

ECONOMIC COMMENTARY

Federal Reserve Bank of Cleveland

Does The Fed Cause Christmas?

by Charles T. Carlstrom and
Edward N. Gamber

Economists, policymakers, and even the general public frequently make the mistaken assumption that the Federal Reserve System can effect predictable changes in real output simply by manipulating the short-term money supply. While it is certainly true that a positive correlation exists between nominal money and real output (see figure 1), the jury is still out on whether this correlation indicates that changes in money *cause* changes in output.

Specifically, it is unproven whether short-run increases in money above trend cause increases in real output above its trend level. And perhaps most important, even if money *does* affect output in the short term, it is not clear how this relationship could be used by the Federal Reserve to enhance social welfare.

This *Economic Commentary* will explore two reasons why the perception that money causes output has maintained its grip. First, as a general rule, correlation is frequently taken to imply causality — often an incorrect assumption. As figure 1 demonstrates, changes in money *do* precede changes in output, inevitably causing some to conclude a causal relationship. However, simple temporal ordering does not concretely indicate causality. Even though changes in nominal money precede changes in output, that observation in and of itself is not sufficient evidence to warrant any particular conclusion about the direction of causality between

money and output. Second, a number of early macroeconomic models were constructed using the assumption that short-term deviations in money would cause changes in output, a view that coincided with the conventional wisdom of economists and policymakers. We will offer an alternative explanation for the positive correlation between money and output. It argues that although we cannot reject the notion that short-run fluctuations in money do not result in short-term fluctuations in output, we also cannot reject the opposite hypothesis that changes in real output, or the expectations of future output, cause changes in money.

After exploring the reasons for this misperception about money and output, this *Commentary* also looks at the policy consequences resulting from it. In particular, since it cannot be known with certainty whether the Federal Reserve has control over real output, the wisdom of conducting policy as if it does must be questioned. We conclude by suggesting an alternative policy based on rules.

■ Correlation Does Not Equal Causality

Does the Federal Reserve cause Christmas? A silly concept, perhaps, but consider the evidence.

As figure 2 illustrates, fourth-quarter changes in the money supply are positively correlated with fourth-quarter changes in output. Without further in-

The casual observer, noting that money and output are frequently correlated, might assume that there is a causal relationship between the two. A closer look at the evidence suggests otherwise.

formation, it is not possible to tell whether increases in money cause the corresponding increases in output, or whether increases in output cause the corresponding increase in money, or whether some third, unspecified variable causes increases in both. Knowing only the positive correlation between the two, an uninformed observer might easily conclude that the Federal Reserve System indeed causes Christmas!

The direction of causality is fairly easy to identify in this particular case. Output rises in the fourth quarter because of increased consumer spending, and the Federal Reserve boosts the money supply to accommodate the increased spending. However, this does not completely explain the causal relationship between money and output, because the two are correlated at times other than Christmas as well.

And even though figure 1 clearly indicates that changes in money *precede* changes in output, can we conclude from this that changes in money “cause” changes in output? Unfortunately, inferences about the direction of

causality between two variables cannot be based on their temporal ordering.¹

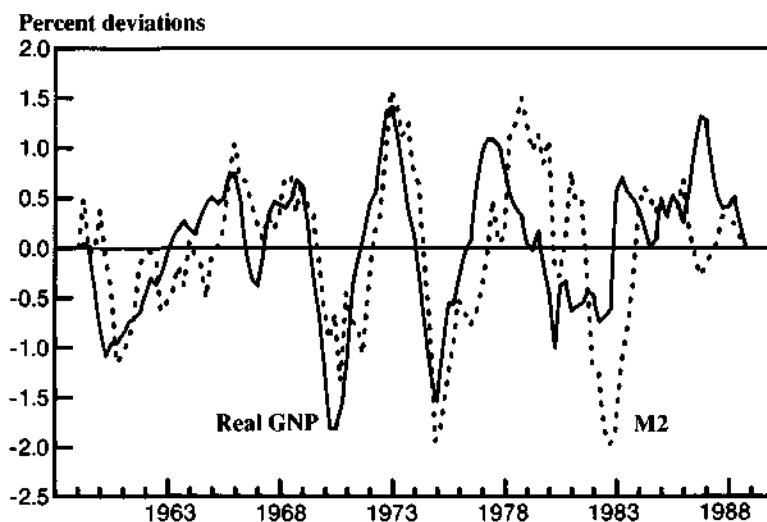
To illustrate the problems inherent in inferring causality from mere temporal ordering, consider the case of the relationship between the act of carrying an umbrella and the potential for rain. In other words, does the act of carrying an umbrella increase the probability of rain, or does the possibility of rain cause an individual to carry an umbrella? If an observer were to rely only on the temporal ordering of umbrella-carrying and rainfall, he or she could easily assume, in the absence of any other data, that the act of carrying an umbrella causes rain to occur. Obviously, people who pay attention to weather forecasts will carry an umbrella when precipitation is predicted, thus negating the earlier conclusion of a temporal relationship indicating causality.

