

---

# Does Money Still Forecast Economic Activity?

*By Sean Beckett and Charles Morris*

Until recently, most economists agreed that movements in the quantity of money help to forecast changes in national output. This generally accepted usefulness of money as an economic indicator is one reason the Federal Reserve has continued to monitor the monetary aggregates despite significant changes in the economy and financial markets. Indeed, weakness in the monetary aggregates was the first reason given by the Federal Reserve for the four most recent cuts in the discount rate.

New research, however, challenges this consensus view (Friedman and Kuttner). The results of this research suggest that money lost the ability to forecast economic activity after the 1970s. If this finding is correct, money no longer provides policymakers with information about future economic activity.

This article investigates the claim that money lost the ability to predict economic activity after the 1970s. The results from this study suggest that, except during the early 1980s, money has remained a useful indicator of future economic activity. Of course, this does not mean that money is the best or only indicator of future economic activity.<sup>1</sup>

The first section of this article explains why

money should be a useful indicator of future economic activity and discusses some of the reasons the money-output relationship may have changed. The second section examines previous research on the ability of money to forecast economic activity. The third section presents new evidence showing money's undiminished ability to forecast economic activity.

## *WHY SHOULD MONEY FORECAST ECONOMIC ACTIVITY?*

Money is useful for forecasting economic activity only if there is a systematic and stable relationship between money and economic activity. Virtually all modern theories of the macroeconomy claim that money is systematically related to future economic activity. But changes in financial markets in the 1980s may have altered money supply and money demand relationships and thereby obscured money's ability to forecast economic activity.

### *Why money is related to economic activity*

Most macroeconomic theories agree that money is related to economic activity. In these theories, the relationship between money and economic activity depends on whether changes in the money stock are due to shifts in money supply or money demand. For example, increases in money

---

*Sean Beckett is a senior economist at the Federal Reserve Bank of Kansas City. Charles Morris is an assistant vice president and economist at the bank. Dan Roberts, an assistant economist at the bank, helped prepare the article.*

supply spur economic activity, while increases in money demand tend to dampen economic activity. And, these shifts in money supply and demand affect output indirectly, through their effects on interest rates.<sup>2</sup>

*Money supply.* Shifts in money supply are positively associated with output through their effect on interest rates. Money supply increases, for example, drive down interest rates to persuade investors to hold the additional money balances. The decline in interest rates, in turn, boosts interest-sensitive components of spending, such as investment. Thus, increases in money supply reduce interest rates and increase output.

For money supply shifts, the change in interest rates—and therefore the change in output—depends on the interest elasticity of money demand. Specifically, the more elastic is money demand, the smaller is the change in interest rates and, therefore, in output.<sup>3</sup> Suppose the supply of money increases. If money demand is very sensitive to changes in interest rates—money demand is very elastic—interest rates need not fall far for money demand to equal money supply. As a result, the increase in output is small. On the other hand, if money demand is inelastic, interest rates must fall a lot for money demand to equal money supply, and the increase in output is greater. Thus, the size of the interest rate effect of a shift in money supply is inversely related to the interest elasticity of money demand.

*Money demand.* Shifts in money demand are negatively associated with output through their effect on interest rates. Suppose money demand increases. To increase their money holdings, investors sell bonds, driving up interest rates. The increase in rates depresses output. Thus, increases in money demand increase interest rates and reduce output.

When the demand for money shifts, the size of the interest rate effect depends on the interest elasticity of the money supply. Specifically, the more elastic is money supply, the smaller is the

change in interest rates and output. The elasticity of supply depends primarily on the Federal Reserve's operating procedure. For example, suppose the Federal Reserve targets interest rates—that is, the Fed adjusts the money supply to hold interest rates at some target level.<sup>4</sup> This choice of operating procedure makes the money supply curve perfectly elastic. When money demand increases, interest rates do not change at all because the Fed supplies whatever quantity of money is needed to meet the increase in demand. As a result, under this operating procedure, a shift in money demand has no interest rate effect on output.

Alternatively, suppose the Fed emphasizes controlling the quantity of money—that is, the Fed attempts to hold the money stock within a narrow band and allows interest rates to vary more. This choice of operating procedure makes the money supply curve relatively inelastic. Now, when money demand increases, interest rates must rise to keep households and firms satisfied with the roughly fixed stock of money. Under this operating procedure, a shift in money demand has a substantial interest rate effect on output. These two examples illustrate that the size of the effect of a shift in money demand on output is negatively related to the interest elasticity of money supply.

