Does Monetarism Retain Relevance?

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Implicitly, central banks reject the propositions of monetarism. They do not characterize themselves as creators of money but instead emphasize their role in influencing financial intermediation. They do not discuss monetary policy in terms of a rule but instead use the language of discretion. They refer to the low level of interest rates to characterize monetary policy as stimulative despite low rates of growth of money and nominal GDP. The question arises of whether monetarist ideas retain any relevance for central banks.

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The quantity theory and its monetarist variant attribute significant recessions to monetary shocks. The literature in this tradition documents the association of monetary and real disorder.[1] By associating the occurrence of monetary disorder with central bank behavior that undercuts the working of the price system, quantity theorists argue for a direction of causation running from monetary disorder to real disorder.[2] These correlations are robust in that they hold under a variety of different monetary arrangements and historical circumstances.

Nevertheless, correlations, no matter how robust, do not substitute for a model. As Lucas (2001) said, "Economic theory is mathematics. Everything else is just pictures and talk." While quantity theorists have emphasized the importance of testable implications, they have yet to place their arguments within the standard workhorse framework of macroeconomics—the dynamic, stochastic, general equilibrium (DSGE) model. This article asks whether the quantity theory tradition, which is long on empirical observation but short on deep theoretical foundations, retains relevance for current debates.

Another problem for the quantity theory tradition is the implicit rejection by central banks of its principles. Quantity theorists argue that the central bank is responsible for the control of inflation. It is true that at its January 2012 meeting, the Federal Open Market Committee (FOMC) adopted an inflation target. However, the FOMC did not accompany its announcement with quantity-theoretic language. Quantity theorists argue that the reason central banks are responsible for inflation is their power over money creation not any influence over conditions in financial markets (intermediation

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[1] Two examples of discussion of monetarist ideas are Laidler (1981) and Mayer(1999).

[2] For example, Milton and Rose Friedman (1980) wrote:

> In one respect the [Federal Reserve] System has remained completely consistent throughout. It blames all problems on external influences beyond its control and takes credit for any and all favorable circumstances. It thereby continues to promote the myth that the private economy is unstable, while its behavior continues to document the reality that government is today the major source of instability.

between savers and investors). Power over money creation comes from the Fed's monopoly over creation of the monetary base (reserves of commercial banks held as deposits with the Fed and currency held by the nonbank public), which serves as the medium for exercising finality of settlement in payments.

This article summarizes the quantity theory tradition without attempting to exposit a quantity-theoretic model. Section 1 sharpens the issues at stake by briefly summarizing some "red flags" for monetarists concerning the behavior of the monetary aggregates over the past few years. The remaining sections provide an overview of the monetarist tradition, which derives from the longer-run quantity-theory tradition.

1. MONETARIST RED FLAGS

In Europe, the behavior of the monetary aggregates engenders monetarist criticisms. In the United Kingdom, the growth rate of money (broad money or M4) started declining in late 2007 from a level of around 13% and became negative in 2011. In the Eurozone, the growth rate of money (broad money or M3) started declining in late 2007 from a level of around 12%, ceased growing in late 2009 and early 2010, and then steadied at around 3% in 2011.[3] Because monetary velocity (the ratio of nominal GDP to money) exhibits a downward trend in both the United Kingdom and in the Eurozone, the increased money demand reinforces the monetary contraction.

Does this pattern of "high" followed by "low" money growth constitute evidence of go-stop monetary policy? Despite low rates of interest, do the recent low rates of money growth indicate contractionary monetary policy? Does the sustained decline in nominal GDP growth provide evidence of contractionary monetary policy? As elucidated in section 4, the issue is stark. One possibility is that in the monetarist tradition the decline in money growth, nominal GDP growth, and

[3] Figures from Federal Reserve Bank of St. Louis, *International Economic Trends*.

real GDP growth reflects a negative monetary shock and causation going from money to output. Alternatively, the precipitating shock could have been real with causation going from real output to money.

2. THE SPIRIT OF THE QUANTITY THEORY TRADITION

David Hume (1752 [1955]) expressed the kind of empirical correlations used by quantity theorists to support the hypothesis of the short-run nonneutrality of money and longer-run neutrality.

> Lowness of interest is generally ascribed to plenty of money. But…augmentation [in the quantity of money] has no other effect than to heighten the price of labour and commodities…. In the progress toward these changes, the augmentation may have some influence, by exciting industry, but after the prices are settled…it has no manner of influence.
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> [T]hough the high price of commodities be a necessary consequence of the increase of the gold and silver, yet it follows not immediately upon that increase; but some time is required before the money circulates through the whole state…. In my opinion, it is only in this interval of intermediate situation, between the acquisition of money and rise of prices, that the increasing quantity of gold and silver is favourable to industry…. [W]e may conclude that it is of no manner of consequence, with regard to the domestic happiness of a state, whether money be in greater or less quantity. The good policy of the magistrate consists only in keeping it, if possible, still increasing…

Knut Wicksell (1935 [1978], 6) referred to episodes of economic disruption in a paper money standard:

> By means of money (for example by State paper money) it is possible – and indeed this has frequently happened – to destroy large amounts of real capital and to bring the whole economic life of society into hopeless confusion.

Hume was generalizing about the expansionary impact of gold inflows from the New World.[4] Wicksell referred to the inflationary issuance of paper money to finance government deficits. An example often cited in the 19th century was the assignat experience in revolutionary France before Napoleon restored the gold standard (White 1876 [1933]). The Hume and Wicksell references make evident the exogenous origin of money creation. The Bullionist (quantity theorists)/Antibullionist (real bills) debate following the depreciation of the pound when Britain abandoned the gold standard

[4] For references to episodes of deflation, see Humphrey (2004).

during the Napoleonic Wars originated the quantity-theoretic criterion for money creation as an independent force (shock) in the more typical case of a central bank employing an interest-rate target. The quantity theory imputes causality to monetary disturbances based on central bank behavior that flouts the need to provide a nominal anchor and to allow the price system to work. The Bullionists argued that as a consequence of setting its bank rate below the "natural" rate of interest the Bank of England created money, which forced an increase in prices.[5]

Wicksell (1898 [1965], 120, 148, and 189) repeated the Bullionist criticism that inflation (deflation) results if the central bank sets a bank rate that ignores the determination of the real rate of interest by market forces:[6]

> [T]here is a certain level of the average rate of interest which is such that the general level of prices has no tendency to move either upwards or downwards…. Its magnitude is determined

