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The Recent Surge in Money Growth: What Would Milton Friedman Say?

by Peter N. Ireland, Boston College and Shadow Open Market Committee*

The M2 money supply in the U.S. grew at annualized rates exceeding 20% throughout much of 2020.[1] Money growth eased somewhat in 2021, but it continues to run at rates well above 10% per year. In total, M2 stands almost 40% higher today than at the end of 2019. And as can be seen in Figure 1, nothing like this has been seen for quite some time, at least not since 1960 and not even during the high-inflation years of the 1970s.

These numbers, by themselves, raise the strong possibility that we have entered a new, and quite remarkable, era in United States monetary history. Does the past serve as any guide to what this new era might eventually bring? What would Milton Friedman say?

Although Friedman's contributions range broadly across many areas of economics, he is best known for his research on monetary history, conducted jointly with Anna J. Schwartz.[2] Friedman and Schwartz's *Monetary History of the United States*—particularly its chapter on the Great Depression of 1929-33—remains one of his most famous works. Published in 1963, the book provides a narrative account of monetary events that links fluctuations in the money supply to changes in output, employment, and inflation. In so doing, it identifies monetary instability as the principal driving force behind instability in the economy as a whole.

Despite Friedman's fame and influence, academic economists and central bankers today rarely talk, or appear to think, about monetary policy in terms of its effects on money growth. Their focus is instead almost entirely on interest rates. This emphasis on interest rates reflects, at least in part, a professional consensus that the statistical links between measures of the money supply and other key macroeconomic variables weakened in the late 1980s and early 1990s. In fact, Friedman was well aware that patterns in more recent data differ from those that he found earlier in his historical analyses.

Nevertheless, Friedman surely would be alarmed by the recent surge in M2 growth. And one can in fact use insights from Friedman's research to see that while the statistical relationships between money growth, real GDP growth, and inflation may have weakened somewhat in recent decades, they have not disappeared. Thus, our recent bout of rapid M2 growth should serve as a warning sign. Unless the Federal Reserve acts soon, and decisively, to shift its monetary policy strategy, higher inflation will persist.

Money, Business Cycles, and Inflation

In their *Monetary History* and related statistical work, Friedman and Schwartz find strong links between money growth and business cycles in data extending back to 1867 and running through 1960.[3] More specifically, they report a clear

*I would like to thank Don Chew for extremely helpful comments on an earlier draft of this paper and the Mercatus Center at George Mason University for financial support of some of the research described herein. Of course, all opinions expressed and errors remaining are solely my own. Please address correspondence to: Peter N. Ireland, Boston College, Department of Economics, 140 Commonwealth Avenue, Chestnut Hill, MA 02467. Email: peter.ireland@bc.edu. Web: irelandp.com.

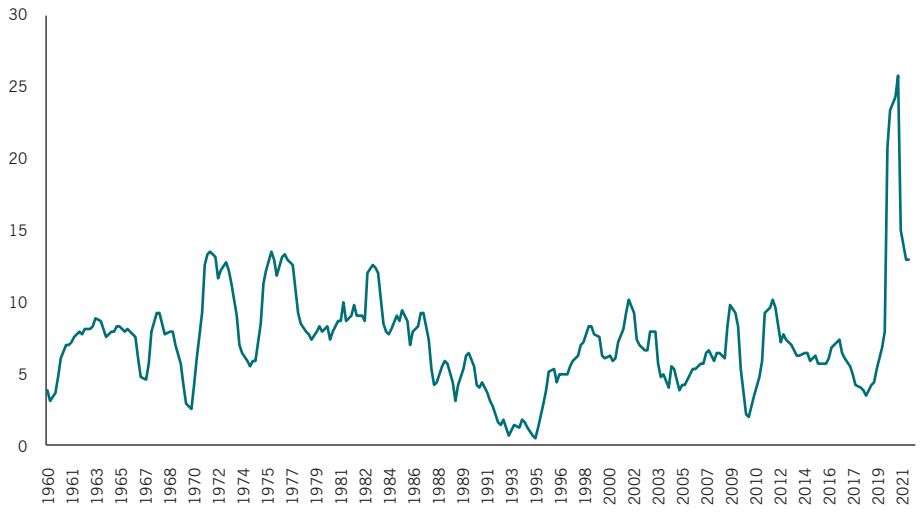
1 The Federal Reserve's M2 monetary aggregate consists of currency in circulation, checking and savings account (including money market deposit account) balances, small (under $100,000) certificates of deposit, and retail money market mutual fund shares (i.e., those held by individuals not businesses).

2 Edward Nelson and Peter Ireland—the former in great detail and the latter in brief summary—enumerate and describe Friedman's scholarly writings. See Edward Nelson, Milton Friedman and Economic Debate in the United States: 1932-1972, Volumes 1 and 2. Chicago: University of Chicago Press, 2020; and Peter N. Ireland, "Book Review of Edward Nelson: Milton Friedman and Economic Debate in the United States, 1932-1972 (Volumes 1 and 2)." *Business Economics* 56 (April 2021): 101-105.

3 See Milton Friedman and Anna J. Schwartz. "Money and Business Cycles." *Review of Economics and Statistics* 45 (February 1963a): 32-64; Milton Friedman and Anna J. Schwartz. *A Monetary History of the United States*, 1867-1960. Princeton: Princeton University Press, 1963b.

Figure 1

Year-over-Year Growth Rate of M2



tendency for money growth to peak shortly before output and employment reach their own cyclical peaks, and for money growth to hit bottom just before output and employment hit their cyclical troughs. Moreover, moderate declines in money growth lead often to mild economic recessions, while deeper monetary contractions are fairly reliable predictors of more severe economic depressions.

In documenting these general facts, Friedman and Schwartz's *Monetary History* reshaped economists' understanding of the Great Depression. Where scholars once believed that the Federal Reserve had done all it could to mitigate the effects of the Great Depression, Friedman and Schwartz showed the Fed was heavily, if not mainly, to blame for its length and depth.[4]

In Friedman and Schwartz's account, the initial economic downturn following the stock market crash of 1929 would have been severe in any case. But nothing like the Great Depression that eventually ensued would have been possible without years of relentlessly tight monetary policy, reflected in a prolonged decline in the M2 money stock. In the words of Friedman and Schwartz,

Monetary behavior during the contraction itself is even more striking. From the cyclical peak in August 1929 to the cyclical trough in March 1933, the stock of money fell by over a third. This is more than triple the largest preceding declines recorded in our series ….

The monetary collapse was not the inescapable consequence of other forces, but rather a largely independent factor which exerted a powerful influence on the course of events. The failure of the Federal Reserve to prevent the collapse reflected not the impotence of monetary policy but rather the particular policies followed by the monetary authorities ….

The contraction is in fact a tragic testimonial to the importance of monetary forces …. For it is true also … that different and feasible actions by the monetary authorities could have prevented the decline in the stock of money – indeed, could have produced almost any desired increase in the money stock …. Prevention or moderation of the decline in the stock of money, let alone the substitution of monetary expansion, would have reduced the contraction's severity and almost certainly its duration. The contraction might still have been relatively severe. But it is hardly conceivable that money income could have declined by over one-half and prices by over one-third in the course of four years if there had been no decline in the stock of money.[5]

4 Thomas Cargill discusses Friedman and Schwartz's profound influence in shaping the consensus that contractionary monetary policy prolonged and intensified the Great Depression, while identifying Clark Warburton and Irving Fisher as earlier proponents of the same view. Likewise, Friedman and Schwartz and Bordo and Schwartz acknowledge the importance of Warburton's research, from the 1940s, on monetary business cycles. Lauchlin Currie also provides data and arguments that foreshadow Friedman and Schwartz's account and interpretation of the Depression. See Thomas F. Cargill. "Clark Warburton and the Development of Monetarism Since the Great Depression." *History of Political Economy* 11 (Fall 1979): 425-449; Thomas F. Cargill, "Irving Fisher Comments on Benjamin Strong and the Federal Reserve in the 1930s." *Journal of Political Economy* 100 (December 1992): 1273-1277; Michael D. Bordo and Anna J. Schwartz. "Clark Warburton: Pioneer Monetarist." *Journal of Monetary Economics* 5 (January 1979): 43-65; and Lauchlin Currie, "The Failure of Monetary Policy to Prevent the Depression of 1929-32." *Journal of Political Economy* 42 (April 1934): 145-177.

5 Friedman and Schwartz (1963b, pp.299-301). See also Michael D. Bordo, Ehsan U. Choudhri, and Anna J. Schwartz. "Was Expansionary Monetary Policy Feasible during the Great Contraction? An Examination of the Gold Standard Constraint." *Explorations in Economic History* 39 (January 2002): 1-28; and Chang-Tai Hsieh and Christina D. Romer. "Was the Federal Reserve Constrained by the Gold Standard during the Depres-

After World War II, Friedman's attention naturally shifted away from the role of monetary contraction in driving deflation and depression and to the role of *excessive* money growth in generating a recurrent, inflationary boom-bust cycle. As discussed in Chapter 10 of the *Monetary History,* M2 growth accelerated during World War II, as the Federal Reserve concentrated on keeping interest rates low to support government borrowing.[6] During the war itself, measured inflation remained subdued, reflecting the imposition of wage and price controls together with increased household saving in response to a shortage of durable goods. After the war, however, controls were lifted, and pent-up spending power was released, leading to two years of double-digit inflation in 1946 and 1947. This historical experience takes on new relevance today, of course, as M2 growth has surged even as business shutdowns and disrupted supply chains have led to shortages of many consumer durable goods.

