Money in the Search for a Nominal Anchor

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Abstract: From the very start of its fifty-year history, the Shadow Open Market Committee advocated for a monetary policy strategy focused on controlling inflation. With time, the rationale for price stability as the principal focus of monetary policy came to be accepted more widely by academic economists and Federal Reserve officials as well. The SOMC also consistently favored an operational approach involving the use of the monetary base as the policy instrument and a broader monetary aggregate as an intermediate target. These features of SOMC strategy, by contrast, have never gained widespread support among academics or at the Fed. This paper outlines the SOMC's preferred approach, focusing on how the Committee's money-based strategy and arguments for it evolved over time. It then shows that these arguments still apply with force today.

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Introduction

Founded by Karl Brunner and Allan Meltzer, the Shadow Open Market Committee first met on September 14, 1973. Figure 1 shows that, at the time, inflation as measured by the consumer price index had reached 7.4 percent. The SOMC's principal objective from the start, Meltzer (2000, p.120) recalls, was to reject the price and wage controls favored by President Nixon, "large parts of the business community, the Congress, many economists, and parts of his own government," and to "show that better policy choices were available and that inflation could be controlled at acceptable cost, if the Federal Reserve controlled money growth."

Figure 1 also shows that, despite the SOMC's best efforts, things would get much worse before they got any better. Inflation peaked at 12.2 percent in November 1975 and, after falling back to 5.0 percent in December 1976, spiked higher again, reaching 14.6 percent in March 1980. And while inflation did come down substantially from 1980 through 1983 under Federal Reserve Chair Paul Volcker, it was not until the early 1990s, under Chair Alan Greenspan, that inflation finally stabilized at levels below 3.0 percent.

Throughout this extended period, the SOMC consistently advocated for a monetary policy strategy focused on controlling inflation. In doing so, Brunner, Meltzer, and other SOMC members relied on a set of arguments that, while unpopular at the time, have since become widely accepted by academic economists and Federal Reserve policymakers alike. More specifically, however, the SOMC also consistently favored an operational approach that emphasized the use of the monetary base instead of the federal funds rate as the monetary policy instrument and the growth rate of a broader monetary aggregate as an intermediate target. These elements of SOMC doctrine have never received much endorsement, either among academics or at the Fed.

After reviewing these points of convergence and divergence between the SOMC and the mainstream, this paper describes how the SOMC's preferred money-based strategy and Committee members' arguments for it evolved over time. It then shows that these arguments still apply with force today. Had policymakers paid more attention to the behavior of the monetary base and the broader monetary aggregates, the return to high inflation in 2021 – what Levy (2024, p.261) calls the "biggest monetary policy error" since the 1970s and also clearly visible in figure 1 – would likely have been avoided. And if policymakers pay more attention to the monetary base and the broader monetary aggregates, the way back to price stability will become much clearer, too.

The SOMC and the Mainstream: Points of Convergence

Poole, Rasche, and Wheelock (2013, pp.64-71) identify nine core principles that underlie the SOMC's preferred monetary policymaking framework. These are the beliefs that:

1. Inflation is a monetary phenomenon.
2. The market system is inherently stable and economic growth reverts to a natural rate.
3. Monetary policy should focus on price stability.
4. Adverse supply shocks reduce potential output.
5. The cost of disinflation reflects the monetary authority's credibility.
6. Policy should be rules based and transparent.
7. Money market (nominal interest rate) targeting is flawed.
8. Money demand is stable.
9. The money stock is controllable.

Poole, Rasche, and Wheelock (2013) and Romer (2013) agree that, while unpopular at the time of the SOMC's founding, principles (1)-(6) have since become generally accepted by academic economists and Federal Reserve policymakers alike. Ireland (2024*a*) likewise shows how these principles emerged from developments in macroeconomic theory during the 1960s through the 1990s and were eventually reflected in the Federal Open Market Committee's (2012) "Statement on Longer-Run Goals and Monetary Policy Strategy."

The assertion that "inflation is a monetary phenomenon" echoes, of course, Milton Friedman's (1968, p.39) famous dictum that "inflation is always and everywhere a monetary phenomenon." As Karl Brunner emphasizes in a position paper for the SOMC's September 1979 meeting, this view was not widely shared during the 1970s. Brunner (1979*b*, p.9) quotes Arthur Okun to illustrate this point:

> A prevalent view asserts that the "inflation of the seventies is a new and different phenomenon." It follows that it "cannot be diagnosed correctly with old theories or treated effectively with old prescriptions" (Arthur Okun, 1979). The "new phenomenon" requires a correspondingly new diversified approach. This would include "enough fiscal-monetary discipline to provide a safety margin against excess demand, a coordinated federal initiative to reduce private costs and constructive measures to obtain price-wage restraint."

That is, monetary policy plays at most a supporting role in the fight against inflation. More important tools include tax and regulatory policies that directly reduce firms' costs of production and the promotion of "voluntary" wage and price controls. In the policy statement prepared for the same SOMC meeting, Allan Meltzer (1979, p.4) offers a very different view, putting monetary policy at the heart of an anti-inflationary program:

> For several years, the Committee has urged the Federal Reserve to adopt a policy of steady, pre-announced reductions in money growth. If this policy had been adopted and maintained for the past three years, we would enter the 1980's with low inflation, low market interest rates and less uncertainty about the future.

In announcing the Federal Reserve's explicit two-percent target for inflation, the FOMC's (2012) own "Statement on Longer-Run Goals and Monetary Policy Strategy" comes much closer to Meltzer's position than to Okun's:

> The inflation rate over the longer run is primarily determined by monetary policy, and hence the Committee has the ability to specify a longer-run goal for inflation. The Committee judges that inflation at the rate of 2 percent, as measured by the annual change in the price index for personal consumption expenditures, is most consistent over the longer run with the Federal Reserve's statutory mandate.

Notably, however, the FOMC's statement omits any reference to "money growth" from its description of monetary policy goals and strategy.

Brunner (1970) and Mayer (1978) both list stability of the free market economy as a core monetarist principle. Public debate over this belief erupted early on in SOMC history when, in response to questioning from Senator William Proxmire, Fed Chair Arthur Burns (1973, p.729) wrote:

> … neither historical evidence nor the thrust of explorations in business-cycle theory over a long century gives support to the notion that our economy is inherently stable. On the contrary, experience has demonstrated repeatedly that blind reliance on the self-correcting properties of our economic system can lead to serious trouble. Discretionary economic policy, while it has at times led to mistakes, has more often proved reasonably successful. The disappearance of business depressions, which in earlier times spelling mass unemployment for workers and mass bankruptcies for businessmen, is largely attributable to the stabilization policies of the last 30 years.

In his position paper for the SOMC meeting held the following spring, Brunner (1974*a*, pp.19-20) responded with a "short critique" that begins

> The Federal Reserve's fundamental thesis of an inherently unstable process generating on its own major fluctuation may be very plausible, just as plausible as the rotation of the sun around the earth. It is quite probable that this thesis guided much of the Chairman's previous activities at the National Bureau of Economic Research. Still, all the time series collected yield no relevant evidence favoring this thesis against the rival view of a fundamentally stable process.

As evidence to support the stability hypothesis instead, Brunner goes on to cite Friedman and Schwartz's (1963) *Monetary History of the United States*, related work by Friedman (1964) on serial correlation in the amplitude of business cycle expansions and contractions, and his own research (Brunner, Fratianni, Jordon, Meltzer, and Neumann 1973) on the effects of monetary and fiscal policies on inflation in Italy, Germany, and the US.

As Hetzel (2024) explains, disagreements over the inherent stability or instability of the free-market economy continue to underlie debates among economists, both in academia and at the Fed, even if participants in those debates don't explicitly recognize that source. But as Hetzel emphasizes as well, New Keynesian models such as Ireland (1996) and Goodfriend and King's (1997) provide a contemporary re-statement of the monetarist principle of stability, through what Blanchard and Galí (2007) call "the divine coincidence:" their implication that a monetary policy directed at stabilizing the aggregate nominal price level simultaneously allows the economy to adjust efficiently to non-monetary shocks. As noted by Ireland (2024*a*), the FOMC's (2012) Statement on Longer-Run Goals and Monetary Policy Strategy recognizes that the divine coincidence can often apply in practice as well as theory, when it states:

> In setting monetary policy, the Committee seeks to mitigate deviations of inflation from its longer-run goal and deviations of employment from the Committee's assessments of its maximum level. These objectives are generally complementary.

Once again, however, it is noteworthy that, just as the FOMC's (2012) statement makes no reference to "money," most New Keynesian models describe monetary policy, even under the divine coincidence, exclusively in terms of interest rates, assigning little or no role to money supply and demand.[1]

[1] For further discussions of this point, see Ireland (2004), Leeper and Roush (2003), Nelson (2008), and Belongia and Ireland (2021).

By emphasizing that monetary policy should focus on price stability, the SOMC also rejected the notion of an exploitable Phillips curve that the Fed could use to achieve lower unemployment in exchange for higher inflation. In his statement to the House Banking Committee, also presented at the March 1979 SOMC meeting, Karl Brunner (1979*a*, pp.13-4) argues

> The choice is *not* between lower unemployment and higher inflation on the one side or higher unemployment and lower inflation on the other side. Our choice lies between a *temporary* increase of unemployment in the present above its normal level in conjunction with a return to the normal level and no inflation in the future on one side, or, on the other side, permanent inflation with intermittent spurts of unemployment beyond its normal level augmented very likely by an increase in the normal level.

This view contrasts sharply with Samuelson and Solow's (1960, p.192) description of the Phillips curve as showing "the menu of choice between different degrees of unemployment and price stability." But it resembles quite closely the position that underlies the inflation targeting strategies advocated by many economists and implemented by many central banks around the world today, as Bernanke, Laubach, Mishkin, and Posen (1999, p.16) explain, in terms that echo Brunner's (1979*a*):

> Thirty years ago, policy-makers and most economists supported "activist" monetary policies, which were defined as policies whose purpose was to keep output and unemployment close to their "full employment" levels at all times. Supporters of activism believed that there was a long-run tradeoff between inflation and unemployment known as the Phillips curve …. To many economists and policy-makers, it seemed possible that actively managed monetary (and fiscal) policies could be used to maintain maximum employment pretty much all the time. That happy outcome was not to be. … In short, the activist monetary policies of the 1960s and 1970s not only failed to deliver their promised benefits, they helped to generate inflationary pressures that could be subdued only at high economic cost.

