THE RECENT SURGE IN MONEY GROWTH:

WHAT WOULD MILTON FRIEDMAN SAY?

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Abstract: The M2 money supply has grown by almost 40 percent since 2019. This number, by itself, raises the strong possibility that we have entered a new and remarkable era in United States monetary history. But what would Milton Friedman say? An examination of Friedman's own writings, together with an analysis of both historical and recent data on money, income, and prices, leaves no doubt that he would be quite concerned. Unless the Federal Reserve moves decisively to wind down and reverse its large-scale asset purchases and raise its target for the federal funds rate, higher inflation will persist.

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Introduction

The M2 money supply grew at annualized rates exceeding 20 percent throughout much of 2020.[1] Money growth eased somewhat in 2021, but continues to run at rates well above 10 percent per year. In total, M2 stands almost 40 percent higher today than it did at the end of 2019. Figure 1 confirms: nothing like this has been seen before, 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 (1963*b*) *Monetary History of the United States* – particularly its chapter on the Great Depression of 1929-33 – remains one of his most famous works. That volume provides a narrative account of events that links fluctuations in the money supply to subsequent changes in output, employment, and inflation. In doing so, it identifies monetary instability as the principal driving force behind instability in the economy as a whole.

Despite Friedman's fame and influence, however, academic economists and central bankers today rarely talk, or even appear to think, about monetary policy in terms of its effects on money growth. They focus, instead, on interest rates. This emphasis on interest rates reflects,

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[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] Nelson (2020) and Ireland (2021) – the former in great detail and the latter in brief summary – enumerate and describe Friedman's scholarly writings.

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 gleaned 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, the recent surge in M2 growth should serve as a warning sign. Unless the Federal Reserve acts soon, and decisively, to recalibrate its monetary policy strategy, higher inflation will persist.

Money, Business Cycles, and Inflation

In their *Monetary History* and in related statistical work, Friedman and Schwartz (1963*a*, 1963*b*) find strong links between money growth and business cycles in data extending back to 1867 and running through 1960. In those data, money growth consistently peaks just before output and employment reach their own cyclical peaks, and money growth troughs just before output and employment hit their cyclical troughs. Moreover, moderate declines in money growth presage mild economic recessions, while deeper monetary contractions portend more severe economic depressions.

In documenting these general facts, Friedman and Schwartz's *Monetary History* reshaped economists' understanding of the Great Depression. Whereas 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.[3]

In Friedman and Schwartz's (1963*b*) 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 Friedman and Schwartz's (1963*b*, pp.299-301) own words:

> 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.

[3] Cargill (1979, 1992) 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 (1963*b*, p.xxii) and Bordo and Schwartz (1979) acknowledge the importance of Warburton's research, from the 1940s, on monetary business cycles. Currie (1934) also provides data and arguments that foreshadow Friedman and Schwartz's account and interpretation of the Depression.

Later work by Bordo, Choudhri, and Schwartz (2002) and Hsieh and Romer (2006) provides further support for Friedman and Schwartz's arguments, by presenting evidence that the Fed could have conducted open market operations of sufficient size, during the early 1930s, to offset the observed decline in M2, even while respecting the constraints imposed by the gold standard.

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. His critique begins in Chapter 10 of the *Monetary History* (Friedman and Schwartz 1963*b*), on "World War II Inflation, September 1939-August 1948," an episode also discussed by Bordo and Levy (2021, pp.65-66).

M2 growth accelerated during World War II, as the Federal Reserve concentrated on keeping interest rates low to support government borrowing. 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 shut-downs and disrupted supply chains have led to shortages of many consumer durable goods.

Friedman and Schwartz's *Monetary History* went to press before US inflation rose more persistently during the 1970s. Instead, 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 from *Newsweek* magazine, for example, presages

today's debates by focusing on whether inflation is "transitory or persistent."[4] There, Friedman (1977) 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.

Next, in a lecture published by the Bank of Japan, Friedman (1983, p.8) 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.

Finally, Friedman (1984, p.30) sums up concisely the conclusions of his lifetime's work studying the Fed:

> 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

[4] See Greenwood and Hanke (2021) and Ireland and Levy (2021) for analyses of today's "transitory vs persistent" debate.

> experience before the Federal Reserve System was established or to the record of some other nations with a different monetary structure.

Both the substance and the 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 complication 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 (1963*a*, 1963*b*) 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 the *American Economic Review* – one by Ben Bernanke and Alan Blinder (1992) and the other by Benjamin Friedman and Kenneth Kuttner (1992) – proved highly influential in shaping this new consensus among academic economists.[5] Meanwhile,

[5] Belongia (1996), Hendrickson (2014), and Belongia and Ireland (2015*a*, 2016) show, however, that much of money's predictive power in statistical models like Bernanke and Blinder (1992) and Friedman and Kuttner's (1992) is restored when the Federal Reserve's simple-sum monetary aggregates are replaced by the Divisia aggregates described by Barnett (1980, 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

Federal Reserve officials and policy advisors, including Greenspan (1997), Meulendyke (1998, pp.52-56), and Thornton (2006), acknowledge 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. In September 1998, the Federal Open Market Committee (1998) 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 (Board of Governors of the Federal Reserve System 2000, p.2).

Eventually, even Milton Friedman had to confront these new realities. In an interview with John Taylor (2001, p.103), Friedman presented a graph comparing year-over-year growth rates in real M2 and real GDP from 1960 through 1999. Figure 2 reproduces and extends Friedman's chart, so that it runs through 2021.[6] 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 quantifies this shift. Before 1990, the correlation between the two series is 0.56; since then, it is –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

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assigned to that asset or assets regarded as having the largest quantity of 'moneyness' per dollar of aggregate value."