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[5] Thornton 1802 [1939], 255-6 wrote:

> [C]apital ... cannot be suddenly and materially encreased by any emission of paper. That the rate of mercantile profits depends on the quantity of this bona fide capital and not on the amount of the nominal value which an encreased emission of paper may give to it, is a circumstance which it will now be easy to point out.... It seems clear that when the augmented quantity of paper ... shall have produced its full effect in raising the price of goods, the temptation to borrow at five percent. will be exactly the same as before; for the existing paper will then bear only the same proportion to the existing quantity of goods, when sold at the existing prices, which the former paper bore to the former quantity of goods, when sold at the former prices; the power of purchasing will, therefore, be the same; the terms of lending and borrowing must be presumed to be the same; the amount of circulating medium alone will have altered, and it will have simply caused the same goods to pass for a larger quantity of paper.... [T]here can be no reason to believe that even the most liberal extension of bank loans will have the smallest tendency to produce a permanent diminution of the applications to the Bank for discount.

Thomas Joplin (1823 [1970], 258-9) employed the terminology of the "natural" rate of interest. When the loan rate diverges from the natural rate, the money supply changes to the extent that this divergence produces a difference in the saving and investment planned by the public.

For a discussion of the history of the distinction between real and nominal interest rates, see Humphrey (1983). For a discussion of the Bullionist-Antibullionist debate, see Hetzel (1987).

[6] Wicksell's analysis did not incorporate the distinction between the nominal and real interest rate developed by Fisher (1896). Friedman (1968 [1969]) first combined this distinction with the Wicksell analysis.

> by the current level of the natural capital rate and rises and falls with it. If … the average rate of interest is set and maintained *below* this normal level … prices will rise and go on rising.
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> [O]nce the entrepreneurs begin to rely upon this process continuing—as soon, that is to say, as they start reckoning on a future rise in prices—the actual rise will become more and more rapid. In the extreme case in which the expected rise in prices is each time fully discounted, the annual rise in prices will be indefinitely great. (italics in original)
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> If prices rise, the rate of interest is to be raised; and if prices fall, the rate of interest is to be lowered.

As evident from the above quotations, quantity theorists contend that the uniqueness of the central bank derives from its control over money creation. That contention contrasts with the view of a central bank as a financial intermediary that exercises its influence through influence over conditions in credit markets. In an exchange with Senator Prescott Bush (R. Connecticut), Milton Friedman [U.S. Cong. 1959, 623-4] expressed the quantity theory view:[7]

> Senator Bush: What should the Federal Reserve Board do with demands for credit increasing? Prior to the most recent recession, we had tremendous increases in the use of installment credit. In fact, there are some pretty reliable opinions that it was overuse of credit by consumers, particularly installment credit that brought about this recession in business because it stimulated the purchase of goods beyond the year in which they should be buying them….
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> Mr. Friedman: Congress and its agencies have a definite responsibility about money. So far as credit is concerned, free enterprise is just as good for credit as it is for shoes, hats, and anything else. The objective of our policy ought to be to allow credit to adjust itself in a free market, provided we maintain a stable monetary background.

3. QUANTITY THEORY HYPOTHESES

The quantity theory starts from two premises. The first premise is that the central bank is the institution that controls money creation. It does so through its control over its liabilities—the monetary base. Because individual welfare depends only upon real variables (physical quantities and relative prices), the central bank must endow money, a nominal (dollar) variable, with a well-defined

[7] Of course, a free market for credit would not be distorted by a financial safety net that prevents creditors (depositors or debt holders) from losing money. Without fear of loss, the creditors of banks do not monitor the risk taking of banks. Banks have then an incentive to take risks because of the privatization of gains and the socialization of losses. By skewing incentives toward risk taking, the safety net results in the misallocation of resources. However, excessive risk taking is not the driving force behind the business cycle (Hetzel 2012).

(determinate) value. Phrased alternatively, the intrinsic worthlessness of money requires the central bank to choose a nominal anchor that determines the money price of goods (the price level).

The second premise is that changes in the price level play a role in the working of the price system in a way that depends upon how the central bank chooses the nominal anchor. The three basic choices that exist for the central bank define alternative monetary regimes. First, with a gold (commodity) standard, the central bank sets the parity price of gold (the paper dollar price of gold). The price level then adjusts to give the paper dollar the same real purchasing power as a gold dollar. Second, with a fixed exchange rate and for a small open economy, the central bank sets the foreign exchange value of the currency. The price level then adjusts to provide the real terms of trade that equilibrates the balance of payments. With each regime, an explicit rule underpins the belief that the central bank will maintain the nominal anchor (the dollar peg to gold or the foreign exchange value of the currency) in the future.

With the third choice of monetary regime, the concern of the central bank is for stability of the domestic price level. This regime necessitates a floating exchange rate (Keynes 1923 [1972], ch. 4). The price level adjusts to endow the nominal quantity of money with the purchasing power desired by the public. A central bank desirous of achieving price stability must close down this adjustment by making nominal money grow in line with the public's demand for real money. How the central bank does so depends upon a choice of one of two possible nominal anchors determined by a choice of one of two possible instruments.

With a reserve aggregate as the instrument, the central bank follows a "Pigovian" rule in which a reserves-money multiplier relationship controls money creation (Pigou 1917). With an interest rate as the instrument, the central bank follows a "Wicksellian" rule in which maintenance of equality between the "bank rate" and the "natural rate" controls money creation (Wicksell 1898

[1962]).[8] With either instrument, the central bank must follow a rule that disciplines the way in which the public forms its expectation of the future price level. The reason is that money possesses value in exchange today only because of the expectation that it will possess value in exchange tomorrow, and the rule conditions that expectation.[9]

With a reserve-aggregate targeting regime, the central bank controls the nominal quantity of money through its control over a reserve aggregate. Given a well-defined demand for real money (the purchasing power of money), sustained changes in the nominal quantity of money that do not correspond to prior changes in the real demand for money work through a real balance effect to change growth in the nominal expenditure of the public relative to trend growth in real output.[10] Trend inflation emerges as the difference. Inflation maintains equality between the real purchasing power desired by money holders and the real purchasing power of the nominal quantity of money (Pigou 1917; Keynes 1923).

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[8] For a review of the quantity-theory literature, see Humphrey (1974, 1990).