Likewise, that adverse supply shocks decrease potential as well as actual output was first noted by Brunner at the September 1975 SOMC meeting, in reaction to the severe and prolonged

recession of 1973-5. Brunner's (1975*b*) position paper cites an earlier report by Bowsher (1975, p.2), which breaks the downturn into two stages:

> The first stage, which began in the late fall of 1973, was largely a response to constraints placed on aggregate supply. The second stage, which began in the early fall of 1974, reflected, in addition, a reduction in the growth of demand for goods and services.

The supply shocks that triggered stage one include, in Bowsher's view, higher oil prices, poor weather conditions, and the adverse effects of price controls. Brunner (1975*b*, p.15) builds on Bowsher's assessment by making a distinction of his own, with key implications for monetary policymaking:

> The distinction between a "real shock decline" in output and a "cyclic decline" in output seems to me important for rational policy making. The latter creates an "output gap" really absent from the former. A disregard of the two distinct processes thus magnifies estimates of the "potential gap" to be removed by expansionary policies. An inadequate analysis of the decline in output observed since November 1973 thus reenforces the danger of inflationary financial responses on the part of policy-makers.

Brunner (1975*b*, p.18) goes on to contrast his own views with those of the "Keynesian establishment," summarized in a newspaper article by Golden (1975) that quotes Walter Heller and Franco Modigliani in arguing for a policy of sustained low interest rates in the face of persistent economic weakness.

The SOMC's (1976, p.3) September 1976 policy statement echoes Brunner's earlier concerns, stating that "monetary policy can contribute to cyclical recovery but can do little to replace capacity lost in the shocks of recent years." That statement, controversial at the time, gradually found support, first, in the development of real business cycle models by Kydland and Prescott (1982) and Long and Plosser (1983) in the 1980s and then, by extension, in New Keynesian models where, as noted above, the divine coincidence applies. In all of these models, potential output, instead of following a smoothly-evolving trend, fluctuates at high frequencies as

shocks hit the economy from the supply side, and monetary policy should allow actual output to fluctuate, too, in order to track those movements in potential. As Galí (2015, p.103) explains:

> … stabilizing output is not desirable in and of itself. Instead, output should vary one-for-one with the natural level of output …. There is no reason, in principle, why the natural level of output should be constant or take the form of a smooth trend, because all kinds of real shocks are a potential source of variation in its level. In that context, policies that stress output stability (possibly around a smooth trend) may generate potentially large deviations of output from its natural level and, thus, be suboptimal.

Ireland (2024*a*) discusses how, similarly, real business cycle and New Keynesian theories helped shape the FOMC's (2012) monetary policy strategy statement.

The idea that the costs of disinflation depend on the credibility of the central bank's commitment to price stability was first raised by Brunner (1974*b*) in his position paper for the September 1974 SOMC meeting. There, Brunner responds to comments by James Tobin on the SOMC's earlier recommendation to end inflation through a program of gradual reductions in money growth. Tobin (1974, pp.228-9) summarizes a pair of simulations, based on two alternative estimates of the Phillips curve slope parameter, both indicating that the SOMC's prescribed policy would require a prolonged period of high unemployment. In the more pessimistic case, "unemployment rises steadily for eight years" in exchange for modest reductions in inflation. Brunner (1974*b*, p.10) provides a very early reference to the Lucas (1976) critique in his counter-argument:

> The Phillips curve models showed in the recent past repeatedly deviations from observations sufficiently large to question the relevance of the longer-run simulation exercised by Tobin. But these longer-range simulations are really made quite dubious and probably quite irrelevant by a property of economic systems recently emphasized by Robert Lucas at a Carnegie-Rochester Conference …. The structural properties and response patterns of an economic system are not invariant to different policies and policy patterns. The mechanical simulation of a policy program substantially different from policy patterns prevailing over the sample period used to estimate the model yields thus little information about the consequences of the program proposed. In particular, the

> simulations of a model estimated over a period of accelerating inflation probably exaggerates the longer-run unemployment effects of an anti-inflationary program.[2]

Brunner (1982, pp.10-1) restates these ideas even more bluntly:

> First and foremost, we need to emphasize that a necessary and sufficient condition for lower inflation is a correspondingly lower rate of monetary growth. We deny on the other hand that a recession of sufficient length and depth is a necessary condition of an anti-inflationary program. Whether or not the monetary retardation required for our purposes translates into a recession depends crucially on the credibility of the policies pursued.

Brunner (1982, p.11) concludes by quoting Goodfriend (1981, p.13): "The policy will work well only if the monetary authority establishes a commitment to bring money growth down that is credible to the financial markets and the public in general."

Today, the important roles played by expectations and credibility in determining the costs of disinflation are widely acknowledged. For example, in outlining his strategy for bringing US inflation back down after its 2021 surge, Federal Reserve Chair Jerome Powell (2022, pp.3-5) lists as two of the three "important lessons" learned from the experience of the "high and volatile inflation of the 1970s … that the public's expectations … can play an important role" and that "the employment costs of bringing down inflation are likely to increase … as high inflation becomes more entrenched in wage and price setting." Powell (2022, p.2) departs, however, from SOMC prescriptions by describing the Fed's disinflationary strategy in terms of higher settings for interest rates, rather than lower rates of money growth.

Finally, the SOMC preferred a transparent and rules-based approach to monetary policymaking, strongly and from the very start, through its advocacy of a strategy based on pre-

[2] The omitted text from this quote, indicated with ellipses, states mistakenly that Lucas' paper was presented at the November 1973 Carnegie-Rochester Conference on price and wage controls, when in fact it was presented at the April 1973 conference on the Phillips curve (see Brunner and Meltzer 1976).

announced targets for money growth. The policy statement approved at the Committee's first meeting in September 1973 reads (SOMC 1973, p.7) quite simply:

> We believe the objective of monetary policy over the next year should be to reduce the rate of inflation. To accomplish this, the growth rate of money for the next six months should be at a steady rate of about 5½%.

As actual rates of money growth and inflation continued to rise, the Committee extended the horizon over which its pre-announced plans for money growth applied. The Committee's (SOMC 1978*a*, pp.3-4) policy statement prescribes 6 percent money growth for 1978, then continues:

> … we recommend reduction in the average rate of monetary expansion by 1% a year until a noninflationary rate of monetary expansion is achieved. The Federal Reserve should publicly commit monetary policy to this stabilizing long-term monetary course in order to fulfill its legal responsibilities under the Federal Reserve Reform Act of 1977.

And the SOMC continued to emphasize the advantages of a rules-based approach to policymaking, even after lower rates of inflation were achieved under Federal Reserve Chairmen Paul Volcker and Alan Greenspan. On the occasion of its 25th anniversary, the SOMC (1998, p.7) emphasized that at the Fed,

> Decisions remain ad hoc. Once memories of the costs of inflation fade, or there is a change in membership and leadership, the Federal Reserve might return to past policies. … To avoid a return to these mistaken policies, we will continue to urge the Federal Reserve to develop and adopt systematic rules for monetary policy.

As many of the essays collected in Bordo, Cochrane, and Taylor (2024) make clear, John Taylor's (1993) article, "Discretion Versus Policy Rules in Practice," played a huge rule in convincing economists and financial market participants that Federal Reserve policy can, and should, be made with reference to a benchmark prescribed by a relatively simple rule. But while the Federal Reserve's March 2024 semi-annual report to Congress presents the interest rate

settings prescribed by the Taylor (1993) rule and several variants, it also argues (Board of Governors of the Federal Reserve System 2024, pp.42):

> As benchmarks for monetary policy, simple policy rules have important limitations. One of these limitations is that the simple policy rules mechanically respond to only a small set of economic variables and thus necessarily abstract from many of the factors the FOMC considers when it assesses the appropriate setting of the policy rate.

Brunner (1983, pp.9-10) anticipates and provides the other side of this argument, from the SOMC viewpoint:

> The idea that central banks should "look at everything" and "flexibly adjust to circumstances" still finds much sympathy and has an intuitive appeal. But, of course, nobody can look at everything. Attention is unavoidably selective and guided by some prior conception. … The consequences of a strategy of "flexible adjustment to prevailing circumstances" are highly sensitive to the reliability of the policymakers' detailed knowledge of the economy's response structure. … But in spite of all the claims to such knowledge, implicitly raised by advocates of activist policymaking, we do not possess the required degree of knowledge. The pursuit of flexible adjustments … becomes thus a speculative game. Attempts to offset shocks are translated with substantial likelihood into effects reinforcing the shocks operating on the economy.

A noteworthy gap remains, therefore, between the SOMC's and Federal Reserve's confidence in the use of monetary policy rules. Even deeper disagreements appear, however, over the appropriate roles of interest rates versus the money stock as instruments, indicators, and targets for successful monetary policymaking.

The SOMC and the Mainstream: Points of Departure

The biggest departure of the SOMC's framework from conventional wisdom, both past and present, comes through the principle that Poole, Rasche, and Wheelock's (2013) list seventh: that interest rate targeting is fundamentally flawed. The SOMC's strong preference, from very start in 1973, for money growth over interest rates as indicators of the stance of monetary policy was

presaged by Brunner and Meltzer's (1968) explanation for the Great Depression, which differs from Friedman and Schwartz's (1963). Friedman and Schwartz blame the Fed's inaction, allowing the broad money stock and the price level to decline by more than one-third from 1929 through 1933, on an intellectual vacuum at the Fed left by the death of Benjamin Strong. Brunner and Meltzer argue, instead, that Federal Reserve officials as a group misinterpreted very low interest rates as a sign of sufficient monetary ease and ignored the contraction in the money stock as a sign of extraordinary monetary tightness. Brunner and Meltzer (1968, p.348) therefore see the Great Depression as exceptional only in its length and severity and not in its fundamental cause. In their view, it appears as just one case among many in which the "use of short-term interest rates as an indicator of monetary policy explains why the Federal Reserve regards its policy as counter-cyclical despite the fact that the monetary base and the money supply (currency plus demand deposits) grow at a greater rate during periods of economic expansion and a lower rate during recessions." Brunner (1975*a*, p.12) elaborates on this point in his March 1975 SOMC position paper:

> An interest target policy misleads monetary authorities and many spectators to believe that expansive (or restrictive) actions have been initiated when nothing has been done or even worse, when actually restrictive measures have been introduced. A decline in interest rates resulting from falling credit demand possesses no expansionary meaning and simply reflects one aspect of the ongoing deflationary process. Its interpretation as an expansive action by the Fed is a dangerous illusion obstructing the useful application of actually expansive policies.