The relationship between money and real output can be subject to the same misperception. Again referring to the umbrella/rain relationship, it is entirely possible that some additional, unknown variable or variables, such as the *expectation* that future output is going to increase, cause money to increase before real output. Thus, the Federal Reserve reacts to the known trend for increased consumer spending, and for corresponding increases in output, by providing extra cash reserves for the holiday season.

■ The Real Business Cycle Explanation

Yet another basis for the misperception about the money/output relationship, and for its persistence, is the fact that most undergraduate textbook macroeconomic models assume that the Federal Reserve controls real output. Traditional Keynesian and monetarist models assume some type of rigidity, such as sticky nominal wages, in order to generate the result that the Federal Reserve can control output by changing money supply. Other models emphasize the difference between the effects of anticipated and unanticipated changes in the money supply. If people in the economy behave rationally, then only un-

FIGURE 1 REAL GNP AND M2



NOTE: Sample period is from 1959:1Q to 1988:1VQ.

SOURCES: Data Resources, Inc., and Board of Governors of the Federal Reserve System.

anticipated changes in the supply of money can affect real output.²

While these models adequately explain certain facts, some econometric studies have found that little of the variation in real output can be accounted for by variations in nominal money. The failure of money to account for a large portion of business-cycle fluctuations has prompted economists to consider alternative explanations of both the business cycle and the correlation between real money and output. One such alternative explanation is commonly referred to as the real business cycle explanation.³

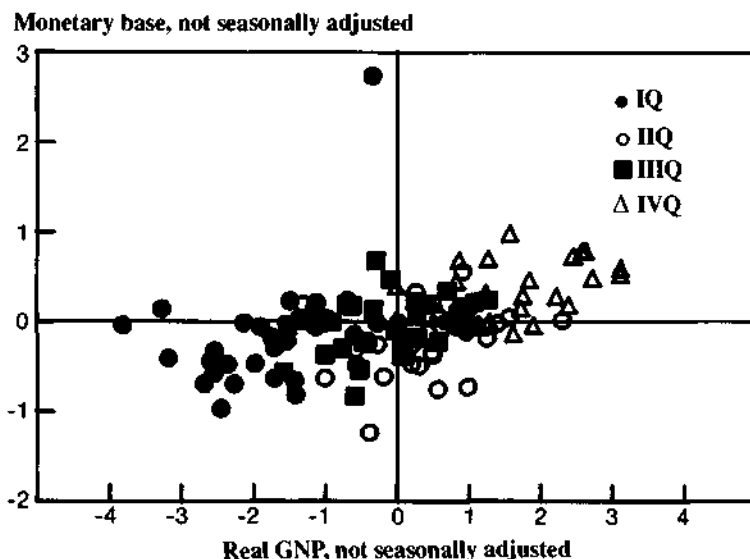
The real business cycle explanation of cyclical fluctuations differs from previous models in that it assumes economic fluctuations to be generated by changes such as technological innovations or other economic "shocks"—positive or negative—and not by money. These innovations or shocks may be productivity-enhancing, such as the invention and subsequent proliferation of personal computers, or productivity-diminishing, as in the case of an increase in the price of raw materials (oil, for example).

