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IS THE QUANTITY THEORY DEAD?
LESSONS FROM THE PANDEMIC

Joshua R. Hendrickson, ***University of Mississippi***

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ABSTRACT

Many policymakers and economists are surprised by the recent high and persistent inflation. This naturally raises questions about what caused it and why it was so unexpected. This paper argues that the quantity theory of money provides a useful framework for forecasting inflation. Anyone equipped with the rather crude forecasting model would have predicted the high and persistent inflation in 2021 and 2022. The failure to foresee such an occurrence was due to the lack of money in monetary policy analysis.

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The recent case of high inflation caught a number of policymakers and economists by surprise. Most commentary coming out of the pandemic suggested that any inflation would be transitory. However, inflation has been persistent, and it was met with an aggressive policy response from the Federal Reserve. This raises some important questions: What caused this significant bout of inflation? Why did policymakers get things so wrong?

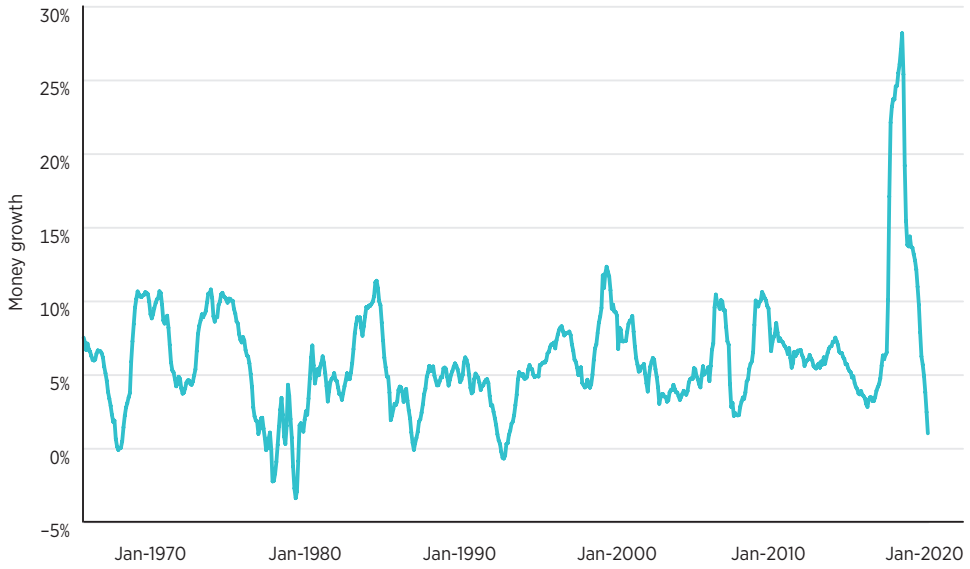
The quantity theory of money may provide the answers. According to the quantity theory, when the growth rate of the money supply exceeds the growth rate of money demand, the ultimate result is higher inflation. As evident from figure 1, the money supply grew quite dramatically during the pandemic. Thus, the quantity theory seems an obvious place to start to examine the causes of inflation. Unfortunately, the money supply has all but disappeared from monetary policy analysis.

The purpose of this paper is to demonstrate that it is a mistake to disregard money from monetary policy analysis. To do this, I construct a very simple forecasting model that consists of two variables: money growth and inflation. I then ask the following question: If you only had data on money growth and inflation over the past 12 months, would this data provide a relatively accurate forecast of inflation for the subsequent year? I am not arguing that this is the best-fitting model nor that it minimizes some forecast error. Instead, I chose this model to examine whether a relatively crude model based on the quantity theory could provide an accurate prediction of the magnitude and the persistence of the observed inflation. The answer is yes. This crude model's performance should give pause to those who have dispensed with the money supply in monetary policy analysis.

WHERE DID THE MONEY GO?

The quantity theory of money has a long history in economics. One might, therefore, expect that the quantity theory would provide a natural starting point for analyzing the recent high inflation. However, in the past couple of decades,

FIGURE 1. MONEY GROWTH



Note: The rate of money growth is measured by the percentage change from one year ago of the Divisia M2 measure of the money supply.

Source: Center for Financial Stability.

money has largely disappeared from monetary policy analysis. There are several reasons for this decline.