The SOMC also argued frequently that interest rate targeting procedures made it difficult for the Fed to begin lowering interest rates as business activity weakened at the onset of recessions and to begin raising interest rates to prevent inflation from rising at the start of economic recoveries. Inertia around business cycle turning points was followed by overreaction later on, generating a "stop-go" pattern of monetary policy that amplified fluctuations instead of

stabilizing the economy. As William Poole (1990, p.63) explains, the problem of interest rate smoothing is both economic and political:

> The problem the Fed faces in keeping money growth on track is one of its own making – its policy of maintaining the federal funds rate in a very narrow band. … The narrow fed funds band has both economic and political disadvantages. The economic problem is that when economic conditions change the Fed sometimes has difficulty in adjusting the rate quickly enough to keep money growth from becoming procyclical. … The political problem … is that everyone knows that the Fed is directly and immediately responsible for changes in the federal funds rate and almost as directly responsible for money market rates tied closely to the funds rate. … People damaged by a rate change have a perfectly natural reaction = "why me?" … The Fed has no way to answer such a question because the timing of the Fed's rate changes in inherently arbitrary.

Critics of the SOMC's preferred alternative to federal funds rate targeting – setting pre-announced targets for the growth rate of the monetary base instead – often argue that this change would allow for harmful and avoidable volatility in market rates of interest. Brunner (1981, p.78) acknowledges, but then downplays the relevance of, these concerns:

> Under a policy of monetary control ongoing shocks are unavoidably absorbed and reflected by interest rates. This will indeed produce some volatility. But the nature of this volatility need be more carefully examined. Transitory shocks will be reflected by a volatile pattern of shortest and short rates with little, if any, spillover to intermediate or long term rates. Permanent shocks also affect interest rates and contribute to generate movements over the whole term structure. The crucial condition requiring our attention at this point is the fact that these movements in interest rates generated by permanent shocks operating beyond the money market cannot be removed by an interest target policy. The latter converts these shocks into permanent accelerations (or decelerations) via monetary accommodation into corresponding accelerations (or decelerations) in the price-level and matching adjustments in the level of nominal interest rates. The uncertainty about the timing and magnitude of monetary accommodation, augmented by the uncertainty of a change in policy, tends however to produce a larger volatility of interest rates in response to permanent shocks under an interest targeting regime than under a regime of monetary control. The social cost of volatile short rates reflecting ongoing transitory shocks seems in my judgment small compared to the social cost imposed on the economy by the alternative policy.

As noted above and as Hetzel (2024) explains in more detail, New Keynesian models such as Goodfriend and King's (1997) provide contemporary re-statements of the traditional monetarist principles on the stability of the free market economy, the primary importance of monetary policy is stabilizing the aggregate nominal price level, and the distinction between shocks to aggregate supply, which affect both the actual and natural rates of output, and shocks to aggregate demand, which lead to gaps between the actual and natural levels of output. Hetzel (2024, p.4) also explains how, by using a monetary policy rule under which the nominal interest rate tracks movements in equilibrium real interest rate – the real interest rate that would prevail in the model's real business cycle core – the central bank can optimally turn "over the determination of real variables to the unfettered operation of the price system" and thereby maintain "the output gap … equal to zero." Galí (2015, p.103) emphasizes this point as well: optimal monetary policy in the New Keynesian model implies that nominal interest rate must track movements in the natural real rate of interest.

While Brunner, Meltzer, and other SOMC members would surely appreciate the elegance of this theoretical result as well as the monetarist arguments for it, they might still express doubts about the ability of the Federal Reserve, in practice, to measure and track precisely movements in the equilibrium real rate. Some indication of this is given by the SOMC's response to Congressional testimony by Fed Chair Alan Greenspan (1993, p.11), which anticipates the New Keynesian proposition by arguing that

> One important guidepost is real interest rates, which have a key bearing on longer-run spending decisions and inflation prospects. In assessing real rates, the central issue is their relationship to an equilibrium interest rate, specifically the real interest rate level that, in maintained, would keep the economy at its production potential over time. Rates persisting above that level, history tells us, tend to be associated with slack, disinflation, and economic stagnation – below that level with eventual resource bottlenecks and rising inflation, which ultimately engenders economic contraction. Maintaining the real rate around its equilibrium

> level should have a stabilizing effect on the economy, directing production towards its long-term potential.

The SOMC (1993, p.4) policy statement that followed counters with

> Analysts have no reliable way to estimate the equilibrium real interest rate, and they cannot measure accurately or in a timely way changes in real interest rates or changes in anticipated inflation. Hence they cannot be certain whether real interest rates are moving toward or away from the equilibrium real interest rate.

An SOMC position paper by William Poole elaborates, before concluding (Poole 1993, pp.85-6):

> At the present state of knowledge, there is no possibility that the Fed will be able to announce an informative quantitative target for the real interest rate that will provide useful information to the market. … The Fed should, I believe, reinforce the message of the value of monetary aggregates targets … and should downplay the usefulness of the real interest rate as a guide to policy.

The SOMC's arguments against using an interest rate rule to track movements in the equilibrium real rate anticipate the difficulties that Powell (2018, p.4) describes with reference to "the stars:"

> For example, u* (pronounced "u star") is the natural rate of unemployment, r* ("r star") is the neutral real rate of interest, and π* ("pi star") is the inflation objective. According to the conventional thinking, policymakers should navigate by these stars. … Guiding policy by the stars in practice, however, has been quite challenging of late because our best assessments of the location of the starts have been changing significantly.

In contrast to Poole (1993), however, Powell (2018, p.11) ultimately expresses confidence in the Fed's ability to "visualize and manage" the "risks from misperceiving the stars."

It seems quite fair to say, therefore, that the SOMC's various objections to interest rate targeting have had little or no long-run impact on the consensus of academic economists or on the implementation of monetary policy by the Fed. Sargent and Wallace's (1975) early result, showing that under the rational expectations hypothesis, a monetary policy that pegs the nominal interest rate fails to pin down a determinate price level, might be interpreted as supporting the SOMC's arguments linking interest rate targeting to nominal instability. But Bennett McCallum

(1981), who would later join the SOMC, qualifies this result importantly by showing that price-level determinacy under an interest rate rule is restored when the rule includes a term through which the interest rate target responds to changes in the money stock or the price level.[3] Building on this insight, Clarida, Galí, and Gertler (2000) compare interest rate rules estimated with data pre and post-1979 to blame macroeconomic volatility during the earlier period on the Fed's insufficient willingness to adjust its interest rate targets in response to changes in inflation and to give credit for the greater macroeconomic stability during the later period to the Fed's more vigorous interest rate response to inflation. Their results reinforce Taylor's (1993, 1999) arguments that successful monetary policy can be implemented with an interest rate instrument, provided the interest rate rule prescribes a sufficiently strong response to inflation. The SOMC, via a position paper by Robert Rasche (1992, p.98), recognizes this point as well:

> The singular distinction between the present funds rate operating procedure and that of the 1970s is that the current FOMC appears to be much more aggressive about implementing changes in the funds rate target, and hence the operating procedure is not characterized by the inertia of the 1970s.

Meanwhile, although from 1979 through 1982 the Federal Reserve briefly but publicly abandoned strict interest rate targeting in favor of procedures focused on bank reserves, Cook (1989) and Gilbert (1994) argue that, even during this period, many policy actions were nevertheless directed towards influencing the federal funds rate. And, as discussed by Thornton (2006), the Fed in 1982 returned to federal funds rate targeting, a practice it continues today.

Similarly, there has been absolutely no convergence between the SOMC and the mainstream on the issue of money demand stability. Instead, two highly influential papers from the same volume of the *American Economic Review* – Bernanke and Blinder (1992) and

[3] McCallum (1986) also credits Parkin (1978) with this insight.

Friedman and Kuttner (1992) – argue that money demand equations and other statistical relationships linking the monetary aggregates to key macroeconomic variables break down when estimated with data starting in the early 1980s. Those same studies find, by contrast, that the federal funds rate and other short-term interest rates have much stronger predictive power for income and prices, especially in the post-1980s data. Research on money demand, both inside and outside the Fed, has largely ceased since the publication of the fourth and last edition of David Laidler's (1993) volume surveying the field.

Most recently and as discussed in more detail below, the monetary base expanded dramatically during and after the financial crisis and Great Recession of 2008-9 without kindling a noticeable acceleration in nominal income growth, leading many observers to conclude that whatever links between money, income, and prices may have been seen in the past have now disappeared altogether. Federal Reserve Chair Jerome Powell's (2021, p.24) response to Senator John Kennedy in Congressional testimony summarizes quite nicely the beliefs of most economists and central bankers today:

> Well, when you and I studied economics a million years ago, M2 and monetary aggregates seemed to have a relationship to economic growth. Right now, I would say the growth of M2, which is quite substantial, does not really have important implications for the economic outlook. M2 was removed some years ago from the standard list of leading indicators, and just that classic relationship between monetary aggregates and economic growth and the size of the economy, it just no longer holds. We have had big growth of monetary aggregates at various times without inflation, so [it's] something we have to unlearn, I guess.

Against this backdrop, whether the money stock can be accurately controlled, as Poole, Rasche, and Wheelock's (2013) last SOMC principle asserts, becomes irrelevant: the Fed wouldn't want to control the money stock, even if it could do so perfectly.

Thus, Poole, Rasche, and Wheelock (2013, p.71) conclude their review by noting that while "many aspects of the SOMC policy framework are now widely accepted," "today there are

few proponents of money supply rules." And in commenting on their paper, Romer (2013, p.108) admits that "reading the authors' chapter, I was struck by the overwhelming sense that 1970s monetarism would have been very sensible if it weren't for all this silly stuff about money." It remains necessary, therefore, to work harder to make sense of the SOMC's money-based operational approach and to ask again if this approach has any relevance for monetary policymaking today.

The SOMC's Money-Based Operational Approach

Throughout the 1970s, the SOMC urged the Federal Reserve to gradually reduce the rate of money growth along a pre-announced path until it reached a level consistent with price stability. The SOMC's (1978*a*, p.3) policy rule for this period is described most succinctly in its March 1978 policy statement: "we recommend reductions of 1% per year in the average rate of monetary expansion until a noninflationary rate … is achieved." But the rationale for the general approach – involving a gradual, pre-announced deceleration of money growth – is spelled out clearly from the start, in SOMC (1973, pp.9-10):

> There are costs of maintaining inflation and costs of ending inflation, but there is no way to end inflation easily or without cost. Sharp and sudden swings between extremes, attempts to break expectations, false promises, ringing statements of commitment to anti-inflationary policy and controls have not succeeded during the past eight years. Less dramatic policies will cost less and will, perhaps, be more effective. They are unlikely to be less effective.