Friedman and Schwartz's *Monetary History* went to press before U.S. inflation rose more persistently during the 1970s. And Friedman's views on the sources of the "Great Inflation" and the chronic economic instability that accompanied it can be found in a series of essays published later. An October 1977 column in *Newsweek* magazine, for example, presages today's debates by focusing on whether inflation is "transitory or persistent."[7] There, Friedman writes,

There is one and only one basic cause of inflation: too high a rate of growth in the quantity of money—too much money chasing the available supply of goods and services. These days, that cause is produced in Washington, proximately, by the Federal Reserve System, which determines what happens to the quantity of money; ultimately, by the political and other pressures impinging on the System, of which the most important are the pressures to create money in order to pay for exploding Federal spending and in order to promote the goal of "full employment." All other alleged causes of inflation—trade union intransigence, greedy business corporations, spend-thrift consumers, bad crops, harsh winters, OPEC cartels and so on—are either consequences of inflation, or excuses by Washington, or sources of temporary blips of inflation.[8]

Then, in a lecture published by the Bank of Japan in 1983, Friedman describes in more detail how the Fed's practice of conducting monetary policy by managing interest rates contributed to both inflation and economic instability:

In practice, the Fed continued to target interest rates, specifically the Federal funds rate, rather than monetary aggregates, and continued to adjust its interest rate targets only slowly and belatedly to changing market pressure. The result was that the monetary aggregates tended on average to rise excessively, contributing to inflation. However, from time to time, the Fed was too slow in lowering, rather than in raising the Federal funds rate. The result was sharp deceleration in the monetary aggregates, and an economic recession.[9]

Finally, writing in 1984, Friedman summed up the conclusions of his lifetime's work studying the Fed as follows:

To summarize this 69-year record: two major wartime inflations; two major depressions; a banking panic far more severe than was ever experienced before the Federal Reserve System was established; a succession of booms and recessions; a post-World War II roller coaster marked by accelerating inflation and terminating in four years of unusual instability—the whole relieved by relative stability and prosperity during the two decades after the Korean War.

Granted, the Fed alone is not to blame for this dismal record. Yet it is—to put it mildly—hardly an impressive performance compared either to our nation's experience before the Federal Reserve System was established or to the record of some other nations with a different monetary structure.[10]

Both the substance and tone of these comments leave no doubt that Friedman would be quite concerned by the recent surge in money growth as a source of persistent inflation and, possibly, the cause of a future recession if the Fed waits too long to correct for it and must then adjust its policies more vigorously later on. There is, however, a significant complica-

sion? Evidence from the 1932 Open Market Purchase Program." *Journal of Economic History* 66 (March 2006): 140-176. They support and extend Friedman and Schwartz's arguments by presenting evidence that the Federal Reserve could have conducted open market operations during the early 1930s large enough to reverse the decline in M2, even given the constraints imposed by the gold standard.

6 Friedman and Schwartz (1963b), on "World War II Inflation, September 1939-August 1948." This episode is also discussed by Michael D. Bordo and Mickey D. Levy; "Do Enlarged Fiscal Deficits Cause Inflation? The Historical Record," *Economic Affairs* 41 (February 2021); pp. 65-66.

7 For analyses of today's "transitory vs persistent" debate, see John Greenwood and Steve H. Hanke. "On Money Growth and Inflation in Leading Economies, 2021-2022: Relative Prices and the Overall Price Level." *Journal of Applied Corporate Finance* 33 (Fall 2021): 39-51; and Peter N. Ireland and Mickey D. Levy, "'Substantial Progress', Transitory vs Persistent, and the Appropriate Calibration of Monetary Policy." Position Paper. New York: Shadow Open Market Committee, September 2021. Available at https://www.shadowfed.org/wp-content/uploads/2021/09/Ireland-Levy-SOMC-October2021.pdf

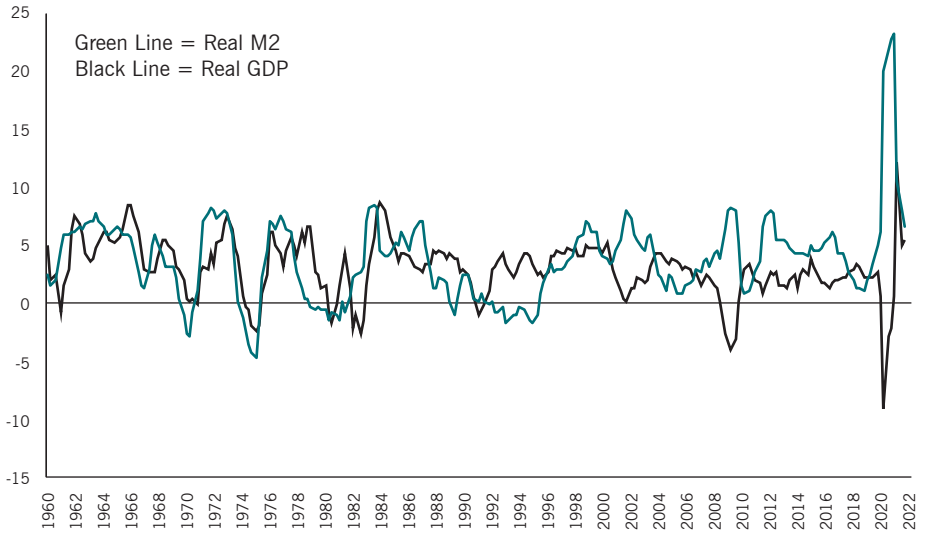
8 Milton Friedman, "Why Inflation Persists." *Newsweek* (3 October 1977): 84.

9 Milton Friedman, "Monetarism in Rhetoric and in Practice." Bank of Japan *Monetary and Economic Studies* 1 (October 1983): 1-14.

10 Milton Friedman, "Monetary Policy for the 1980s." In John H. Moore, Ed. *To Promote Prosperity: U.S. Domestic Policy in the Mid-1980s*. Stanford: Hoover Institution Press, 1984, pp. 23-60.

Figure 2

Year-over-Year Growth Rates of Real M2 and Real GDP



tion that Friedman would have to address in making his case for the importance of money growth today.

"I'm Baffled"

Sometime in the mid-to-late 1980s, the strong correlations between money growth, output, employment, and inflation that Friedman and Schwartz first uncovered started to weaken. By the early 1990s, many economists had concluded that short-term interest rates, such as the federal funds rate, serve more reliably to indicate the stance of monetary policy and hence bear a closer relationship to key macroeconomic variables.

Two articles published in 1992 in the *American Economic Review*–one by Ben Bernanke and Alan Blinder and the other by Benjamin Friedman and Kenneth Kuttner—proved highly influential in shaping this new consensus among academic economists.[11] Meanwhile, Federal Reserve officials and policy advisors, including Alan Greenspan, acknowledged that the Fed placed increasing emphasis on managing the federal funds rate, and paid correspondingly less attention to the monetary aggregates, throughout the 1980s and 1990s.[12] In September 1998,[13] the Federal Open Market Committee initiated the practice, which it continues to this day, of announcing an explicit target for the federal funds rate immediately after each meeting. And in June 2000, the FOMC stopped announcing target ranges for money growth.[14]

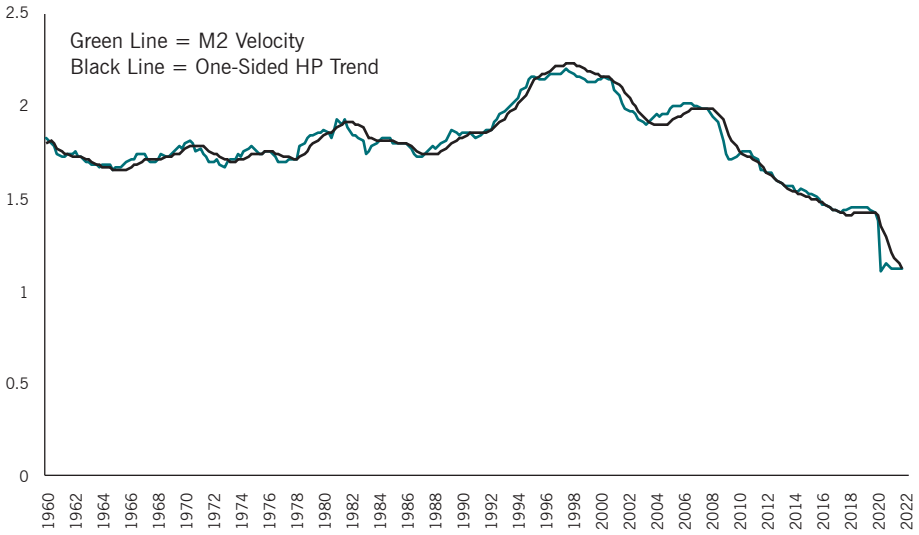
11 See Ben S. Bernanke and Alan S. Blinder. "The Federal Funds Rate and the Channels of Monetary Transmission." *American Economic Review* 82 (September 1992): 901-921; Benjamin M. Friedman and Kenneth N. Kuttner. "Money, Income, Prices, and Interest Rates." *American Economic Review* 82 (June 1992): 472-492; Michael T. Belongia, "Measurement Matters: Results from Monetary Economics Reexamined," *Journal of Political Economy* 104 (October 1996): 1065-1083; Joshua R. Hendrickson, "Redundancy or Mismeasurement? A Reappraisal of Money." *Macroeconomic Dynamics* 18 (October 2014): 1437-1465; Michael T. Belongia and Peter N. Ireland, "Interest Rates and Money in the Measurement of Monetary Policy." *Journal of Business and Economic Statistics* 33 (April 2015a): 255-269; Michael T. Belongia and Peter N. Ireland, "Money and Output: Friedman and Schwartz Revisited," *Journal of Money, Credit, and Banking* 48 (September 2016): 1223-1266; and Milton Friedman and Anna J. Schwartz, *Monetary Statistics of the United States: Estimates, Sources, Methods*. New York: Columbia University Press, 1970. Belongia, Hendrickson, and Ireland have shown, however, that much of money's predictive power in statistical models like those by Bernanke and Blinder and Friedman and Kuttner is restored when the Federal Reserve's simple-sum monetary aggregates are replaced by the Divisia aggregates described by William A. Barnett in "Economic Monetary Aggregates: An Application of Index Number and Aggregation Theory." *Journal of Econometrics* 14 (September 1980): 11-48; and in *Getting It Wrong: How Faulty Monetary Statistics Undermine the Fed, the Financial System, and the Economy*, Cambridge: MIT Press, 2012, Instead of treating currency, checking, and savings accounts as perfect substitutes, these Divisia measures use microeconomic aggregation theory to weight them according to the liquidity services they provide to the consumers and firms that hold them. Earlier, in fact, Friedman and Schwartz (1970, p. 151) themselves anticipated the usefulness of this "more general approach" to monetary aggregation that "consists of regarding each asset as a joint product having different degrees of 'moneyness,' and defining the quantity of money as the weighted sum of the aggregate value of all assets, the weights for individual assets varying from zero to unity with a weight of unity assigned to that asset or assets regarded as having the largest quantity of 'moneyness' per dollar of aggregate value."

