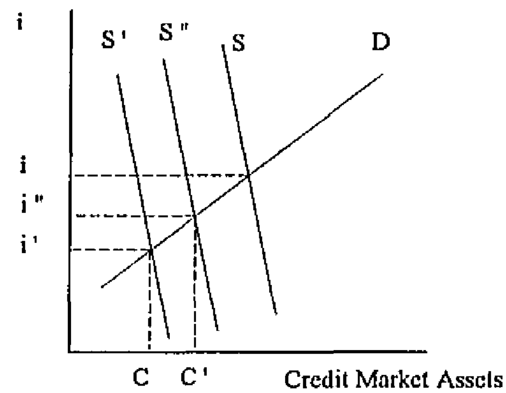


Figure 6.8.a. Supply and Demand of Financial Assets

In the open market for securities (Figure 6.8.a), the Federal Reserve's purchase of bonds reduces the supply of bonds, and the supply curve shifts to the left to S'. Given that the demand for securities is constant, the price of bonds rises, and open market interest rates decline to i'. As a direct effect of this decline in open market rates, given that the borrowing is interest sensitive, borrowing in the securities market increases, and the private sector borrowers who can issue bonds increase their spending. The effect of this increased private sector bond supply is seen as the rightward shift of the supply curve to S". We may assume that this excess supply of securities in the market may cause some increase in the interest rates to i". In Figure 6.8.a the increase in the borrowing of public and private businesses in the credit market is seen as an increase from C to C'.

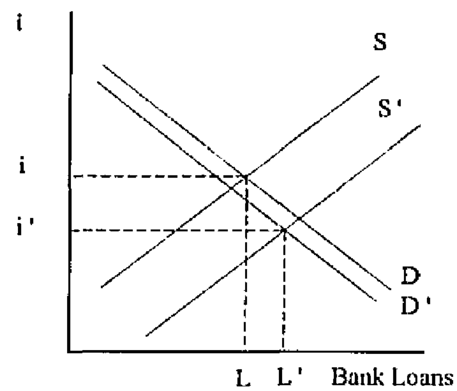


Figure 6.8.b. Supply and Demand of Financial
Liabilities (Bank Loans)

On the other hand, as shown in Figure 6.8.b, the same policy action of the Federal Reserve increases bank reserves, reduces interest rates on open market securities. Banks, seeing that the interest rates on loans are higher relative to those on securities, use their excess reserves to extend more loans. The supply of loans shifts to the right to S'. Borrowers, however, seeing that the cost of borrowing from banks is higher than the cost of borrowing in the securities market, reduce their demand for bank loans. This interest rate differential causes opposite shifts of demand and supply in the loans market, and depresses the interest rate on bank loans.

The shift of loan demand is not very large in the loans market, because only some of the borrowers have access to borrowing in the securities market, the rest have to rely on bank loans only. For those who rely on bank loans only, the total business spending increases due to the larger amounts of bank loans they borrow. The increase in bank loans is shown as an increase from L to L' in Figure 6.8.b.

The effects of these increases in bank-sourced and credit market-sourced loans on the economy can be presented by using the IS / LM framework. Below, in Figure 6.9, the effects of monetary policy on the level of output is shown.

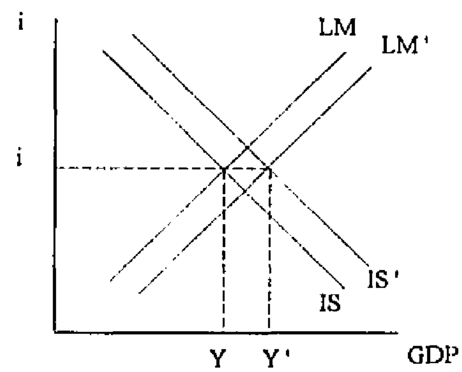


Figure 6.9. Monetary Policy in IS / LM

According to Figure 6.9, the monetary policy affects not only the LM curve, but also the IS curve (Bernanke, 1988). An open market purchase of treasury securities by the monetary authority, as in the example above, increases the money supply, and therefore causes the LM curve to shift to the right. However, when open market rates are lower, open market borrowing, as well as bank lending, increases. The total spending increases for both those firms who do not borrow in the securities markets, and those who borrow in the securities markets. This higher spending causes a rightward shift of the IS curve. When both IS and LM curves shift to the right, the level of output will be higher. The equilibrium rate of interest depends on the relative magnitude of the shifts in both curves.