A number of the SOMC's core beliefs listed by Poole, Rasche, and Wheelock (2013) underlie this view: that inflation is a monetary phenomenon, that monetary policy should focus on price stability, that the cost of disinflation reflects the monetary authority's credibility, and that policy should be rules based and transparent. But the SOMC rule also reflects the view that money

growth serves more reliably than interest rates in indicating the stance of monetary policy – a theme that, again, can be traced back to Brunner and Meltzer (1968).

Poole, Rasche, and Wheelock (2013, pp.94-104) and Romer (2013, pp.111-2) observe that the specific numerical targets for money growth recommended in SOMC policy statements fluctuate noticeably from meeting to meeting. For instance, in September 1973 the SOMC recommended 5 1/2 percent money growth, in September 1976 the target fell to 4 percent, and in March 1978 it rose to 6 percent. These fluctuations, however, do not represent discretionary deviations from the SOMC's preferred rule. Instead, they reflect the Committee's consistent application of the same rule – a deliberate but graduate moderation in the rate of money growth – starting from initial conditions that shifted over time as the Fed by contrast continued to allow for volatility in the rates of money growth and inflation. Meltzer (2000, p.124) explains:

> … problems arose very early in our experience. First , the Federal Reserve did not follow our recommendations. As proponents of gradualism, we had to either propose a large correction or rebase our recommendation in light of what had happened. We almost always chose the latter course.

Similarly, from 1973 through 1978, the SOMC's money growth targets typically refer to M1, although policy statements and position papers occasionally cite growth-rate figures for the monetary base as well. Rather than arbitrary oscillations between different measures of money, this reflects consistent application of a monetary policy framework that uses the base as its instrument and M1 growth as an intermediate target. As Brunner (1974*a*, pp.4,7) explains, "the monetary base effectively summarizes the behavior of the monetary authorities." This central bank behavior – as reflected in the monetary base – "is clearly visible" in M1 even "within shorter horizons," but "dominates beyond the shorter horizons the evolution" of M1 growth. The

SOMC's statistical work supporting this approach, initiated by Brunner (1974*a*), continues with Johannes and Rasche (1980*a*, 1980*b*).[4]

Beginning in Fall 1978, however, the SOMC shifted its emphasis away from M1 and towards the monetary base. This shift reflects concerns (SOMC 1978*b*, p.4) that regulatory changes and financial innovations could potentially make variations in M1 growth misleading signals of the monetary policy stance. At that time, growth in the dollar volume of funds held by the public in newly-introduced, interest-bearing but still highly liquid assets – especially NOW accounts and money market mutual fund shares – began to blur the distinction between checking and savings deposits reflected traditionally by the definitions of M1 and M2. In response to those same changes, in fact, the Federal Reserve soon redefined its monetary aggregates as described by Simpson (1980), introducing two variants of M1, labelled M1-A and M1-B, with NOW accounts included in the latter but not the former, in addition to modifying the range of assets included in M2 and M3. Addressing the problem, Brunner (1982, p.16) concludes: "in the context of unresolved or unattended measurement problems for both M1 and M2 … monetary policymakers should provisionally target the monetary base."

The SOMC's search for a replacement of M1 as a suitable intermediate target for policy continued into the 1990s. For a brief period in 1990 and 1991, SOMC policy statements set recommended growth rates for M2, comparing these to the Federal Reserve's own announced targets (Poole, Rasche, and Wheelock 2013, pp.100-1). But continuing financial innovations, discussed by Duca (2000), Bachmeier and Swanson (2005), and Carlson, Hoffman, Keen, and Rasche (2005), began to distort the M2 figures as well. In response, Poole (1991) argues, first,

[4] James Johannes and Robert Rasche regularly provided money multiplier forecasts to support SOMC discussions via position papers throughout the early-to-mid-1980s. Their research on this topic culminates in a monograph: Rasche and Johannes (1987).

for a modification he calls "M2-ST" (pronounced "M2 minus ST") that subtracts small time deposits from M2. Poole (1992) then calls for a further modification, also suggested by Motley (1988), that adds institutional money market mutual fund shares and names this preferred monetary aggregate "MZM" for "money zero maturity." Poole (1994, p.104) traces the organizing principle behind MZM back to the empirical definition of money suggested by Friedman and Schwartz (1963): "currency plus all assets convertible on demand and at par (that is, without penalty)."

Thus, while the SOMC consistently favored a policy with the monetary base as its instrument, the Committee struggled to find an appropriate broader monetary aggregate for use as an intermediate target, switching over time from M1 to M2 and then MZM. Rasche (1992, p.97) laments, "at a quick glance, the behavior of various monetary aggregates in the recent past is quite bewildering." This problem – of finding the "right" monetary aggregate – will be returned to below.

Though it was cast in terms of the monetary base more frequently than a broader monetary aggregate, the SOMC's preferred monetary policy rule resembles Friedman's (1960) more closely than Taylor's (1993), not only because it focuses on the money stock instead of the interest rate but also because, apart from issues relating to the transition from inflationary initial conditions to price stability in steady state, it eschews any feedback from economic conditions to its prescribed policy actions. The SOMC's arguments against the use of a more activist feedback rule echo Friedman's as well. Friedman (1960, p.87) emphasizes that because "monetary changes have their effect after a considerable lag and over a long period and that the lag is rather variable," departures from his constant money growth rate rule are more likely to be destabilizing than stabilizing. Similarly, SOMC members frequently argued that policymakers

lack the timely information and detailed knowledge of the economy's structure that would allow them to successfully implement more activist policies.

Brunner (1982, pp.16-7) uses the incomplete information argument to explain why monetary policy should focus on controlling money growth, instead of nominal income or the price level directly:

> Monetary control is not exercised for its own sake. It is an instrument used to influence the behavior of the price level or of the nominal growth national product. A strategy of monetary control manipulates an intermediate magnitude as a means to influence the behavior of an ultimate target. It is claimed on occasion that this intermediate targeting is inefficient. A "final targeting" is offered as a more efficient strategy. Monetary policy should directly control the nominal gross national product. Analytic elaborations of this idea which postulate a direct control of nominal GNP by the authorities, in the sense of a special action which can immediately fix this magnitude, are hardly worth any discussion. A more relevant approach argues that an economic structure, defined by a model, implies a unique relation between policy instruments and nominal GDP. No intermediate target is needed. On the contrary, it can be shown that, given the model, the use of intermediate targeting is in general an inferior procedure. This argument depends however crucially on the assumption of full and reliable information expressed by the model. This assumption still belongs at this stage to Never-Never Land. Controlling GNP on the basis of misconceived beliefs about the details of the economy's response structure involves substantial risks of a destabilizing activist policy pattern.

The September 1983 policy statement (SOMC 1983, p.3) makes the same point more concisely:

> Targets for nominal GNP growth have been proposed as an alternative to monetary targets. The idea is that the Federal Reserve would adjust the growth of money to achieve targets for GNP growth. We find no merit in proposals of this kind. They would increase economic instability and make money growth even more unstable than under current procedures.

Likewise, Brunner (1984) compares a "price rule" that adjusts the growth rate of the money supply to target the price level with a "quantity rule" that simply fixes the growth rate of money. He concedes (Brunner 1984, p.15) that while quantity rule "avoids potential risks," it also "sacrifices potential gains of performance." But he also emphasizes that the "risks are real and the potential gains in the absence of adequate knowledge somewhat illusory."

Eventually, however, even the SOMC gave up on constant money growth rate rules. The September 1991 Policy Statement (SOMC 1991, p.5) explains:

> For many years, we advocated and cited growth of the monetary base as the most reliable measure of Federal Reserve actions. In spring 1990, we realized that growth of the base was distorted by large increases in currency to meet demands for a relatively stable and generally acceptable money in Eastern Europe and Latin America. These distortions continue to affect the level of the monetary base but no longer substantially affect its current growth rate. Our calculations show that the annual growth of the monetary base for the year to date has remained in a range of 5 percent to 6 percent after correcting for past distortions. … The Federal Reserve should maintain growth of the monetary base within this range next year, excluding changes in demand for U.S. currency from the Soviet republics, Eastern Europe, Latin America or elsewhere, which should be accommodated.

Two years later, Allan Meltzer (1993) presented a SOMC position paper that introduced a simple formula for computing a target rate of growth for the monetary base, adaptively correcting for all changes in base velocity, not just those caused by increases in foreign holdings of US currency, and adjusting for changes in real GDP growth as well. According to this new rule, year-over-year growth of the monetary base gets set equal to 2 percent plus the three-year average of real GDP growth minus the three-year average of base velocity growth. The rule is thereby constructed to achieve 2 percent inflation on average, but also seeks to achieve modest stabilization objectives. According to Meltzer (1987, pp.12-3):

> The three year moving average gives time to learn whether shocks are permanent or transitory. It provides for faster money growth relative to output in a cyclical recession and slower money growth relative to output in a cyclical expansion. Money growth adjusts to maintained changes in the growth rate of output or in the growth rate of monetary velocity. The rule does not rely on forecasts. Unlike a rule prescribing a fixed rate of money growth, the proposed rule keeps the expected price level constant.

Personnel changes also affected the nature and range of policy rules consulted by the SOMC. In November 2000 (SOMC 2000), Allan Meltzer retired both as member and chair of Committee. Charles Plosser and Anna Schwartz became co-chairs, and Bennett McCallum

joined as a new member. Not surprisingly, starting in November 2002, SOMC Policy Statements began referring to the prescriptions of the monetary policy rule proposed by McCallum (1987, 1988).[5] Like Meltzer's, the McCallum rule provides a target for the growth rate of the monetary base that adjusts, adaptively, to past changes in base velocity. Slightly different from Meltzer's, the McCallum rule prescribes a quarter-to-quarter growth rate for the monetary base and uses a four-year average of base velocity to adjust for shifts in currency and reserves demand. A more substantial distinction between the two rules comes, however, through McCallum's inclusion of an additional feedback term through which the prescribed rate of base growth would increase or decrease as nominal income fell below or rose above a target level. McCallum's (1988) experiments using a range of small-scale macroeconomic models led him to prefer a rule that placed a modest but still significant weight on this additional feedback term, marking a further departure from the constant money growth rule.