[9] Woodford (2005) states the general argument for a rule based on the idea that individuals make efficient use of information (take account of the forecastable behavior of central banks) in forecasting the future:

> Because the key decision-makers in an economy are forward-looking, central banks affect the economy as much through their influence on *expectations* as through any direct, mechanical effects of central bank trading in the market for overnight cash. As a consequence, there is good reason for a central bank to commit itself to a systematic approach to policy that not only provides an explicit framework for decision-making within the bank, but that is also used to explain the bank's decisions to the public. (italics in original)

[10] Friedman (1961 [1969], 255) wrote of the real balance effect consequent upon an open-market purchase by the central bank:

> [T]he new balance sheet is out of equilibrium, with cash being temporarily high relative to other assets. Holders of cash will seek to purchase assets to achieve a desired structure…. [T]his process … tends to raise the prices of sources of both producer and consumer services relative to the prices of the services themselves; for example, to raise the price of houses relative to the rents of dwelling units, or the cost of purchasing a car relative to the cost of renting one. It therefore encourages the production of such sources … and, at the same time, the direct acquisition of services rather than of the source….

In a reserve-aggregate targeting regime, a real balance effect provides the nominal anchor by giving the price level a well-defined value. As explained by Patinkin (1965), arbitrary changes in the price level produce changes in real money balances (outside money) and consequent changes in the expenditure of the public that counteract the price level changes. Woodford generalizes Patinkin's analysis by adding to contemporaneous money the public's expectation of future money. [11]

Since the Treasury-Fed Accord of 1951 and before December 2008, the Fed has possessed an evolving reaction function broadly characterized as "lean-against-the-wind" (LAW).[12] The instrument has been a short-term interest rate (the funds rate since 1970). In order to provide for nominal and real stability, the central bank must implement LAW in a way that allows the price

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[11] As formulated by Woodford (2003, 108), equation 1) expresses the price level (P) given the central bank's target for money (M^s):

$$\log P_t = \sum_{j=0}^{\infty} \varphi_j E_t[\log M^s_{t+j} - \eta_i \log(1+i^m_t) - u_{t+j}] - \log \bar{m}$$

In 1), φ_j depends upon the interest elasticity of money demand, η_i. i^m is the interest paid on money. u captures exogenous changes in real output, the natural rate of interest, money demand, and the interest paid on money. $\bar{m}$ is the steady-state demand for real money.

[12] LAW marked the departure from the real-bills pre-World War II focus on financial market instability construed as speculative behavior in asset markets or macroprudential regulation in today's terminology (on real bills, see Humphrey 1982 and Hetzel 1985). With LAW, the FOMC focused directly on the economy as opposed to asset prices. Hetzel (2008a and 2008b) contrasts the two broad variants of LAW. The first variant emerged gradually with FOMC chairman William McChesney Martin (until derailed by the populist policies of Lyndon Johnson) and reemerged after the Volcker disinflation. It focused on moving short-term interest rates in a way that countered sustained changes in the rate of resource utilization in the economy (*changes* in the output gap) and on maintaining low, stable inflation premia in long-term government bond yields. The second characterized the "fine tuning" period from the mid-1960s through the end of the 1970s. It focused on moving short-term interest rates in response to the *level* of the output gap and on responding directly to actual inflation. Hetzel (2012) argues that this latter variant reappeared in 2008 through the practice of responding directly to actual inflation. LAW procedures provide a necessary condition for allowing market forces to determine the real interest rate. The fine-tuning variant under which the FOMC periodically attempts to increase the magnitude of a negative output gap to lower inflation contravenes this latter principle.

system to work and that conditions the public's expectation of the future value of money (McCallum 1986; Goodfriend 1987; Hetzel 1995).[13] With an interest-rate instrument, a real balance effect does not provide a nominal anchor. The nominal anchor comes from credibility for a rule with which the central bank will initiate a contractionary monetary policy action if the public's expectation for inflation exceeds the bank's target (Goodfriend 1993; Hetzel 2008a, ch. 21), and conversely for a shortfall of expected inflation from target.[14]

With an interest-rate instrument and a LAW reaction function, growth in nominal expenditure emerges as the sum of two components: growth in real expenditure and in inflation. Because of the assumption that the central bank cannot exercise systematic control over real variables, to avoid becoming a source of instability, the central bank needs to implement LAW in a way that allows the price system to determine the first component—real expenditure (output). The

[13] If the central bank possesses a credible rule that stabilizes the expectation of the future price level, it need respond only to the real behavior of economy. The LAW procedures with which the Fed moves the funds rate away from its prevailing value in response to sustained changes in the economy's rate of resource utilization cause the real funds rate to track the natural rate of interest (Hetzel 2008b). In effect, the central bank delegates to the price system determination of the real interest rate and, by extension, other real variables. In principle, realized inflation can offer information on the real economy and a central bank reaction function could include as arguments both real output and inflation, but that fact in no way implies central bank manipulation of a Phillips curve relationship between inflation and output.

[14] With an interest rate instrument, money demand controls money creation. The central bank then limits money creation indirectly through its control of the public's expectation of the future price level. That expectation disciplines nominal money demand. The discipline comes from the belief by the public that the central bank will vary its interest rate target if in the future the price level deviates from target. As formulated by Woodford (2003, 83), equation 2) expresses the contemporaneous price level (P) given the central bank's target for the price level (P^*):

$$\log P_t = \sum_{j=0}^{\infty} \varphi_j E_t[\log P^*_{t+j} + \phi_p^{-1}(\hat{r}_{t+j} - \nu_{t+j})]$$

In 2), ϕ_p measures how the central bank changes its interest rate instrument in response to deviations of the price level from target and φ_j is a function of ϕ_p. ν_t captures exogenous changes to the interest rate rule. $\hat{r}$ is the natural rate of interest.

rule determines the long-run behavior of the second component—trend inflation—through the way in which it conditions the inflationary expectations of firms that set prices for multiple periods.[15] Trend nominal expenditure then arises from the sum of the two components: potential output growth and trend inflation. Because of the central bank's interest-rate peg, the nominal money stock follows the public's demand for nominal money. However, the rule constrains that demand in a way consistent with the inflation target.

