Monetarism, Federal Reserve Policy and the Monetarist Experiment

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MONETARISM, FEDERAL RESERVE POLICY
AND THE
MONETARIST EXPERIMENT

A Thesis
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by
Richard L. Cantrell
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MONETARISM, FEDERAL RESERVE POLICY,
AND THE
MONETARIST EXPERIMENT

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ABSTRACT

MONETARISM, FEDERAL RESERVE POLICY,
AND THE
MONETARIST EXPERIMENT

Richard L. Cantrell    July 19, 1994    62 Pages
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The purpose of this thesis is to examine the period between the fourth quarter of 1979 through the third quarter of 1982 with respect to Federal Reserve policy. This period is known as the "Monetarist Experiment" because the Federal Reserve announced that it would be adopting monetarist principles in the implementation of its policy. Supporters of monetarism claim that this was not a true monetarist experiment because the Federal Reserve implemented policy incorrectly.

Using statistical and time-series regression analyses, I address this question and conclude that the "Monetarist Experiment" was nothing of the kind. Federal Reserve policy never actually changed and monetary aggregates were not affected according to the principles of monetarism. Furthermore, using regression techniques, I conduct a simulation experiment using growth rates for the money supply which are more in line with monetarist philosophies. The resulting GNP growth rates are much smoother and steadier over time. Had monetarism been tried, rather than the chaotic money supply fluctuations that characterized the period, we would likely have seen an economy characterized by greater stability.
Chapter One

Introduction and Review of Monetarism

This paper will represent a discussion of Federal Reserve policy between 1979 and 1982. This period is referred to as the "Monetarist Experiment" because the Federal Reserve announced that they would be following monetarist ideas with respect to the implementation of policy. It is the purpose in this thesis to show that the policy was non-monetarist in its implementation because Federal Reserve goals were never altered to those of monetarists.

In terms of the literature we will be discussing three major areas. The first is literature dedicated to the discussion of monetarism and its theoretical background. The second area is discussion of literature concerning opponents of monetarism. The third area is literature devoted to discussion of the "Monetarist Experiment" itself.

What is Monetarism?

The basic idea of monetarism is that inflation is a monetary phenomenon. Changes in growth rates of money have effects on changes in the rate of inflation. Given this basic
idea, monetarists maintain that only a slow and steady rate
growth for the money supply, one which is in line with the
real rate of growth for the economy, can insure that the price
level will remain stable (Macesich 3).

The leading voice in monetarist Economics is that of
Milton Friedman. In his years as a monetarist economist, he
has summarized the monetarist view on the relationship between
the growth rate of money and the price level:
1. There is a constant, though not precise, relationship
between the rate of growth of the money supply and the rate of
growth of nominal income.
2. This relationship is not obvious at first mostly because
there is a lag in the effect of a change in the growth rate of
the money supply to a change in the growth of nominal income.
3. On average, a change in the growth rate of money produces
a change in the growth rate of nominal income on the order of
two to three quarters later. This is, of course, on average
and is subject to the individual cases.
4. The change in income shows up first in output, and almost
not at all in prices.
5. On average, the effect on the price level shows up some
two to three quarters after the initial effect on income.
Therefore, the total delay between a change in the growth rate
of money and a change in the price level is approximately
twelve to eighteen months.
6. Even after allowing for a delay in the effect of monetary
growth, the relationship is not perfect. There can be slips between the change in money and the change in income, possibly because of slight shifts in money demand or velocity.

7. In the short-run, money changes affect output primarily. However, over the long-run, money changes affect primarily prices (Macesich 3-4).

In short, monetarists believe that money and its rate of growth have important impacts on short-run economic phenomena such as inflation, output, and income.

Monetarism is typically identified with Milton Friedman, and deservedly so; he has been one of the leading monetarist economists in America for the better part of fifty years. Therefore, we naturally consider him to be the leader of the Chicago School of Economic Thought. However, the foundations for monetarist theory were in place long before Friedman.

Friedman attributes the substantive foundations for monetarist thought to Irving Fisher. Fisher set forth the idea of a quantity theory of money: that is, a relationship between money and prices. Obviously, the general idea that money and prices are related is one of the oldest in the history of economic thought. However, the Quantity Theory of Money states this idea in terms of mathematics. Fisher developed the quantity equation: \( MV = PT \), money multiplied by the constant velocity equals prices multiplied by the volume of transactions. Not only did Fisher present this equation, he also applied it in various contexts. Fisher maintained
that fluctuations in economic activity were reflections of changes in the quantity of money (Milton Friedman, *Monetary Economics* 3).

In his book *Appreciation and Interest* (1876) Fisher analyzed the relationship between interest rates and inflation. This relationship calls into question the difference between nominal and real rates of interest. His example is as follows: if you lend someone one-hundred pounds today and in one year's time you receive one-hundred six pounds, and in the meantime the price level rises by six percent then your one-hundred six pounds will be worth one-hundred pounds today. The nominal rate of interest is six percent but the real rate is zero. Fisher also distinguished between actual interest real rates, realized after the event, and the anticipated real interest rate that lenders and borrowers expect. This distinction is very important in understanding the relationship between inflation and real rates of interest. If the expected rate of inflation is less that six percent, then a lender might be willing to lend at six percent because his anticipated real interest rate would be greater than zero. Similarly, if the expected rate of inflation is greater than six percent, that same lender would not be willing to lend at six percent because his anticipated real interest rate would be less than zero. This distinction between actual real rates and anticipated real rates helps to explain why inflation tends to linger once it has begun. As
inflation accelerates, people come to expect it and build this expected inflation into the interest rates they are willing to pay or demand (Milton Friedman, *Monetary Economics* 3-4).

Now that we see that there is a relationship between money and income and, furthermore, between money and inflation, we must now discuss monetarism with respect to policy implementation. What can public policy makers, both monetary and fiscal, learn from the study of monetarist Economics?

First, let us discuss monetary policy as a tool. Monetarism is associated with the idea that monetary policy is the most effective tool at the disposal of the Federal Government. Monetary policy dominates fiscal policy in terms of affecting the economy (Olsen 462). In its most general sense, the credo of the monetarists is that monetary policy is much more effective in influencing aggregate demand and output than is fiscal policy (Harris 429).

We now have one-half of the monetarist suggestion for policy implementation. Money matters and is relatively more important than fiscal policy; we must affect changes in the money supply. The second question is "how?" There are a number of ways to affect the supply of money. We can use the yo-yo approach and bounce the growth rate of money up or down as we see short-run changes in the economy (which has often been typical of the Federal Reserve approach) or we can take a different approach.
Milton Friedman proposes that money matters and that monetary policy dominates fiscal policy. However, Friedman has proposed how our policy may be implemented. Instead of the discretionary policy which the Federal Reserve uses, Friedman suggest choosing an appropriate rate of growth for the money supply and adhering to it. With a steady rate of growth of money we would see a steady growth in income, output, and, eventually, inflation. This is not to say that we could perfectly predict income based on the growth of money; however, with steady growth of money, inflation would eventually become steady and, therefore, inflation expectations would be steady as well (Milton Friedman, Program 99-100). Given what was set forth by Irving Fisher concerning the relationship between expected inflation and realized inflation (Milton Friedman, Monetary Economics 3-4), eliminating some uncertainty in expectations would lead to a more stable economy, other things constant.

Monetarism vs. Non-Monetarism

There has always been a considerable debate over what determines the levels and growth rates of nominal GNP, prices, and unemployment. Macroeconomics is concerned with these variables and how we may use stabilization policy to make them move in desirable directions. There are three major categories of stabilization policy:
1. Monetary policy - using changes in the money supply and interest rates

2. Fiscal policy - using changes in government spending and taxation

3. A miscellaneous category of government policy including wage-price controls or incomes policies.

The particular policy which one favors is related to which underlying theory one prefers (Miller and Pulsinelli, Macroeconomics 16-17).