12 See Alan Greenspan, "Rules vs. Discretionary Monetary Policy." Speech at the 15th Anniversary Conference of the Center for Economic Policy Research. Stanford: Stanford University, 5 September 1997 and available at https://www.federalreserve.gov/boarddocs/speeches/1997/19970905.htm; Ann-Marie Meulendyke, U.S. *Monetary Policy and Financial Markets*. New York: Federal Reserve Bank of New York, 1998. Available at https://files.stlouisfed.org/files/htdocs/aggreg/meulendyke.pdf.; and Daniel L. Thornton, "When Did the FOMC Begin Targeting the Federal Funds Rate? What the Verbatim Transcripts Tell Us." *Journal of Money, Credit, and Banking* 38 (December 2006): 2039-2071.

13 Federal Open Market Committee. "Press Release." 29 September 1998. Available at https://www.federalreserve.gov/boarddocs/press/general/1998/19980929/.

14 Board of Governors of the Federal Reserve System. *Monetary Policy Report to the Congress*. Washington D.C., 20 July 2000. Available at https://www.federalreserve.gov/boarddocs/hh/2000/July/FullReport.pdf, p.2.

Figure 3
M2 Velocity and Trend



Eventually, even Milton Friedman had to confront these new realities. In an interview with John Taylor published in 2001, Friedman presented a graph comparing year-over-year growth rates in real M2 and real GDP from 1960 through 1999.[15] Figure 2 reproduces and extends Friedman's chart, so that it runs through 2021.[16] Both Friedman's original graph and the update here show real M2 and real GDP moving closely together from 1960 through the mid-to-late 1980s. Thereafter, the relation breaks down.

Table 1
Correlations between Year-over-Year Real M2 and Real GDP Growth

	M2 Unadjusted for Trend Velocity Shifts	M2 Adjusted for Trend Velocity Shifts
Quarterly Data		
1959:1 – 1989:4	0.56	0.56
1990:1 – 2021:4	–0.42	–0.27
1959:1 – 2021:4	0.02	0.16
1990:1 – 2019:4	–0.33	0.26
1959:1 – 2019:4	0.27	0.46
Annual Data		
1867 – 2021	0.39	0.82
1867 – 2019	0.43	0.83
1867 – 1989	0.45	0.83
1990 – 2019	–0.32	0.56

Before 1990, as reported in Table 1, the correlation between the two series was 0.56; since 1990, it has been –0.42. Combining the first three decades of positive co-movement with the last three decades of negative co-movement, the correlation for the full sample equals zero. In fairness, the most recent observations, showing the sharp contraction in real GDP associated with the economic shutdown in March 2020 and the coincident burst in M2 growth, surely reflect the Federal Reserve's response to an unprecedented crisis. But even when these observations are excluded, the correlation between real M2 and real GDP growth remains negative, at –0.33, from 1990 through the end of 2019.

So, how do we explain this change in 1990 from a significantly positive to a sharply negative correlation between monetary and economic variables? To try and answer this question, let's start by looking at the "equation of exchange," which says

$$MV=PY, \tag{1}$$

where M is the money supply, V is the velocity of money, P is the aggregate nominal price level, and Y is real GDP. When we rewrite the equation as follows;

$$m+v=p+y, \tag{2}$$

where lowercase variables denote the growth rates of the corresponding uppercase variables, it becomes clear that any changes in velocity—which means that $v \neq 0$ —are bound to

15 John B. Taylor, "An Interview with Milton Friedman." *Macroeconomic Dynamics* 5 (February 2001): 101-131, p. 103.

16 The appendix provides a detailed description of, and lists the sources for, all of the data used in this paper.

weaken the connections between money growth m, inflation p, and real GDP growth y.

Recognizing this, Friedman used his second graph plotting the velocities of M1, M2, and M3 presented to Taylor in 2001 to pinpoint the precise timing of the break. And as can be seen in Figure 3, both Friedman's graph and the update presented here show that the velocity of M2, which had remained remarkably stable throughout the 1960s, 1970s, and 1980s, became unexpectedly higher in the early 1990s. The extended graph in Figure 3 also shows that the earlier stability of M2 velocity never returned. After rising from 1992 through 1995, M2 velocity reversed course and has declined fairly steadily ever since.

These post-1990 movements in velocity should not be viewed as completely random, divorced from economic fundamentals.[17] Nevertheless, they clearly underlie the shift in money-output correlations, from positive to negative, we noted in Figure 2. And as Friedman confessed to Taylor in 2001, "I'm baffled."[18]

But as we now try to show, insights from Friedman's earlier work can help reconcile the more recent data with his preferred, "quantity-of-money-theoretic" approach to predicting and understanding the effects of monetary policy and money growth on the economy.

The Quantity Theory Revisited

Long before his interview with Taylor, Friedman provided his own "restatement" of the quantity theory of money. In a 1956 article, Friedman begins with the following summary statement: "the quantity theory is in the first instance a theory of the *demand* for money."[19] And as he later elaborates,

The quantity theorist accepts the empirical hypothesis that the demand for money is highly stable …. This hypothesis needs to be hedged on both sides. On the one side, the quantity theorist need not, and generally does not, mean that the real quantity of money demanded per unit of output, or the velocity of circulation of money, is to be regarded as numerically constant over time …. On the other side, the quantity theorist must sharply limit, and be prepared to specify explicitly, the variables that it is empirically important to include in the function. For to expand the number of variables regarded as significant is to empty the hypothesis of its empirical content; there is indeed little difference between asserting that the demand for money is highly unstable and asserting that it is a perfectly stable function of an infinitely large number of variables.[20]

And in seeking to provide a model of velocity that is consistent with both "sides" of his hypothesis, Friedman re-expresses the equation of exchange shown earlier by depicting velocity not as a constant but instead as a function of a small set of variables:

$$MV(r_b, r_e, p, w, Y, u) = PY \qquad (3)$$

in which r_b and r_e are the expected returns on bonds and equities, w is the ratio of capital to labor income, and, as before, p and Y are the rate of inflation and the level of real income.[21] In Friedman's view, the demand for money—and hence the velocity function in equation 3 above—emerges from the solution to a more general portfolio allocation problem in which households and companies divide their wealth between capital assets of various kinds, including bonds, stocks, and durable goods that may also serve as stores of value. In this model of money velocity, increases in the expected returns of bonds and equities, as well as increases in inflation (as the rate of appreciation in the value of physical goods), are all expected to increase velocity as investors substitute out of money and into those higher-yielding assets.[22] Meanwhile, in Friedman's velocity function, real income Y measures the cash flow generated from total wealth, while the ratio w of capital to labor income reflects the proportion of wealth held in relatively liquid capital assets to that represented by illiquid human capital. Increases in these variables are expected to reduce velocity, since they both capture increases in total financial wealth, some of which will be held in monetary form. Finally, the model makes use of a composite index of geographic mobility and economic uncertainty u that could also affect money

17 John Duca, for instance, solves the "case of the missing M2" that drove M2 velocity higher in the early 1990s by noting that financial innovations made stock and bond mutual fund shares much more liquid in those years. See John V. Duca, "Financial Technology Shocks and the Case of the Missing M2," *Journal of Money, Credit, and Banking* 32 (November 2000): 820-839. Meanwhile, Anderson, Bordo, and Duca attribute the decline in velocity since then to a combination of falling interest rates and flight-to-quality portfolio dynamics during and after the financial crisis of 2008-09. See Richard G. Anderson, Michael Bordo, and John V. Duca. "Money and Velocity During Financial Crises: From the Great Depression to the Great Recession." *Journal of Economic Dynamics and Control* 81 (August 2017): 32-49.

18 Friedman with Taylor (2001), p. 105.

19 Milton Friedman, "The Quantity Theory of Money – A Restatement," in *Studies in the Quantity Theory of Money. Chicago*: University of Chicago Press, 1956, pp. 3-21.

20 Ibid, p. 16.

21 Note, in particular, that r_b and r_e are the *expected* returns on bonds and stocks, which can remain stable over time even as the *realized* returns on those same assets vary considerably from period to period. Portfolio allocation decisions must, of course, be made under conditions of risk and uncertainty, with reference to expected returns but before knowing realized returns.