To reiterate, the central bank is unique because of its monopoly over the creation of the monetary base and, as a consequence, over broader money creation. With a floating exchange rate, the price level adjusts to endow the nominal quantity of money with the purchasing power desired by the public. This monetary character of the price level endows the central bank with control over inflation through its control over trend growth in nominal expenditure. Central to the way in which quantity theorists endow this framework with empirical content is the assumption that the price system works well in the absence of monetary shocks that cause the price level to evolve in an unpredictable way (Humphrey 2004, . Violation of the discipline placed on central banks by a rule that allows the price system to determine real variables produces monetary emissions (absorptions) that force changes in nominal expenditure (output) and the associated booms and recessions.

The assumption that markets work well in the absence of monetary disorder subsumes more fundamental assumptions about markets. Competitive markets determine market-clearing prices and those prices aggregate information from dispersed markets efficiently. As a result, the central bank

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[15] In the base case of price stability maintained by a credible rule, firms setting prices for multiple periods only change their dollar prices in order to change the relative price of their product. For a general discussion, see Wolman (2001, 30-31) and Goodfriend (2004, 28). The central bank moves its interest-rate instrument in a way that tracks the natural interest rate. Allowing the price system to work causes firms to maintain the optimal markup of product price over marginal cost. The environment of nominal expectational stability conditions the price-setting behavior of firms and maintains price stability apart from random, transitory changes in prices.

can avoid major recessions by following a rule that allows market forces to determine real variables (the real rate of interest, real output, and employment) and relative prices. Moreover, the efficient use of information by market participants implies that the central bank cannot systematically control real variables (exploit the inflation/unemployment correlations of empirical Phillips curves).[16]

Monetary nonneutrality arises from behavior by the central bank that causes the price level to evolve in an unpredictable way.[17] In the absence of a widely-understood, credible rule underpinning an inflation target, changes in the price level have to occur in a way that is uncoordinated by a common set of expectations among price setters. That unpredictability presents price-setting firms with a coordination problem that they cannot solve. To counter monetary instability, collectively, firms would have to move dollar prices together to search for the price level that endows nominal money with the real purchasing power desired by money holders while also maintaining dollar prices individually to achieve the relative prices that clear markets. The price system fails to provide the requisite coordination.

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[16] The best known statement of the hypothesis that the central bank cannot control real variables in a predictable fashion is in Friedman (1968 [1969]). In response to an attempt by the central bank to control real variables in a systematic fashion, expectations adjust in a way that cause prices to change to eliminate the ability of the central bank to manipulate the real quantity of money: the long-run neutrality of money telescopes into the short run. In an attempt to systematize this hypothesis, Lucas (1972) provided the first systematic exposition of quantity-theory ideas. See also Humphrey (1999). Friedman (1958 [1969], 182-3) wrote:

> [O]nce it becomes widely recognized that prices are rising, the advantages … [adduced to support the view that "slowly rising prices stimulate economic output"] will disappear…. If the advantages are to be obtained, the rate of price rise will have to be accelerated and there is no stopping place short of runaway inflation. From this point of view, there may clearly be a major difference between the effects of a superficially similar price rise, according as it is an undesigned and largely unforeseen effect of such impersonal events as the discovery of gold, or a designed result of deliberative policy action by a public body.

[17] This hypothesis is in the spirit of the model in Lucas (1972) in which only unpredictable policy actions have real effects. In New Keynesian, sticky-price models, the central bank can exert a predictable control over real variables.

4. THE KEYNESIAN-MONETARIST DEBATE

No central bank characterizes the role it plays in the economy as emanating from its control over money creation. Instead, central banks characterize their influence over prices and the economy in terms of how they affect conditions in financial markets and the resulting impact on financial intermediation. Moreover, the use of the language of discretion when combined with the legislative injunction to maintain "maximum employment" implies ongoing discretionary intervention into the working of the price system rather than implementation of a rule that delegates the determination of employment to market forces. Implicitly, the message is that the central bank counters economic instability that arises in the private economy. Although not articulated as such, it follows from such an "activist" policy of intervening to influence employment that the control of inflation entails trading off between inflation and unemployment based on a Phillips curve relating the two variables.

As a way of assessing the tacit rejection of quantity theory ideas by central banks, this section reviews the Keynesian-monetarist debate. As in the real-bills tradition, Keynesians often assume that recessions follow as the consequence of prior unsustainable speculative increases in asset prices and credit-driven overconsumption. Herd behavior among investors reflects "animal spirits." Both traditions reject the relevance of money as a factor determining either prices or cyclical fluctuations. With the central bank understood as a financial intermediary, the liabilities of the central bank (the monetary base and, by extension, the money stock) are determined by market (real) forces. In the real bills tradition, purposeful monetary expansion by the central bank leads to asset bubbles. In the Keynesian tradition, purposeful monetary expansion by the central bank leads to offsetting changes in monetary velocity that render monetary policy inefficacious. Both traditions attribute nominal and real instability to real shocks.

Figures 1 through 7 organize the discussion. Figures 1 and 2 show annual rates of CPI inflation, respectively, for the intervals starting after the Civil War to World War II and subsequent

to World War II to the present. For the post-World War I period to World War II, Figures 3 to 5 present graphs of growth rates of nominal and real output (GNP), M1 velocity and the interest rate, and growth rates of M1 and nominal output (GNP). For the post-Korean War period until the start of the Volcker disinflation, Figures 6 and 7, respectively, present graphs of growth rates of nominal and real output (GDP) and growth rates of M1 and nominal output (GDP).[18] In Figures 3 and 6, which display the rate of growth of nominal and real output for the years 1919 through 1940 and 1953 through 1981, inflation (deflation) measured by the implicit output deflator appears as the rate of growth of nominal output (dashed line) minus the rate of growth of real output (solid line). Inflation appears as the cross-hatched lines sloping upward (dashed line above the solid line) while deflation appears as the cross-hatched lines sloping downward (solid line above the dashed line).

Keynesian economists have pointed to real shocks to explain the behavior of inflation shown in Figures 1 and 2. At the time of the Samuelson-Solow (1960 [1966]) formulation of the Phillips curve relating inflation to the unemployment rate, Keynesian economists divided inflation into three major categories: demand pull, cost push, and wage-price spiral.[19] By assumption, the real interest rate is ineffectual in keeping real output close to potential output. Persistent positive output gaps created by positive real shocks such as increased defense expenditures or an investment boom fueled

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[18] The second set of graphs excludes the graph of the interest rate and M1 velocity because of the small interest sensitivity in the latter period of real M1 demand (the inverse of velocity). The graphs end in the early 1980s when the deregulation of interest rates made real M1 demand sensitive to interest rates. As a result, the visual relation between M1 and nominal GDP disappears. In particular, when the economy weakens and the interest rate falls, funds flow out of the money market into NOW accounts (interest-bearing checkable deposits included in M1). Heightened M1 growth then corresponds to weakness in nominal output growth. Even with a stable M1 demand function, the relationship between growth rates of money and nominal output is obscured by a decline in velocity (Hetzel and Mehra 1989). The pre-1981 period is an extraordinary laboratory for testing quantity-theory ideas because of the usefulness of M1 growth as a measure of the impact of monetary policy on nominal expenditure and nominal output.