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

excluded, the correlation between real M2 and real GDP growth remains negative, at –0.33, from 1990 through the end of 2019.

To make sense of these shifting correlations, recall the equation of exchange, which reads

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

where M is the money supply, V is the velocity of money, P is the aggregate nominal price level, and Y is real GDP. Rewritten as

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

where lower-case variables denote the growth rates of the corresponding upper-case variables, this equation makes clear that changes in velocity, causing $v \neq 0$, will weaken the connections between money growth m, inflation p, and real GDP growth y.

Thus, in a second graph presented to Taylor (2001, p.104), Friedman plotted the velocities of M1, M2, and M3 to pinpoint the precise timing of the break. Figure 3 reproduces and updates Friedman's chart, focusing on M2 velocity. Again, 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, moved unexpectedly higher in the early 1990s. The extended graph here reveals that, in addition, the earlier stability of M2 velocity never returned. After rising from 1992 through 1995, M2 velocity reversed course and has declined, relentlessly, ever since.

These post-1990 movements in velocity should not be viewed as completely random, divorced from economic fundamentals.[7] Nevertheless, they clearly underlie the shift in money-

[7] Duca (2000), 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. Meanwhile, Anderson, Bordo, and Duca (2017) 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.

output correlations, from positive to negative, seen in figure 2. In his interview with Taylor (2001, p.105), Friedman confessed: "I'm baffled."

And, yet, insights from Friedman's earlier work can help reconcile the recent data with his preferred, quantity-theoretic approach to predicting and understanding the effects that monetary policy in general – and money growth in particular – have on the economy.

The Quantity Theory Revisited

Long before his interview with Taylor, Friedman provided his own "restatement" of the quantity theory of money. Friedman (1956, p.4) begins with a summary: "the quantity theory is in the first instance a theory of the *demand* for money." Later (p.16), he 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.

To illuminate further both "sides" of his hypothesis, Friedman (1956, p.11) re-expresses the equation of exchange (1) by depicting velocity V 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 (3), 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.[8] In Friedman's view, the demand for money – and hence the velocity function in (3) – emerges from the solution to a more general portfolio allocation problem in which decision-makers divide their wealth between capital assets of various kinds, including bonds, stocks, and durable goods that may also serve as stores of value. Hence, in (3), increases in the expected returns r_b and r_e on bonds and equities, as well as increases in inflation p as the rate of appreciation in the value of physical goods, should all work to increase velocity as investors substitute out of money and into those higher-yielding assets. Meanwhile, in Friedman's velocity function, real income Y measures the cash flow generated from total wealth, while the ratio of capital to labor income w reflects the proportion of wealth held in relatively liquid financial assets instead of illiquid human capital. Increases in these variables are expected to decrease velocity, as they both capture increases in total financial wealth, some of which will inevitably be held in monetary form. Finally, u is a composite index of geographic mobility and economic uncertainty that, Friedman hypothesizes, may also affect money demand.[9] Thus, in (3), nominal GDP PY is determined through 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 is followed by a series of studies – Cagan (1956), Klein (1956), Lerner (1956), and Selden (1956) – that provide empirical

[8] 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.

[9] Bordo and Jonung (1987) and Ireland (1991, 1994*a*, 1994*b*) develop and test this hypothesis of Friedman's in much greater detail.

evidence to support the quantity theory. Laidler (1993) surveys the voluminous literature that appeared as many other economists continued to pursue this research agenda throughout the decades that followed, presenting estimates and tests of equations linking real money demand to a small number of fundamental determinants. And while the same shifts in velocity shown in figure 3 led to a slowdown in research on money demand in the 1990s, work along these lines continues to this day, as exemplified by Belongia and Ireland (2019), Benati, Lucas, Nicolini, and Weber (2021), and Stewart (2021).

Belongia and Ireland (2015*b*, 2017) take a slightly different approach to the empirical implementation of the quantity-theoretic ideas expressed by Friedman (1956) through (3). Observing that the determinants of money demand identified by Friedman (1956) and throughout the subsequent literature are likely to evolve only slowly over time, Belongia and Ireland (2015*b*, 2017) rewrite the equation of exchange (1) as

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

where the first equality defines a shift-adjusted measure of the money stock $\widetilde{M}$ that corrects for long-run movements in velocity captured by the new variable V^*. Thus, in (4), $\tilde{V}$ becomes the deviation of actual velocity V from its long-run level V^*.[10]

[10] Belongia and Ireland's (2015*b*, 2017) V^* or "V-star" thereby plays a role similar to Hallman, Porter, and Small's (1991) P^* or "P-star." 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 (2015*b*, 2017) show that the performance of the P-star model improves when a time-varying value for V^* is estimated, using the same methods employed here. Reynard (2006) also shows that measures of money growth have strong predictive power for inflation once slow-moving trends in velocity are accounted for.

By replacing (3) with (4) as the equation that gives the quantity theory its empirical content, Belongia and Ireland (2015*b*, 2017) accept Friedman's (1956) view that the quantity theory does not require velocity to be numerically constant. At the same time, however, Belongia and Ireland (2015*b*, 2017) must also concede that for (4) to serve as a practical guide to monetary policymaking and monetary policy evaluation, the long-run level of velocity V^* must be estimated in real time, that is, without the use of data that only become available *after* policy decisions affecting the current money supply M have been made. Moreover, they must hope that unpredictable changes in velocity V away from the estimated long-run level V^* remain small enough that stability in $\tilde{V}$ will provide, via (4), a tighter statistical connection between growth in shift-adjustment money $\tilde{M}$ and growth in nominal GDP PY.