Unlike previous models of the business cycle, the success of real business cycle models rests on their ability to generate artificial data to match observed comovements among output, investment, consumption, and employment.

If these models explain cyclical fluctuations without relying on money, then how do they explain the correlation between real output and money? Recall that correlation and causality are two different concepts. Although these models assign no causal role to money, they do yield predictions for the correlation between money and output. In particular, real business cycle theory predicts that the positive correlation between money and output is due to reverse causality. In other words, nominal money and real output are positively correlated because changes in real output cause changes in nominal money.⁴

Suppose, for example, that scientists discover a material that is superconductive at room temperature. Such a discovery would be considered a positive technological shock that would, in the long run, lead to higher potential real output in the economy. The immediate effect, however, would be an increase in the demand for

FIGURE 2 REAL GNP AND MONETARY BASE



NOTE: Sample period is from 1959:1Q to 1988:4Q.

SOURCES: Data Resources, Inc., and Board of Governors of the Federal Reserve System.

money as firms attempted to finance new investment projects and as consumers, anticipating a permanent increase in income, spent more money.

As the demand for money increases, the banking sector supplies a larger quantity of money in the form of checking and savings accounts. We should therefore observe a positive correlation between real output and broader measures of money such as M1 and M2, with changes in money preceding the changes in output. The Federal Reserve would be inclined to accommodate the increased demand for money as well. If this was the case, then we would also observe a positive correlation between the monetary base and real output.

The correlations between real output and different measures of money are qualitatively consistent with real business cycle theory. These correlations indicate that the bulk of the relationship between money and real output can be found within the components of money determined by the banking sector. They also indicate that monetary changes occur prior to changes in real output.

In particular, the correlation between the monetary base and real output is small relative to the correlation between real output and M1 or M2. The contemporaneous correlation between real output and M1 is 0.59, and the correlation between real output and M2 (lagged two quarters) is .68.⁵

Few economists disagree with the hypothesis that at least some of the correlation between real output and money is due to reverse causality. The point of disagreement centers on whether this is the *only* link between short-term money fluctuations and output. While these correlations do not imply reverse causality, they are at least consistent with it. The data do not reject the possibility that changes in real output can either partially or totally explain movements in nominal money.

■ Policy Implications

The popular media continuously report that the Federal Reserve is either tightening or loosening the money supply in order to inhibit or stimulate the growth rate of real output. The general public and policymakers alike act as if short-run money can, and therefore should, be used to control output. As we have shown, there is no conclusive evidence

to suggest that the Federal Reserve has any real ability to control real output simply by manipulating the money supply.

Given our ignorance about the money-output relationship, how should the Federal Reserve conduct policy? At first glance, it would seem that the effects of current policy would be benign if short-term fluctuations in money do not cause output. However, we argue that acting as if monetary policy affects output is at worst benign and may actually be harmful. And most would agree that policy should, first and foremost, do no harm, to borrow the physician's maxim.

Even if money does affect real output through "Keynesian channels" such as nominal wage contracts, it is unclear whether using monetary policy to stabilize output would actually increase output.⁶ Similarly, a neoclassical model by Lucas (1977) predicts that output changes induced by monetary policy are actually welfare-reducing. Policies that lead to increased variability of money also lead to price instability, and are thus ultimately detrimental to social welfare.⁷

There is also some evidence indicating that countries with the highest growth rates of money actually have lower growth rates of real output.⁸ The theoretical explanation for this is that higher inflation, typically associated with higher money growth, is in reality a tax on real money balances. Like any other tax, this particular one lowers output below its potential level. Higher growth rates of money are also usually accompanied by higher variability of money growth, adding an additional element of distortion to the economic picture. The uncertainty generated by changes in this tax lowers output even further.

Although a pure real business cycle model predicts that money is completely neutral, it is quite possible that the true explanation of why output has recurrent fluctuations will require both Keynesian and real business cycle

elements.⁹ Some movements in real output — deviations from trend — may be optimal, as described by real business cycle theorists, and some may be due to market failures, as described by Keynesians. At the present time, however, it is impossible to distinguish between these two types of cyclical fluctuations.