[19] See for example, Ackley (1961), ch. 16.

by excessive optimism create demand-pull inflation. The exercise of market power by large corporations and unions creates cost-push inflation. Inflationary expectations, which are by assumption undisciplined by the systematic behavior of the central bank, can create a self-perpetuating spiral of wage and price increases. Because Keynesians believe that real phenomena like government deficit spending and the monopoly power of unions and corporations cause inflation, they argue that the control of inflation requires manipulation of a countervailing real force—the output gap. Specifically, to counter inflationary forces, the central bank must increase the amount of idle resources in the economy (unemployed workers).[20]

Figures 3-5 and 6-7 are useful in discussing the opposite assumptions made about causality by Keynesians and quantity theorists. Heuristically, in discussing causality, these two schools place the graphs in a different order. Keynesians place the graph showing real output first and money last while quantity theorists reverse the order. That is, Keynesians and quantity theorists divide over whether the shocks that drive the fluctuations in the real output series are real or nominal and over the causes of the common movements of real and nominal variables (whether Phillips curve correlations are structural). [21]

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[20] In the 1970s, the United States and other industrial countries used incomes policies and actual wage and price controls to control perceived cost-push inflation (Hetzel 2008a) and, it was assumed, to lessen the need for excess unemployment to control inflation. As a result of the failure of aggregate-demand policy to control unemployment combined intervention by government into private price setting to control inflation, governments turned the control of inflation over to central banks. However, that assignment of responsibility left unaddressed the Keynesian presumption that the control of inflation requires manipulation of an output gap subject to Phillips curve constraints.

[21] This discussion omits the real business cycle (RBC) viewpoint. Early Keynesianism (see Samuelson 1967) and the RBC view share a common assumption about the irrelevance of monetary shocks for the business cycle. Quantity theory arguments for the primacy of monetary shocks as precipitating serious recessions are antithetical to both the Keynesian and RBC views, which maintain the irrelevance of monetary phenomena for the behavior of real phenomena.

Keynesians believe that real shocks drive the fluctuations in real output. Fluctuations in nominal output, monetary velocity, and money are derivative to the fluctuations in real output. Such real shocks typically appear as irrational swings in investor sentiment between excessive optimism and excessive pessimism (animal spirits). Sticky prices transmit the shock to nominal output. Pessimism about the future causes monetary velocity (the demand for money) to decline as households hoard money. However, the decline in output produces an even larger decline in the demand for money and the central bank accommodates that decline by contracting the money stock. If the central bank were to increase the money stock, a pessimistic public would simply hoard the additional money (a liquidity trap).

In recession, the central bank can lower the real interest rate by lowering its interest rate target. The real interest rate is the price of current resources in terms of future resources foregone. A "low" real interest rate should transfer demand for consumption and investment from the future to the present and thereby mitigate negative shocks to real aggregate demand. However, Keynesians believe that the real interest rate in particular and the price system in general are weak reeds. The price system fails to serve its role as an equilibrating mechanism. Pessimism about the future overwhelms the self-equilibrating properties of the price system.

The Keynesian policy prescription for recession is deficit spending by the government. Ex ante, given an increase in pessimism about the future, private saving exceeds investment. With reductions in the real interest rate ineffective in redistributing aggregate demand from the future to the present, only a decline in output reduces saving to restore ex post equality between saving and a lower level of investment. (The Keynesian multiplier derives from the fact that saving declines only as a fraction of the decline in output.) The counterpart to irrational pessimism on the part of households is a short time horizon that does not account for the recovery of economic activity in the

future. In contrast, government can take a longer-run perspective. By running a deficit, it can dissave sufficiently to offset the excessive saving of the public.

Real shocks interact with a poorly working price system characterized by sticky nominal prices and by relative prices that fail to clear markets. Keynesians want central banks to target a real variable, the output gap, and to determine the behavior of inflation as an optimal trade-off between the output gap and (changes in) inflation based on a presumed hard-wired real-nominal (unemployment-inflation) relationship captured by Phillips curve correlations. Price stickiness constitutes a friction that causes real shocks to impact real output and employment. At the same time, it is the lever by which a central bank can exercise control over real variables through its control over nominal variables (the nominal interest rate and nominal expenditure).

In contrast to Keynesian assumptions, quantity theorists attribute sustained changes in prices (inflation and deflation) to behavior by the central bank that produces sustained departures of money growth from the growth in real money demand consistent with the growth in potential output. Intuitively, as illustrated in Figures 3 and 6, inflation makes the real purchasing power of the money growth consistent with growth in nominal GDP (dashed line) consistent with the real purchasing power demanded as a result of growth in real GDP (solid line). In attributing causation to the correlations among the series displayed in Figures 3-5 and 6-7, quantity theorists assume an initial monetary shock manifested in the fluctuations in money. Given an assumption of stability in the functional form for monetary velocity, they consider the fluctuations in nominal and real output as derivative.

Because money is endogenously determined when the central bank employs an interest rate peg, fluctuations in money need not reflect monetary shocks. The endogeneity of money implies that neither sustained high (low) money growth nor sharp fluctuations in money growth necessarily produce inflation (deflation) or cyclical fluctuations in economic activity. The relevant criterion for

money to become a source of nominal and real instability is behavior by the central bank that flouts the discipline imposed by the requirements of creating a stable nominal anchor and of allowing the price system to work. Flouting that discipline creates monetary shocks through forcing changes in money that require an unpredictable evolution of the price level.