With these goals in mind, Belongia and Ireland (2015*b*, 2017) produce estimates of V^* using the one-sided version of the Hodrick-Prescott (1997) filter described by Stock and Watson (1999, p.301). Crucially, the "one-sided" nature of this statistical procedure means that the time-varying estimate of V^* is updated based only on current and past – but not future – data on velocity itself. Moreover, 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 (1997) original study, the setting $\lambda = 1600$ is used to estimate trend velocity V^* in the quarterly data shown in figure 3. Later, when the analysis shifts to annual data, the setting $\lambda = 6.25$ suggested by Ravn and Uhlig (2002) is used instead. Thus, provided the determinants that enter Friedman's (1956) velocity function do move 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.[11]

Figure 3 confirms that, in fact, the one-sided estimate of trend velocity V^* tracks quite closely movements in actual velocity V over the entire 1960:1-2021:4 sample of quarterly data. Movements in the estimated trend do tend to lag movements in velocity itself, reflecting, of course, 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 of V from V^* are small. Thus, as hoped for, $\tilde{V}$ in (4) remains stable.

Figure 4 redraws 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. Table 1, again, helps to quantify. When 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. The correlation computed with all the pre-2020 data increases from 0.27 to 0.46.

It is interesting to use Friedman and Schwartz's (1982) long, historical series on M2 to extend the analysis back further, just as they did. Figure 5 reveals that M2 velocity declined persistently from 1867 through the end of World War II. This graph serves to highlight,

[11] Nelson (2020, Vol.1, pp.124, 372) notes that although – or perhaps *because* – Friedman himself was a skilled applied statistician, he was wary of results derived from multivariate regression models. Nelson cites the appendix to Friedman and Schwartz (1991, p.49), in which Friedman writes, "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."

therefore, that the period of stable M2 velocity from 1960 through 1990 is the exception, not the rule. The graph also shows, however, that movements in M2 velocity remain smooth enough to be tracked, quite well and in real time, using the one-sided Hodrick-Prescott filter.

Figure 6 then shows 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 (1963*b*) explanation of the Great Depression. Table 1 summarizes: 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. Focusing narrowly on the episode from 1990 through 2019, the correlation, at 0.56, remains sizable.

Altogether, these findings should reassure quantity theorists who might otherwise struggle, as Friedman himself did in his interview with Taylor (2001), to interpret the recent behavior of M2. Although it is true that the extremely tight links between money and the business cycle loosen somewhat, they remain evident in the post-1990 period provided allowance is made for slow-moving trends in velocity. And they appear larger, still, when the quarterly data originally presented by Friedman to Taylor (2001) are replaced by annual data. This makes sense, as annual averaging smooths out quarter-to-quarter noise in measured GDP so as to focus on intermediate-term trends, which are more likely driven by macroeconomic fundamentals, including Federal Reserve monetary policy.

It is also interesting to use the quantity-theoretic approach embodied in (4) 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 (2001). Figure 7 compares these series using the long annual time series, running back to 1867, originally

provided by Friedman and Schwartz (1982) but extended through the present. The graph shows clearly that episodes of major inflation – most significantly those during World War II and the 1970s – are accompanied by rapid growth in the shift-adjusted money supply. And the graph shows, just as clearly, episodes of disinflation or even outright deflation – following World War I, during the Great Depression, in the early 1980s, and for a brief period during the financial crisis of 2008-09 – coincide with periods of decelerating money growth or outright monetary contraction.

Figure 7 also shows that, even more so than real GDP growth, measured inflation exhibits year-to-year volatility that is unrelated to intermediate and longer-run monetary trends. Lucas (1980) demonstrates that quantity-theoretic links between money growth and inflation are revealed much more clearly when multi-year moving averages of both series are compared. Following this approach, figures 8-10 plot three, five, and ten-year moving averages of shift-adjusted nominal M2 growth and inflation.[12]

Most strikingly, figure 10 renders visible the various eras of monetary policy successes and failures mentioned in the passage quoted above from Friedman (1984): rapid money growth and inflation during both world wars, monetary contraction and with severe and persistent deflation during the Great Depression, 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.

Table 2 confirms that the measured correlations between money growth and inflation become stronger, first, when slow-moving trends in velocity are accounted for and, especially,

[12] Strictly speaking, Lucas (1980) uses more sophisticated time-series filters to extract and compare low-frequency movements in money growth and inflation. Here, the same end is achieved simply by taking long moving averages.

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 message from this analysis, based on Milton Friedman's monetary economics, is that the recent bulge in M2, if not reversed, will soon fuel higher inflation.

Other Views

Two recent articles in the *Journal of Applied Corporate Finance* – Greenwood and Hanke (2021) and Stella (2021) – present analyses and interpretations of the recent surge in US money growth that complement those offered here. Both papers focus on the implications of money growth for inflation, asking: does the striking increase in the US money supply since 2020 necessarily portend a significant and sustained increase in prices?

Greenwood and Hanke (2021) address this question using a quantity-theoretic framework very similar to Milton Friedman's and, hence by extension, 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 (1977) emphasized in his *Newsweek* column reflect changes in money supply relative to money demand. Greenwood and Hanke illustrate this distinction vividly, by showing that over the past three decades, free-market reforms in China have generated similar patterns in the prices of goods relative to services across the world's major economies. Each economy has, nonetheless,

experienced its own level of aggregate price inflation, based on 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 countries that, nevertheless, had different inflation rates because of different monetary policy reactions.