Let us first discuss the "Keynesian Revolution" in Economic thought. This revolution is identified with John Maynard Keynes and his 1936 book The General Theory of Employment, Interest, and Money. In this book, Keynes criticizes earlier economic thinking (the classical model) on empirical and theoretical grounds (Miller and Pulsinelli, Macroeconomics 128).

The most basic criticism of monetary policy by the Keynesians has to do with the stability of money demand (or velocity). Classical economists (and monetarists) maintain that the demand for money is relatively stable, meaning that monetary policy will have a constant effect on the quantity of money that is demanded. However, Keynesians believe that money demand is unstable and therefore monetary policy is relatively ineffective, especially in periods of recession or depression because profit expectations are already depressed to the point where nominal interest rates are not affected by
a change in the money supply (Keynes 304-06). Keynes maintains that monetary policy is ineffective because in his demand for money function there is a flat portion of the curve. What this money demand function says is that there may be an interest rate that is low enough to cause people to hold a limitless amount of money, and financial institutions are prepared to sell bonds and hold excess reserves (Miller and Pulsinelli, Macroeconomics 511-15). Essentially, Keynesians believe that, in a recessionary period, monetary policy cannot even affect nominal interest rates, let alone GNP growth rates or inflation, because of the perverse movements of money demand or velocity.

Because the demand for money is not stable, we may be faced with an unstable economy, contrary to what the classical economists believe. Given our unstable economy, stabilization policy must be used in order to correct the instability in the economy. Because, according to Keynesians, monetary policy is ineffective in terms of changing the economy during recessionary times, fiscal policy is the method by which stabilization can occur. Fiscal policy must be used whenever aggregate demand is insufficient to absorb the current level of GNP (Morgan 68).³

An important idea of the Keynesian model is the concept of price/wage and interest rate inflexibility (the liquidity trap). New Keynesians reject this idea of price and interest rate instability. Instead of agreeing with Keynes that
unemployment can exist at equilibrium positions, New Keynesians refer to unemployment as a disequilibrium problem. Unemployment is not a result of the rigidity of prices and wages, but it exists because prices do not adjust instantaneously to their equilibrium values because of imperfect information (Harris 280).

With respect to policy, the New Keynesians differ from Keynesians in that they find discretionary monetary policy, in conjunction with appropriate fiscal policy, to be desirable. Fiscal policy is important to New Keynesians for the same reason it is important to Keynesians -- to absorb current GNP levels which cannot be absorbed by aggregate demand. However, according to New Keynesians, monetary policy does have an indirect effect on the price level through its effect on money wages, and New Keynesians seek to use monetary policy to exploit the relationship of the Phillips curve (Rousseas 77). For these reasons, New Keynesians favor fiscal policy and discretionary monetary policy in order to "fine-tune" the economy.

The third non-monetarist school of thought consists of those who favor the Rational Expectations Hypothesis. In short, this theory says that because expectations are rational, errors made in one period have no effect on errors made in subsequent periods (Miller and Pulsinelli, Macroeconomics 8).

With respect to policy, the theory simply states that no
stabilization policy can affect systematic changes in output and employment even in the short-run. Because the errors concerning inflation that people make are not correlated with previous errors, the difference between expected inflation and actual inflation is random. Because these errors are random, they cannot be affected in a systematic way and certainly long-run unemployment and output will return to natural rates (Harris 459).

Even though expectations are rational, the Federal Reserve can attempt to "fool" people with respect to policy. If a change in policy (or a supply/demand shock) is anticipated or announced then the economy remains at its natural level of output (Miller and Pulsinelli, *Macroeconomics* 406). However, the Federal Reserve can choose not to announce a plan to increase (or decrease) the growth rate of the money supply. Given this, there exists imperfect information concerning policy. In the short-run, there can be some unpredictable effect, but economic agents will already have guessed a change in Federal Reserve policy and will have incorporated inflation into their expectations (assuming Federal Reserve policy is expansionary) and output and unemployment will be unaffected. Because some economic agents will have overestimated and some will have underestimated inflation the Federal Reserve cannot affect output or employment in a systematic way (Miller and Pulsinelli, *Macroeconomics* 407). In terms of policy implications, the
Rational Expectationalists are not particularly far removed from the monetarists. The only difference between the two in terms of stabilization policy is that monetarists specify the growth rate of the money supply to be approximately equal to the natural growth rate for the economy. Rational Expectationalists see that as a non-issue because, regardless of the actions of the Federal Reserve, unemployment and output will return to natural rates.\(^5\)

Now that we have established what monetarism is and what its major opponents in the arena of macroeconomics are, we must attempt to settle the debate over monetary vs. fiscal policy using empirical data applied to economic theory. The most well known and studied of these models is the Anderson-Jordan equation otherwise known as the St. Louis equation.

Revisiting Anderson-Jordan

The St. Louis equation was developed by two men, Leonall Anderson and Jerry Jordan, while they were working in the research department at the Federal Reserve Bank of St. Louis (hence the St. Louis equation). This equation is among the most important and influential econometric models in modern economic thought and has elicited numerous articles and criticisms over the last twenty plus years.

Let us start by discussing what the Anderson-Jordan model (hereafter referred to as A-J) is and what it implies. The
equation is as follows:

1) \[ D_{Y_{t}} = a_{0} + \sum B_{i}D_{m_{t-i}} + \sum G_{i}D_{e_{t-i}} + u_{t} \]

where \( y \), \( m \), and \( e \) denote nominal GNP, the money stock (M1), and nominal high-employment government expenditures, respectively, and \( u \) denotes the usual random disturbance term. It can be written more compactly as:

2) \[ D_{Y_{t}} = a_{0} + B(L)D_{m_{t}} + G(L)D_{e_{t}} + u_{t}, \]

where \( B(L) \) and \( G(L) \) are polynomial distributed lags of order \( k \). Anderson and Jordan choose \( k=3 \). This lag structure means that, in this model, the effects of monetary and fiscal policy are constrained to lie on a polynomial of order three. What this equation says is that changes in nominal GNP are a function of changes in the M1 money supply and changes in government spending (Batten and Thornton 10).

The empirical results of A-J favored the monetarist ideas. The coefficients on M1 were positive and significant while the coefficients on government expenditures were insignificant at the five percent level of significance (Batten and Thornton 12). Though there have been a number of econometric criticisms of the A-J model, its structure is still the blueprint for further econometric research in the area of monetary vs. fiscal policy.
Given the Anderson-Jordan equation and its results, it would appear that, in terms of policy implementation, monetary policy, in our model, dominates fiscal policy with regards to affecting nominal income. These results might seem to put to rest the ongoing debate. However, monetarism is not only that money matters; we must also correctly target the money supply and reach stable growth rates for that money. The next question in our discussion of monetarism is whether or not it can work in practice.

The Monetarist Experiment

The Federal Reserve, between 1970 and 1979, was attempting to control the money supply through the use of the Federal Funds rate. This period marks the beginning of the "modern" era of Federal Reserve policy. The Federal Reserve chose a firm intermediate target for money supply growth and attempted to reach that target through the use of Federal Funds rate targeting. The Federal Reserve was required to forecast the position of the money demand schedule and deduce what long term interest rate would be needed in order to meet its intermediate target. The problem that the Federal Reserve encountered was shifting money demand. The forecasts for the money demand schedule were inaccurate and that caused the Federal Reserve to miss its intermediate target growth rate for the money supply. Eventually, the money stock began
growing faster than what was consistent with intermediate targets. By 1979, the money stock and inflation had accelerated. This prompted the Federal Reserve to announce a different strategy for policy implementation. The Federal Reserve would begin targeting non-borrowed reserves directly (Miller and VanHoose 669-73).

This change in policy marks the beginning of the "Monetarist Experiment." This "Monetarist Experiment" lasted through the third quarter of 1982, exactly three years. Opponents of monetarism use the instability of the economy during this period as a severe criticism of monetarism (Olsen 463-64).