5. MONETARIST METHODOLOGY FOR TESTING "MONEY MATTERS"

Much of the monetarist literature concentrates on event studies designed to distinguish between real and monetary causes of inflation and of the business cycle. Friedman and Schwartz (1963) are synonymous with this methodology. As examples, Friedman and Schwartz (1963 [1969], 216-7) attributed the deflation that began after 1873 to "political pressure for resumption [establishment of gold convertibility of the paper greenbacks issued in the Civil War that] led to a decline in high-powered money…." In arguing for monetary shocks as the cause of recessions, that is, for monetary contraction arising from events unrelated to the determination of nominal income, they argued:

> [C]hanges in the stock of money can generally be attributed to specific historical circumstances that are not in turn attributable to contemporary changes in money income and prices.… [In 1892-94] agitation for [monetizing] silver and destabilizing movements in Treasury cash produced fears of imminent abandonment of the gold standard by the United States and thereby an outflow of capital which trenched on gold stocks. Those effects were intensified by the banking panic of 1893, which produced a sharp decline, first in the deposit-currency ratio and then in the deposit-reserve ratio.

With the establishment of a central bank (the Fed), this strategy for identification of monetary shocks becomes harder. The desired information, namely, the economy's response to the Fed's behavior, is confounded in macroeconomic correlations with the Fed's response to the economy's behavior. As a result, quantity-theorists rely on an identification strategy based on the assumption that nominal and real stability require consistent implementation of a rule that provides a stable nominal anchor and that allows the price system to determine real variables.

An implication of the assumption that the price system works well to maintain economic stability unless disrupted by monetary disturbances is that monetary policy procedures that provide for economic stability require continual adjustment of the central bank's interest rate target in response to the ongoing fluctuations in strength and weakness in economic activity. It becomes natural to look for isolated episodes in which the Fed has pursued some objective unrelated to smoothing the fluctuations in the growth rate of real economic activity that produce corresponding changes in the economy's rate of resource utilization. That is, the intent is to isolate departures from moving the real interest rate implicit in the interest rate target in a way that redistributes aggregate demand over time to counter unsustainable strength and weakness in the economy. With such departures, the Fed moves short-term interest rates up or down in a sustained way and then either imparts significant inertia or holds fixed its interest rate target despite increasing weakness or strength in the economy. One then looks for monetary deceleration or acceleration. The quantity theory hypothesis is that this criterion provides a necessary and sufficient condition for booms and recessions (Hetzel 2012, chs. 6 and 7).

Obvious examples are the interest-rate pegs of World War I and World War II. The example highlighted by Friedman and Schwartz (1963) and Meltzer (2003) was the intermittent real-bills focus of policy prior to World War II. With real bills, the Fed concentrated on preventing speculative bubbles in asset prices rather than on allowing the real interest rate to vary continually to stabilize real economic activity. Another example, highlighted by the same authors, was the decade-and-a-half effort to manage aggregate demand in a way intended to stabilize the unemployment rate at its full-employment level started after the Kennedy tax cut in 1964. In conjunction with pursuit of the objective of full employment, policymakers attempted to maintain a moderate level of demand-pull inflation while using incomes policies to mitigate cost-push inflation (Hetzel 2008a; and "The Great Inflation" forthcoming). Hetzel (2012) argues that the employment by central banks since

2008 of reaction functions that entail a direct response of the interest rate setting to realized inflation constitutes another example. As argued by Friedman (1960), such a rule imparts inertia to reductions in short-term interest rates in the face of persistent declines in economic activity (Hetzel 2012 and "Appendix: The Fed's Post-2008 Quantitative Procedures.").

Disentangling causation: Money and Prices

The following sketches briefly the kind of historical narrative quantity theorists have used to disentangle causation between money and prices. Figure 1 shows annual inflation rates from 1869 to 1949. Quantity theorists argue that the monetary arrangements of the United States explain the broad patterns shown in the graph.[22]

From 1869 through 1897, deflation predominated. After the Civil War, the United States stopped issuing Greenbacks while the economy grew. The resulting deflation allowed a return in 1873 to the gold standard at the pre-war parity. The deflation also reflected increases in the real price of gold due to limited worldwide supplies of gold combined with increased demand as the world economy grew and the demand for monetary gold stocks increased as countries joined the international gold standard as part of the Latin Monetary Union. Starting in the mid-1890s, the world

[22] Friedman (1966, 17) stated the quantity theory position phrased in terms of the events he used to disentangle causation from correlation. That is, he argued that historical experience demonstrated that intervention by the government into the price-setting in private markets was inevitably futile as a way of controlling inflation. Only moderation in money growth was effective.

> Since the time of Diocletian, … the sovereign has repeatedly responded to generally rising prices in precisely the same way: by berating the "profiteers," calling on private persons to show social responsibility by holding down the prices at which they sell their products or their services, and trying, through legal prohibitions or other devices, to prevent individual prices from rising. The result of such measures has always been the same: complete failure. Inflation has been stopped when the quantity of money has been kept from rising too fast, and that cure has been effective whether or not the other measures were taken.

stock of gold began to grow because of gold discoveries in Alaska and South Africa and because invention of the cyanide process rendered the extraction of gold more efficient.[23]

The monetization of government debt in World War I created a large spike in inflation. When released from the task of financing the war effort, in 1920 and 1921, the Fed initiated a contractionary monetary policy with sharp increases in the discount rate to end inflation and to arrest gold outflows. The severe deflation associated with the Great Depression, which began in August 1929, derived from the Fed's desire to maintain a high cost to banks of obtaining funds first to stop and then to prevent reemergence of a presumed speculative bubble in the price of equities and real estate.[24] The inflation after 1934 occurred because of the monetization of the gold inflows accompanying the increase in the dollar price of gold and political instability in Europe. The Fed's immobilization of bank reserves in 1936 and 1937 through phased increases in required reserve ratios temporarily replaced monetary expansion and inflation with monetary contraction and deflation. World War II again created inflation through a rate peg that forced the Fed to monetize government deficits.

Figure 2 shows annual inflation rates from 1949 to 2011. The surge in inflation in late 1951 was an inflation shock. It arose during the Korean War when the crossing of the Yalu River by the Chinese in November 1951 created the expectation of World War III with the return of price controls and inflation (Hetzel and Leach 2001a). However, contrary to the Keynesian presumption of hard-

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[23] Various monetary histories exist for the United States (Friedman and Schwartz 1963; Friedman 1992; Hetzel 2008a and 2012; Meltzer 2003 and 2009; and Timberlake 1993).