Greenwood and Hanke (2021) then turn to consider more specifically the 36.4 percent increase in the US 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 here in figures 3 and 5. Greenwood and Hanke take averages of past data – simpler substitutes for the one-sided Hodrick-Prescott filter used here – to estimate a 2.4 percent annual rate of "normal" real GDP growth and a continued downward trend in M2 velocity at the rate of 1.7 percent 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 (2021, Table 2, p.49) arrive at their prediction that the US price level will have to rise by more than 28 percent to restore the long-run balance between money supply and demand. Like the calculations behind figures 7-10 here, therefore, Greenwood and Hanke's point to the danger of significant US price inflation if the Federal Reserve does not act to reverse the recent increase in the M2 money supply.

Finally, Greenwood and Hanke (2021, Table 2, p.49) observe that there has been 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 percent increase in prices in Israel, an 11.1 percent increase in prices in the UK, and a 3.5 percent increase in prices

in Japan.[13] Thus, Greenwood and Hanke usefully show how, over the next few years, incoming data from countries around the work will help economists put the quantity theory to the test, in work that continues in the tradition of Friedman and Schwartz (1963*a*, 1963b), Cagan (1956), Klein (1956), Lerner (1956), and Selden (1956).

On first reading, the content and the spirit of Stella's (2021) recent article seem to stand quite apart from those exhibited here and in Greenwood and Hanke (2021). After more careful consideration, however, some points of general agreement appear as well. In addition, some of the differences that remain might be fruitfully addressed in future research that tests the quantity theory's implications against those of its competitors.

Stella (2021) devotes most of his article to illustrating and explaining why the quantity theory in its simplest form has difficulty accounting for the behavior of US inflation since 1990: velocity, which had been relatively stable throughout the 1960s, 1970s, and 1980s, 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 (2001). As noted here and in Greenwood and Hanke (2021), however, by using past data to estimate and control for slow-moving trends in velocity, one can take a more flexible view that remains fully consistent with Friedman's (1956) earlier "restatement" of the quantity theory and that provides a better account of inflation since 1990.

Much of Stella's analysis focuses not on the M2 measure of the money stock that is studied here, but on the monetary base (M0), defined as currency in circulation plus bank

[13] In a *Wall Street Journal* editorial, Friedman (1997) encouraged the Bank of Japan to engage in large-scale asset purchases to increase the rates of money growth and inflation. 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.

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 movements in both M0 and M1 since 2008, which have been unrelated to movements in real GDP, inflation, or any other macroeconomic variable.

Walter and Courtois (2009), Ireland (2019*a*, 2019*b*), and Kantor (2022) discuss 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. All four studies emphasize the Fed's introduction of interest payments on bank reserves as a key factor explaining why this increase in reserves supply, which greatly expanded the monetary base, failed to generate higher inflation.

In fact, the US 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 US 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. By the time Lehman Brothers and American International Group became embroiled in the crisis in September 2008, however, the need for additional emergency lending far exceeded the value of securities that remained on the Fed's balance sheet. Thus, the Fed asked Congress to 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. The Fed's October 6 press release (Board of Governors of the Federal Reserve System 2008) explains, specifically, that

> 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.

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. As Ireland (2019*a*, 2019*b*) and Kantor (2022) explain, interest on reserves and flight-to-quality dynamics continued to prevent the growing supply of bank reserves generated through QE from generating more rapid growth in broader measures of the money stock, such as M2, and through quantity-theoretic channels, increasing the rate of inflation as well. On the other hand, Belongia and Ireland (2021) show that, after allowing for a large, one-time shift in the demand for reserves associated with the introduction of interest on reserves in 2008, increases in reserves supply *do* once again appear to be associated with increases in money, nominal consumer spending, and inflation. Detecting these effects statistically, however, requires a simultaneous equation model that disentangles 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 US. 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. As noted by Judson, Schlusche, and Wong (2014), 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. The effects on M1 were even larger, with year-over-year growth rates during 2011 approaching 20 percent.

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 450 percent 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 (2021) article, Chew (2021, p.3) goes even further, suggesting 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.

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 Barnett (1980, 2012), 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." Barnett (2016, pp.277-278) motivates our

interest in the Divisia monetary aggregates using logic along much the same lines as 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 ….

Indeed, the M4 Divisia aggregate described by Barnett, Liu, Mattson, and van den Noort (2013) 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 M2. Intriguingly, recent studies by Keating, Kelly, Smith, and Valcarcel (2019) and Dery and Serletis (2021) 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. This work supports 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 (2021) 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. Still, this more modest correlation coefficient must be balanced against the massive, 40 percent increase in M2 itself. As Greenwood and Hanke (2021) show, even if some of this bulge in the money supply is

absorbed by an increase in money demand, a substantial increase in the US price level should still be expected.

Stella (2021) goes on to propose a "fiscal theory of the price level" that in his view might improve on the quantity theory of money in its ability to explain movements in inflation. Stella traces the origins this fiscal theory back to work by Wallace (1981).[14] Briefly but therefore very loosely stated, the fiscal theory of the price level emphasizes that in the absence of outright default, government debt must either be serviced through future budget surpluses or depreciated away through future inflation. Thus, when government debt increases but expected future budget surpluses do not, expected future inflation must rise instead. The origins of this inflation can be said to be "fiscal" rather than "monetary."