### *Why the relationship between money and economic activity may have changed*

Financial markets witnessed significant developments in the 1980s—deposit rate deregulation, substitutes for deposits, and changes in Federal Reserve operating procedures.<sup>5</sup> Deposit rate deregulation and substitutes for deposits may have changed the impact of money supply shifts by changing the interest elasticity of money demand. The net effect of these developments is difficult to determine, however, because they have opposite effects on the elasticity of demand. In contrast, the interest elasticity of money supply unambiguously fell in response to the change in the Federal Reserve's operating procedure in

1979. The fall in the supply elasticity increased the impact of money demand shifts. This increased impact was temporary, however, because the change in Fed operating procedures was temporary.<sup>6</sup>

*Changes in the impact of money supply shifts.* Deposit rate deregulation strengthened the interest rate effect of money supply shifts by decreasing the elasticity of demand for some components of money, such as time deposits.<sup>7</sup> To see why, suppose the money supply decreases, causing market interest rates to rise. Before deregulation, rates on time deposits could not rise with market rates because banks could not raise deposit rates above regulatory ceilings. As a result, the spread between market rates and the return on money would widen, driving down the demand for money. Since deregulation, however, banks can increase deposit rates and retain some of their deposits. As a result, for a given increase in market interest rates, the demand for money falls less than it did before deregulation. In other words, deposit rate deregulation decreased the interest elasticity of money demand.

At the same time, the growth in substitutes for bank deposits such as stock and bond mutual funds may have increased the interest elasticity of money demand (Sellon). Again, consider the example of a rise in market interest rates. Before the increase in popularity of mutual funds (but after deposit rate deregulation), individuals might have responded by switching some of their funds from demand deposits to small time deposits, whose rates vary with market rates. Because both demand and small time deposits are part of some measures of the money stock, the increase in interest rates would have had little effect on such measures. But since mutual funds have grown in popularity, individuals might now move some funds out of deposits altogether and into stock or bond mutual funds. Such a portfolio shift would reduce the money stock. In this way, substitutes for deposits may have increased the interest elasticity of money demand.

Overall, it is difficult to determine whether the

impact of money supply shifts on output became stronger or weaker in the 1980s. The decrease in the elasticity of money demand due to deposit rate deregulation may have been canceled by the increase in elasticity due to the growth in popularity of stock and bond mutual funds.

*Changes in the impact of money demand shifts.* The changes in Federal Reserve operating procedures changed the impact of money demand shifts by drastically changing the interest elasticity of money supply. Before October 1979, the Fed conducted monetary policy by targeting short-term interest rates. Under this procedure, the money supply was highly elastic. As a result, money demand shifts had virtually no effect on output. From October 1979 through October 1982, the Fed placed greater emphasis on managing the growth of the monetary aggregates and allowed interest rates to vary more than before. This change drastically reduced the elasticity of money supply.<sup>8</sup> As a result, money demand shifts had a large effect on interest rates and, therefore, on output.

The change in operating procedures was temporary. After October 1982, the Fed returned to an operating procedure that placed greater emphasis on short-term interest rates, making money supply highly elastic again. Thus, the change in the impact of money demand shifts was only temporary.

#### *PREVIOUS RESEARCH ON WHETHER MONEY FORECASTS ECONOMIC ACTIVITY*

Money can help forecast economic activity if there is a significant statistical association between money and future economic activity. Research that examines data through the early 1980s presents mixed results, with some studies finding a consistently strong association between money and future output, and others finding little association. More recent research that includes the entire 1980s suggests that this association dropped and possibly disappeared in the 1980s.

### *Evaluating money's ability to forecast economic activity*

Money helps forecast economic activity if it is reliably associated with future output. Most previous studies of the relationship between money and economic activity rely on the so-called Granger test to determine if there is a reliable association (appendix). In the simplest, bivariate version of this test, a measure of output is regressed on past values of itself and on past values of a measure of money. If money is statistically significant in this regression, then money provides information about future output over and above that provided by past values of output. In other words, a significant Granger test indicates that money forecasts economic activity.<sup>9</sup>

A tougher, multivariate version of the Granger test adds additional variables, such as prices and interest rates, to the bivariate regression. These other variables also contain information about future output. If money is still statistically significant after additional variables are added to the regression, then money contains information about future output beyond the information contained in these additional variables.