Milton Friedman indicts Federal Reserve policy by mentioning that during the experiment, the Federal Reserve reverted to its old policy. Despite its announcement to change policy and target monetary aggregates, the Federal Reserve began targeting the straight Federal Funds rate during a brief period of time in the spring of 1980 ("Monetary Policy" 109).

Along with Milton Friedman, many other monetarists criticize the Federal Reserve's policy during this period. The instability of the growth rates of monetary aggregates leads these critics of the Federal Reserve to conclude that the Federal Reserve never really abandoned its commitment to interest rate control. If this is the case, the Federal Reserve, despite its policy announcement, must forego control
Critics of the Federal Reserve's policy during the "Monetarist Experiment" were not restricted to the private sector. Before the end of the experiment, Larry Roos, the president of the St. Louis Federal Reserve, made several speeches complaining that the Open Market Committee was not being faithful to the monetarist doctrine (Greider 390). This criticism of Federal Reserve policy during the experiment is particularly damaging because it was levied from within the Federal Reserve itself.

Also, during the experiment, when the Federal Reserve claimed to target the growth of the money supply, the discount rate was also being targeted. The Federal Reserve would have a difficult time maintaining control of the money supply if the discount rate (and later the Federal Funds rate) is also targeted (Greider 216-18).

Furthermore, during 1980, the first full year of the experiment, "money supply growth rose and fell like a yo-yo."(Greider 218) The money supply was up 13% in February, down 17% in April, up nearly 23% in August, and down 17% in December. This pattern can be seen in interest rates as well. Granted, during this experiment we see the Federal Reserve's impact on the economy being as bizarre as the jumping interest rates and money supply growth rates. This period showed short gyrations from recession to recovery and back again (Greider
The volatility of the money supply growth rates are yet another indication of the Federal Reserve's failure to correctly implement monetarism.

Some Economists, however, do believe that the Federal Reserve acted in good faith and began to target non-borrowed reserves. Michael Bradley and Dennis Jansen specify vector auto-regressive models for the period before and during the "Monetarist Experiment." They estimate these models in order to determine whether there were different patterns of influence among monetary variables in the two periods. Their findings favor the idea that the Federal Reserve had begun targeting non-borrowed reserves because they note marked differences between the two periods with regards to the influences of monetary policy variables. Non-borrowed reserves, during the experiment, no longer varied with interest rates. In the views of Bradley and Jansen, the Federal Reserve had changed policy (328-34). Furthermore, during the "Monetarist Experiment" the variability of the Federal Funds rate increased to nearly twenty times what it was between 1970 and 1979. These two observations tend to support the idea that the Federal Reserve was no longer targeting the Federal Funds rate (Miller and VanHoose 678).

We see that the Federal Reserve may have abandoned its commitment to interest rates and began targeting non-borrowed reserves. However, the Federal Reserve did not achieve their targets for monetary aggregates. Many non-monetarists suggest
that the Federal Reserve is simply unable to accurately target the growth rate of the money supply. These non-monetarists maintain that non policy supply and demand-side factors make attaining targeted money supply growth rates very difficult (Bryant 6-7). Because the Federal Reserve cannot explicitly control the growth rate of the money supply, widening the target range for the Federal Funds rate not only makes the Federal Funds rate unstable, but makes the money supply growth rate unstable as well (Mishkin 392-4). This type of criticism calls into question the practicality of monetarism as a guide for policy. If the Federal Reserve cannot explicitly control the growth rate of the money supply, then a fixed-rate rule for monetary policy is not achievable.

During a meeting of the American Economic Association in December of 1983, Benjamin Friedman attacks the "Monetarist Experiment" by citing numerous inconsistencies in economic behavior with respect to the implementation of monetarist principles in Federal Reserve policy. First of all, he shows that the monetary aggregates M1, M2, and M3 did not move together over the period between 1979 and 1982. Between the fourth quarter of 1979 and the fourth quarter of 1980, the M1 growth rate moved from 7.4% to 7.2% while M2 and M3 growth rates went from 8.1% to 9.0% and 9.6% to 9.7% respectively during this period. From 1980 to 1981, the M1 growth rate dropped from 7.2% to 5.1% while M2 rose to 9.4% and M3 was up to 11.7%. In 1982, the M1 growth rate rose to 8.5% while the
M2 and M3 rates rose to 9.3% and 10.1% respectively. According to the monetarist ideal, these aggregates should move roughly in tandem. Also, the movement of some monetary aggregate should roughly explain the movement of the growth rate of nominal GNP. Friedman shows that the nominal GNP growth rate went from 9.7% in 1979 to 9.3% in 1980 and to 10.8% in 1981. These were years in which the growth rate of M1 declined from 7.4% in 1979 to 5.1% in 1981. Also, in 1982, the growth rate of GNP was 2.6% while the M1 growth rate was at 8.5%. These observations seem to be inconsistent with the principles of monetarism (Benjamin Friedman 382-84).

These inconsistencies in GNP growth rates with respect to monetary growth rates seem to add credibility to the idea that monetarism did not work when the Federal Reserve used it as a guide for policy implementation.

The obvious champion to whom I shall look for a rebuttle of Benjamin Friedman's criticisms is, of course, Milton Friedman. Milton Friedman introduced a paper at the same conference as Benjamin Friedman. In this paper, Friedman responds to the critics of monetarism.

With regard to the different movements in monetary aggregates, Friedman cites the confusion of labels. The aggregates, how they are currently defined, do not correspond to those aggregates about which the claims by monetarists were made. The current M2 is much broader than the earlier M2. It is almost identical to the M4 aggregate compiled earlier by
Friedman and Schwartz. The M1 measure is closer, conceptually to the earlier M2 because it includes interest bearing deposits. Monetarists never recommended the use of such broad aggregates as M2 and M3 as monetary targets. The closest approximations to those aggregates recommended are M1 and the monetary base (Milton Friedman, "Lessons" 398).

On the question of movements in GNP growth with respect to changes in a monetary aggregate growth, Friedman says that a year is too long a time unit to use, especially between the years 1980 through 1983 which were characterized by abnormally short cyclical phases in the economy. Monetarists attribute these short cyclical phases to short and volatile gyrations in monetary growth during this period of time. Also, monetarists have concluded that nominal GNP growth lags behind M1 growth some six months, on average. Friedman cites swings in M1 and nominal GNP one quarter later from 1978:4 to 1979:4 for M1 and 1979:1 to 1980:1 for nominal GNP. Fluctuations in the two measures move up and identically (although not in magnitude or measure) in direction when the data is lagged one quarter (Milton Friedman, "Lessons" 399).

Milton Friedman takes one more stab at the anti-monetarist. Although the opponents of monetarism refer to the Federal Reserve policy during this time period as monetarist, Friedman maintains that it was decidedly non-monetarist in its implementation. The Federal Reserve claimed to target monetary aggregates, but that is only part of a monetarist
policy. In addition to targeting explicitly monetary aggregates, the achievement of a steady and predictable rate of growth in the aggregate is essential as well. On this point, the Federal Reserve was decidedly anti-monetarist. Friedman shows the simple standard deviation of quarter to quarter monetary growth rates prior to October 1979 (1.59%) and after October 1979 (5.64%). The volatility of monetary growth was higher in the three years of the experiment than it was in any earlier three year period since World War II. This volatility serves as a particularly strong refutation of anti-monetarist claims that the Federal Reserve tried monetarism and it did not work. The Federal Reserve, in fact, did not use a monetarist policy during the period of 1979 through 1982 (Milton Friedman, "Lessons" 399).