Even if money *can* be used to control output, how would the choice be made between which shocks to offset and which to leave alone? Even in the most optimistic scenario, where the choice to act is very clear, the gain from doing so is reputedly small. Lucas (1988) points out that the welfare gains made by smoothing business cycle fluctuations are small and are dwarfed by the potential gains from increasing long-run growth.¹⁰

Given this, and the need for the money supply to be as predictable as possible to prevent output changes that are clearly welfare-reducing, we believe that it would be better for the Federal Reserve to commit to a monetary policy rule. One such rule would be for the Federal Reserve to commit to a long-run goal such as price stability. However, if such a long-run policy is intended to reduce uncertainty, it should specify in advance a complete target path for a particular price index. Then people could see how the Federal Reserve

intended to lower the current rate of inflation and how it would respond to future deviations of the price level from the announced path.

■ Footnotes

1. For example, see James Tobin, "Money and Income: Post Hoc Ergo Propter Hoc?" *Quarterly Journal of Economics*, May 1970, 84, 301-17.
2. See Lucas (1972) for a formal model of this theory, and Lucas (1977) for a more heuristic discussion of the model. Robert E. Lucas, Jr., "Expectations and the Neutrality of Money," *Journal of Economic Theory*, April 1972, 4, 103-24; and Robert E. Lucas, Jr., "Understanding Business Cycles," in *Stabilization of the Domestic and International Economy*, edited by Karl Brunner and Allan H. Meltzer, Carnegie-Rochester Conference Series on Public Policy, Amsterdam: North Holland Publishing Co., 1977, 5, 7-30.
3. For a review of this literature, see Prescott (1986) and Stockman (1988). Edward C. Prescott, "Theory Ahead of Business Cycle Measurement," *Quarterly Review*, Federal Reserve Bank of Minneapolis, Fall 1986, 9-22; and Alan C. Stockman, "Real Business Cycle Theory: A Guide, an Evaluation, and New Directions," *Economic Review*, Federal Reserve Bank of Cleveland, Quarter IV, 1988, 24-47.
4. See Robert C. King and Charles I. Plosser, "Money, Credit, and Prices in a Real Business Cycle," *American Economic Review*, June 1984, 74, 363-80, for a formal model of this mechanism.
5. All correlations are calculated using percent deviations from trend.

6. Hoehn (1989) shows that the optimal policy under nominal wage contracting is nominal output stabilization. See James G. Hoehn, "Procyclical Real Wages Under Nominal-Wage Contracts with Productivity Variations," *Economic Review*, Federal Reserve Bank of Cleveland, Quarter IV, 1988, 11-23.

7. See Lucas (1977), second title under footnote two.

8. See Robert C. Kormendi and Philip G. Meguire, "Macroeconomic Determinants of Growth: Cross-Country Evidence," *Journal of Monetary Economics*, September 1985, 16, 141-64.

9. This argument is due to Stockman (1988). See second title under footnote three.

10. See Robert E. Lucas, Jr., "On the Mechanics of Economic Development," *Journal of Monetary Economics*, July 1988, 22, 3-42.

Charles T. Carlstrom is an economist at the Federal Reserve Bank of Cleveland. Edward N. Gamber is an assistant professor of economics at the University of Missouri-St. Louis and was formerly a visiting scholar at the Federal Reserve Bank of Cleveland. The authors wish to thank John Carlson, Randall Eberts, William Gavin, William Osterberg, and Alan Stockman for helpful comments. In addition, we wish to thank Susan Black for valuable research assistance.

The views stated herein are those of the authors and not necessarily those of the Federal Reserve Bank of Cleveland or of the Board of Governors of the Federal Reserve System.

Federal Reserve Bank of Cleveland
Research Department
P.O. Box 6387
Cleveland, OH 44101

Address Correction Requested:
Please send corrected mailing label to
the above address.

Material may be reprinted provided that
the source is credited. Please send copies
of reprinted materials to the editor.

BULK RATE
U.S. Postage Paid
Cleveland, OH
Permit No. 385