Beginning in November 2002, the SOMC's Policy Statements (e.g., SOMC 2002) also began referring to the settings for the federal funds rate prescribed by the Taylor (1993) rule. This might be regarded as surprising, given the SOMC's longstanding objections to the Federal Reserve's interest-rate targeting procedures. As noted above, however, McCallum's (1981, 1986) earlier research suggested that the problem with those procedures was not so much that they used an interest rate instrument but that they failed to adjust the interest rate instrument with sufficient speed and vigor in response to changes in inflation – a critical distinction recognized later by Rasche (1992) and illustrated in more detail by Clarida, Galí, and Gertler (2000). In fact, the Taylor rule embodies what Woodford (2003, p.40) calls the "Taylor principle," that is, the guideline that the interest rate must rise more than proportionally to a change in inflation to

[5] See, for example, SOMC (2002, pp.1-3) and SOMC (2003, pp.2-3).

preserve the stability of inflation around its long-run target. McCallum's (2006) SOMC Position Paper uses both his own rule and Taylor's to evaluate federal reserve policy under Chair Alan Greenspan. With studies like his, the SOMC continued to argue for the usefulness of policy rules for the monetary base, even as it recognized the value of the Taylor rule as well.

Evidence of Money's Continued Relevance Today

Problems with the SOMC's reliance on M1 both as an indicator of the Fed's monetary policy stance and as an intermediate target within the Committee's preferred strategic framework arose in the early 1980s when financial innovations and regulatory changes blurred the distinction between non-interest-bearing demand deposits in M1 and interest-bearing savings deposits in M2. These problems intensified in 1983 and 1984, when observations of extremely rapid M1 growth led the SOMC to warn of a return to higher rates of inflation that, fortunately, never materialized. Meltzer (2000, p.126) recounts

> … the monetarist mistake was the failure to forecast the decline in inflation from 10.9% in 1981 to 3.2% in 1983 and 4.3% in 1984 …. Money growth in 1983 and 1984 averaged 9%.

Milton Friedman (1984, p.400) makes the same "monetarist mistake" in expressing these concerns:

> The increased rate of monetary growth in the 1981-93 biennium suggests that we have passed the trough in inflation and that inflation will be decidedly higher from 1983 to 1985 than it was from 1981 to 1983.

As Laidler (2024, p.8) emphasizes, "this widely publicized and erroneous prediction of the imminent reappearance of double digit inflation … did much to undermine the empirical case for basing monetary policy on control of the money supply, even among interested lay observers."

Around this same time, however, Barnett (1980) demonstrated how economic aggregation and statistical index number theory could be used to construct more accurate measures of the money supply in circumstances – exactly like those that have prevailed in the US since the early 1980s – in which consumers derive liquidity services from a range of assets that pay interest at different rates and substitute imperfectly for one another in their portfolios. Barnett's preferred "Divisia" monetary aggregates assign different weights to these different assets based on the spreads between the interest rate on an illiquid "benchmark" asset and the interest rates paid on the liquid assets themselves.

Figure 2 compares the growth rates of the Federal Reserve's official "simple-sum" M1 and M2 aggregates to the corresponding Divisia aggregates.[6] Most notably, the Divisia aggregates signal a much sharper monetary contraction, not only during 1983-4 episode but throughout the years of the Volcker disinflation. Barnett (2012, pp.102-11) discusses this episode, concluding (p.111) that "Friedman's error resulted from his use of the Fed's official simple-sum monetary aggregates, which greatly distorted what had happened to the economy's monetary service flow."

Chrystal and MacDonald (1994, p.76) coin the term "Barnett critique" to refer to the broader set of findings suggesting that "problems with tests of money in the economy in recent years may be more due to bad measurement theory rather than to an instability in the link between the true money and the economy." Belongia (1996), Hendrickson (2014), and Belongia and Ireland (2016) provide illustrations of this critique, by showing that results from Bernanke

[6] All data series used in this study come from the Federal Reserve Bank of St. Louis' FRED database at https://fred.stlouisfed.org/, except those for the Divisia monetary aggregates, which are described by Barnett, Liu, Mattson, and van den Noort (2013) and are available from the Center for Financial Stability at https://centerforfinancialstability.org/amfm_data.php.

and Blinder (1992), Friedman and Kuttner (1992), and related studies suggesting instability in money demand and weakness in other statistical relationships between the money stock and measures of aggregate prices and income are frequently reversed when Divisia aggregates replace simple sums in their analyses.

More recently, the usefulness of quantity-theoretic approaches to monetary policy evaluation appears to have been cast in strong doubt by the experience during and after the financial crisis and Great Recession of 2007-9 when, as noted above, the monetary base increased by a factor of four without generating anything close to a proportional increase in nominal income or the price level. However, a quick look at the data together with a small amount of reflection reveal that this conclusion is not as immediate and obvious as many seem to think.

First, as the top panel of figure 3 shows, a substantial fraction of this increase in the monetary base occurred during a very narrow interval at the height of the financial crisis in late 2008. As emphasized by Walter and Courtois (2009) and Ireland (2019), the Federal Reserve began paying interest on bank reserves during this time, precisely so that the huge increase in reserves required by the expansion of its emergency lending programs following the failure of Lehman Brothers and AIG would *not* put further downward pressure on the federal funds rate and thereby add to inflationary pressures. The approximate doubling of the monetary base in 2008 is, therefore, best interpreted as reflecting rightward shifts in both the demand for and supply of bank reserves that left the stance of monetary policy approximately unchanged.

It remains true that the monetary base expanded rapidly again as the Fed implemented two more waves of quantitative easing in from 2009 through 2014. Allowing for the subsequent years of "quantitative tightening," however, the base just about doubled, from $1.7 trillion in

January 2009 to $3.3 trillion in January 2019.[7] In absolute terms this increase appears large, but it occurred over a period spanning an entire decade, long enough for the power of compounding to kick in. When expressed as an annualized growth rate, the increase amounts just slightly less than 7 percent on average over 2009-19: somewhat rapid to be sure but, as Belongia and Ireland (2024) emphasize, not out of line with postwar historical experience and certainly quite far from hyperinflationary.

Further evidence that the 2008 increase in the supply of base money was largely "sterilized," as Walter and Courtois (2009, p.2) put it, by a corresponding shift in the demand for reserves appears in the remaining two panels of figure 3, which reveal that neither simple-sum nor Divisia M2 growth accelerated persistently between 2008 and 2019. By contrast, M2 growth did surge during the period of zero interest rates and quantitative easing in 2020-21, presaging the unwanted inflation that followed. Reynard (2023) examines these and several other episodes of central bank balance sheet expansion in the US, Japan, and Argentina and finds that consistently, rapid growth of base money gets followed by more rapid inflation only when broad money growth accelerates as well.

These observations point to the need, first, to measure the money stock as accurately as possible and, second, to control for slow-moving trends in money demand when looking for quantity-theoretic links between money growth and nominal spending. As noted above, the SOMC gradually reached the same conclusions post-1980, through Poole's (1991, 1992, 1994)

[7] These figures refer to the monetary base as reported by the Federal Reserve Board of Governors. The SOMC typically referred to an alternative measure of the monetary base, adjusted for changes in reserve requirements by the St. Louis Federal Reserve Bank. Both of these measures of the monetary base are examined in more detail below, but since the St. Louis Fed discontinued its series in 2019, the graph in figure 3 – running through 2024 – uses the Board of Governors' measure instead.

work developing the MZM aggregate as an alternative to the Federal Reserve's M1 and M2 and through Meltzer's (1987, 1993) and McCallum's (1987, 1988, 2006) work with monetary policy rules that adapt to shifts in base velocity. These ideas have been used, most recently, by Belongia and Ireland (2015, 2017, 2022) and Ireland (2023, 2024*b*, 2024*c*) to confirm the continued relevance of measures of money within a strategic framework directed at achieving and maintaining aggregate price stability.[8]

This work extends the P-star model, which was developed by researchers at the Federal Reserve in the late 1980s at the request of then-Chair Alan Greenspan and presented to an academic audience via an article in the *American Economic Review* by Hallman, Porter, and Small (1991). As emphasized by Ireland (2023), these facts are not just trivia. They serve as reminders that empirical work exploring quantity-theoretic linkages between monetary aggregates and the price level *were* once of at least some interest to top policymakers and their advisors at the Fed and to academic economists as well.

The original P-star model takes as its starting point the equation of exchange

$$M_t V_t = P_t Y_t, \tag{1}$$

where M_t denotes the money stock, V_t monetary velocity, P_t the aggregate nominal price level, and Y_t real GDP. Of course, (1) holds as an identity, by virtue of the definition of velocity as nominal GDP $P_t Y_t$ divided by the money stock M_t. The P-star model gives the equation testable implications and predictive power, however, by making assumptions about the behavior of velocity and real GDP. To accomplish this, Hallman, Porter, and Small rewrite (1) to define the variable – "P-star" – that gives their model its name:

[8] Much of the analysis that follows draws on and extends that from Ireland (2024*c*).

$$P_t^* = \frac{M_t V_t^*}{Y_t^*}. \qquad (2)$$

In (2), V_t^* and Y_t^* denote the "natural," "equilibrium," or "trend" levels to which velocity and real GDP are expected to return in the long run. Both can vary over time, V_t^* because of persistent shifts in the demand for money relative to other assets, including those resulting from financial innovations and regulatory changes like those that affected M1 velocity in the early 1980s and M2 velocity in the early 1990s, and Y_t^* because of technological changes that generate fluctuations in the rate of long-run economic growth. The variable P_t^* then has the interpretation as the level to which aggregate prices will converge, given the current level of the money stock, as velocity and real GDP return to their own long-run levels.

Consistent with the quantity theory of money, therefore, the P-star model allows increases in the money supply to be held temporarily as excess cash balances, thereby lowering velocity, or to temporarily stimulate spending, thereby increasing real GDP, in the short run. The model implies, however, that as these effects wear off in the long run, any change in the money stock will be matched by a proportional change in the aggregate price level.[9]

Hallman, Porter, and Small (1991) test the P-star model with the regression equation

$$\Delta\pi_t = \alpha + \beta_1 \Delta\pi_{t-1} + \beta_2 \Delta\pi_{t-2} + \beta_3 \Delta\pi_{t-3} + \beta_4 \Delta\pi_{t-4} + \gamma(p_{t-1}^* - p_{t-1}) + \varepsilon_t, \qquad (3)$$

where $\pi_t = 400[\ln(P_t) - \ln(P_{t-1})]$ denotes the quarterly inflation rate, expressed in annualized percentage-point terms, $\Delta\pi_t = \pi_t - \pi_{t-1}$ denotes the corresponding change in inflation, the lagged "price gap" variable $p_{t-1}^* - p_{t-1} = 100[\ln(P_{t-1}^*) - \ln(P_{t-1})]$ is the percentage-point deviation of the equilibrium price level from the actual price level, and the regression error ε_t is

[9] Humphrey (1989) discusses the P-star model's quantity-theoretic foundations in more detail.

assumed to be uncorrelated with its own lagged values as well as with the other right-hand-side variables in (3).