In his article "Monetary Policy: Theory and Practice" (1982), Friedman refers to Federal Reserve policy as a function of "bureaucratic inertia." This is not in reference only to the period of the experiment, but throughout the history of the Federal Reserve. The Federal Reserve fails to correct mistakes despite its widespread recognition because the Federal Reserve has no bottom line. The Federal Reserve has no budget constraint, it faces no voters, and once its board members are appointed to a full term, they cannot be reappointed. In contrast, the private sector has a bottom line, monetary losses. If this occurs, employees get fired or demoted. In government, this occurs to a smaller extent in
that officials are subject to voter disenchantment (114). This lack of a bottom line is why the Federal Reserve is able to make mistakes in policy and can continue to make those same mistakes, like the failure during the experiment, without retribution.

From a political standpoint, it is very difficult to implement a change in policy which is designed to reduce inflation. There was a desire to quell inflationary trends but at the same time avoid policies which might lead to recession. The Federal Reserve's policy of targeting bank reserves is referred to as "monetarist." However, the political desires to avoid any recessionary trend made for an environment which was hardly conducive to the monetarist fixed-growth rule (Olsen 468).

Critics of monetarism named the Federal Reserve policy of 1979-82 the "Monetarist Experiment." These critics maintain, however, that it could never be monetarist enough to satisfy the purists of the monetarist community (Olsen 468). This particular criticism of monetarism is unfounded because there is no gray area in monetarist theory. The monetarist theory is very specific in terms of suggestions for policy. The simple fact that money supply growth rates were extremely volatile during the experiment gives rise to suspicion that the Federal Reserve did not implement monetarism. Critics of monetarism, while trying to emphasize the Federal Reserve inability to control non-borrowed reserves, unwittingly give
strength to the argument that Federal Reserve policy was not monetarist by highlighting volatile money supply growth during the period. It must be emphasized that volatile money supply growth rates and a Federal Reserve policy which is monetarist are mutually exclusive events.

Overview of Thesis

Given that there has been considerable debate over the reference to this period of time as a monetarist experiment, there is sufficient evidence given by monetarists to examine this period of time and determine if it was an experiment in monetarism. It has been suggested that there is, at least, reasonable doubt that the Federal Reserve abandoned its previous policy of targeting interest rates and began to target monetary aggregates. However, whether or not the Federal Reserve abandoned its commitment to interest rates is not as important as the ultimate goal of policy.

As we shall see, not only is there some doubt that the Federal Reserve changed the intermediate target of its policy, but there is some doubt as to whether or not the Federal Reserve changed the goal of its policy. In the next chapter, we will look at the "Monetarist Experiment" from an empirical point of view. We will discuss the issue of changes in Federal Reserve policy and also examine the true goals of Federal Reserve policy.
Chapter Two
An Empirical Look at the Monetarist Experiment

Because of the instability in the economy during the period of the "Monetarist Experiment," anti-monetarists have hailed the period as a failure of monetarism, while monetarists have maintained that the principles of monetarism were never implemented by the Federal Reserve with regards to policy. In the first chapter, we saw that there are compelling arguments on either side of the issue. In this chapter, we will begin to explore this issue from a purely empirical standpoint.

Was it Monetarism?

As we have discussed in the first chapter, there are two major components of a monetarist policy. First, the growth rate of the money supply should be the intermediate target of macro-economic policy. Instead of trying to affect changes in the economy by using fiscal policy, the Federal Government should use monetary policy. Second, not only is it important to target monetary aggregates, but it is also imperative that
these aggregates grow in a steady fashion, one which is in line with the natural growth of the economy. Furthermore, monetarism is concerned with long term macroeconomic goals such as stable inflation or increased GNP growth. In order to implement monetarism, the Federal Reserve must have a clear macroeconomic goal, that is, stabilized inflation. A monetarist policy requires this goal; therefore, the actual intermediate target is unimportant since the Federal Reserve's tool (monetary policy) never changes. In other words, the Federal Reserve targets the money supply whether directly, through non-borrowed reserve targeting, or indirectly, through Federal Funds rate targeting (Wallich 23).

Now that we have established the criteria for identifying a monetarist policy, we can look simply at the numbers from this period and draw our own conclusions. Was it a failure of monetarism, or merely a failure of policy?

Initially, let us assume that, consistent with its announcement, the Federal Reserve began targeting monetary aggregates in order to stabilize inflation in the fourth quarter of 1979. Given this assumption (which we will see can be questioned), the Federal Reserve needs only to insure slow, steady growth in the money supply in order to meet monetarist criteria. Let us look at the numbers.

First, we need to determine which monetary aggregate we are going to use for our empirical test. We chose the M1 monetary aggregate for two reasons: 1) the Federal Reserve has
more control over that aggregate than over more comprehensive aggregates like M2 or M3 because M1 is influenced to a greater extent by the monetary base and, 2) Anderson and Jordan used the M1 aggregate in their St. Louis equation.

Now that we have our monetary aggregate, let us look at the descriptive statistics of the growth rate of M1 in the period between the fourth quarter of 1976 and the third quarter of 1979 (the three years just before the experiment). The sample mean of this series is .0207046 in decimal form and the sample standard deviation of this series is .0067743. Now we can compare those numbers with the descriptive statistics of this series during the experiment. Between the fourth quarter of 1979 and the third quarter of 1982, we find that the mean changed some (it was .0151898) but the standard deviation grew from .0067743 to .0162607 (see Tables 2.1 and 2.2 for statistical output). There is enough evidence in just these sample descriptive statistics to warrant further study. The fact that the standard deviation is 2.4 times as large during the experiment gives us some idea that monetary growth rates became unstable during this period.

This point is shown graphically in Figure 2.1. Figure 2.1 shows quarterly growth rates for the M1 aggregate from 1962 through the third quarter of 1982. The graphical representation shows visually the instability of the series over the time period of the experiment (1979.4 through 1982.3). As we can see, growth rates were not particularly
Table 2.1

Descriptive Statistics for the Growth Rate of M1

Sample Range 1976.4 through 1979.3
Number of Observations - 12

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Max</th>
<th>Min</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM1</td>
<td>0.0207046</td>
<td>0.0067743</td>
<td>0.0344314</td>
<td>0.007735</td>
</tr>
</tbody>
</table>

Table 2.2

Sample Range 1979.4 through 1982.3
Number of Observations - 12

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Max</th>
<th>Min</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM1</td>
<td>0.0151898</td>
<td>0.0162607</td>
<td>0.0565691</td>
<td>-0.0028413</td>
</tr>
</tbody>
</table>
Quarterly growth rates of the M1 money supply (DM1) over the period 1962.1 through 1982.3
stable in the years before the experiment. If this had been a truly monetarist experiment, we would expect to see a series that is more, not less, stable.

In addition to simple visual investigation of the standard deviations for the M1 growth rate series, it is necessary that we conduct a statistical test on the variances of the two time periods in question. Our test is an F-test on the ratio of variances. We set our null hypothesis to be that the true variance of the series DM1 over the experiment period is less than or equal to the variance of the series DM1 over the three years before the experiment. Our test statistic is 5.7616865 and our critical value is 2.82 (Gujarati 682). Because our test statistic is greater than our critical value, we must reject the null hypothesis and conclude that the variance of our series DM1 is higher over the period of the experiment (1979.4 through 1982.3) than it was over the three years prior to the experiment.11

Given this evidence, we must conclude that the Federal Reserve did not strive for a stable rate of monetary growth. Therefore, this experiment was decidedly non-monetarist in its implementation, and we cannot conclude that it is a failure of monetarism.

Was Policy Really Changed?

Now that we have concluded that the experiment conducted
between the fourth quarter of 1979 and the third quarter of 1982 was not a monetarist experiment, we must now challenge an assumption made earlier in this chapter -- that the Federal Reserve changed its ultimate goal. In essence, we must examine the idea that the Federal Reserve changed policy and began to target non-borrowed reserves in order to stabilize inflation.