22 Conversely, if, especially in the aftermath of financial crises, the expected returns on competing assets, including equities, remain depressed, velocity may fall as investors shift their portfolios towards monetary assets. In this case, Friedman's velocity function shows how, in the absence of extraordinary increases in the money supply, growth in nominal GDP may remain persistently subdued.

demand.[23] In sum, equation (3) shows nominal GDP PY as being determined by the interaction between changes in the nominal supply of money M and the demand for real money represented by the function V.

In the edited volume that contains it, Friedman's 1956 essay was followed by a series of studies that provide empirical evidence to support the quantity theory.[24] To be sure, the shifts in money velocity shown in Figure 3 led to a slowdown in research on money demand in the 1990s. But studies along these lines have continued, including a number of my own fairly recent studies with Michael Belongia.[25]

Two of our studies take a slightly different approach to the empirical implementation of Friedman's 1956 velocity model. Observing that Friedman's proposed determinants of money demand were likely to change only slowly over time, we recast the equation of exchange into the following form:

$$\tilde{M}\tilde{V} = (MV^*)\left(\frac{V}{V^*}\right) = PY, \qquad (4)$$

where the first equality defines a shift-adjusted measure of the money stock $\tilde{M}$ that corrects for long-run movements in velocity captured by a new variable, V^*. Thus, in our version of the model, $\tilde{V}$ becomes the *deviation* of actual velocity V from its long-run level V^*.[26]

By so doing, we provided an empirically testable version of Friedman's equation of exchange based on the quantity theory that, as Friedman himself noted, did not require velocity to remain constant and could accommodate and capture the effects of such changes. But, as we were forced to concede, for our model to serve as a practical guide to monetary policymaking and evaluation, the long-run level of velocity V^* must be estimated in real time—that is, without the use of data that become available only *after* the policy decisions affecting current money supply have been made. Moreover, the policymakers must also hope that unpredictable changes in velocity away from the estimated long-run level remain small enough that stability in $\tilde{V}$ will ensure a tighter statistical connection between the growth in our shift-adjusting money and growth in nominal GDP.

With these goals in mind, we produced time-varying estimates of V^* using a "one-sided" statistical procedure based only on current and past—but not future—data on velocity itself.[27,28] And despite concerns that the model can handle only

23 Michael Bordo, Lars Jonung, and Peter Ireland develop and test this hypothesis of Friedman's in much greater detail: Michael D. Bordo and Lars Jonung. *The Long-Run Behavior of the Velocity of Circulation*. Cambridge: Cambridge University Press, 1987; and Peter N. Ireland, "Financial Evolution and the Long-Run Behavior of Velocity: New Evidence from U.S. Regional Data." *Federal Reserve Bank of Richmond Economic Review* 77 (November/December 1991): 16-26; Peter N. Ireland, "Money and Growth: An Alternative Approach." *American Economic Review* 84 (March 1994a): 47-65; and Peter N. Ireland, "Economic Growth, Financial Evolution, and the Long-Run Behavior of Velocity." *Journal of Economic Dynamics and Control* 18 (May-July 1994b): 815-848.

24 These essays are Phillip Cagan, "The Monetary Dynamics of Hyperinflation." In Milton Friedman, Ed. *Studies in the Quantity Theory of Money*. Chicago: University of Chicago Press, 1956, pp. 23-117; John J. Klein, "German Money and Prices, 1932-44." In Milton Friedman, Ed. *Studies in the Quantity Theory of Money*. Chicago: University of Chicago Press, 1956, pp. 121-159; Eugene M. Lerner, "Inflation in the Confederacy, 1861-65." In Milton Friedman, Ed. *Studies in the Quantity Theory of Money*. Chicago: University of Chicago Press, 1956, pp. 163-175; and Richard T. Selden, "Monetary Velocity in the United States." In Milton Friedman, Ed. *Studies in the Quantity Theory of Money*. Chicago: University of Chicago Press, 1956, pp.179-257. For a survey of the voluminous literature presenting estimates and tests of equations linking real money demand to a small number of fundamental determinants, see David E.W. Laidler, *The Demand for Money: Theories, Evidence, and Problems* 4th Ed. New York: Harper-Collins, 1993.

25 Michael T. Belongia and Peter N. Ireland. "Money and Output: Friedman and Schwartz Revisited." *Journal of Money, Credit, and Banking* 48 (September 2016): 1223-1266; Michael T. Belongia and Peter N. Ireland, "Circumventing the Zero Lower Bound with Monetary Policy Rules Based on Money." *Journal of Macroeconomics* 54 (December 2017): 42-58; and Michael T. Belongia and Peter N. Ireland. "The Demand for Divisia Money: Theory and Evidence." *Journal of Macroeconomics* 61 (September 2019): Article 103128. See also Luca Benati, Robert E. Lucas, Jr., Juan Pablo Nicolini, and Warren Weber, "International Evidence on Long-Run Money Demand." *Journal of Monetary Economics* 117 (January 2021): 43-63; and Kenneth G. Stewart, "The Simple Macroeconometrics of the Quantity Theory and the Welfare Cost of Inflation." Manuscript. Victoria, British Columbia: University of Victoria, May 2021. Available at http://web.uvic.ca/~kstewart/StewartQTM.pdf.

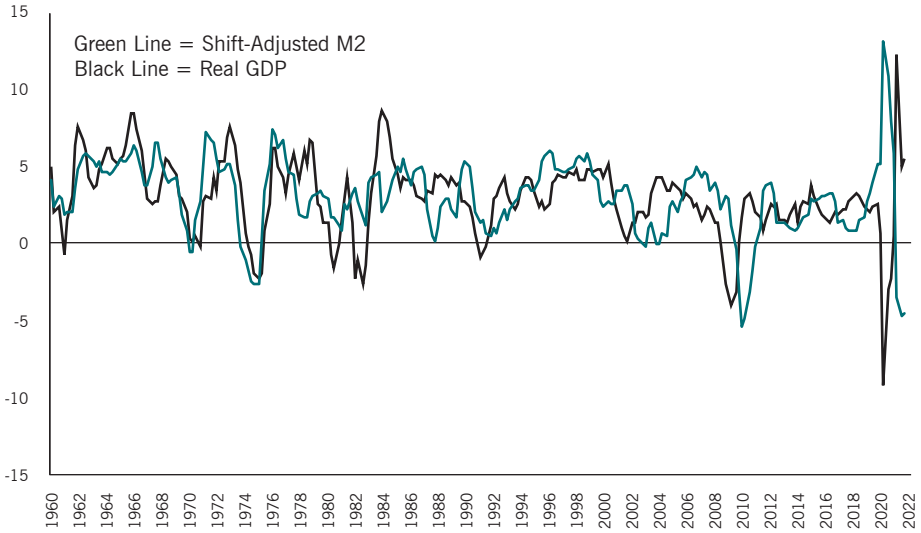
26 Belongia and Ireland's "V-star" thereby plays a role similar to the "P-star." in Jeffrey J. Hallman, Richard D. Porter, and David H. Small. "Is the Price Level Tied to the M2 Monetary Aggregate in the Long Run?" *American Economic Review* 81 (September 1991): 841-858. It is the value towards which velocity (or, in the earlier study, the aggregate nominal price level) tends to gravitate in the long run. In fact, Hallman, Porter, and Small's 1991 original P-star model assumes that M2 velocity fluctuates around a constant mean of 1.65; its predictions therefore went off track when, as shown in figure 3, M2 velocity moved higher in the early 1990s. Belongia and Ireland show that the performance of the P-star model improves when a time-varying value for is estimated, using the same methods employed here. Samuel Reynard also shows that measures of money growth have strong predictive power for inflation once slow-moving trends in velocity are accounted for. See Samuel Reynard, "Money and the Great Disinflation." Working Paper 2006-7. Zurich: Swiss National Bank, January 2006. Available at https://www.snb.ch/n/mmr/reference/working_paper_2006_07/source/working_paper_2006_07.n.pdf.

27 The procedure is described in James H. Stock and Mark W. Watson. "Forecasting Inflation." *Journal of Monetary Economics* 44 (October 1999): 293-335. They use a one sided version of the time-series filter presented in Robert J. Hodrick and Edward C. Prescott. "Postwar U.S. Business Cycles: An Empirical Investigation." *Journal of Money, Credit, and Banking* 29 (February 1997): 1-16. (1997). Conveniently, this filter has only one parameter that must be calibrated. Typically denoted by λ, this parameter governs the smoothness of the estimated trend relative to its cyclical deviations. Following Hodrick and Prescott's original study, the setting $\lambda = 1600$ is used to estimate trend velocity in the quarterly data shown in figure 3. Later, when the analysis shifts to annual data, the setting $\lambda = 6.25$ is used instead. This was suggested in Morten O. Ravn and Harald Uhlig, "On Adjusting the Hodrick-Prescott Filter for the Frequency of Observations." *Review of Economics and Statistics* 84 (May 2002): 371-380.

28 Provided policymakers are comfortable with a velocity function that moves slowly, the one-sided filter provides an attractive alternative to estimating a specific, multivariate regression for money demand and dealing with the parameter instabilities that, inevitably, seem to plague such models. Edward Nelson notes that although – or perhaps because – Friedman himself was a skilled applied statistician, he was wary of results derived from multivariate regression models. See Nelson (2020, Vol. 1, pp.124, 372) Nelson cites Friedman, "I have been extremely skeptical of relying on projections from a multiple regression, however well it performs on the body of data from which it is derived; and the more complex the regression, the more skeptical I am." See the Appendix to Milton Friedman and Anna J. Schwartz. "Alternative Approaches to Analyzing Economic Data," *American Economic Review* 81 (March 1991): 39-49.