2.4. Controllability Revisited:

The presentations above imply the control of total lending through open market interest rates. An initial change in open market interest rates is carried to the other short-term and long-term interest rates in the markets for funds. However, as explained in the previous chapter, the interest sensitivities of the supply and demand side actors may create rigidities in the markets, and control is difficult via this mechanism. This is why, as a last step of the monetary transmission mechanism, another mechanism of control is presented in this section.

The possibility that capital requirements can influence the borrowing of different sectors in the economy suggests a mechanism by which this tool can affect the level of total borrowing. The markets for bank loans and securities are used for the analysis.

Ideally, when an expansionary policy is adopted, a lower capital ratio is imposed on financial institutions. This expands the ability of banks to hold financial assets. When banks are allowed to have lower capital with respect to their financial assets, they can increase their supply of loans and securities. In the loans market, a higher supply of loans reduces the interest rate on loans and attracts more borrowers. The market comes to an equilibrium where loans are higher. The change in the loan rate depends on the relative magnitude of the increases in the demand and supply for loans. This mechanism is presented in Figure 6.10. Total increase in bank loans is shown as an increase from L to L'.

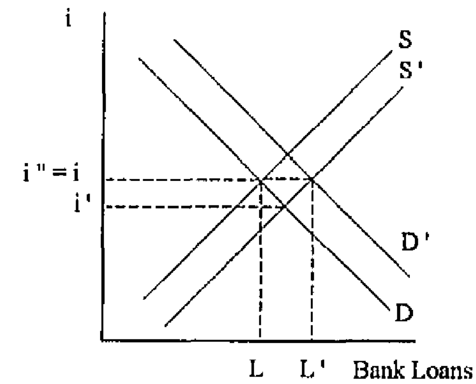


Figure 6.10. Capital Ratio and Bank Loans

The effect of the capital requirements on credit market borrowing is presented in Figure 6.11. First of all, lower capital requirements imposed on banks may also increase the demand for securities in the securities market, because they can hold more securities with respect to their capital. This effect is presented as a rightward shift of the demand curve for securities. Initially, this may create a decrease in this market's interest rate. As a consequence, a lower interest rate attracts a greater supply of marketable securities, due to the low cost of borrowing in this market relative to the bank loans market. This interest

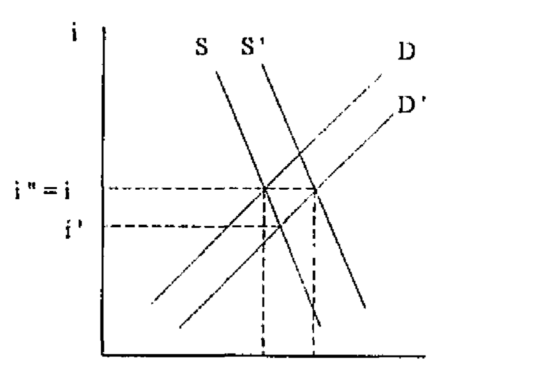


Figure 6.11. Capital Ratio and Securities

rate differential causes supply curve to shift to the right (S'). The market comes to an equilibrium where more securities are traded in the market (C'). The final effect on interest rates depends on which curve shifts more.

Second, while there are no capital requirements on credit market borrowers, their capital ratios do affect their credit ratings, and therefore, their ability to borrow in the securities market. When borrowers have higher capital ratios, demand for the marketable securities they issue may increase. However, the capital ratios of the issuers of marketable securities are not under the control of any authority, and the availability of capital is influenced by outside forces. Therefore, it is difficult to use capital ratios to influence the supply of securities in this market.

In terms of financial institutions, capital requirements can be set by a regulatory authority, but they cannot be changed as often as reserve requirement ratios. Moreover, changes must be carefully evaluated, because small changes will have huge effect on lending capacity. Therefore, they are not easy to use as a short-term policy tool by the monetary authority. Because of these reasons, while capital and the capital ratios are the relevant control route, the Federal Reserve cannot use them. This may well explain the Federal Open Market Committee's current preoccupation with interest rates in its policy shifts.