When Stella (2021, p.9) 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 (2021, p.11) states this aim concisely, explaining that

> In sum, 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 [quantity theory of money] has long been interpreted as telling us, the quantity of monetary liabilities alone.

This is yet another intriguing question that deserves further consideration: does a broader measure of nominal liabilities that includes US 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. Just like Chew

[14] Sargent and Wallace (1981) and Leeper (1991) also contribute importantly to the development of this framework. More recently, Cochrane (2021) provides an overview, while Cochrane (2022) presents the fiscal theory in great detail.

(2021) and Greenwood and Hanke (2021), Stella's article is useful in part because it sets the stage for further tests of the quantity theory and its competitors.

Stella (2021, p.21) concludes by suggesting that, in the end, there may 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.

A recent *Wall Street Journal* editorial by Sargent and Silber (2022) takes a similar view, offering up two specific quotes from Friedman to provide the evidence that Stella alludes to. First, in another *Newsweek* column, Friedman (1978, pp.52-3) finds fiscal origins for the high inflation of that time:

> 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 ….

Later, Friedman (1994, p.207) wrote about the origins of inflation more generally:

> 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.

Although, based on all his work emphasizing the predictive power of money, it seems safe to say that Friedman would continue to favor his own quantity-theoretic framework to Stella's fiscal alternative, Friedman would just as surely concur on this point: the fact that the 40 percent increase in M2 has coincided with massive increases in federal borrowing that will be difficult to repay through future taxes makes it even more likely that higher inflation will follow.

What Happens Next?

As revealed by Friedman's (1977) *Newsweek* column, today's debates over whether inflation will prove "transitory or persistent" echo strongly similar debates over the role that Federal Reserve policy played in driving inflation higher during the 1970s. Friedman's position in that debate was unequivocal. The words he used back then 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, Hetzel (2021) and Ireland and Levy (2021) elaborate on this position by emphasizing that "what happens next" depends crucially on what the Federal Reserve *does* next. 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 US 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. What Friedman (1968, p.7) 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 – 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. Belongia and Ireland (2021) show that, just like more traditional open market operations – also purchases of government bonds with newly-created bank reserves – large-scale asset purchases 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. 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.

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

(2020). 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.

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

	M2 Unadjusted for Trend 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

Table 2. Correlations between Average M2 Growth and Inflation

	M2 Unadjusted for Trend 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
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

Figure 1. Year-over-Year Growth Rate of M2

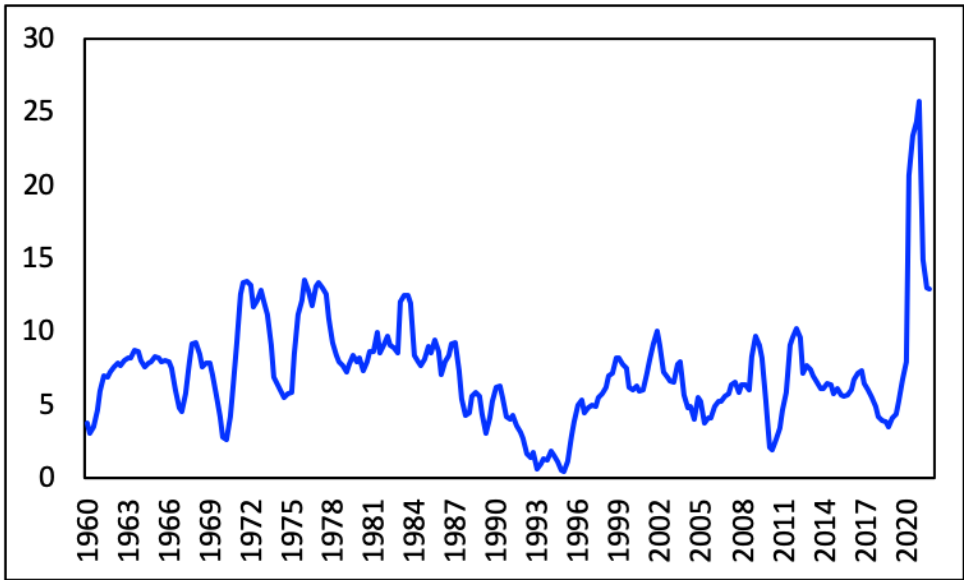
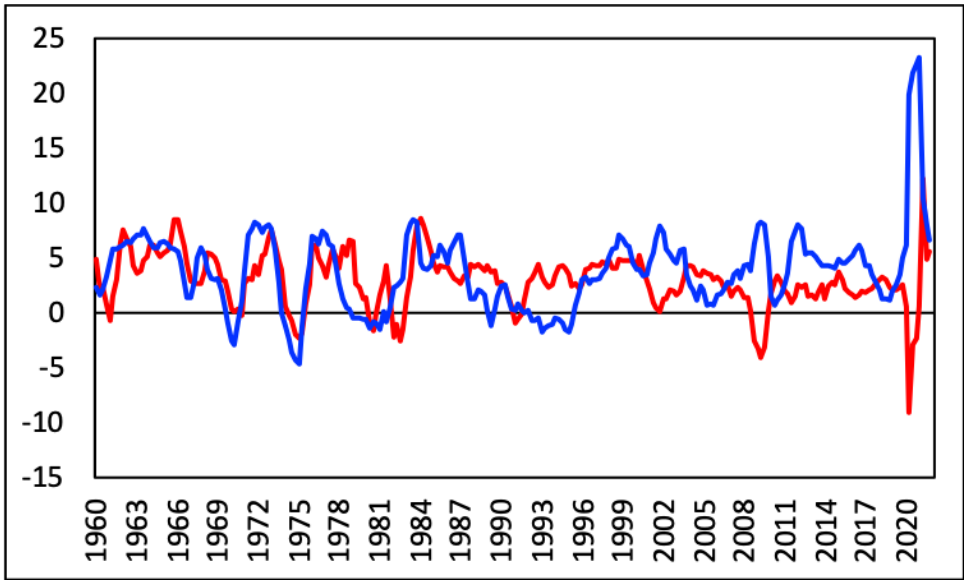
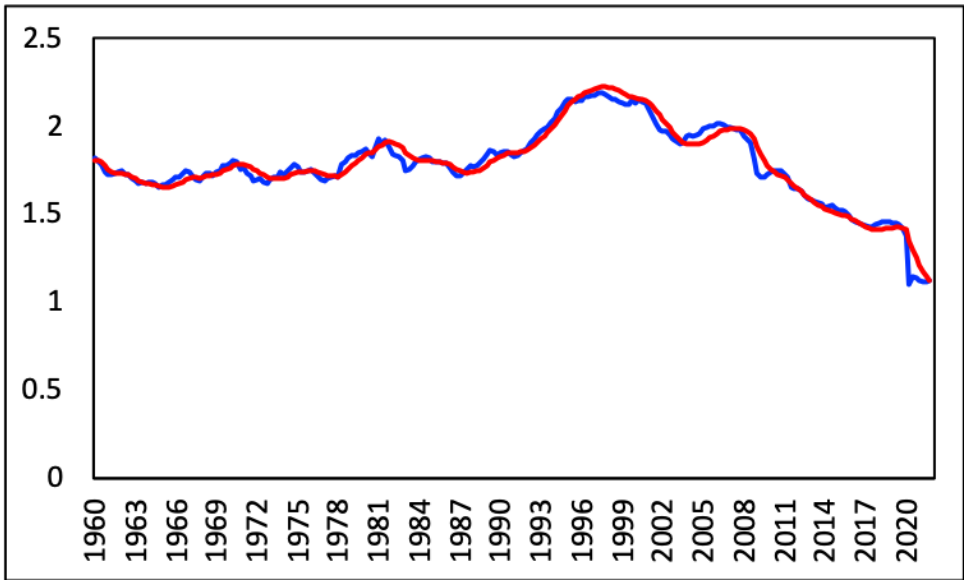