Figure 4

Year-over-Year Growth Rates of Real Shift-Adjusted M2 and Real GDP



relatively small changes in the velocity function, the one-sided estimate of trend velocity V^* in fact, as can be seen in Figure 3, tracks quite closely the changes in actual velocity over the entire 1960-2021 sample of quarterly data. Movements in the estimated trend do tend to lag movements in velocity itself, reflecting the one-sided nature of the time-series filter. But because velocity drifts up and down very gradually, and does not display large quarter-to-quarter movements, the deviations are small. And so, as we hoped to find, our measure remains remarkably stable.

Figure 4 is a reworking of Figure 2, with growth in real "shift-adjusted" M2 replacing growth in real M2 itself. Before 1990, the picture looks much the same as it did before, reflecting the underlying stability of M2 velocity itself over that first part of the sample. After 1990, however, the graph shows a much tighter relationship between real money and output growth. As reported in Table 1, when our shift-adjusted M2 replaces M2, the correlation between real money and output growth computed with data from 1990 through 2019 flips in sign: from −0.33 in Figure 2 to 0.26 in Figure 4. And the correlation computed with all the pre-2020 data increases from 0.27 to 0.46.

Moreover, when we followed Friedman and Schwartz in extending their historical series, we find a persistent decline in M2 velocity, shown in Figure 5, from the beginning of the series in 1867 through the end of World War II.[29] And thus the period of stable M2 velocity from 1960 through 1990 is the exception, not the rule. But even so, the movements in M2 velocity remain smooth enough to be tracked, quite well and in real time, using the one-sided filter.

And as shown in Figure 6, we find a remarkably tight relationship between real shift-adjusted M2 growth and real GDP growth extending from 1867 through the present. Clearly visible in the graph is the deep monetary contraction that lies at the heart of Friedman and Schwartz's explanation of the Great Depression. And as reported in Table 1, the correlation between real shift-adjusted M2 growth and real GDP growth exceeds 0.80 over sample periods starting in 1867 and ending in 1989, 2019, or 2021. Even during the more recent episode of shrinking money velocity from 1990 through 2019, the correlation, at 0.56, remains sizable.

Viewed together, then, these findings should reassure quantity theorists who might otherwise struggle, as Friedman himself did in his 2001 interview with Taylor, to interpret the recent behavior of M2. Although it is true that the extremely tight links between money and the business cycle have loosened somewhat, they remain detectable even in the post-1990 period, provided allowance is made for slow-moving trends in velocity. And they appear larger still when we replace the quarterly data originally presented by Friedman to

29 For an analysis of their long, historical time series on M2, see Milton Friedman and Anna J. Schwartz, *Monetary Trends in the United States and the United Kingdom: Their Relation to Income, Prices, and Interest Rates, 1867-1975*. Chicago: University of Chicago Press, 1982.

Figure 5
M2 Velocity and Trend

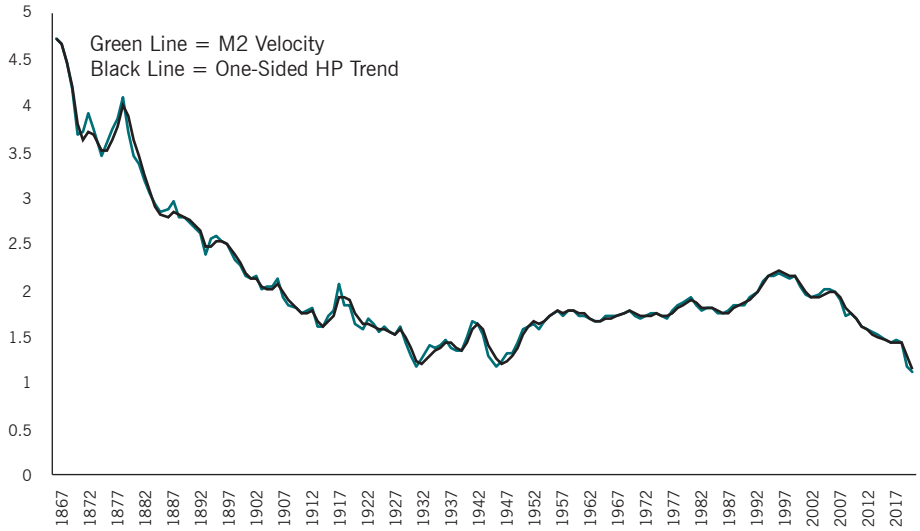
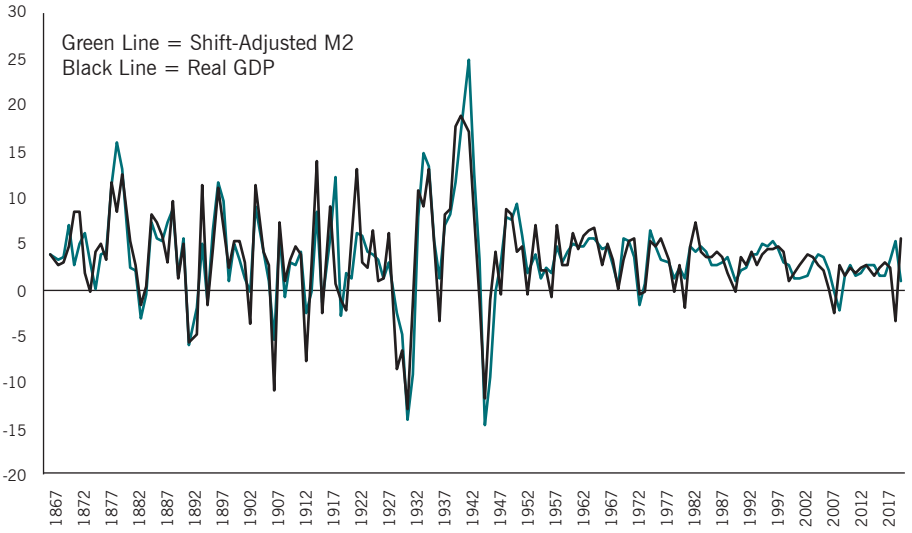


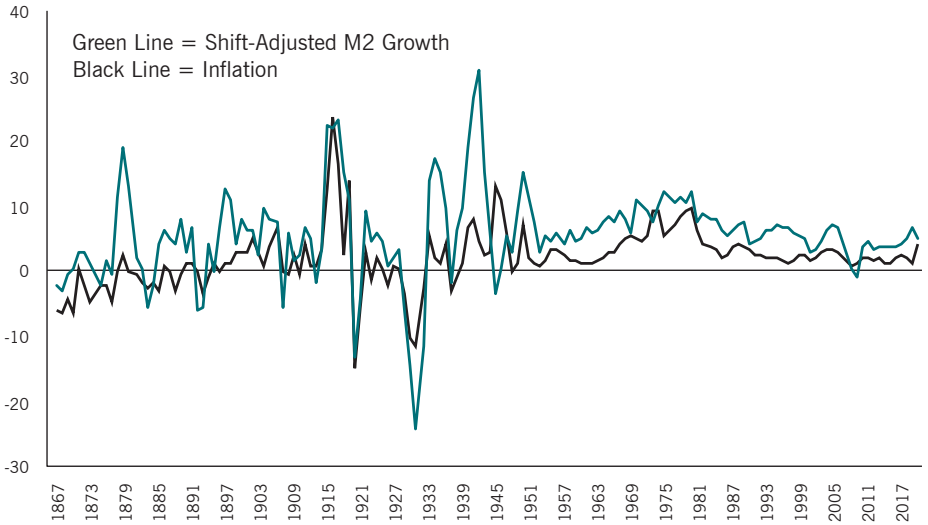
Figure 6
Annual Growth Rates of Real Shift-Adjusted M2 and Real GDP



Taylor by annual data. This makes sense if only to the extent that annual averaging smooths out quarter-to-quarter noise in measured GDP and so allows us to focus on intermediate-term trends that are more likely driven by macroeconomic fundamentals, including Federal Reserve monetary policy.

It is also interesting to use the theoretical approach embodied in our proposed model of velocity to assess the strength and stability of links between shift-adjusted nominal money growth and inflation, an important issue that Friedman did not discuss in his interview with Taylor. As can be seen in Figure 7, a comparison of these series using the long annual time series running back to 1867 and extended through the present shows clearly that the major episodes of those during World War II and the 1970s are accompanied by rapid growth in the shift-adjusted money supply. And just as clear in the figure are the episodes of disinflation or even outright deflation—those following World War I, during the Great Depression, in the early 1980s, and for a brief period

Figure 7
Shift-Adjusted M2 Growth and Inflation: Annual



during the financial crisis of 2008-09—that coincide with periods of decelerating money growth or outright monetary contraction.

Nevertheless, also visible in Figure 7 are stretches of year-to-year volatility in measured inflation that, even more than real GDP growth, exhibit no relation to intermediate and longer-run monetary trends. But a 1980 paper by Robert Lucas showed that the theoretical links between money growth and inflation are revealed much more clearly when comparing multi-year moving averages of both series. And the findings summarized in Figures 8-10, in plotting the three-, five-, and ten-year moving averages of shift-adjusted nominal M2 growth and inflation, would seem to bear Lucas out.[30]

Most strikingly, Figure 10 renders visible the various eras of monetary policy successes and failures mentioned in Friedman's 1984 summary statement cited earlier: those of rapid money growth and inflation during both world wars; of monetary contraction and with severe and persistent deflation during the Great Depression; of accelerating money growth and inflation again during the 1970s; and, more encouragingly, two periods of stable money growth and inflation following the Korean War and, again, starting in the mid-1980s.