First, central banks tend to use interest rates as a tool or an intermediate target for monetary policy.[1] If the view is that monetary policy is mostly transmitted to economic activity through the effect on the interest rate, then measures of the money supply might not convey any additional information about monetary policy that is not captured by the interest rate. Second, beginning with Goldfeld and continuing with others like Friedman and Kuttner and Estrella and Mishkin, many have called into question the stability of money demand and, therefore, the usefulness of money both in the conduct of policy and as a variable that communicates important information.[2] Finally, the declining role of currency in an

1. The interest rate is a tool or an intermediate target depending on whether it is something that central banks directly control. For example, the Federal Reserve can use the interest rate paid on reserves as a tool. However, the federal funds rate is an intermediate target, because it is determined by the supply and demand for bank reserves.
2. Stephen M. Goldfeld, "The Case of the Missing Money," *Brookings Papers on Economic Activity* 3 (1976): 683–730; Benjamin M. Friedman and Kenneth N. Kuttner, "Money, Income, Prices, and Interest Rates," *American Economic Review* 82, no. 3 (1992): 472–92; and Arturo Estrella and Frederic S. Mishkin, "Is There a Role for Monetary Aggregates in the Conduct of Monetary Policy?," *Journal of Monetary Economics* 40 (1997): 279–304.

age of digital commerce as well as the growing ability of banks to economize on reserves created concerns that central bank balance sheets might become arbitrarily small and, therefore, an ineffective tool for monetary policy.

As a result, what has come to be known as the New Keynesian model was developed, and it has emerged as a workhorse model of monetary policy analysis.[3] This model emphasizes the short-term nominal interest rate as *the* tool of monetary policy—and thus money is absent from the model. This absence is based on the argument that the expected future path of the nominal interest rate is sufficient to understand policy. In other words, money is redundant in that it does not communicate anything that is not already communicated by the path of the nominal interest rate. Thus, and perhaps with some irony, a project that began out of concern about the ability of monetary aggregates having a meaningful role in the conduct of monetary policy in this hypothetical cashless future, ultimately resulted in a model in which money is no longer important for understanding monetary policy.

There are reasons to be skeptical of this prevailing view. For example, as a practical matter, it certainly seems as though the Federal Reserve considers the size of its balance sheet an important tool. During both the Great Recession and the COVID-19 pandemic, the Federal Reserve not only lowered its target for the federal funds rate but also engaged in quantitative easing. In fact, quantitative easing is not that different from monetary policy conducted prior to the Great Recession. During that time, the primary tool used to target the federal funds rate was open market operations, the buying and selling of bonds. The only difference between standard monetary policy of the time and quantitative easing is the magnitude of the purchases.[4]

Furthermore, even if interest rates are used to communicate changes in monetary policy, they can be misleading about the stance of policy.[5] Nominal interest rates incorporate rates of time preference, the expected growth rate of the economy, and expected inflation. An expansionary monetary policy might have a short-run liquidity effect that lowers the nominal interest rate, but a low nominal interest rate does not necessarily signify that policy is or has been expansionary. This is because expansionary monetary policy tends to increase expected inflation and thus nominal rates. The current level of nominal interest

3. Michael Woodford, "Monetary Policy in a World Without Money," *International Finance* 3, no. 2 (2000): 229–60, and *Interest and Prices* (Princeton, NJ: Princeton University Press, 2004).
4. Another critical difference is that the Federal Reserve not only engages in balance sheet policy through open market operations but also pays interest on reserves.
5. Scott Sumner, *The Money Illusion* (Chicago, IL: Chicago University Press, 2021), 165–67.

rates captures both the stance of the current policy and the long-run effects of earlier policies. High interest rates can, therefore, signify expansionary policy and low rates contractionary policy.

When judging the stance of monetary policy, it is appropriate to compare actual macroeconomic data to the central bank's goal. If the central bank's goal is 2 percent inflation, then an inflation rate above 2 percent is evidence of an overly expansionary policy, whereas inflation below 2 percent is evidence of an overly contractionary policy. Nonetheless, the central bank must rely on intermediate targets and other indicator variables to determine whether expected future outcomes are on target. So data other than the interest rate may communicate information about the ability of the central bank to meet its future goals. And, since interest rates can be misleading about the stance of policy, a natural alternative is to look at the behavior of the money supply.