CHAPTER VII

CONCLUSIONS AND SUGGESTIONS FOR FURTHER RESEARCH

Section 1: Summary and Conclusions

The purpose of this study is to determine the role of credit market assets in an expanded quantity theory and the equation of exchange. The equation of exchange is the economic identity which formulates the relationship between money, its velocity, real output and prices. The behavioral assumption about the constancy or the stability of velocity in this economic identity makes it a theory which explains the transmission from money to prices or nominal income. According to the quantity theory, the change in the stock of money influences nominal income or prices. Money owes its place in this equation to its uniqueness as a medium of exchange and a store of value. Today, the existence of a wide variety of money substitutes, and easy movements among them, obscures the difference between money and other financial assets.

For money to be useful in influencing nominal income or prices, its velocity should be stable in the long run. The research on M1 and M2, the aggregates used as money by the Federal Reserve, suggests that their velocities are not stable in the long run. If the velocity of total credit market assets is stable in the long run, it is better to use them to influence nominal GDP or prices.

According to the hypothesis of this study, credit market assets can replace money in the quantity theory, and this substitution provides a better explanation of the transmission mechanism by which monetary policy influences economic activity. In this model, credit market assets held by the domestic private nonfinancial sectors are related to the level of nominal GDP. When credit market assets increase, there is an effort by economic agents to diversify into real assets, and this new spending on real assets raises the level of nominal GDP.

For the empirical testing of the model, three variables are constructed as proxies for financial assets. These variables are C1, total credit market assets held by private domestic nonfinancial sectors; C2, total credit market debt owed by domestic nonfinancial sectors; and C3, total financial assets. These variables and current definitions of money variables (M1, M2) are tested for cointegration, i.e., a stable long-run equilibrium relationship between the variable tested, and nominal income and interest rates. Test results suggest that compared to M1 and M2, the variable C1 is more powerful, and is cointegrated with nominal income and interest rates.

This empirical finding supports the hypothesis of this study. Namely, the velocity of C1 is stable in the long run, and credit market assets have a stable long-run relationship with nominal economic activity. Open market interest rates and capital requirements are two possible tools which can be used by the monetary authority to influence credit market assets.

In terms of economics education, this implies that the textbook explanations of the monetary transmission mechanism should be revised to include the role of credit market assets in the mechanism. The markets for bank loans and for marketable securities may constitute helpful tools for the classroom presentation of this mechanism.

Section 2: Suggestions for Further Study

The research done in this study is limited to the construction of several financial asset variables from the flow of funds accounts of the Federal Reserve Board of Governors, and testing them against M1 and M2 by employing the Engle-Granger cointegration tests. This research is an attempt to show the role of credit market assets in the economy. Following are some suggestions for further development of this line of study.

The first is the study of other countries. The analysis in this study was limited with the U.S. data. Therefore, the cointegration relationship is valid for the United States. A further study may examine whether the same results are valid for other countries.

The second is the control of credit market assets. In this study the control of credit market assets by the Federal Reserve is not analyzed broadly. However, for credit market assets to be used as a monetary policy tool, they should be controlled by the monetary authority. If open market interest rates are to be used to control the growth of credit market assets, the link between a certain rate of interest and a certain growth rate of credit market assets should be identified. Due to the diversity of credit market instruments, credit market assets are likely to show a low degree of controllability using open market interest rates.

Similarly, if the capital requirement ratio is to be used to control the growth of credit market assets, the connection between capital requirements and credit market assets should be analyzed. However, though capital requirements may offer better controllability, the Federal Reserve lacks direct control over capital. Many issuers of capital market assets are beyond the control of the banks' regulatory agencies. This raises the danger that there may be no direct control over the supply of credit market assets, and heightens the importance of the interest rate policy the Federal Reserve follows today. Further research on the effects of interest rates on credit market assets gains importance because of the lack of controllability via capital requirements.

The last is the classroom presentation. The presentation of a transmission mechanism using credit market assets can be done in a simulation package. In this study, the classroom presentations are in graphical form. The use of computer technology in classroom teaching may provide a better understanding of the topic by students. A further development of the classroom presentation would require the creation of this kind of simulation package.

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