As reported in Table 2, we also find that the measured correlations between money growth and inflation become stronger when, first, slow-moving trends in velocity are accounted for; and, especially, when the data are averaged over longer horizons. Most notably, the correlation between ten-year moving averages of shift-adjusted money growth and inflation over the period from 1867 through 1989 is 0.85. And even focusing on the most recent decades, from 1990 through 2019, the correlation between those series is 0.49.

Also visible in Figures 7-10 is the sharp acceleration in money growth in 2020. The clear message from this analysis, which is grounded in Milton Friedman's monetary economics, is that the recent bulge in M2, if not reversed, will soon fuel higher inflation.

Two Other Views

Two recent articles in this journal—one by John Greenwood and Steve Hanke, and the other by Peter Stella—present analyses and interpretations of the recent surge in U.S. money growth that complement my own offered here.[31] Both papers focus on the implications of money growth for inflation, and pose the question: does the striking increase in the U.S. money supply since 2020 necessarily portend a significant and sustained increase in prices?

30 In order to extract and compare low-frequency movements in money growth and inflation, we simply take long moving averages. Lucas uses more sophisticated time-series filters in Robert E. Lucas Jr., "Two Illustrations of the Quantity Theory of Money." *American Economic Review* 70 (December 1980): 1005-1014.

31 Greenwood and Hanke (2021); and Peter Stella, "Interpreting Modern Monetary Reality." *Journal of Applied Corporate Finance* 33 (Fall 2021): 8-23.

Figure 8
Shift-Adjusted M2 Growth and Inflation: Three-Year Averages

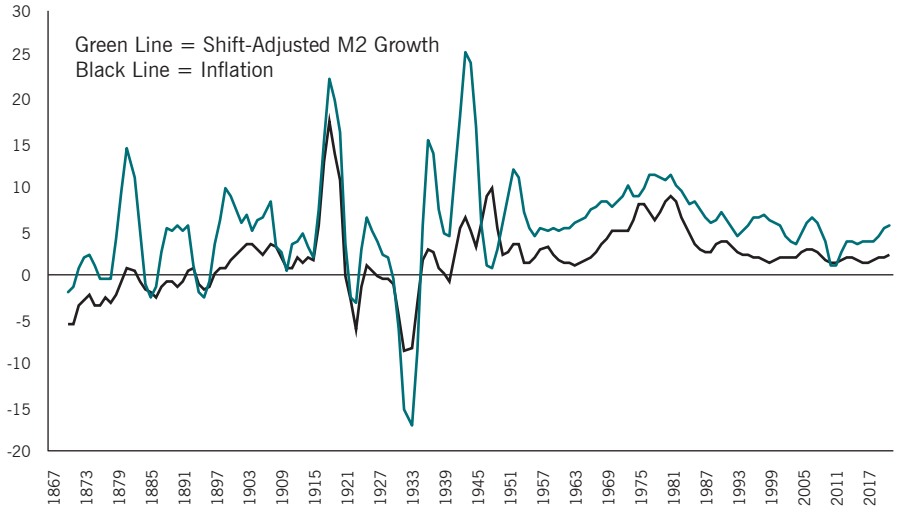
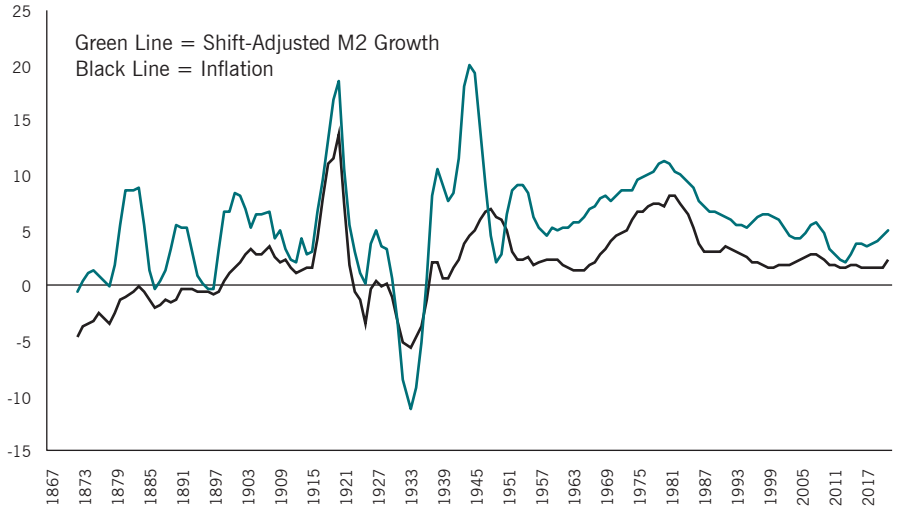


Figure 9
Shift-Adjusted M2 Growth and Inflation: Five-Year Averages



Greenwood and Hanke address this question using a classical monetarist framework very similar to Milton Friedman's and the one employed here. They begin by distinguishing between movements in relative prices, which are driven by a multitude of factors, including shifting patterns of international trade and abrupt changes in oil and other commodity prices, and movements in the aggregate nominal price level, which as Friedman emphasized in his 1977 *Newsweek* column, reflect changes in money supply relative to money demand. Greenwood and Hanke provide a memorable illustration of this distinction by showing that, over the past three decades, free-market reforms in China have generated patterns in the prices of goods relative to services that are similar across all of the world's major economies. Each economy has nonetheless experienced its own level of aggregate price inflation that has been determined, at least in part, by its own central bank's monetary policy choices. Greenwood and Hanke show likewise that, during the 1970s, disruptions to international oil supplies led to similar patterns in relative prices across

Figure 10

Shift-Adjusted M2 Growth and Inflation: Ten-Year Averages

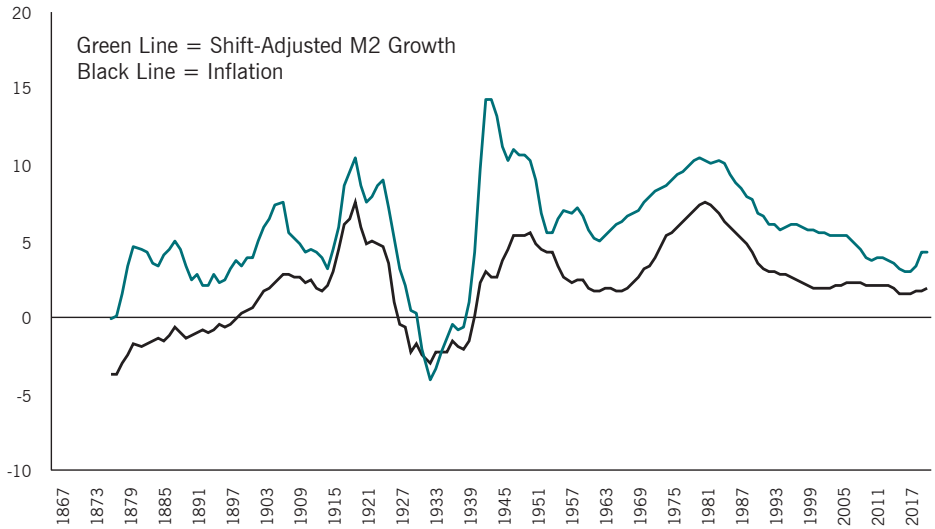


Table 2

Correlations between Average M2 Growth and Inflation

	M2 Unadjusted for Trend Velocity Shifts	M2 Adjusted for Trend Velocity Shifts
One-Year Averages		
1867 – 2021	0.52	0.69
1867 – 2019	0.53	0.69
1959 – 2019	0.36	0.75
1867 – 1989	0.54	0.69
1959 – 1989	0.22	0.71
1990 – 2019	–0.36	0.46
Three-Year Averages		
1867 – 2021	0.62	0.74
1867 – 2019	0.62	0.74
1959 – 2019	0.53	0.84
1867 – 1989	0.64	0.75
1959 – 1989	0.47	0.88
1990 – 2019	–0.39	0.47

	M2 Unadjusted for Trend Velocity Shifts	M2 Adjusted for Trend Velocity Shifts
Five-Year Averages		
1867 – 2021	0.66	0.78
1867 – 2019	0.66	0.78
1959 – 2019	0.66	0.89
1867 – 1989	0.69	0.78
1959 – 1989	0.76	0.96
1990 – 2019	–0.37	0.39
Ten-Year Averages		
1867 – 2021	0.73	0.84
1867 – 2019	0.73	0.84
1959 – 2019	0.83	0.94
1867 – 1989	0.75	0.85
1959 – 1989	0.93	0.97
1990 – 2019	–0.03	0.49

countries that nevertheless had different inflation rates that can be attributed to different monetary policy reactions.

Greenwood and Hanke then turn to consider more specifically the 36.4% increase in the U.S. M2 money supply observed over the period from February 2020 through September 2021. They note, importantly, that the effects of the two-year surge in money growth on inflation will be offset partially by growth in real GDP as well as a possible continuation of the downward trend in M2 velocity shown earlier in Figures 3 and 5. Greenwood and Hanke take averages of past data—simpler versions of the one-sided Hodrick-Prescott filter used here—to project a 2.4% annual rate of "normal"

real GDP growth and a continued downward trend in M2 velocity at the rate of 1.7% per year. By subtracting two years of trend growth in GDP and trend decline in velocity from the raw data on M2, Greenwood and Hanke arrive at their prediction that the U.S. price level will have to rise by more than 28% to restore the long-run balance between money supply and demand. Like the calculations behind my Figures 7-10, therefore, Greenwood and Hanke's point to the danger of significant U.S. price inflation if the Federal Reserve does not act to reverse the recent increase in the M2 money supply.