The theoretical objections to including money in the model are also weak. The New Keynesian model begins with the presumption that money serves no meaningful role, because the model includes no explicit role for exchange. Subsequently, after demonstrating that the model can be solved without any reference to money, the result is tested by retrofitting money into the very model for which money was assumed to be unimportant. It should, therefore, come as no surprise that this exercise reveals money to be redundant.

These money-less models are closed by stipulating an interest rate rule for monetary policy. This method is actually isomorphic to a model specification that uses an inverse money demand equation and specifies a process for the money supply. This alternative interpretation of the model is hard to distinguish from the preferred interpretation. Yet, this is not just semantics. It has been shown that the monetary interpretation of the model can provide a better empirical fit to periods in which policy was at the zero lower bound than the preferred interpretation.[6]

Finally, and perhaps most importantly for this paper, there are the empirical results that pertain to money. Nearly all the evidence cited to raise doubts about empirical relationships between money and other economic variables uses simple sum monetary aggregates. But the theoretical underpinnings of these simple sum aggregates are flawed. The implicit assumption is that by simply adding together each component of a monetary aggregate, all the components are perfect substitutes. This is a result that does not satisfy even casual observation.

6. Joshua R. Hendrickson and Ronald Mau, "If It Were a Snake, It Would Have Bitten You: Money in the New Keynesian Model" (Working Paper, 2022).

The Divisia monetary aggregates developed by William Barnett are an alternative to simple sum aggregates.[7] Unlike simple sum aggregates, Divisia monetary aggregates weigh each component of the aggregate by the degree to which the component serves as money, and they are consistent with economic theory, aggregation theory, and index number theory. Empirical work reveals that many of the purported puzzles in monetary economics are actually the result of using simple sum measures of the money supply and that Divisia aggregates perform better than simple sum aggregates in most cases.[8] In addition, Belongia and Ireland show that including Divisia monetary aggregates improves forecasting of macroeconomic variables and that leaving out these variables causes a deterioration in the fit of the model.[9] More recently, Belongia and Ireland have estimated counterfactual policies that suggest using monetary aggregates would result in better outcomes around the zero lower bound of nominal interest rates.[10]

As discussed, there are practical, theoretical, and empirical reasons to include money in monetary policy analysis. Money cannnot be excluded without sacrificing a policy tool or losing important information. In addition, the various explanations for why money is absent from monetary policy analysis rest on a weak foundation. In the next section, I test these weaknesses by estimating a simple forecasting model that only includes two variables: money growth and inflation. The model, therefore, represents a rather crude test of the quantity theory. I chose this model deliberately. If this rather simple model can provide a useful forecast of the high and persistent inflation over the last couple of years,

7. William A. Barnett, "Economic Monetary Aggregates: An Application of Index Number and Aggregation Theory," *Journal of Econometrics* 14 (1980): 11–48.
8. William A. Barnett, "Recent Monetary Policy and the Divisia Monetary Aggregates," *American Statistician* 38 (1984): 165–72, and "Which Road Leads to Stable Money Demand?" *The Economic Journal* 107 (1997): 1171–85; Michael T. Belongia, "Measurement Matters: Recent Results from Monetary Economics Revised," *Journal of Political Economy* 104, no. 5 (1996): 1065–83; Michael T. Belongia and Jane M. Binner, *Divisia Monetary Aggregates* (New York: Palgrave, 2000); Michael T. Belongia and Peter N. Ireland, "Money and Output: Friedman and Schwartz Revisited," *Journal of Money, Credit and Banking* 48, no. 6 (2016): 1223–66; and Joshua R. Hendrickson, "Redundancy or Mismeasurement?," *Macroeconomic Dynamics* 18 (2014): 1437–65.
9. Michael T. Belongia and Peter N. Ireland, "Interest Rates and Money in the Measurement of Monetary Policy," *Journal of Business & Economic Statistics* 33, no. 2 (2015): 255–69.
10. In terms of better outcomes, Belongia and Ireland (2017) demonstrate that the Federal Reserve could have used its control of the monetary base and broader aggregates to produce a more stable nominal income around a target. In their subsequent paper, Belongia and Ireland (2018) show that targeting constant growth of a broad monetary aggregate at the zero lower bound would have produced a faster recovery following the Great Recession. Michael T. Belongia and Peter N. Ireland, "Circumventing the Zero Lower Bound with Monetary Policy Rules Based on Money," *Journal of Macroeconomics* 54 (2017): 42–58, and "Targeting Constant Money Growth at the Zero Lower Bound," *International Journal of Central Banking* 14, no. 2 (2018): 159–204.

that would be a strong indictment of the abandonment of money in monetary policy analysis.