In (3), a positive and statistically significant estimate of the coefficient γ confirms the model's quantity-theoretic implication that inflation will accelerate when the price gap is positive, as P_t rises to meet P_t^*. Likewise, inflation will decelerate when the price gap is negative. The past changes in inflation included on the right-hand-side of (3) allow the convergence of P_t to P_t^* to take place smoothly and with a longer lag. A positive and statistically significant estimate of γ, therefore, implies that the P-star price gap is a useful indicator of the effects that past money growth will have on future inflation.

Belongia and Ireland (2015, 2017) modify the P-star model to apply to nominal GDP growth instead of inflation and to account for the larger movements in monetary velocity seen in the US since 1980. The modification starts by rewriting the equation of exchange (1) as

$$M_t V_t = Q_t, \tag{4}$$

replacing the aggregate price level of real GDP on the right-hand-side by their product, nominal GDP: $Q_t = P_t Y_t$. Next, the variable "Q-star" gets defined analogously to P-star as

$$Q_t^* = M_t V_t^*. \tag{5}$$

In (5) as in (2), V_t^* represents the equilibrium level of velocity. Therefore, Q_t^* is the equilibrium level of nominal GDP implied by the current level of the money stock, to which nominal GDP should converge as velocity returns to its own long-run level.

Comparing (2) and (5) reveals one key advantage of nominal GDP growth over inflation targeting when implemented with reference to the P-star model: nominal GDP targeting does not

require an estimate of the natural rate of output Y_t^*.[10] On the other hand, (5) still requires an estimate of velocity's trend value V_t^*. Hallman, Porter, and Small (1991) selected M2 as their measure of money and took V_t^* to be a constant, since M2 velocity fluctuated around a constant long-run value in quarterly data from 1955 through 1988. This modelling choice, though quite convenient at the time, provide unfortunate when, in the early 1990s, the financial innovations discussed by Duca (2000), Bachmeier and Swanson (2005), and Carlson, Hoffman, Keen, and Rasche (2005) caused M2 velocity to move sharply higher. As discussed further by Orphanides and Porter (2000), this shift in velocity threw the original P-star model's forecasts off track almost immediately after the publication of the Hallman-Porter-Small article.

Belongia and Ireland (2015, 2017) show, however, that movements in equilibrium velocity can be tracked closely by estimates provided by a one-sided version of the Hodrick-Prescott (1997) time-series filter described by Stock and Watson (1999). Essentially, this version of the HP filter uses a long moving average of past values of velocity itself to compute a time-varying estimate of V_t^* similar to those used in Meltzer's (1987, 1993) and McCallum's (1987, 1998, 2006) rules for adjusting a target for monetary base growth for velocity shifts. Importantly, the one-sided filter's use of past data alone means that the model's estimates of V_t^* and Q_t^* can be updated with information available to policymakers in real time.

Figure 4 plots the velocities of both simple-sum and Divisia M2, as well as two measures of the monetary base.[11] The first measure – the St. Louis adjusted monetary base – is the one

[10] For a broader discussion of the problems monetary policymakers face when estimating the natural rate of output, see Orphanides (2001) and Orphanides and van Norden (2002).

[11] When comparing the four panels of figure 4, it is important to note that while simple-sum M2 and both measures of the monetary base are expressed in units of dollars, Divisia M2 is an index number, normalized to equal 100 in the base year of 1967. Thus, unlike the numerical values of base and simple-sum M2 velocity, which measure the dollar value of nominal GDP relative to the

preferred by Meltzer (1993) and McCallum (2006). As its name suggests, this measure was constructed at the Federal Reserve Bank of St. Louis and adjusts for changes in reserve requirements as well as for the retail deposit sweep programs used by banks starting in the mid-1990s to minimize their required reserves.[12] Unfortunately, the St. Louis Fed discontinued this series in the fourth quarter of 2019. Hence, figure 4 also plots the velocity of the monetary base as computed by the Federal Reserve Board over the period since 2009. Unlike the St. Louis measure, the Board's base series is not adjusted for changes in reserve requirements, nor is it seasonally adjusted. The graph in figure 4 reveals, however, that base velocity computed with the Board's measure since 2009 does not appear to contain important seasonal fluctuations.

Each panel of figure 4 compares velocity V_t to the corresponding estimate of V_t^* obtained from the one-sided HP filter.[13] In every case – including, impressively, for the St. Louis base series, which shows a massive decline in velocity in 2008 – movements in V_t^* adapt quickly to changes in velocity itself, raising hopes that, after accounting for movements in trend velocity, the P-star model will remain a useful guide, either in using a broad monetary aggregate like M2 as an intermediate target to achieve a desired path for nominal GDP as suggested by Brunner (1982) or in using the monetary base to directly target nominal GDP as suggested by McCallum (1987, 1988, 2006).

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dollar value of the money stock, the numerical values of Divisia M2 velocity has no special meaning. Instead, the percentage changes in Divisia M2 velocity should be compared to those in simple-sum and base velocity: all measure the growth rates of nominal GDP relative to the corresponding measure of the money stock.

[12] The St. Louis adjusted base series is described by Anderson and Rasche with Loesel (2003). Deposit sweep programs are discussed by Anderson and Rasche (2001).

[13] Applying the filter requires choosing a value for the parameter λ that governs the relative volatilities of the cyclical and trend components; the setting $\lambda = 1600$ used here is the one recommended for quarterly data by Hodrick and Prescott (1997).

To test this hypothesis, the original P-star regression (3) can be replaced by

$$\Delta g_t = \alpha + \beta_1 \Delta g_{t-1} + \beta_2 \Delta g_{t-2} + \beta_3 \Delta g_{t-3} + \beta_4 \Delta g_{t-4} + \gamma(q^*_{t-1} - q_{t-1}) + \varepsilon_t, \qquad (6)$$

where $g_t = 400[\ln(Q_t) - \ln(Q_{t-1})]$ denotes the quarterly growth rate of nominal GDP, expressed in annualized percentage-point terms, $\Delta g_t = g_t - g_{t-1}$ denotes the corresponding change in nominal GDP growth, and the lagged "nominal GDP gap" $q^*_{t-1} - q_{t-1} = 100[\ln(Q^*_{t-1}) - \ln(Q_{t-1})]$ is computed as the percentage-point deviation between the equilibrium and actual levels of nominal GDP. Just as before, a positive and statistically significant estimate of the coefficient γ from (6) implies that the Fed could use its influence over M2 or its direct control of the monetary base to successfully stabilize nominal income and spending. In particular, the Fed could stimulate M2 growth or directly increase the growth rate of the monetary base to increase Q^*_t via (5) and thereby put upward pressure on nominal GDP growth through (6). Likewise, it could act to slow the rate of M2 or monetary base growth, reducing Q^*_t and putting downward pressure on nominal GDP growth.

Table 1 displays results when (6) is estimated with quarterly data on simple-sum and Divisia M2. The longest sample period starts in 1967:1, as determined by the availability of data on Divisia M2, and ends in 2024:1. From that long sample, both estimates of the key parameter γ are large, associating a one-percentage-point nominal GDP gap with an acceleration of nominal GDP growth, one quarter later, of more than half a percentage point. These estimates are both highly significant as well: *p* values less than 0.01 reject the null hypothesis that the coefficient equals zero with an extremely high degree of confidence.

Since, as noted above, the predictive power of broad money growth is widely believed to have weakened after 1980, table 1 also reports estimates of (6) from subsamples of data before and after 1980. Indeed, estimates of γ do decline from around 0.90 before 1980 to about 0.60

after. But even the post-1980 estimates associate the lagged nominal GDP gap with a sizable acceleration in nominal GDP growth. And estimates from both subsamples remain highly significant.

Finally, table 1 zooms in on two recent periods: the first starting in 1980 and running through 2007 and the second covering the period since 2008, when the Federal Reserve's target for the federal funds rate has been repeatedly constrained by the zero lower interest rate bound. The estimates of γ of across these two subsamples show that the effects of broad money growth on nominal GDP have actually become *stronger* since 2008. And while the Barnett critique favoring the use of Divisia over simple-sum monetary aggregates has often been found to be important, none of the results here appears sensitive to the choice between simple-sum and Divisia M2.

Table 2 focuses on estimates of (6) using the two measures of the monetary base. As noted above, base velocity moved sharply lower in 2008, when the Fed began paying interest on bank reserves. Not surprisingly, therefore, the parameter value $\gamma = 0.04$ appears small when estimated with quarterly data on the St. Louis monetary base running from 1967:1 through 2019:3.[14] But even in this case, the *p* value for testing the null hypothesis that this key coefficient equals zero falls below 0.10, rejecting that hypothesis with 90 percent confidence.

Stronger results re-emerge when (6) is estimated with data over separate subsamples, using the St. Louis base measure for periods running from 1967:1 through 1979:4 and from 1980:1 through 2007:4 and using the Federal Reserve Board's measure for a period running from 2009:1 through 2023:4 – thereby allowing for a one-year transition period during which banks

[14] As also noted above, the St. Louis Fed discontinued its series for the adjusted monetary base, so that samples of data using this series must end no later than 2019:3.

adjusted their demand for reserves in response to the Fed's decision to pay interest on reserves. Once more, the estimated value of γ falls after 1980, but remains sizable in both recent periods, associating a one-percentage-point increase in the nominal GDP gap with a quarter percentage-point acceleration in nominal GDP growth one quarter later. And in each of the three subsamples, the estimate of γ retains a high degree of statistical significance.

These results confirm that, while a constant money growth rate rule like that prescribed by the SOMC from the earliest years of its existence is no longer desirable, a modified rule like Meltzer's (1987, 1993) or McCallum's (1987, 1988, 2006) can still serve as a useful alternative to Taylor's (1993), as a benchmark that uses information in measures of the money stock to evaluate the stance – neutral, overly accommodative, or overly restrictive – of the Federal Reserve's monetary policies.

Conclusion: A Final Case Study

A final case study highlights the continued usefulness of the SOMC's preferred approach to monetary policy analysis and evaluation using the monetary base and the broader monetary aggregates. The top left-hand panel of figure 5 plots year-over-year growth in nominal GDP since 2009. The graph shows the extended period of moderate and stable nominal GDP growth extending from 2011 through 2019, the sharp decline in nominal spending during the 2020 economic closures, and the even more dramatic acceleration in nominal GDP growth reflecting the unwanted rise in inflation since 2021.