### *Previous research*

The modern analysis of the association between money growth and future output growth begins with Sims's (1972, 1980) introduction of Granger tests into the debate. Sims (1972) found that money had a significant ability to forecast economic activity when real output was regressed on lagged values of itself and of money.<sup>10</sup> However, in a Granger test that also included short-term interest rates, money did not appear to add predictive information to that already contained in interest rates (Sims 1980).<sup>11</sup> Sims's studies shed no light on any changes in money's ability to forecast economic activity in the 1980s because the sample in his studies ends in 1978.

Following Sims, many researchers used

Granger tests to investigate whether money forecasts economic activity. These tests gave different answers depending on the variables used to measure money and output, on the frequency of observation of the data (monthly or quarterly), on the specification of the Granger test regression, and on the sample used in the regression.<sup>12</sup> Eichenbaum and Singleton, for example, found that the association between money and future output appeared to weaken when data from the early 1980s were included. Other researchers, however, found that money improves forecasts of economic activity even with data from the early 1980s. Christiano and Ljungqvist concluded that, at least in a bivariate regression, money does forecast economic activity when data through 1985 are included. Using multivariate Granger tests and data through 1985, Stock and Watson concluded that money significantly improves forecasts of economic activity even when information about past inflation and interest rates is incorporated.<sup>13</sup>

The first study to include data from all of the 1980s was done by Friedman and Kuttner. This study focused more closely on the possibility that money's ability to forecast economic activity diminished in the 1980s. Friedman and Kuttner examined three samples: 1960 through 1990, an early sample (1960-79), and a late sample (1970-90).<sup>14</sup> For each of these samples, Friedman and Kuttner performed a number of multivariate Granger tests.

Friedman and Kuttner found that money's predictive power typically declines when data from the 1980s are included (Table 1).<sup>15</sup> When money and the price level are the only explanatory variables (simple specification), money significantly improves forecasts of economic activity for the entire period and for the early sample that excludes the 1980s. This improvement is indicated in Table 1 by significance levels well below the conventional 5 percent threshold. For the late sample, which concentrates on the 1970s and 1980s, money does not make a statistically significant contribution to forecasts of real growth, as indicated by very high

Table 1

**Significance Levels of Granger Tests for M2**  
(Percent)

<u>Specification</u>	<u>1960:Q2-1990:Q4</u>	<u>1960:Q2-1979:Q3</u>	<u>1970:Q3-1990:Q4</u>
Simple	0	1	8
Extended	71	11	97

Note: The numbers in each column are marginal significance levels for the F-test of the joint hypothesis that all of the coefficients on M2 are equal to zero in a regression estimated over the indicated sample. For example, the "0" in the first row and column indicates that the M2 coefficients are statistically different from zero at less than the one-half of 1 percent level using the simple specification estimated over the entire sample. The simple specification regresses the growth rate of real gross national product (GNP) on lagged values of itself, the growth rate of the GNP deflator, and the growth rate of M2. The extended specification adds lagged values of the change in the 3-month Treasury bill rate and the spread between the 6-month commercial paper rate and the 6-month Treasury bill rate. Four lags of each variable are included in both specifications. The significance levels were calculated by the authors from figures published in Friedman and Kuttner.

significance levels. This finding suggests that the link between money and future output was weaker in the 1980s than before.<sup>16</sup>

When information is included on short-term interest rates and the quality spread (extended specification)—the spread between the rates paid by private corporations and the rates paid by the U.S. Treasury—money adds virtually nothing to forecasts of economic activity. Money's contribution is much closer to being statistically significant when the data from the 1980s are excluded. Even in this early sample, however, money does not significantly add to the information contained in the other variables.

**DOES MONEY STILL FORECAST  
ECONOMIC ACTIVITY?**

Previous studies have found that including data from the 1980s reduces money's ability to forecast economic activity. Indeed, the one study that included all of the 1980s found that money's predictive power has disappeared. It is possible, however, that the money-output relationship

appeared to break down for all of the 1980s only because the relationship temporarily changed after the Federal Reserve changed its operating procedure. The evidence presented below suggests that the relationship returned to normal after the Federal Reserve abandoned the reserves operating procedure in 1982, and that money once again provides useful information about future economic activity.