Finally, Greenwood and Hanke note the considerable cross-country variation in money growth rates since the beginning of 2020. According to their calculations, recent money growth is likely to fuel a 19.7% increase in prices in Israel, an 11.1% increase in prices in the U.K., and a 3.5% increase in prices in Japan.[32] In sum, Greenwood and Hanke provide a useful illustration of how, during the next few years, incoming data from countries around the world will help economists put the quantity theory to the test, in work that continues in the tradition of Friedman and Schwartz.

Peter Stella's article, on the other hand, at least appears, especially on a first reading, to take a different view of monetarism. After more careful consideration, however, our general positions seem consistent enough with one another to allow remaining differences to be addressed by future research testing the quantity theory's predictive power against its competitors'.

Stella devotes most of his article to illustrating and explaining why the quantity theory in its simplest form has difficulty accounting for the behavior of U.S. inflation since 1990. His main focus is the instability of velocity, which though relatively stable during the period 1960-1990, moved higher in the early 1990s before reversing course to trend downward around 1995. These are, of course, the same developments that left Friedman "baffled" in his interview with Taylor.

But, as I noted earlier, along with Greenwood and Hanke, one can use past data to make adjustments for slowing velocity that, as proposed as early as Friedman's 1956 "restatement" of the quantity theory (and extended in my own work with Michael Belongia) provide a clearer view of the relation of conventional money growth measures and inflation since 1990. And it's also important to keep in mind that much of Stella's analysis focuses not on the M2 measure of the money stock that is my main focus, but on the monetary base (M0), defined as currency in circulation plus bank reserves, and M1, which until recently was defined as currency plus checking account balances. Stella is correct to point out that there have been very large increases in both M0 and M1 since 2008—increases that have proven to be unrelated to movements in real GDP, inflation, or any other macroeconomic variable. But as a number of studies have shown, the enormous increases in the supply of bank reserves brought about by the Fed's emergency lending and large-scale asset purchase programs ("quantitative easing" or QE) during and after the financial crisis of 2008 go a long way—together with the Fed's introduction of interest payments on bank reserves—in explaining why the resulting expansion of the monetary base failed to generate higher inflation.[33]

In fact, the U.S. Congress initially granted the Fed authority to pay interest on reserves in October 2006; this legislation, however, delayed implementation until October 2011. Then, in December 2007, the financial crisis took hold. Initially, the Fed was able to conduct emergency lending of newly created reserves to banks, while simultaneously selling U.S. Treasury securities off its balance sheet so as to "sterilize," or offset, the effects of this lending on the total supply of reserves and hence the monetary base. But by the time Lehman Brothers and American International Group became embroiled in the crisis in September 2008, the need for additional emergency lending far exceeded the value of securities that remained on the Fed's balance sheet. And so the Fed asked Congress to allow it to begin paying interest on reserves immediately.

The Fed's goals, at the time, were to continue expanding the supply of reserves through emergency lending, and to use interest on reserves to induce a commensurate increase in banks' demand for reserves, so as not to create excessive inflation. As the Fed's October 6 press release explains,

The payment of interest on excess reserves will permit the Federal Reserve to expand its balance sheet as necessary to provide the liquidity necessary to support financial stability while implementing the monetary policy that is appropriate in light of the System's macroeconomic objectives of maximum employment and price stability.[34]

32 In a 1997 *Wall Street Journal* editorial, Friedman encouraged the Bank of Japan to engage in large-scale asset purchases to increase the rates of money growth and inflation. See Milton Friedman, "Rx for Japan: Back to the Future." *Wall Street Journal* (17 December 1997): p.22. What would Friedman say, more than two decades later, as Japan continues to experience a deflationary monetary environment? That is another question that calls out for additional research.

33 See John R. Walter and Renee Courtois. "The Effect of Interest on Reserves on Monetary Policy." Federal Reserve Bank of Richmond *Economic Brief* EB09-12 (December 2009); Peter N. Ireland, "Interest on Reserves: History and Rationale, Complications and Risks." *Cato Journal* 39 (Spring/Summer 2019a): 327-337; Peter N. Ireland, "Monetary Policy Implementation: Making Better and More Consistent Use of the Federal Reserve's Balance Sheet." *Journal of Applied Corporate Finance* 31 (Fall 2019b): 68-76 and Brian Kantor, "Recent Monetary History, A Monetarist Perspective." *ZAeconomist*, February 2022. Available at http://www.zaeconomist.com/wp-content/uploads/2022/02/Recent-monetary-policy.pdf.

34 Board of Governors of the Federal Reserve System. Press Release. 6 October

Later, as the financial crisis itself subsided, the Fed's priorities shifted away from fighting inflation and towards promoting a more vigorous economic recovery and bringing inflation back *up* to target. The Fed's payment of interest on reserves and flight-to-quality dynamics continued to prevent the growing supply of bank reserves generated through QE and other normal channels from creating more rapid growth in broader measures of the money stock like M2 and so increasing the rate of inflation.[35] Nevertheless, as my own recent study with Michael Belongia has shown, when one adjusts for the large, one-time shift in the demand for reserves associated with the introduction of interest on reserves in 2008, increases in reserves supply *do* appear to resume their historical association with increases in money, consumer spending, and inflation.[36] Detecting these effects statistically, however, requires a simultaneous equation model that distinguishes between shifts in the demands for, and supplies of, bank reserves and M2.

Meanwhile, in recent years, the M1 measure of the money supply has been beset with problems of its own. First, in 2011, the Federal Deposit Insurance Corporation modified its assessment formulas to encourage banks to bring offshore deposits back to the U.S. Around the same time, the Federal Reserve lifted its long-standing regulation prohibiting the payment of interest on "demand deposits," meaning checking deposits held by businesses rather than individual consumers. These regulatory changes generated a burst in measured money growth, unrelated to changes in economic activity, that can be seen even in the graph for M2 in Figure 1.[37] The effects on M1 were even larger, with year-over-year growth rates during 2011 approaching 20%.

Then, in April 2020, the Federal Reserve lifted restrictions limiting the number of monthly transfers depositors could make in and out of savings accounts. In effect, this removed all remaining legal distinctions between "checking" and "savings" accounts. In recognition of this change, the Fed simultaneously redefined M1 to include savings and well as checking account balances. As a result, the M1 money stock increased from about $4 to $18 trillion during 2020—a measured change of some 450% that is also, of course, unrelated to any other change in economic activity. M2, which has always included both checking and savings accounts, remained unaffected by these regulatory and definitional changes, making it a preferred measure of money, at least for studies that focus on the years since 2008.

In commenting on Stella's article, Don Chew goes even farther, suggesting the possibility that, in recent years,

… the disintermediation of banks and the rise of "shadow banking" have undermined any stability in the money multiplier or velocity of money – and thus any predictability with which increases in M0 make their way from banks into the broader economy.[38]

Chew's comment, together with the observation that recent distortions in M1 have been internalized within M2, points to another promising avenue for future research: expanding the Fed's official measures of money further to incorporate a wider range of safe and highly liquid assets beyond bank deposits. This, in fact, is a key aim of the research program initiated by William Barnett, which as noted above creates Divisia monetary aggregates that assign different weights to a large number of different assets, depending on how close or far they are to matching what in economic theory is called "money."[39] And in more recent work, Barnett motivates our interest in the Divisia monetary aggregates using logic along much the same lines as Stella's and Chew's, appealing also to the classic work of Friedman and Keynes:

Following on from the work of Friedman … there has been a dramatic increase in substitutes for money associated with "shadow banking." Long before the evolution of shadow banking assets, Keynes recognized the relevancy of broad monetary measures. Paradoxically, the response of the Federal Reserve to money market innovations has been to remove the entire negotiable money market from its monetary aggregates by discontinuing its broad aggregates, M3 and L …. In contrast, Divisia monetary aggregates can dynamically incorporate properly weighted substitutes for money as they evolve ….[40]

Indeed, the M4 Divisia aggregate described by Barnett and his colleagues includes "institutional" money market funds shares owned by businesses, large bank certificates of deposit, overnight and term repurchase agreements, commercial paper, and Treasury bills in addition to all of the components of

2008. Available at https://www.federalreserve.gov/monetarypolicy/20081006a.htm.

35 See Ireland (2019a, 2019b) and Kantor (2022).

36 Michael T. Belongia and Peter N. Ireland, "The Transmission of Monetary Policy Shocks Through the Markets for Reserves and Money," Manuscript. Chestnut Hill: Boston College, August 2021. Available at http://irelandp.com/papers/reservesmarket.pdf.

37 As noted in Ruth Judson, Bernd Schlusche, and Vivian Wong. "The Demand for M2 at the Zero Lower Bound: The Recent U.S. Experience." Finance and Economics Discussion Series Paper 2014-22. Washington: Federal Reserve Board, January 2014. Available at https://www.federalreserve.gov/pubs/feds/2014/201422/201422pap.pdf.

38 Don Chew, "A Message from the Editor." *Journal of Applied Corporate Finance* 33 (Fall 2021): 2-3.

39 Barnett (1980, 2012).

40 William A. Barnett, "Friedman and Divisia Monetary Measures." In Robert A. Cord and J. Daniel Hammond, Eds. *Milton Friedman: Contributions to Economics and Public Policy*. Oxford: Oxford University Press, 2016, pp. 277-278.