Prior to the experiment, the Federal Reserve used discretionary monetary policy as a means to an end. The Federal Reserve used policy that was designed to exploit the Phillips curve and target the unemployment rate with the rate of inflation being a secondary issue. The Federal Reserve supposedly changed its policy and began targeting monetary aggregates in order to stabilize inflation, making the unemployment rate a secondary issue. In order to test this proposition, we must determine a relationship between monetary growth and the civilian unemployment rate. The Federal Reserve, except during the experiment, would try to use monetary policy to try to control unemployment. It is at this point that our money reaction function begins.

A money reaction function is a model that is designed to demonstrate the reaction of monetary policy to changes in some other macroeconomic phenomenon. In this model we will examine the reaction of monetary policy to changes in the civilian unemployment rate (see Figure 2.2). However, during the time period of the experiment, we would not expect to see
Unemployment Rate (URATE) and Growth Rate of M1 (PM1)
in Percents (1962.1 through 1988.4)
changes in the civilian unemployment rate to have any effect on the growth of money because, according to the Federal Reserve, inflation control via influence over monetary aggregates was its main objective. Our reaction function is as follows:

\[ DM_{1t} = a_0 + a_1DM_{1t-1} + a_2URATE_{t-1} + a_3UD + a_4UD2 + u_t \]

where \( DM_1 \) is the growth rate of the M1 money aggregate, \( URATE \) is the civilian unemployment rate (\%), \( UD \) is the civilian unemployment rate lagged one quarter multiplied by a dummy variable which equals one in quarters 1979.4 through 1982.3, and zero in all other periods; and \( UD2 \) is the civilian unemployment rate lagged one quarter multiplied by a dummy variable which equals one in quarters 1982.4 through 1988.4, and zero in all periods before and during the experiment. This equation says that the growth rate of M1 in period \( t \) is influenced by the growth rate of M1 in period \( t-1 \), the civilian unemployment rate in period \( t-1 \), and our interactive terms.

The important parts of this money reaction function are the interactive terms -- the dummy variables multiplied by the lagged unemployment rate. Because we have specified the variables as we have, we should expect to see the first interactive term (UD) have a significantly negative coefficient if the Federal Reserve changed policy during the
experiment. Similarly, we should see the second interactive term have a significant positive coefficient if policy was changed during the experiment and then changed back after the experiment. The significance of these terms would imply that the unemployment rate became less important to the Federal Reserve during the experiment. If policy was not changed, the first interactive (UD) term would be insignificant because the effect of a lagged value of the unemployment rate was not altered during the experiment period. Similarly, if the second interactive term (UD2) is insignificant, then policy after the experiment, with regards to unemployment, would not have been changed.

Because the Federal Reserve claimed to change policy, we would expect that our money reaction function will show this change in policy. However, that is not the case. The coefficients on the lagged unemployment rate terms and the lagged M1 growth rate term are significant at the five percent level. The coefficients on our interactive terms, however, are not significant even at the 69 and 29 percent levels, respectively (see Table 2.5 for the output for this regression and Augmented Dickey-Fuller test on M1 growth rate stationarity). These insignificant values indicate that no detectable change took place in the relationship between lagged unemployment and monetary policy during the experiment nor after the experiment. These findings force us to seriously reconsider the claims by the Federal Reserve
Table 2.5

Money Reaction Function Equation

Sample Range 1962.1 through 1988.4
Number of Observations - 108
Dependent Variable - DM1

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>T-Stat</th>
<th>2-Tail Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>.0010376</td>
<td>.0035741</td>
<td>.2903164</td>
<td>.7722</td>
</tr>
<tr>
<td>DM1 (-1)</td>
<td>.2137285</td>
<td>.0946701</td>
<td>2.2576137</td>
<td>.0261</td>
</tr>
<tr>
<td>URATE (-1)</td>
<td>.0018910</td>
<td>.0006120</td>
<td>3.0899200</td>
<td>.0026</td>
</tr>
<tr>
<td>UD</td>
<td>-.0001733</td>
<td>.0004418</td>
<td>-.3923018</td>
<td>.6956</td>
</tr>
<tr>
<td>UD2</td>
<td>.0003868</td>
<td>.0003707</td>
<td>1.0433198</td>
<td>.2992</td>
</tr>
</tbody>
</table>

R²: .181253
Adj. R²: .149457
Regression S.E.: .009543
Log Likelihood: 351.7234
Durbin-Watson: 1.970805

Mean of Dep. Variable: .015688
S.D. of Dep. Variable: .010348
Sum of Squared Residuals: .009380
F-Statistic: 5.700515
Prob(F-Statistic): .000348

Stationarity Test for
the Growth Rate of M1

Sample Range 1962.1 through 1988.4
Number of Observations - 108

Augmented Dickey-Fuller: UROOT(C,0) DM1

Dickey-Fuller t-statistic: -7.4627
MacKinnon critical values: 1% -3.4917
5% -2.8882
10% -2.5808

33
concerning the objectives of monetary policy during the experiment. Not only were monetary aggregates not stabilized during this period, we also have found that policy goals were never changed.

The Federal Reserve was still seeking solutions to short-run macroeconomic problems. Instead of allowing the economy to proceed with only steady monetary growth, the Federal Reserve persisted in discretionary, reactionary monetary policy. We must conclude that the period referred to as the "Monetarist Experiment" was nothing more than the Federal Reserve continuing policy as before and that it never resembled true monetarism.
Chapter Three
Modelling a Monetarist Experiment

Constructing a Proper Model

In the past two chapters, we have discussed the Federal Reserve "Monetarist Experiment" and have concluded, based on empirical results, that it was not monetarism in any usual sense of the term. In fact, we have shown that the objectives of Federal Reserve policy never changed during the period in question. The next step is to conduct a "what if?" monetarist experiment and simulate nominal GNP growth rates over the period of the fourth quarter of 1979 through the third quarter of 1982.

In order to begin our experiment, we must construct an econometric model which adequately explains GNP growth in terms of monetary growth. As we have seen, the Anderson-Jordan equation is the bench-mark model for this relationship and will be the basis for building a model for our experiment.

First, we must list all variables which will be used in our model building and subsequent simulation experiment. They are as follows:

M1 – The M1 money stock in billions of dollars (SAAR)
GOVEX - Federal Government expenditures in billions of dollars (SAAR)

Y - Gross National Product, total, in billions of dollars (SAAR)

DM1 - Growth rate of the M1 money stock

DGOV - Growth rate of Federal Government Expenditures

DGNP - Growth rate of nominal Gross National Product

Each variable is quarterly data from the first quarter of 1961 through the fourth quarter of 198812.

For our estimation of a regression equation, I have chosen DGNP, DM1, and DGOV. DM1 is a proxy for monetary policy by the Federal Reserve and DGOV is a proxy for fiscal policy by the Federal Government.

Our theoretical relationship is that GNP growth should be a function of money supply growth and government expenditure growth. A linear regression equation will look similar to this:

\[ DGNP_t = a_0 + a_1 DM_{1t-2} + a_2 DGOV_{t-2} + u_t \]

where DGNP is our growth rate of GNP, DM1 is the growth rate of the M1 money stock, DGOV is the growth rate of Federal Government expenditures, and u is the usual random disturbance term. It must be noticed that both explanatory variables are lagged two quarters, considered consistent with monetarist economic theory. In chapter one, we discussed the monetarist
view as set forth by Milton Friedman\textsuperscript{13}. In his view, there is a lagged effect of six months between a change in money supply growth and a change in nominal GNP growth. We specify our econometric model in this fashion in order to assure that it is well-grounded in economic theory.

In order to use variables in a time-series model such as this, it is necessary that the individual series be stationary (mean reverting) over time. The best way to test the stationarity of a time series is by using the Augmented Dickey-Fuller test. Micro-TSP does this test automatically and produces the outputs.

Let us look first at the series DGNP. As we can see, our Dickey-Fuller t-statistic is $-6.865$ -- sufficiently large (in absolute value) to reject the null hypothesis of a unit root (non-stationarity); therefore, we conclude that the series is stationary over our sample period (1962.1 through 1979.3). The same is true for the series DM1 and DGOV. The Dickey-Fuller t-statistics are $-5.4521$ and $-8.2957$, respectively, both of which are large enough (in absolute value) to reject the null hypothesis of a unit root at the five percent level of significance (see output for DM1, DGOV and DGNP in Table 3.1).