*Methodology*

As in previous studies, Granger tests are used to determine whether money is useful in forecasting economic activity. Money is useful if it provides information not already contained in past observations of output growth. Money is even more useful if it provides information about future economic activity beyond that provided by other variables. Most of the variables used in this analysis are standard—money, inflation, and interest rates. In addition, the quality spread used by Friedman and Kuttner is included because this variable appears to have strong predictive power and

because it appears to contain much of the information contained in the monetary aggregates.

Choosing measures of money, output, prices, and interest rates is difficult because many competing measures are available. In this article, money is measured by the M2 aggregate.<sup>17</sup> Economic activity is measured by the growth rate of real gross domestic product (GDP), and inflation is measured by the growth rate of the implicit GDP deflator.<sup>18</sup> As in most previous studies, the interest rate is measured by the change in the 3-month Treasury bill rate.<sup>19</sup> Finally, the quality spread is measured by the difference between the 6-month commercial paper rate and the 6-month Treasury bill rate, the same measure used by Friedman and Kuttner.<sup>20</sup> The data are quarterly observations from the third quarter of 1960 through the second quarter of 1992.

The final decision before conducting the Granger tests is how many lags of the variables to include in the regression. Friedman and Kuttner use four lags in their study. In our specification, though, the fifth lag of the variables, if included, is statistically significant. In addition, several other statistical criteria point to five as the optimal number of lags. As a result, five lags are used in the regressions reported here.<sup>21</sup>

### *Empirical results*

The empirical results presented here answer three questions about the relationship between money and economic activity. First, is money still useful for forecasting output? Second, if money is still useful, has the nature of the relationship between money and output changed? Finally, how would ignoring money affect the forecast of output growth?

At first glance, M2 appears to have lost its former ability to predict output (Table 2). M2 is highly significant in forecasting output for the entire period: the Granger test is significant at the 2 percent level. When the sample is broken into an early period and a late period, however, M2 is able to predict output only in the early period. The

Granger test is significant at the 4 percent level for the period from the third quarter of 1960 through the third quarter of 1979. From 1970 on, the significance level of the Granger test is 24 percent, nowhere near the conventional 5 percent threshold.<sup>22</sup> This evidence is consistent with that found by Friedman and Kuttner.

This evidence is open to two very different interpretations, however, because Granger tests can be insignificant for two different reasons. These Granger tests compare the strength of the money-output relationship to the uncertainty about this relationship. The strength of the relationship is measured by the estimates of the regression coefficients on M2 growth. The uncertainty about this relationship is measured by the standard errors of the coefficients, which depend on how well the Granger test regression fits the data. Thus, the test may be insignificant if the money-output relationship is weak, that is, if the regression coefficients on M2 are small. Alternatively, even when the money-output relationship is very strong, the Granger test may be insignificant if there is a great deal of uncertainty about the money-output relationship, that is, if the regression does not fit the data very well.<sup>23</sup>

Friedman and Kuttner adopt the first interpretation of this evidence. They conclude that the insignificant Granger tests in the late sample indicate a weak money-output relationship in that period. It is possible, though, that these tests indicate greater uncertainty about the money-output relationship in the late sample.

One reason the uncertainty about the money-output relationship may have increased in the late sample is that the money-output relationship changed temporarily during the early 1980s. The Granger test regressions measure the combined effects of money supply shifts and money demand shifts. The effects of money demand shifts—and, thus, the combined effects of supply and demand shifts—changed when the Federal Reserve changed its operating procedures. As a consequence, a single regression estimated across these

Table 2  
**Significance Levels of Granger Tests for M2**  
 (Percent)

<u>1960:Q3 - 1992:Q2</u>	<u>1960:Q3 - 1979:Q3</u>	<u>1970:Q1 - 1992:Q2</u>	<u>1970:Q1-1992:Q2 excluding 1979:Q4-1982:Q4</u>
2	4	24	2

Note: The numbers in each column are marginal significance levels for the F-test of the joint hypothesis that all of the coefficients on M2 are equal to zero in a regression estimated over the indicated sample. For example, the "2" in the first column indicates that the M2 coefficients are statistically different from zero at the 2 percent level when the regression is estimated over the entire sample. For each sample, the growth rate of real gross domestic product (GDP) is regressed on five lags of itself, the growth rate of M2, the change in the 3-month Treasury bill rate, the difference between the 6-month commercial paper rate and the 6-month Treasury bill rate, and the growth rate of the implicit GDP deflator.

different periods fits the combined data poorly. This poor fit increases the uncertainty about the money-output relationship and, therefore, reduces the significance of the Granger test.<sup>24</sup> Thus, M2 may appear to lose its predictive power in the late sample simply because the money-output relationship changed temporarily during the early 1980s.