Most recently, nominal GDP growth has been trending downward. But will this trend continue? To help answer this question, the remaining panels of figure 5 plot the three measures of the nominal GDP gap used, above, in estimating (6) over periods running through the present:

based on simple-sum and Divisia M2 and the Board's measure of the monetary base. Negative values for all three measures show how monetary policy put downward pressure on nominal GDP growth from 2011 through 2019. That the federal funds rate target remained in a range near zero for much of this period should bring back to mind the SOMC's warning that interest rates can be misleading indicators of the monetary policy stance. Strongly positive measures for all three money-based gap measures show, too, how excess money growth propelled nominal GDP growth and inflation higher in 2020 and 2021 – dynamics reminiscent of SOMC descriptions of monetary policy during the 1970s, which emphasized how, by holding interest rates too low for too long during the early stages of economic recovery, the Fed generated procyclical fluctuations in money growth and fueled inflation's rise.

Most recently, however, all three gap measures have moved back into negative territory. These readings confirm that that the interest rate increases implemented by the FOMC in 2022 and 2023 *have* worked, as intended, to greatly reduce inflationary pressures. Recent patterns in money growth help assure us that Federal Reserve policy is now consistent with a return of nominal income growth and inflation to more normal levels. In doing so, they also confirm the continued relevance of the SOMC's arguments for a money-based operational strategy.

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Table 1

Estimated P−star Forecasting Equations for Nominal GDP Using Broad Money

Dependent Variable: Changes in Nominal GDP Growth Δg_t

1967:1 – 2024:1

	Simple−Sum M2			Divisia M2		
	estimate	*t* stat	*p* value	estimate	*t* stat	*p* value
constant	−0.04	−0.14	0.89	−0.03	−0.09	0.92
Δg_{t-1}	−0.84	−13.67	0.00	−0.85	−13.92	0.00
Δg_{t-2}	−0.56	−7.32	0.00	−0.59	−7.62	0.00
Δg_{t-3}	−0.35	−4.58	0.00	−0.37	−4.86	0.00
Δg_{t-4}	−0.17	−2.85	0.00	−0.18	−3.01	0.00
$q^*_{t-1} - q_{t-1}$	0.62	6.28	0.00	0.56	6.30	0.00

1967:1 – 1979:4

	Simple−Sum M2			Divisia M2		
	estimate	*t* stat	*p* value	estimate	*t* stat	*p* value
constant	0.17	0.31	0.76	0.44	0.77	0.45
Δg_{t-1}	−0.93	−6.57	0.00	−0.94	−6.74	0.00
Δg_{t-2}	−0.72	−4.25	0.00	−0.74	−4.45	0.00
Δg_{t-3}	−0.61	−3.61	0.00	−0.64	−3.82	0.00
Δg_{t-4}	−0.21	−1.55	0.13	−0.23	−1.65	0.11
$q^*_{t-1} - q_{t-1}$	0.86	2.82	0.01	0.90	3.02	0.00

1980:1 – 2024:1

	Simple−Sum M2			Divisia M2		
	estimate	*t* stat	*p* value	estimate	*t* stat	*p* value
constant	−0.05	−0.15	0.88	−0.23	−0.63	0.53
Δg_{t-1}	−0.83	−11.89	0.00	−0.84	−12.05	0.00
Δg_{t-2}	−0.52	−5.83	0.00	−0.54	−6.04	0.00
Δg_{t-3}	−0.28	−3.16	0.00	−0.29	−3.37	0.00
Δg_{t-4}	−0.16	−2.28	0.02	−0.16	−2.39	0.02
$q^*_{t-1} - q_{t-1}$	0.60	5.55	0.00	0.54	5.49	0.00

Table 1 (Continued)

Estimated P−star Forecasting Equations for Nominal GDP Using Broad Money

Dependent Variable: Changes in Nominal GDP Growth Δg_t

1980:1 – 2007:4

	Simple−Sum M2			Divisia M2		
	estimate	*t* stat	*p* value	estimate	*t* stat	*p* value
constant	−0.05	−0.20	0.84	−0.19	−0.81	0.42
Δg_{t-1}	−0.51	−5.81	0.00	−0.52	−5.94	0.00
Δg_{t-2}	−0.06	−0.61	0.55	−0.08	−0.83	0.41
Δg_{t-3}	0.03	0.38	0.71	0.01	0.16	0.88
Δg_{t-4}	−0.03	−0.38	0.70	−0.03	−0.40	0.69
$q^*_{t-1} - q_{t-1}$	0.34	2.89	0.00	0.27	2.87	0.01

2008:1 – 2024:1

	Simple−Sum M2			Divisia M2		
	estimate	*t* stat	*p* value	estimate	*t* stat	*p* value
constant	1.20	1.28	0.21	1.25	1.32	0.19
Δg_{t-1}	−0.94	−7.99	0.00	−0.95	−8.01	0.00
Δg_{t-2}	−0.69	−4.45	0.00	−0.70	−4.51	0.00
Δg_{t-3}	−0.44	−2.84	0.01	−0.45	−2.90	0.01
Δg_{t-4}	−0.24	−2.09	0.04	−0.25	−2.14	0.04
$q^*_{t-1} - q_{t-1}$	0.74	3.77	0.00	0.69	3.69	0.00

Table 2

Estimated P−star Forecasting Equations for Nominal GDP Using Base Money

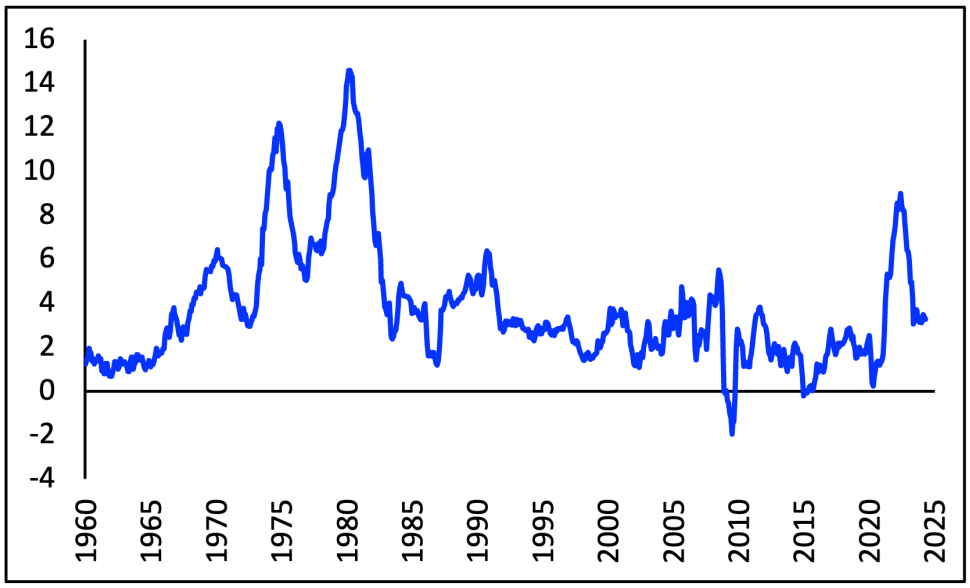
Dependent Variable: Changes in Nominal GDP Growth Δg_t

	St. Louis Adjusted Base 1967:1 – 2019:3			St. Louis Adjusted Base 1967:1 – 1979:4		
	estimate	*t* stat	*p* value	estimate	*t* stat	*p* value
constant	0.00	0.00	1.00	0.45	0.74	0.46
Δg_{t-1}	−0.62	−8.89	0.00	−0.81	−5.36	0.00
Δg_{t-2}	−0.38	−4.78	0.00	−0.57	−3.14	0.00
Δg_{t-3}	−0.28	−3.57	0.00	−0.47	−2.64	0.01
Δg_{t-4}	−0.07	−1.04	0.30	−0.13	−0.90	0.37
$q^*_{t-1} - q_{t-1}$	0.04	1.77	0.08	1.29	2.28	0.03

	St. Louis Adjusted Base 1980:1 – 2007:4			Board of Governors Base 2009:1 – 2024:1		
	estimate	*t* stat	*p* value	estimate	*t* stat	*p* value
constant	−0.07	−0.29	0.77	0.75	0.75	0.46
Δg_{t-1}	−0.51	−5.81	0.00	−0.99	−7.97	0.00
Δg_{t-2}	−0.09	−0.86	0.39	−0.79	−4.75	0.00
Δg_{t-3}	0.00	0.02	0.99	−0.53	−3.19	0.00
Δg_{t-4}	−0.04	−0.56	0.57	−0.29	−2.36	0.02
$q^*_{t-1} - q_{t-1}$	0.26	2.47	0.02	0.27	3.27	0.00

Figure 1

Consumer Price Inflation

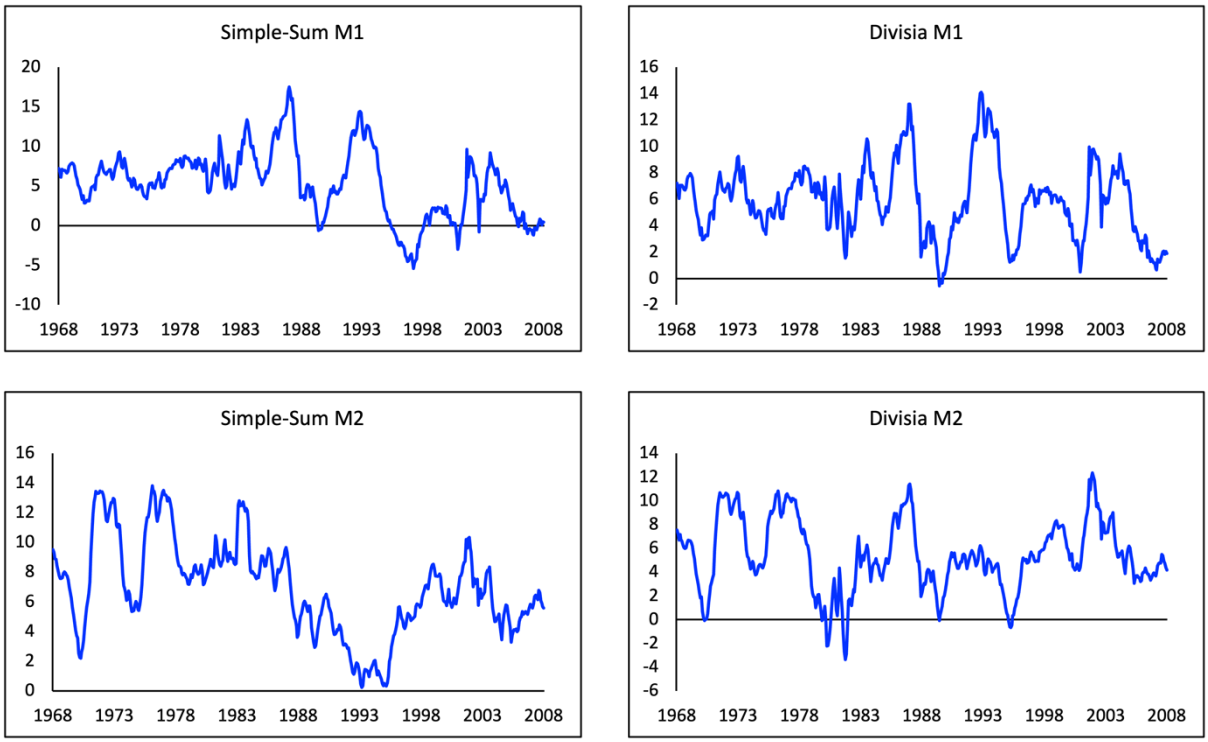


Note: The graph shows year-over-year percentage changes in the consumer price index for all urban consumers.