Figure 2. Year-over-Year Growth Rates of Real M2 and Real GDP



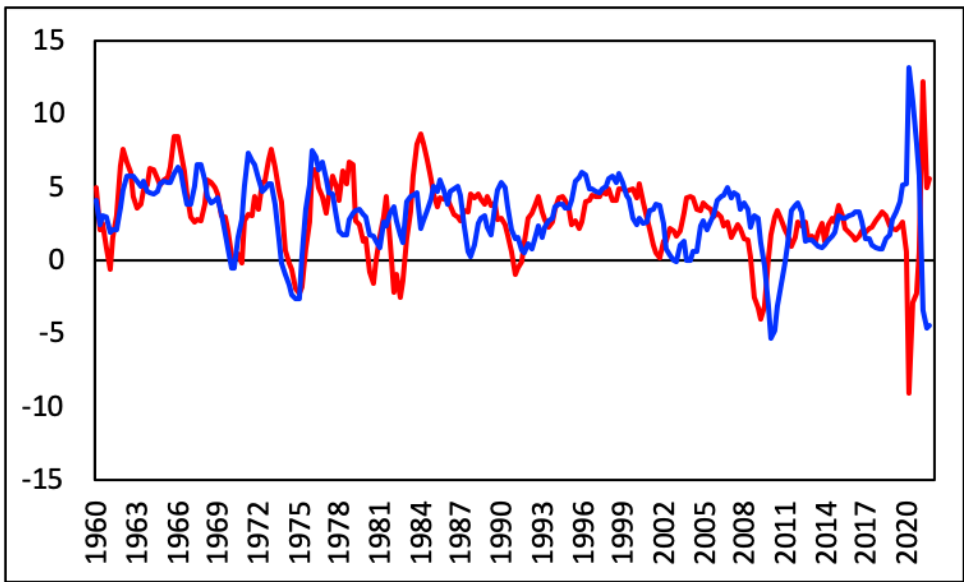
Blue Line = Real M2 Red Line = Real GDP

Figure 3. M2 Velocity and Trend



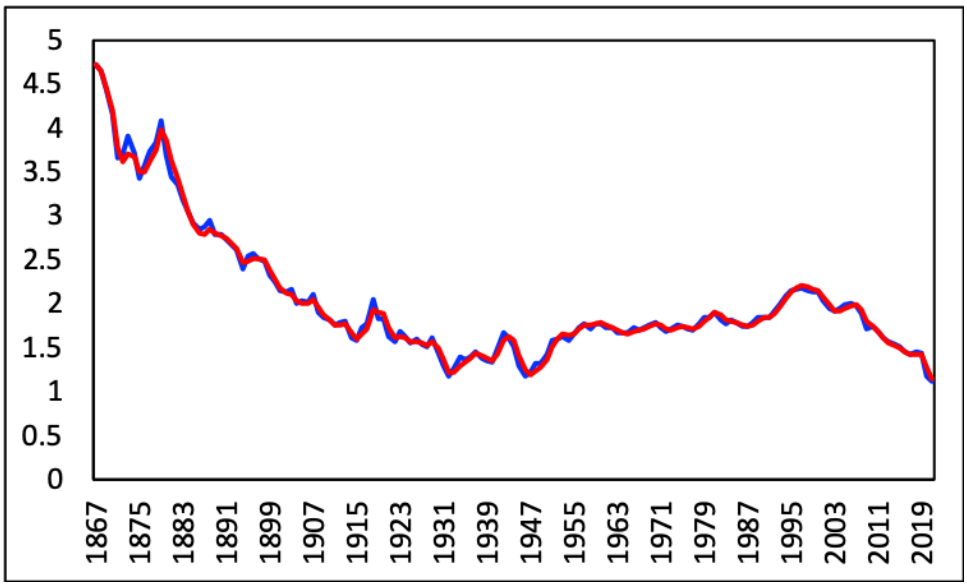
Blue Line = M2 Velocity Red Line = One-Sided HP Trend