Now that we have our functional relationship and our variables, we estimate a linear regression equation. We initially estimate an equation with a number of different lags for each explanatory variable. The only significant
Table 3.1

Stationarity Test for the Growth Rates of GNP, M1 and Federal Government Expenditures

Sample Period 1962.1 through 1979.3
Number of Observations - 71

Augmented Dickey-Fuller: UROOT(C,0) DGNP

<table>
<thead>
<tr>
<th>Dickey-Fuller t-statistic</th>
<th>1%</th>
<th>5%</th>
<th>10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dickey-Fuller t-statistic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MacKinnon critical values:</td>
<td>-6.8650</td>
<td>-3.5239</td>
<td>-2.9023</td>
</tr>
<tr>
<td>1%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Augmented Dickey-Fuller: UROOT(C,0) DM1

<table>
<thead>
<tr>
<th>Dickey-Fuller t-statistic</th>
<th>1%</th>
<th>5%</th>
<th>10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dickey-Fuller t-statistic</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>MacKinnon critical values:</td>
<td>-5.4521</td>
<td>-3.5239</td>
<td>-2.9023</td>
</tr>
<tr>
<td>1%</td>
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<td></td>
</tr>
<tr>
<td>5%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10%</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Augmented Dickey-Fuller: UROOT(C,0) DGOV

<table>
<thead>
<tr>
<th>Dickey-Fuller t-statistic</th>
<th>1%</th>
<th>5%</th>
<th>10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dickey-Fuller t-statistic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MacKinnon critical values:</td>
<td>-8.2957</td>
<td>-3.5239</td>
<td>-2.9023</td>
</tr>
<tr>
<td>1%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
coefficient is that on the second lag of the M1 growth rate (DM1(-2)). This finding is consistent with theory, since the effect of a change in money is shown to have a six month (two quarter) lagged effect (see Table 3.2 for the regression output).

Because we find that the coefficients on all of the government expenditure variables are insignificant at the five percent level, we must test for exclusion restrictions. More specifically, in this model, we must test to see if all the coefficients on government expenditure are jointly equal to zero. To do so, we first obtain the sum of squared residuals from our initial regression (.004570). Then we run a restricted regression (one which leaves out the variables on government expenditures) and obtain the sum of squared residuals from that regression (see Table 3.3 for the output of this regression). The value we obtain is .004916. If the coefficients on the government expenditure variables are jointly equal to zero, the sum of squared residuals should not change when we run our restricted regression. We calculate an F-statistic for this test which is equal to 1.6404085.\(^\text{14}\)

If this number is larger than our critical F value, we will reject the null hypothesis that the coefficients on the three government expenditure variables are jointly equal to zero. At the five percent significance level, we find in the F-table that the critical value is 2.76 (Gujarati 682). Because our calculated F-statistic is less than our critical
### Table 3.2

Initial (Unrestricted) Model Estimation for the Growth Rate of GNP

Sample Range 1962.1 through 1979.3
Number of Observations - 71
Dependent Variable - DGNP

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>T-Stat</th>
<th>2-Tail Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.0086173</td>
<td>0.0032219</td>
<td>2.6746107</td>
<td>0.0095</td>
</tr>
<tr>
<td>DM1(-1)</td>
<td>0.2344976</td>
<td>0.1529078</td>
<td>1.5335885</td>
<td>0.1300</td>
</tr>
<tr>
<td>DM1(-2)</td>
<td>0.6533872</td>
<td>0.1566585</td>
<td>4.1707749</td>
<td>0.0001</td>
</tr>
<tr>
<td>DGOV</td>
<td>0.0803978</td>
<td>0.0516727</td>
<td>1.5559037</td>
<td>0.1246</td>
</tr>
<tr>
<td>DGOV(-1)</td>
<td>0.0513824</td>
<td>0.0514467</td>
<td>0.9987503</td>
<td>0.3216</td>
</tr>
<tr>
<td>DGOV(-2)</td>
<td>-0.0761785</td>
<td>0.0520677</td>
<td>-1.4630665</td>
<td>0.1483</td>
</tr>
</tbody>
</table>

R²        | 0.308167    | Mean of Dep. Variable | 0.021576 |
Adj. R²   | 0.254949    | S.D. of Dep. Variable | 0.009714 |
Regression S.E. | 0.008385 | Sum of Squared Residuals | 0.004570 |
Log Likelihood  | 241.8638    | F-statistic          | 5.790650 |
Durbin-Watson   | 2.031513    | Prob(F-statistic)    | 0.00176  |

### Table 3.3

Final (Restricted) Model Estimation for the Growth Rate of GNP

Sample Range 1962.1 through 1979.4
Number of Observations - 71
Dependent Variable - DGNP

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>T-Stat</th>
<th>2-Tail Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.0100249</td>
<td>0.0026753</td>
<td>3.7539609</td>
<td>0.0004</td>
</tr>
<tr>
<td>DM1(-1)</td>
<td>0.2740664</td>
<td>0.1539737</td>
<td>1.7799555</td>
<td>0.0796</td>
</tr>
<tr>
<td>DM1(-2)</td>
<td>0.6021313</td>
<td>0.1567026</td>
<td>3.8425106</td>
<td>0.0003</td>
</tr>
</tbody>
</table>

R²        | 0.255749    | Mean of Dep. Variable | 0.021576 |
Adj. R²   | 0.233859    | S.D. of Dep. Variable | 0.009714 |
Regression S.E. | 0.008503 | Sum of Squared Residuals | 0.004570 |
Log Likelihood  | 239.2712    | F-statistic          | 11.68352  |
Durbin-Watson   | 2.091816    | Prob(F-statistic)    | 0.00043   |
value, we must fail to reject the null hypothesis and conclude that the coefficients on DGOV, DGOV(-1), and DGOV(-2) are jointly equal to zero. This result leaves the restricted regression to serve as our final model.

Our findings during this test are not unlike the findings of Anderson and Jordan. They concluded that the coefficients on government expenditure were not significant with respect to affecting GNP growth. Similarly, in our linear model, we must reach the same conclusion. Since no single coefficient on government expenditure was significant and they were all jointly insignificant, we must conclude that fiscal policy is ineffective in influencing the growth of nominal income (GNP) -- thereby leaving us with a very simple, but effective, model for conducting our monetarist experiment (See Figure 3.1 for a graphical representation of the relationship between DGNP and DM1).

**Diagnostics of Our Model**

Now that we have a simple linear model with which to conduct our experiment, it is important that we run a series of diagnostic tests on this model to insure that there are no inherent statistical problems within the model. Since we have already tested the two time series variables for stationarity, we need not cover that again; instead, we can look at the model itself.
Quarterly growth rates for GNP (DGNP) and M1 (DM1) over the period 1962.1 through 1979.3
The first, and most obvious, test to perform is a t-test for the significance of the coefficients on the DM1(-1) and DM1(-2) variables. From our statistical output, we find that the t-statistic on our DM1(-1) coefficient is 1.7799555. The value called 2-tailed significance gives us the significance level at which we can reject the null hypothesis that the coefficient equals zero. Since this value is .0796, we can reject the null hypothesis at a 7.9 percent level of significance. The t-statistic on our DM1(-2) coefficient is 3.8425106. The 2-tailed significance gives us .0003, meaning that we can reject the null hypothesis at the .03 percent level of significance (Newbold and Bos 88).

Our second diagnostic test is the F-test which tests the overall significance of the model. The outcome of this test should not be different from the t-test, and indeed it is not. Our F-statistic from the statistical output is 11.68352. The number just below the F-statistic on the regression output is the level of significance at which we can reject the null hypothesis that the model is insignificant overall. This number is .000043, which is far below any relevant significance level. Therefore we are able to reject the null hypothesis and conclude that the model is significant overall (Newbold and Bos 89-90).