[24] Like Friedman and Schwartz (1963), Hetzel (2012, ch. 4) attributes the Depression to contractionary monetary policy. Friedman and Schwartz place primary emphasis on bank runs. In contrast to Friedman and Schwartz, Hetzel emphasizes the robustness of the banking system. He argues that given unit banking the decline in the money stock required by contractionary monetary policy took place in part through closing the weaker banks by bank runs. The bank runs were a byproduct not a cause of contractionary monetary policy.

wired (intrinsic) inflation persistence, the shock did not propagate. In 1957, inflation increased to 3%. Arthur Burns, who was chairman of the Council of Economic Advisors from 1953 to 1956, and William McChesney Martin attributed the increase to the slowness of policy to tighten after the 1954 trough in the business cycle (Hetzel 2008a, 52).

The most striking part of Figure 2 is the irregular increase in inflation from one percent in 1964 to 13 percent in 1981 followed by disinflation and quiescent inflation until the drop in 2009. Hetzel (2008a, chs. 6-12 and 22-25; 2012, ch. 8; "The Great Inflation," forthcoming) attributed the increase in inflation to a monetary policy oriented toward achievement of full employment, almost universally considered as represented by a 4% unemployment rate, combined with the widespread understanding of inflation as a cost-push phenomenon. Given the presumed high social costs of an unemployment rate in excess of 4% and the belief in the nonmonetary character of inflation, the working assumption of monetary policy was that "incomes policies," represented in the extreme case by wage and price controls, were the desirable method of restraining inflation. The prevailing assumption was that using restrictive monetary policy (low rates of money growth) to deal with an inflation caused by cost-push pressures and by inflation shocks would create "high" interest rates that would hurt housing disproportionately and would create a socially intolerable level of unemployment. With a few exceptions, FOMC members attributed high rates of growth of money to the need to accommodate cost-push inflation in order to avoid high unemployment.

Disentangling Causation: Money and Output in the Depression

The following provides a flavor of the kind of monetary narrative that quantity theorists provide to disentangle causation from the correlations shown in Figures 3 through 7. For quantity theorists, the iconic example of Fed interference with the price system is its high interest rate policy started in 1928 of countering the presumed speculative excess in financial markets associated with

high P/E ratios for stocks on the New York Stock Exchange. In his testimony at the Strong hearings [U.S. Cong. 1927, 381], Cassel provided an early statement of this criticism:

> Cassel: [Increases in Federal reserve bank rates to limit speculation] may have an effect on the general level of prices that will result in a depression in production in the country, followed by a decrease in employment, all only for the purpose of combating some speculators in New York. I think that is absurd.... [T]he Federal reserve system has no other function than to give the country a stable money. The business of checking stock-exchange speculation is disturbing this function....
>
> Mr. Wingo: I say that monetary causes are not the only causes that affect the general price level. There are other things besides monetary causes.
>
> Cassel: No; the general level of prices is exclusively a monetary question.

In 1930, Cassel (1930) provided a more complete account of how the Fed's focus on preventing asset bubbles required interference with the working of the price system. That interference created monetary contraction and deflation.[25]

> This limitation [of money supplies] … has of late been far too strict. The reason is the attempt to regulate the bank rate in such a way that it would have a supreme influence on the Stock Exchange, limiting the speculative inflation of share prices…. The Federal Reserve system … since last summer has adhered to rates which were far too high, with the result of a collapse in prices which seriously endangered the whole political economy…. The collapse in prices is bound to drag with it the whole rest of the world…. The whole matter is a blatant example of what happens if we yield to the modern tendency of permitting Government to meddle unnecessarily with economics. The Government assumes a task which is not in its province; in consequence of this it is driven to mismanage one of its most pertinent tasks, i.e., the supervision of money resources. This causes a depression, which the same government seeks to remedy by measures which are again outside the sphere of its true activity and which can only make the whole position worse.

In congressional testimony in April 1932, Gov. Harrison explained why the Fed was unwilling to pursue an expansionary monetary policy. The House Committee on Banking and Currency held these hearings to promote a bill to require the Fed to restore the price level to its pre-deflation value. Repeatedly, Harrison challenged that goal on the grounds that it would require the Fed to increase bank reserves while the price level was falling even if it believed that banks would use the additional funds for speculative purposes. Harrison (U.S. Cong. 1932, 485) said:

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[25] Lars Christensen, The Market Monetarist, June 9, 2012, reproduces the quotation.

> [S]uppose…the price level is going down, and the Federal reserve system begins to buy government securities, hoping to check the decline, and that inspires a measure of confidence, and a speculation is revived in securities, which may in turn consume so much credit as to require our sales of Governments. There was that difficulty in 1928 and 1929.

Hetzel (2008a, 2012) argues that the Fed fell into a deflation trap. The high nominal interest rates presumed necessary to restrain speculation required monetary contraction. Monetary contraction created deflation, which engendered expected deflation. Expected deflation raised real interest rates. Higher real interest rates exacerbated monetary contraction, and so on. Starting in March 1933, the monetary standard changed (Hetzel 2012). The new Roosevelt administration undertook to end the Depression. Based on the widespread public association of economic decline with deflation, the administration undertook measures to raise "prices." However, consonant with the common understanding at the time, it thought in terms of raising relative prices. The desire to raise the prices of agricultural products entailed manipulating the dollar price of gold.

In March 1933, Roosevelt embargoed gold exports and floated the dollar. For the remainder of 1933, the government pursued what amounted to a commodity stabilization scheme to raise the dollar price of gold. In January 1934, the United States raised the dollar price of gold from $20.67 per ounce to $35.00 per ounce. At the same time, the Fed removed itself from the active conduct of monetary policy in favor of the Treasury by freezing the size of the holdings of Treasury securities in its portfolio and by keeping the discount rate at a level that eliminated most borrowing by banks from the discount window. Along with political instability in Europe, the dollar depreciation in 1934 from $20.67 an ounce to $35 an ounce produced gold inflows, which the Fed monetized.

Prior to March 1933, the Fed's instrument was the marginal cost of funds to banks determined by the sum of the discount rate and the nonpecuniary ("administrative guidance") surcharge imposed on banks' use of the discount window (Hetzel 2008a, ch. 3; Hetzel 2012, ch. 4). These procedures made the monetary base endogenous. After March 1933, the monetary base became exogenous. Despite the exogenous increases in money produced by gold inflows, M1

velocity remained stable a stable function of interest rates (Figure 4). That fact contradicts the Keynesian liquidity trap assumption that purposeful money creation would simply be neutered by an offsetting change in velocity.