FORECASTING INFLATION WITH THE MONEY SUPPLY

Whether the money supply is a useful predictor for the inflation rate is an empirical question. To answer this question, I estimate a two-variable vector autoregression (VAR) model of the form:

$$y_t = A_0 + A_1 y_{(t-1)} + \ldots + A_j y_{(t-j)} + e_t,$$

where $y_t = [\Delta m_t \, \Delta p_t]'$, Δm_t is the growth rate of the money supply, and Δp_t is the inflation rate; $A_0, A_1, \ldots, A_j$ are parameter matrices; and e_t is an error term.

I use the percentage change from one year ago of Divisia M2 to measure money growth and of the consumer price index (CPI) to measure inflation. The data are obtained from the Center for Financial Stability and the Federal Reserve Bank of St. Louis's FRED database. I estimate the model using monthly data and 12 lags over a sample period beginning in 1967. I estimate two samples. The first sample uses data from 1967 through 2020 to provide a forecast of inflation for the subsequent 12 months of 2021. The second sample uses data from 1967 through 2021 to provide a forecast of inflation in 2022. The purpose of this simple model is not to argue that this is the optimal or best-fitting forecasting model of inflation, but rather to determine the degree to which an accurate forecast of inflation can be gained using only data on money growth and inflation over the past year.

Figure 2 plots the results of the first sample. The solid line denotes the model's forecast with the shaded area capturing the 95 percent confidence interval. The dotted line shows actual inflation. As shown in the figure, the inflation forecast from this crude model systematically under-forecasts inflation. Nonetheless, the forecast for 2021 indicates a persistent rise in inflation throughout the year to approximately 6 percent. Furthermore, although the point estimate of the forecast is consistently below actual inflation, observed inflation is within the 95 percent confidence interval. What this demonstrates is that this crude forecasting model actually performs well in its prediction of the direction and persistence of inflation. This is especially important, given the widespread expectation that any inflation would be transitory.

Figure 3 plots the results of the second sample. The solid line denotes the model's forecast with the shaded area capturing the 95 percent confidence interval. The dotted line shows actual inflation. As shown in the figure, the forecast for 2022 indicates persistently high inflation throughout the year. The point

FIGURE 2. INFLATION FORECAST FOR 2021

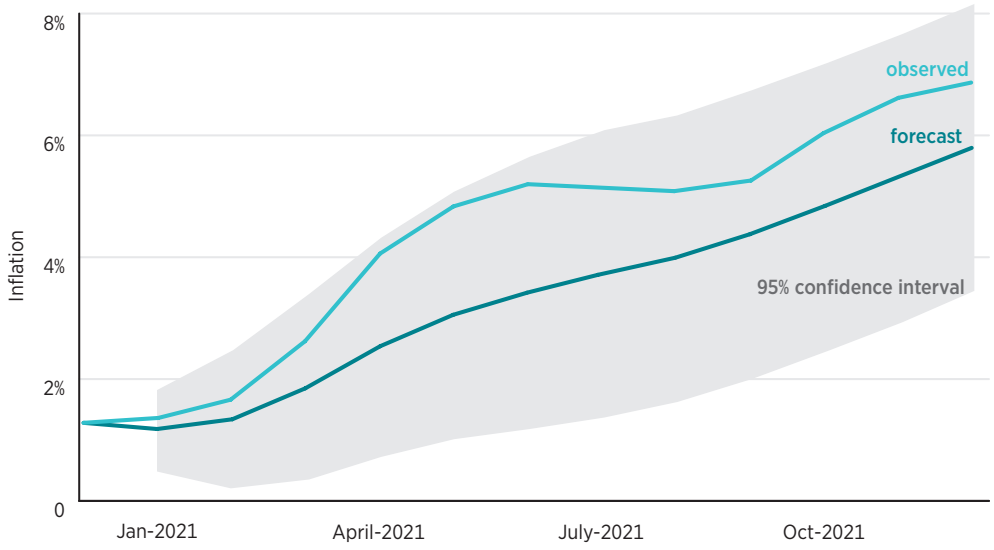
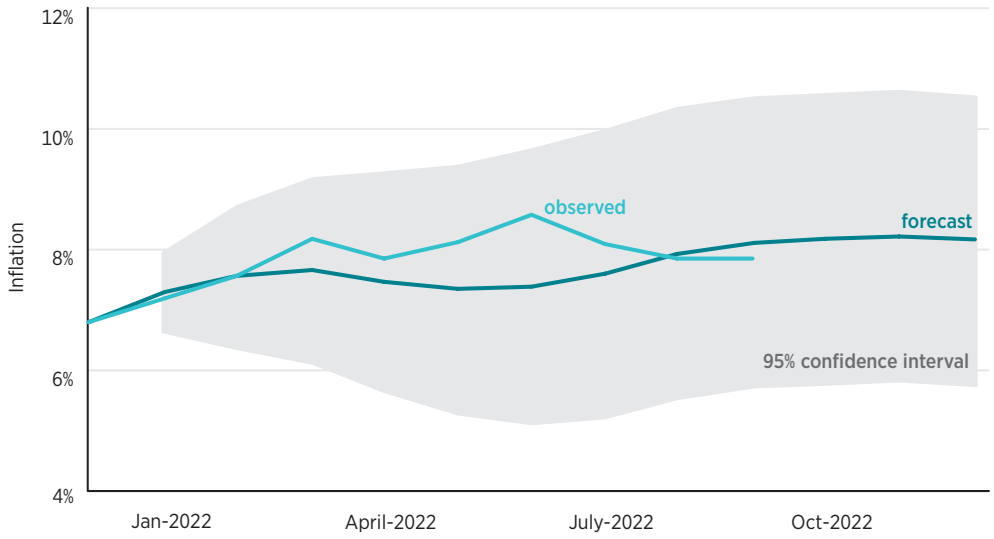