Figure 4. Year-over-Year Growth Rates of Real Shift-Adjusted M2 and Real GDP



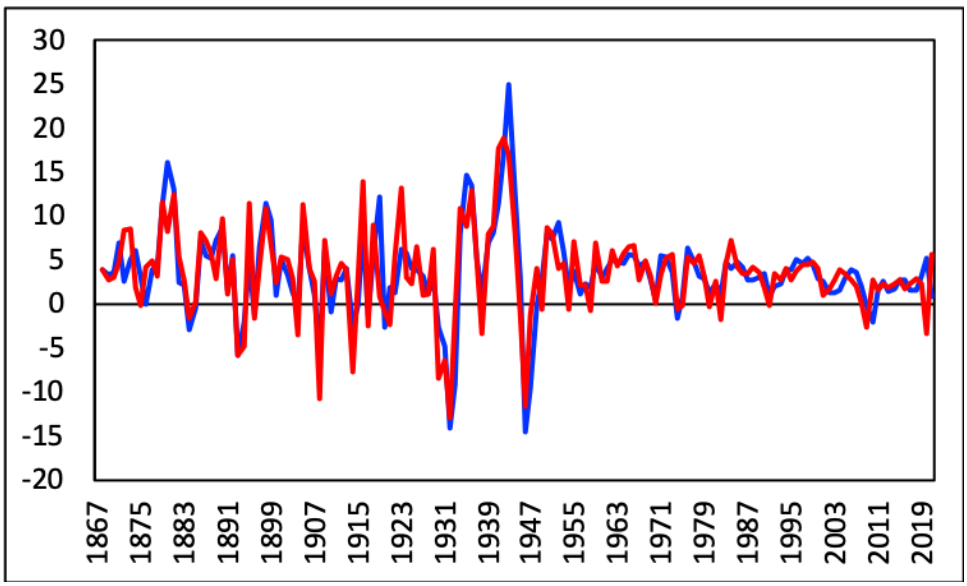
Blue Line = Shift-Adjusted M2 Red Line = Real GDP

Figure 5. M2 Velocity and Trend



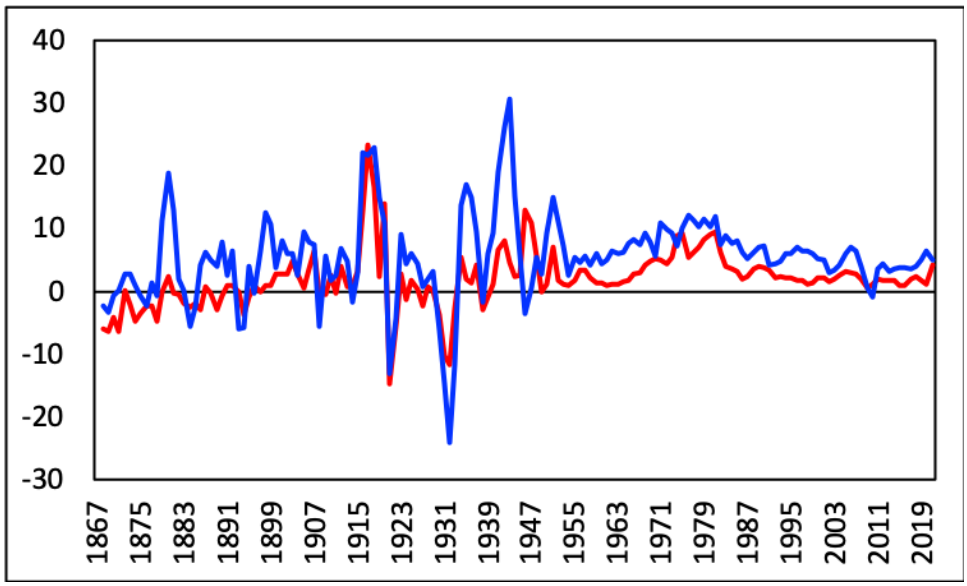
Blue Line = M2 Velocity Red Line = One-Sided HP Trend