Since this is a time series model, we must be aware of the problem of first-order serial correlation or autocorrelation. Autocorrelation occurs when the residuals
from the model are not independent of one another -- that is, that the error in one period may influence the errors in future periods.\textsuperscript{15}

A standard test for autocorrelation is called the Durbin-Watson test (the Durbin-Watson statistic appears in the statistical output). The null hypothesis of this test is that there is no autocorrelation. We have our Durbin Watson test statistic (2.091816), and now we need a critical value. When we use the Durbin-Watson table, we find that there are two values for each number of observations and degrees of freedom. If the calculated Durbin-Watson statistic is above the upper limit test statistic, then we fail to reject the null hypothesis. In our case (with two degrees of freedom and 71 observations) our Durbin-Watson lower limit is 1.554 and our upper limit is 1.672. Because our calculated test statistic is above the upper limit, we must fail to reject the null hypothesis and conclude that there is no evidence of first-order serial correlation in the residuals of our model (Newbold and Bos 100-02).

The only diagnostic of the model itself which is left to examine is the $R^2$ value.\textsuperscript{16} In our model, $R^2$ is .255749, which means that only twenty-five percent of the variation in DGNP is explained by our regression. However, this is a simple regression model and it is able to explain twenty-five percent of the variation in the dependent variable. Considering all those variables that the Federal Reserve cannot control and
that may affect the growth of nominal GNP, this model says that twenty-five percent of nominal growth is a function of the growth rate of the money supply.

Now that we have our model, we can begin to make our predictions for the time period of the experiment. With these predictions we can make comparisons between true monetarism and the policy in which the Federal Reserve actually was engaged.

**Results From the Simulation**

Now that we have determined our model to be adequate and statistically sound, we can begin to make some predictions with it. The first predictions we estimate are those from the period of the fourth quarter of 1979 through the third quarter of 1982. This period is, of course, the period of the Federal Reserve "Monetarist Experiment." Because our simulation is a "what if?" model, we must substitute the observed growth rates of the money supply with manufactured growth rates which are more consistent with monetarist ideas. To perform this simulation, we use numbers from a normally distributed random variable with a mean of 3.5 and a standard deviation of 0.0072842 (the standard deviation of the original series DM1 over the period 1962.1 through 1979.3). We use this normally distributed variable as a proxy for those elements of the growth rate of the M1 money supply which cannot be explicitly
controlled by the Federal Reserve. We chose the mean of our M1 growth rate to be 3.5 percent because Milton Friedman specified that the growth rate should be between 3.5 and 4 percent (Program 100), and this number seems to be in line with the long-term growth rate of the United States economy. Furthermore, a random error term \( e_t \) is included which is a randomly generated variable with a mean of zero and a standard deviation equal to that of the series DGNP over the sample set (.009714). This error term serves as a proxy for endogenous determinates of the growth rate of GNP which are not under the control of the Federal Reserve.

Now that we have our simulated values for the growth rate of M1 and our error term, we can substitute them into the regression equation which is written as

\[
\text{DGNP}_t = 0.0127125 + 0.2740664(DM1_{t-1}) + 0.6021313(DM1_{t-2}) + e_t
\]

to get our predicted values for the growth rate of GNP (YDOT).

Let us first make some simple comparisons between our simulated values and our observed values over the test period. The observed mean over the period is 0.0184467 with a standard deviation of 0.0156911. The simulated mean is 0.0413731 with a standard deviation of 0.0067551 (See Table 3.4). From simple visual examination, we see that the simulation experiment yielded GNP growth rates which were not only higher, on average, but were also more stable (the standard deviation was
2.32 times as small). A graphical representation of this relationship can be found in Figure 3.2.

Given these results for our simulation, we can take these predictions farther. Let us look at predictions from this model over a larger time period. Since our data sets are quarterly through 1988, we can compare predictions to observed values through this time period (for a graphical representation, see Figure 3.3). Over the time period of 1979.4 through 1988.4, we see an observed mean growth rate of .0183889 with a standard deviation of .0103227. Compare that to a simulated growth rate mean of .0412880 and standard deviation of .0072417 (See Table 3.5). We can see that, even over a longer period of time, stable money growth leads to a more stable growth of nominal income.

Now that we have our predictions, we need to make sure that these predictions have some degree of reliability associated with them. First of all, we must look at the within-sample predictions (YSTAT) of the model. A graphical comparison of these and observed values can be found in Figure 3.4. We must compare our predictive model to the naive forecast (that is, a one step ahead forecast). If our model does not predict GNP growth rates better that the naive forecast, we cannot be confident in our simulated predictions. Our test uses the Theil Inequality Coefficient (Theil's U)\(^7\). If our model does not predict as well as the naive forecast, then our U will be greater than one; if it predicts as well as
Predicted values for the growth rate of GNP (YDOT) and observed values for the GNP growth rate (DGNP) during the "Monetarist Experiment"
Quarterly predictions for the growth rate of GNP (YDOT) and quarterly observed values for GNP growth (DGNP) 1979.4 through 1988.4
Quarterly static forecasts for the growth rate of nominal GNP (YSTAT) and observed values for GNP growth (DGNP) within sample 1962.1–1979.3
the naive forecast, $U$ will equal one; and if it predicts better than the naive forecast, $U$ will be less than one. Micro-TSP calculates Theil's $U$ for us. Please see Table 3.6 for Micro-TSP output of the Theil's $U$. As we can see, Theil's $U$ for our within sample forecasts is equal to .181867 which is less than one. Therefore, we can say that our model predicts better than the naive forecast.

Because we have concluded that our model is adequate and our predictions are reliable, we must examine the implications this has in terms of evaluating monetarism and subsequent policy decisions. In Chapter Four we will discuss these implications.
Table 3.4

Descriptive Statistics for Actual GNP Growth (DGNP) and Simulated GNP Growth (YDOT)

Sample Period 1979.4 through 1982.3
Number of Observations - 12

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Max</th>
<th>Min</th>
</tr>
</thead>
<tbody>
<tr>
<td>DGNP</td>
<td>.0184467</td>
<td>.0156911</td>
<td>.0434610</td>
<td>-.0031962</td>
</tr>
<tr>
<td>YDOT</td>
<td>.0413731</td>
<td>.0067551</td>
<td>.0546058</td>
<td>.0304660</td>
</tr>
</tbody>
</table>

Table 3.5

Sample Period 1979.4 through 1988.4
Number of Observations - 37

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Max</th>
<th>Min</th>
</tr>
</thead>
<tbody>
<tr>
<td>DGNP</td>
<td>.0183889</td>
<td>.0103227</td>
<td>.0434610</td>
<td>-.0031962</td>
</tr>
<tr>
<td>YDOT</td>
<td>.0412880</td>
<td>.0072417</td>
<td>.0562357</td>
<td>.0287029</td>
</tr>
</tbody>
</table>

Table 3.6

Theil U Test on Within Sample Forecasts

Forecast Series - YSTAT

Forecast Evaluation - 71 Observations

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Root Mean Squared Error</td>
<td>.008321</td>
</tr>
<tr>
<td>Mean Absolute Error</td>
<td>.006541</td>
</tr>
<tr>
<td>Mean Absolute Percentage Error</td>
<td>45.18691</td>
</tr>
<tr>
<td>Theil Inequality Coefficient</td>
<td>.181867</td>
</tr>
<tr>
<td>Bias Proportion</td>
<td>1.88E-17</td>
</tr>
<tr>
<td>Variance Proportion</td>
<td>.328271</td>
</tr>
<tr>
<td>Covariance Proportion</td>
<td>.671729</td>
</tr>
</tbody>
</table>
Chapter Four

Policy Implications and Conclusions

Policy Implications

Given these results from our simulation experiment, what implications can this have for Federal Reserve policy? We have observed nominal GNP growth rates which are unstable over the entire period (1962.1 through 1988.4). We have also observed unstable monetary growth over the period, particularly over the period called the "Monetarist Experiment." Now, given our statistical model, we see a relationship between money supply growth and nominal GNP growth. Because we understand this relationship, we can expand our interpretation of our statistics to say that since there is a positive relationship between money supply growth and nominal GNP growth, we can also say that there is a relationship between monetary instability and GNP instability. What does this tell us about the objectives of Federal Reserve policy?