FIGURE 3. INFLATION FORECAST FOR 2022



estimate for the forecast is closer to the observed path of inflation through September 2022 than it was for the prior year's forecast. Observed inflation is again comfortably within the 95 percent confidence interval.

These results have important implications. In early 2021, most commentators, pundits, and policymakers were confident that any observed inflation would be transitory. However, the simple model used here forecasts a persistent increase in the inflation rate throughout 2021. Although the forecast systematically underpredicts inflation, it nonetheless predicts a persistent increase in the inflation rate throughout the year with no expectation of a mere transitory spike. The model also forecasts persistently high levels of inflation in 2022 that are consistent with observed inflation.

It stands to reason that policymakers would have taken a more aggressive stance with monetary policy earlier if they had a forecast similar to that produced here.

CONCLUSION

In 2021, the United States experienced a persistent rise in inflation that continued throughout the year. Thus far, the inflation rate has remained high. This is contrary to the consensus expectation of a transitory period of inflation. A natural question, then, is why inflation has been so high and persistent as well as why so many policymakers and pundits got it wrong.

A place to start would be the quantity theory of money. After all, the growth rate of the money supply, as measured by Divisia M2, rose dramatically during and after the COVID-19 pandemic. In fact, money growth was as high as 25 percent in February 2021. This is the highest growth rate of the money supply on record, higher than even the Great Inflation of the 1970s. However, over the past two decades, money has all but disappeared from monetary policy analysis. This is because of the predominant view that the effects of monetary policy are primarily transmitted through the expected future path of interest rates.

In this paper, I have shown that the absence of money from monetary policy analysis is misguided. I have also provided evidence that a rather crude forecasting model, based on the quantity theory, is capable of forecasting both the direction and the persistence of inflation over the last two years, contradicting claims that inflation would be transitory. I hope this paper will motivate interest in re-introducing money into monetary policy analysis.

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ABOUT THE AUTHOR

Joshua R. Hendrickson is an associate professor at the University of Mississippi. His work primarily centers on issues related to monetary theory, history, and policy. He has written extensively on nominal GDP targeting and the political economy of Bitcoin. His work has appeared in the *Journal of Money, Credit and Banking*, *Journal of Economic Dynamics and Control*, *Macroeconomic Dynamics*, *Journal of Economic Behavior & Organization*, *Economics & Politics*, *Economic Inquiry*, *Journal of Macroeconomics*, and *Southern Economic Journal*. He received his PhD in economics from Wayne State University and MA and BA in economics from the University of Toledo. He can be reached at jrhendr1@olemiss.edu.

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