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



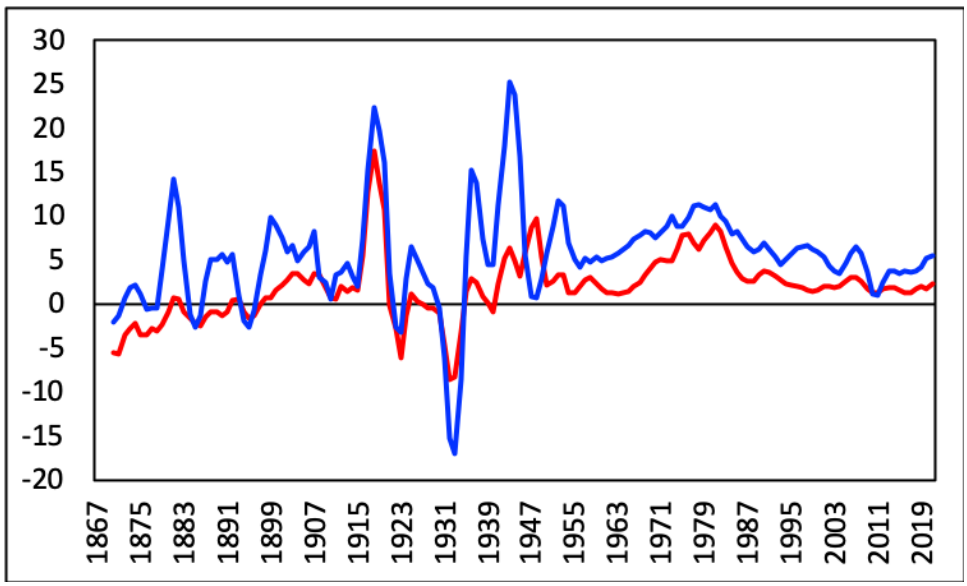
Blue Line = Shift-Adjusted M2 Red Line = Real GDP

Figure 7. Shift-Adjusted M2 Growth and Inflation: Annual



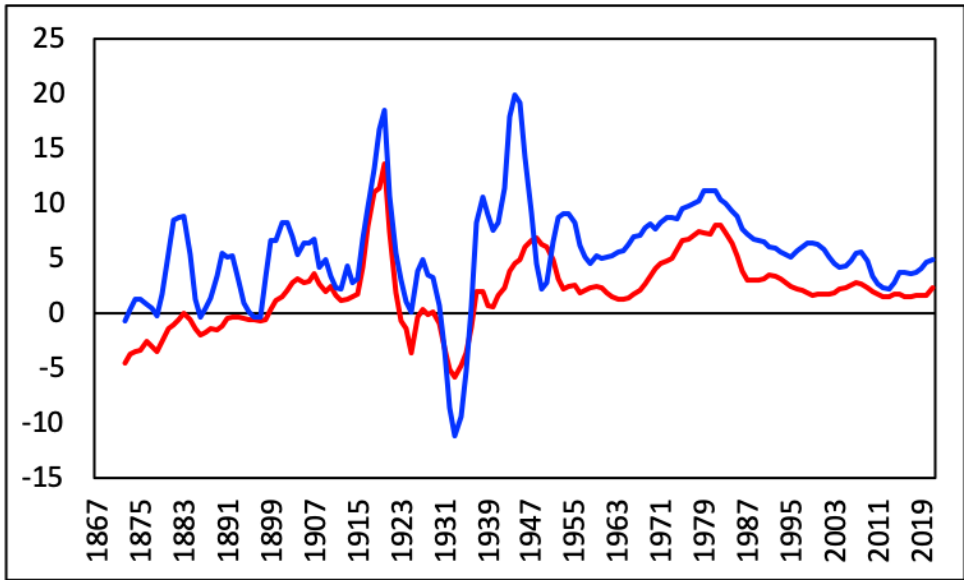
Blue Line = Shift-Adjusted M2 Growth Red Line = Inflation

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



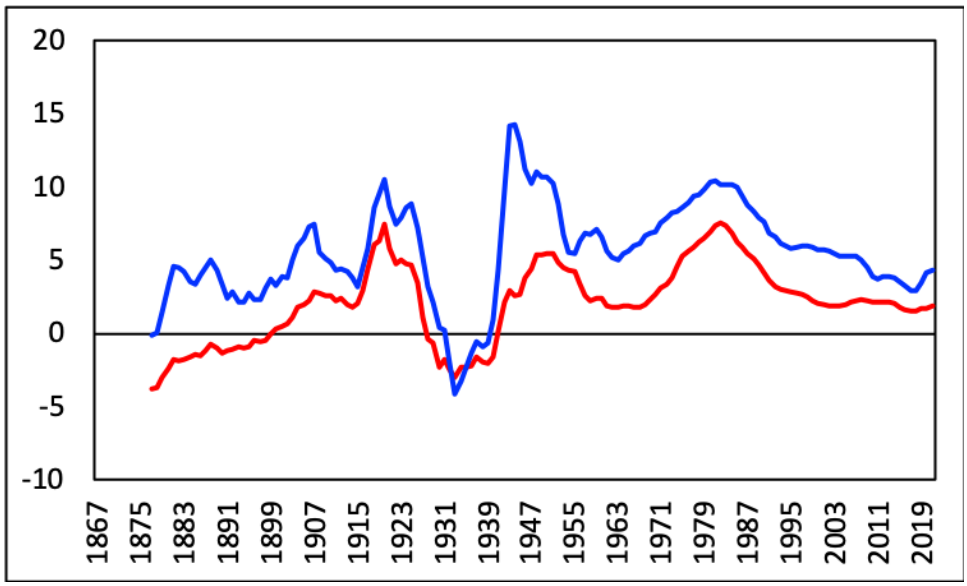
Blue Line = Shift-Adjusted M2 Growth Red Line = Inflation

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



Blue Line = Shift-Adjusted M2 Growth Red Line = Inflation

Figure 10. Shift-Adjusted M2 Growth and Inflation: Ten-Year Averages



Blue Line = Shift-Adjusted M2 Growth Red Line = Inflation