In fact, money regains its ability to forecast economic activity when the sample is restricted to periods when the Fed's operating procedure emphasized short-term interest rates (Table 2). This regression was estimated over the late sample excluding data from the fourth quarter of 1979 through the fourth quarter of 1982.<sup>25</sup> In this regression, the Granger test on money is significant at the 2 percent level.<sup>26</sup> In other words, M2 still forecasts economic activity.

Even though M2 continues to forecast economic activity, the nature of the relationship between money and output may have shifted in the 1980s. For example, an increase in M2 growth may signal a much smaller or larger increase in real growth now than it did before the 1980s. Such a change in the money-output relationship would

be important information for policymakers.

The Chow test provides evidence on whether the relationship between real growth and other macroeconomic variables, including money, is the same in the 1980s and 1990s as it was in the 1960s and 1970s (Chow). In particular, the Chow test can be used to see whether the coefficients in the Granger test regression change after 1982. If the coefficients are significantly different after 1982, then the relationship between real growth and the explanatory variables in the regression is different after 1982.

Four Chow tests were performed, and none detected any change in the relationship between real growth and other variables after 1982 (Table 3). In the first test, the coefficients on money growth were allowed to change after 1982, but the coefficients on the other variables were restricted to remain the same in both periods. In the second test, all of the coefficients were allowed to change after 1982. The regressions for both of these tests used data from the entire sample. The last two tests repeated the first two tests for the late sample. (The observations from the reserves operating procedure period are excluded from

Table 3

**Significance Levels of Chow Tests**  
(Percent)

<u>Sample</u>	<u>M2</u>	<u>All variables</u>
1960:Q3 - 1992:Q2	57	36
1970:Q1 - 1992:Q2	62	43

Note: The results in the first column are from a regression in which only the coefficients on M2 and the intercept are allowed to change after 1982. The results in the second column are from a regression in which all of the coefficients are allowed to change after 1982. The numbers in each column are marginal significance levels for the F-test of the joint hypothesis that the indicated coefficients changed after 1982. For example, the "57" in the first row in the column labeled "M2" indicates that the coefficients on M2 and the intercept after 1982 are statistically different from the coefficients before 1983 only at the 57 percent level. The period from the fourth quarter of 1979 through the fourth quarter of 1982 is excluded from each regression. For each sample, the growth rate of real gross domestic product (GDP) is regressed on five lags of itself, the growth rate of M2, the change in the 3-month Treasury bill rate, the difference between the 6-month commercial paper rate and the 6-month Treasury bill rate, and the growth rate of the implicit GDP deflator.

both samples.) None of the tests were significant at the conventional 5 percent level.<sup>27</sup>

Since some observers have expressed concerns that M2's usefulness as a guide to future economic activity might have declined recently, it is interesting to see exactly what information M2 has added to recent forecasts of real growth. One way to do this is to reestimate the Granger test regression excluding M2, and then compare its forecasts of real output to those of the original regression that includes M2 (Chart 1). The forecasts that ignore M2 failed to foresee the most recent recession and predicted a much stronger recovery than has occurred (top panel of Chart 1). The forecasts that included information on M2 also missed the recession, but they accurately predicted the weakness of the recovery since the second quarter of 1991 (bottom panel).<sup>28</sup> Of course, this comparison does not imply that forecasts that incorporate information on money are always more accurate than forecasts that ignore money. They do show, though, that money has made a useful contribution to forecasts of real growth in recent quarters.

## CONCLUSIONS

A number of financial market developments in the 1980s had the potential to alter the relationship between money and future real growth, thereby reducing money's ability to forecast economic activity. Some recent research has found that money's ability to forecast economic activity declined when data from the 1980s are included in the analysis. However, this research overlooks the possibility that the reduction in money's predictive power was temporary.

In particular, the temporary change in the Federal Reserve's operating procedure may have had a powerful effect on the money-output relationship. This article finds that, when the period of this change is excluded from the analysis, money's ability to forecast economic activity is undiminished. Thus, the change in operating procedure may account for the previous research showing that money's ability to forecast economic activity declined in the 1980s.



Chart 1  
Effect of Excluding Money on Forecasts of Real GDP Growth