The goal of monetary stabilization policy is not to insure steady growth of nominal income. It is, instead, to target short term macroeconomic phenomena such as unemployment and nominal interest rates. There are some serious problems
with this type of policy. The obvious problem is that stabilization policy ignores the growth of the entire economy. By targeting only the unemployment rate, the Federal Reserve ignores the importance of stable GNP growth. Another problem with this type of policy is that short-term macroeconomic variables are controlled only in the nominal sense. Long-run rates of real GNP growth or unemployment cannot be controlled by the Federal Reserve. By trying to control macroeconomic variables in the short-run, the Federal Reserve is likely to forego long-term economic stability.

In terms of policy, the Federal Reserve, in order to conduct a true monetarist experiment, must abandon the attempted exploitation of the Phillips curve and seek to insure a stable rate of growth for the economy through stable money supply growth. Short-run fluctuations in monetary growth lead to fluctuations in the growth of nominal income. This leads to unstable expectations of inflation and instability in the economy.

Conclusions

The Federal Reserve announced, in 1979, that they would be implementing monetarist principles with regards to monetary policy. This experiment lasted from the fourth quarter of 1979 through the third quarter of 1982. Because this period was characterized by economic instability, opponents of
monetarism labeled the experiment as a failure of monetarism. As the results of this paper have shown, this experiment was decidedly non-monetarist in its implementation because monetary aggregates showed unstable growth and the objectives of Federal Reserve policy never changed. Therefore, monetarism is not dead, as opponents of monetarism believe, or want to believe. In fact, this Federal Reserve experiment has served only to strengthen the monetarist position.

We have discussed the principles of monetarism at length throughout this paper. We know that monetarists recommend steady growth rates for the money supply to insure steady growth of nominal income. We also know that fiscal policy is ineffective in terms of changing nominal income; in other words, money matters.

To expound upon the most important aspect of monetarism, that is steady growth of money, what does that really mean for policy? Monetarists do not say that the Federal Reserve should indiscriminately change growth rates for money just because money matters. In fact, in it's most basic sense, monetarism says to leave the economy alone and allow it to function. Simply allow the money supply to grow at a steady rate, one which is in line with the long-run growth rate of the economy. Monetarism is not a recipe for implementing discretionary monetary policy in order to affect short-run changes in macroeconomic variables. Rather, monetarism is reaffirmation of the idea that markets work without outside
interference. Similar to Rational Expectations, monetarism is a philosophy which is in favor of limiting policy, both monetary and fiscal, such that the economy is allowed to adjust for economic phenomena on its own, without interference from policy-makers who are concerned with the short-run.$^{18}$

In its most basic sense, monetarism is a reaffirmation of everything that free-market Economists believe. Because the economy is dependent on the expectations of market players, stability of those expectations is of paramount importance with respect to maintaining a stable economy. Economists maintain that these expectations are rational and that markets work efficiently and can adjust, on their own, to changes in macroeconomic conditions. If this is true, then short-run stabilization is not only unnecessary, but potentially harmful because it can alter short-run expectations and disrupt the efficiency of markets. Those who favor discretionary stabilization and "fine-tuning" of the economy must have doubts about the efficiency of markets and the rationality of market participants.

Monetarism is an important component of Capitalism. Monetarists reject short-run stabilization and interference with free markets in favor of long-run stability of the economy based on a stable rate of inflation and the rationality of market participants and their expectations.
Notes

1. Macesich lists an abridged version of the monetarist view set forth by Milton Friedman in his essay "Counter Revolution in Monetary Theory, 1991."

2. Friedman sets forth Fisher's examples and refers to him as the greatest American Economist (Monetarist Economics. 3-4).

3. Keynes admits that in inflationary periods, contraction of the money supply through stricter reserve requirements could have an impact on interest rates and nominal income (Miller and Pulsinelli 187-188).

4. The New Keynesians during the 1970's seemed to change their views concerning monetary policy. In his article "The Monetarist Controversy, or Should We Forsake Stabilization Policies?" Franco Modigliani, who is a leading non-monetarist economist concedes that the debate is no longer about whether or not monetary policy was an effective tool. The debate is now more concentrated on the issue of whether or not the economy can be stabilized and if so, "should the government be trusted with the necessary power."

5. There is a belief on the part of some economists that monetary policy is nothing more than an extension of public finance where inflated money serves as a tax. Interest collected through the sale of government securities is eventually piped back into the Treasury and used for public policy objectives.

6. Dallas Batten and Daniel Thornton discover three major criticisms of A-J that have been levied over the years and they respond to them, successfully, in "The Monetary Fiscal Policy Debate and the Anderson-Jordan Equation." Federal Reserve Bank of St. Louis Review. (October 1986)


8. The Federal Reserve cites recent financial innovations as having a blurring affect on the definition of money and have made the M1 and M2 aggregates more difficult to achieve. This is discussed in detail by Anthony Solomon in "Financial Innovation and Monetary Policy," in the 1981 Annual Report of the Federal Reserve Bank of New York.

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10. Statistical tables and figures are derived directly from Micro TSP.

11. For a discussion of the F-test on the ratio of variances, see Pfaffenberger and Patterson 560-2.


13. from "Counter Revolution in Monetary Theory" by Milton Friedman.

14. This is the formula for calculating our test statistic:

\[ F = \frac{SSR_r/SSR_u - 1}{N - K_u - 1/q} \]

Where \( SSR_r \) is the sum of squared residuals of the restricted regression, \( SSR_u \) is the sum of squared residuals in the unrestricted regression, \( N \) is the number of observations, \( K_u \) is the number of right side variables in the unrestricted regression, and \( q \) is the number of restrictions (3, in our model). This test statistic is distributed as an F with \( q \) degrees of freedom in the numerator and \( N-K_u-1 \) degrees of freedom in the denominator. Inserting values into our equation, we calculate our test statistic to be 1.6404085 (Newbold and Bos 90-1).

15. The existence of autocorrelation within a classical linear regression has important consequences for the model since a classical model assumes that autocorrelation does not exist. The problem with estimating a linear ordinary least squares model where autocorrelation exists is that the coefficient is no longer the Best Linear Unbiased Estimator (BLUE). It is still linear and unbiased but it is no longer efficient (minimum variance). This can affect our treatment of coefficients in that we may tend to call them insignificant when in fact they are significant (Gujarati 362-63). That does not appear to be a problem in this model, but we must still test for autocorrelation.

16. \( R^2 \) is a measure of "goodness of fit." It is defined as the Explained Sum of Squares divided by the Total Sum of Squares. This ratio tells us how much variation in the dependent variable (DGNP) is explained by our regression.
As most econometrics experts will agree, falling in love with $R^2$ is a dangerous proposition. A low $R^2$ value does not always mean that the regression is ineffective nor does a high one mean that the model is exceptional. It is merely a measure which can help to identify the explanatory power of the model (Newbold and Bos 61).

17. For a discussion of Theil's U test see Newbold and Bos (449-51).

18. Because of its similarity to monetarism in this respect, The Rational Expectations Hypothesis is sometimes considered a branch of monetarism, and not totally non-monetarist. Furthermore, monetarists and Rational Expectationalists see economic "fine-tuning" as the introduction of additional uncertainty into an economy where a degree of uncertainty already exists.
Works Cited


Olsen, Leif H. "Is Monetarism Dead?" *Cato Journal* 6 (Fall 1986): 461-76.