Source: Federal Reserve Bank of St. Louis Economic Database (FRED).

Figure 2

Simple-Sum versus Divisia Money Growth

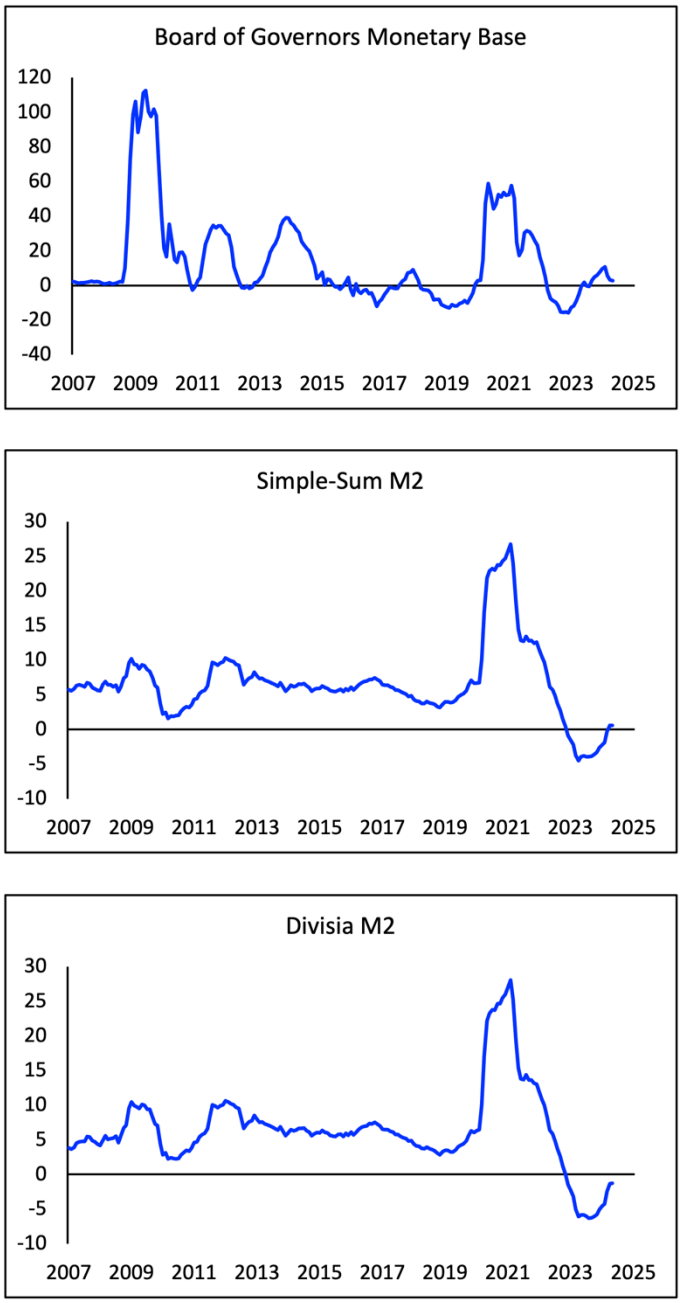


Note: Each panel shows year-over-year percentage changes in the indicated monetary aggregate.

Sources: FRED, Center for Financial Stability (CFS).

Figure 3

Monetary Base and M2 Growth

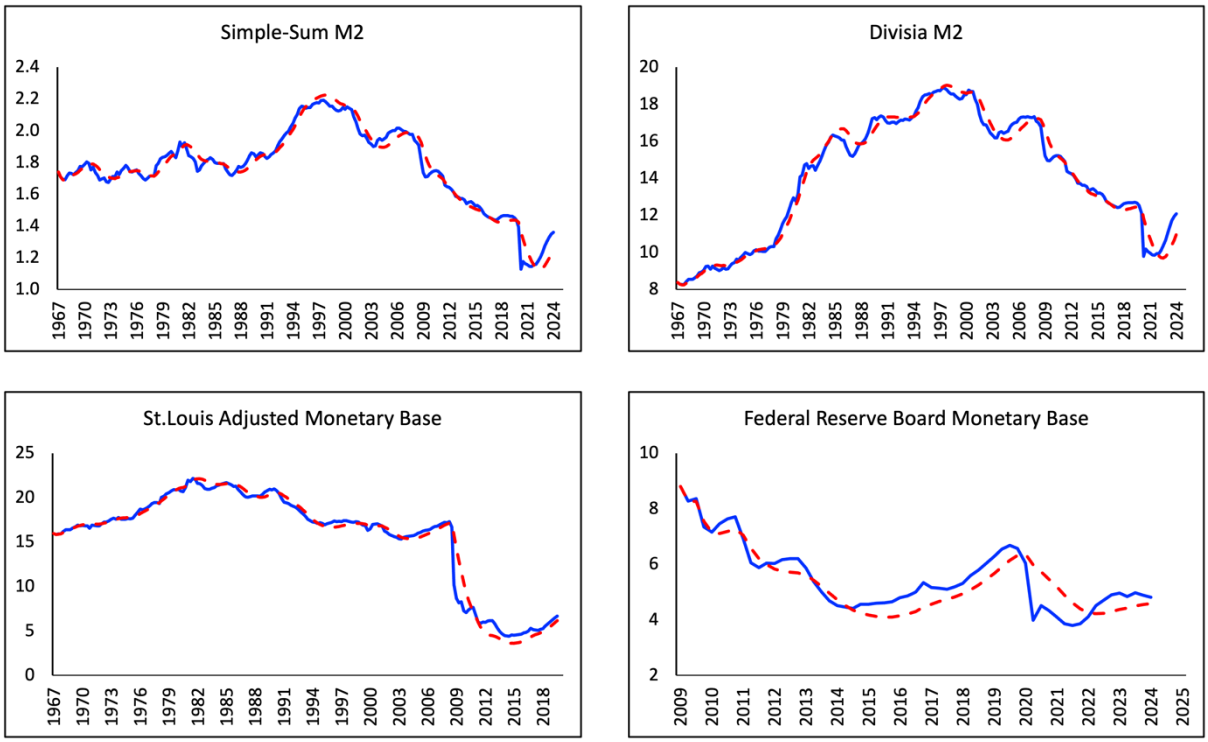


Note: Each panel shows year-over-year percentage changes in the indicated monetary aggregate.

Sources: FRED, CFS.

Figure 4

Velocities of Broad and Base Money

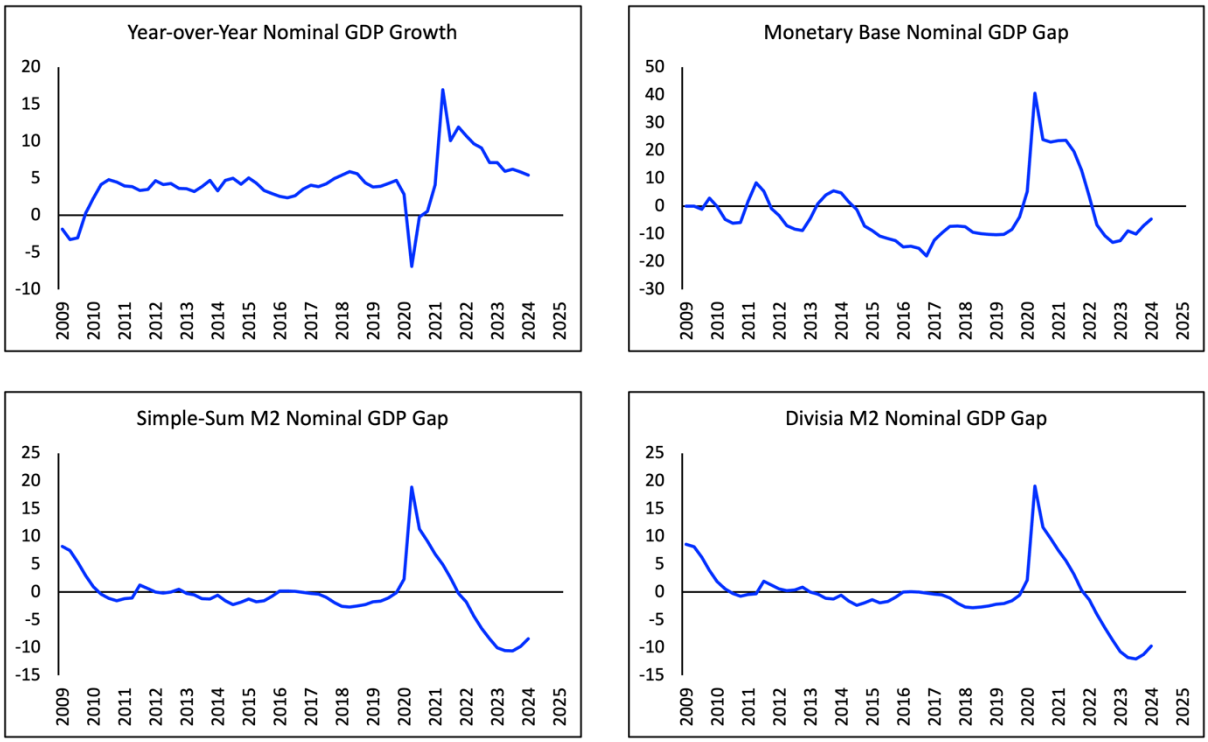


Note: Each panel shows the velocity of the indicated monetary aggregate (solid blue line) together with its equilibrium value, estimated using the one-sided Hodrick-Prescott filter.

Sources: FRED, CFS, author's calculations.

Figure 5

Nominal GDP Growth and Money-Based Nominal GDP Gaps



Note: The top left-hand panel shows year-over-year percentage changes in nominal GDP. The remaining three panels show the nominal GDP gap, in percentage points, computed using the indicated monetary aggregate.

Sources: FRED, CFS, author's calculations.