M2.[41] Intriguingly, recent studies find that Divisia M4 has strong predictive power for subsequent movements in output and inflation, even in samples that run through and past the financial crisis of 2008.[42] This work supports Stella's and Chew's conjecture about the rising importance of non-bank finance to the monetary system, but also shows that the quantity theory's implications can still be applied to broader measures of money.

In any case, Stella is also correct to point out that even using the M2 measure, the links between money growth and inflation have weakened over the past several decades. The bottom panel of Table 4 shows, for example, that while the correlation between ten-year averages of M2 growth and inflation is nearly perfect, at 0.97, when computed with data from 1959 through 1989, it falls to 0.49 when recalculated for the 1990-2019 period. Stella goes on to suggest that we consider some version of the "fiscal theory of the price level"—associated most recently with John Cochrane—and its possible role in increasing the explanatory power of the quantity theory of money, especially in predicting inflation. After tracing the origins of this fiscal theory back to work by Neil Wallace,[43] Stella notes that government debt must either be serviced through future budget surpluses or "depreciated away" through future inflation. And so when government debt increases but expected future budget surpluses do not, expected future inflation must rise instead. The origins of such inflation are identified as "fiscal" rather than "monetary" in the sense that it's the deficit spending that is supplying the pressure that leads the government to print money.

When Stella refers to the need for a "cheat code to decipher the modern macro policy drivers of inflation," he focuses specifically on what an econometrician would call "reduced form" relationships that, while inspired by theory, work on a more basic level to help forecast inflation. Stella states this aim concisely, explaining that

the FTPL [fiscal theory of the price level] suggests that what matters for future inflation is the sum of sovereign monetary and non-monetary liabilities, and not, as the QTM has long been interpreted as telling us, the quantity of monetary liabilities alone.[44]

This gives rise to an intriguing suggestion that deserves further consideration: Might a broader measure of nominal liabilities that includes U.S. government debt as well as the more traditional components of monetary aggregates like M2 do a better job of tracking, statistically, movements in inflation? The possibility would be well worth exploring in future research. When read along with Greenwood and Hanke's article, Stella's is useful in part because it sets the stage for further tests of the quantity theory and its competitors.

As Stella concludes his article, there may well prove to be less difference than initially meets the eye between his positions and Friedman's:

There is certainly evidence to support the often heard claim that Friedman's emphasis on keeping long-run money growth low was merely a simple way to prevent politicians from evading the future tax implications and negative political consequences of excess spending today by resorting to imposing the obscure "inflation tax" in the future.[45]

A recent *Wall Street Journal* editorial by Thomas Sargent and William Silber[46] takes a similar view, offering up two statements by Friedman in the 1970s to provide the evidence that Stella alludes to. First, in a 1978 *Newsweek* column, Friedman identified fiscal origins for the high inflation of that time when he wrote:

We have been having inflation not because evil men at the Fed have been willfully turning the printing press, but because John Q. Public has been demanding inflation and aborting every attempt to stop inflation. We, the public, have been asking Congress to provide us with ever more goodies – yet not to raise our taxes. Congress has obliged, enlisting inflation as a hidden tax to finance the difference ….[47]

41 William A., Barnett, Jia Liu, Ryan S. Mattson, and Jeff van den Noort. "The New CFS Divisia Monetary Aggregates: Design, Construction, and Data Sources." *Open Economies Review* 24 (February 2013): 101-124.

42 See John W. Keating, Logan J. Kelly, A. Lee Smith, and Victor J. Valcarcel; "A Model of Monetary Policy Shocks for Financial Crises and Normal Conditions." *Journal of Money, Credit, and Banking* 51 (February 2019): 227-259, and Cosmas Dery and Apostolos Serletis. "Interest Rates, Money, and Economic Activity." *Macroeconomic Dynamics* 25 (October 2021): 1842-1891.

43 See Neil Wallace, "A Modigliani-Miller Theorem for Open-Market Operations." *American Economic Review* 71 (June 1981): 267-274. Other important contributions to the framework include Thomas J. Sargent and Neil Wallace. "Some Unpleasant Monetarist Arithmetic." Federal Reserve Bank of Minneapolis *Quarterly Review* 5 (Fall 1981): 1-17; and Eric M. Leeper, "Equilibria Under 'Active' and 'Passive' Monetary and Fiscal Policies." *Journal of Monetary Economics* 27 (February 1991): 129-147. More recently, John Cochrane provides an overview in John H. Cochrane, "The Fiscal Theory of the Price Level: An Introduction and Overview." Manuscript. Stanford: Hoover Institution, December 2021. Available at https://www.johnhcochrane.com/s/Fiscal_theory_JEP.pdf; and the fiscal theory in great detail in John H. Cochrane, *The Fiscal Theory of the Price Level*. Princeton: Princeton University Press, forthcoming 2022.

44 Page 11 of Stella (2021).

45 Page 21 of Stella (2021).

46 Thomas Sargent and William Silber. "Inflation, Deficits and Paul Volcker." *Wall Street Journal* (4 March 2022): A19.

47 Milton Friedman, "Burns on the Outside." *Newsweek* (9 January 1978): pages 52-53.

Then, almost two decades later, Friedman effectively pointed to the fiscal origins of inflation when he noted more generally that "Financing government spending by increasing the quantity of money is often the most politically attractive method, to both the president and the members of Congress."[48]

But What Happens Next?

A look back at Friedman's 1970s *Newsweek* columns would make clear the remarkable similarities between today's debates over whether inflation will prove "transitory or persistent" and those that took place well over 40 years ago. Friedman's position in that debate was unequivocal. The words he used back then are the ones he would most likely use today. To repeat: "There is one and only one basic cause of inflation: too high a rate of growth in the quantity of money."

In Friedman's absence, Mickey Levy and I and a number of others have elaborated on this position by emphasizing that "what happens next" depends crucially on what the Federal Reserve *does* next.[49] As noted above, FOMC members have not systematically followed movements in M2, or any other measure of the money supply, in many years. And it is unlikely that they will change their approach to monetary policymaking by paying more attention to money any time soon. Still, one can ask how the Fed's current strategic framework, based on a combination of large-scale asset purchases and federal funds rate management, determines the behavior of the M2 money supply and thereby influences economic growth and inflation.

As the U.S. economy continues to recover from the March 2020 shutdowns, consumer and business confidence will continue to improve, risk-aversion will ease, and the demand for precautionary savings will diminish. And what Friedman[50] referred to as the "natural" rate of interest will rise.

If against this backdrop the FOMC is willing to wind down its asset purchase programs rapidly and to begin raising its target for the federal funds rate in lockstep with the rising natural rate, households and firms will have the incentive to use their stocks of liquid assets—as reflected in the now-elevated level of M2—to save and pay down debt. As they do, bank deposits will be extinguished. The bulge in real M2 from 2020 and 2021 will dissipate as the increase in nominal M2 reverses itself. Inflation will fall back to lower, more acceptable, levels.

Suppose, on the other hand, the FOMC moves too slowly to end and reverse quantitative easing. As Michael Belongia and I have shown, large-scale asset purchases, like more traditional open market operations purchases of government bonds with newly created bank reserves, generate faster growth in M2. Thus, in this alternative scenario, rapid growth in nominal M2 will not cease.

Suppose also that meanwhile, the FOMC persists in holding the federal funds rate target below the rising natural rate. This leaves households and firms ready to spend. The recent rise in *real* M2 will still reverse itself, but through a large and persistent rise in the nominal price level—that is, through inflation. And the longer the FOMC waits before raising rates, the greater becomes the risk that more dramatic policy actions—in the form of even steeper and more abrupt interest rate increases—will be needed to bring inflation back down. And in that event, the boom-bust pattern of the 1970s will reappear, with high and volatile inflation accompanied by another recession.

So what would Milton Friedman say about the recent surge in M2 growth? That it signals strongly that the Federal Reserve needs to adjust its policies sooner, rather than later, to avoid persistently higher inflation and, possibly, another recession to correct for it later.

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48 Page 207 of Milton Friedman, *Money Mischief: Episodes in Monetary History*. San Diego: Harvest Books, 1994.

49 See Robert L. Hetzel, "A Quantity Theory Framework for Thinking About Monetary Policy." *Studies in Applied Economics* 174. Johns Hopkins Institute for Applied Economics, Global Health, and the Study of Business Enterprise, March 2021. Available at https://sites.krieger.jhu.edu/iae/files/2021/03/A-Quantity-Theory-Framework-for-Thinking-about-Monetary-Policy.pdf. and Ireland and Levy (2021).

50 Milton Friedman, "The Role of Monetary Policy." *American Economic Review* 58 (March 1968): 1-17.

Appendix: Data Sources

All quarterly data, 1959:1-2021:4, come from the Federal Reserve Bank of St. Louis' FRED database. Annual data on real and nominal GDP and the GDP deflator, 1867-2020, are from the MeasuringWorth.com website; their sources are described in detail by Johnston and Williamson.[51] These series are extended through 2021 using data from FRED. Annual M2 data, 1867-1958, are from Table 4.8 of Friedman and Schwartz (1982, pp.122-129); these are spliced to annual M2 data, 1959-2021, from FRED.

At both quarterly and annual frequencies, M2 velocity is measured by dividing nominal GDP by the M2 money supply. Inflation is measured as percentage changes in the GDP deflator.

51 Johnston, Louis and Samuel H. Williamson, "Sources and Techniques Used in the Construction of Annual GDP, 1790-Present." *Measuring Worth*, 2020. Available at https://www.measuringworth.com/datasets/usgdp/sourcegdp.php.

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