Friedman and Schwartz (1982, 626) generalized:

> A stable demand function for real money balances means that an autonomous change in either nominal money or nominal income will have to be accompanied by a corresponding change in the other variable, or in variables entering into the demand function for money, in order to equate the desired quantity of money balances with the quantity available to be held…. Given stability of money demand, *variability in conditions of money supply*, and similar parallelism for the period as a whole, it is appropriate to regard the observed fluctuations in the two nominal magnitudes as reflecting primarily an influence running from money to income. (italics supplied)

Disentangling Causation: Money and Output in the Stop-Go Period

After the Treasury-Fed Accord of 1951, in an evolutionary process, FOMC chairman William McChesney Martin and his adviser Winfield B. Riefler developed procedures termed "lean-against-the-wind" (LAW) by Martin (Hetzel 2001a; 2001b; 2008a, ch. 5). In the changed intellectual environment of the time in which government accepted a role in economic stabilization, LAW involved moving short-term interest rates in a way that counteracted above-trend and below-trend growth in real output. Under Martin, concern for increases in long-term government bond yields furnishing evidence of increases in expected inflation replaced the real-bills concern with speculative increases in asset prices (Hetzel 2008a, ch. 5).

The extent of the discipline placed on LAW derives from the importance the FOMC assigns to price stability or stabilization of inflation at a low level. However, different chairman have imposed such discipline in two very different ways. They have imposed it either by behaving in a way that stabilized expected inflation or by responding to the actual emergence of inflation. Hetzel (2008a) terms the former variant "lean-against-the-wind with credibility." Martin departed from LAW with credibility after 1964 in an ultimately futile attempt to avoid a politically divisive increase in interest rates with his own FOMC house divided. He attempted to eliminate the need for an

increase in interest rates through a tax hike that would eliminate the deficit. The effort failed (Hetzel 2008a, ch. 7; Bremner 2004). Despite the passage of an income tax surcharge in June 1968, which transformed the deficit into a surplus, high money growth trumped restrictive fiscal policy, and the economy expanded while inflation rose.

Arthur Burns, Martin's successor, desired to control inflation and inflationary expectations but through the use of incomes policies to control the wage setting of corporations and unions with presumed market power. In this way, Burns viewed monetary policy through the lens of the businessman (Hetzel 1998). Burns' successor, G. William Miller, buttressed by a Keynesian Board of Governors, followed a similar strategy.

Under Burns and Miller, monetary policy earned the appellation of stop-go or, more aptly, go-stop. Given the political and policymaking consensus holding 4% as a desirable target for the unemployment rate, the FOMC operated with consensus about the magnitude of the output gap. The output gap was the difference between actual output and output consistent with a 4% unemployment rate. In go phases, the FOMC pursued an expansionary monetary policy by limiting increases in the funds rate even after the emergence of economic recovery. In doing so, it intended to engineer a high enough rate of growth in aggregate output in order to lower the magnitude of the assumed negative output gap.

In response to stimulative monetary policy, with a lag of almost two years, the inflation rate rose (Hetzel 2008a, Figure 23.3).[26] The FOMC responded directly to the increase in realized

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[26] Friedman (1989, 31) wrote:

> "[A] change in the rate of monetary growth produces a change in the rate of growth of nominal income about six to nine months later…. The changed rate of growth of nominal income typically shows up first in output and hardly at all in prices…. The effect on prices … comes some 12 to 18 months later, so that the total delay between a change in monetary growth and a change in the rate of inflation averages something like two years.

inflation by raising the funds rate and then maintaining that rate while a negative output gap developed (see discussion explaining Figures 8.1 to 8.5, Hetzel 2012). The resulting cyclical inertia in interest rates created procyclical money growth. In the stop phases, the FOMC never intended to engineer recession. The intent of the FOMC was always to maintain a negative output gap of moderate magnitude to lower inflation in a controlled way—the so-called easy landing.

The stop-go period is the closest one comes in historical experience to the policy guideline represented by conventional Taylor rules. That is, the FOMC acted on the basis of an assumed knowledge of the output gap and responded directly to realized inflation. The FOMC also acted with a sense of the normal or benchmark interest rate such that a "high" interest rate indicated contractionary monetary policy and a "low" interest rate indicated expansionary monetary policy. This sort of policy rule turned out to be destabilizing as predicted by Friedman (1960).

Under FOMC chairmen Volcker and Greenspan, the FOMC returned to the procedures that had evolved in the pre-1965 era. The FOMC followed a LAW procedure but with a rule designed to stabilize expected inflation. The discipline imposed by the desire to return to low, stable inflationary expectations removed much of the cyclical inertia in funds rate movements. Specifically, the FOMC moved the funds rate in a sustained, persistent fashion in response to changes in the rate of resource utilization in the economy.

In doing so, the FOMC moved the funds rate in response to sustained changes in the output gap, but without any presumption about the magnitude of the gap. Moreover, it abandoned any assumption of knowledge of a normal or benchmark real interest rate and allowed changes in the funds rate to cumulate without fear of overly high or low interest rates. The discipline on changes in the funds rate made in response to sustained changes in the economy's rate of resource utilization came from a superimposed reaction to sharp increases in bond rates interpreted as increases in expected inflation. That is, the FOMC followed its LAW procedures subject to the constraint that

financial markets believed that funds rate changes would cumulate to whatever degree necessary to prevent deviations of trend inflation from a low, stable value. The rule stabilized the expectation of inflation and thus conditioned the price-setting behavior of firms setting prices for multiple periods. Phrased alternatively, the Fed's reaction function abandoned the direct response to realized inflation that had characterized the earlier stop-go period (Hetzel 2008a).

Several authors have characterized the monetary policy that followed the Volcker disinflation (Goodfriend 1993 and 2004; Goodfriend and King 2005; Hendrickson 2012; Hetzel 2008a, chs. 13-15; 2012, ch. 8; Mehra 2001). The common strand in these accounts is the importance that FOMC chairmen Volcker and Greenspan assigned to stability in inflationary expectations measured by moderate long-term bond rates and by the absence of discrete jumps in bond rates. Stability of expected inflation meant not only a low inflation premium in bond rates but also the decoupling of increases in the inflation premium from the above-trend growth in output that had developed in the stop-go era. The focus on expected inflation moved the FOMC away from the direct response to inflation that had characterized the stop phases of the preceding stop-go monetary policy.

The considerable stability in growth of potential output in the 1980s that persisted through most of the 1990s meant that to achieve low, stable inflation the FOMC had to engineer low, stable growth in nominal expenditure (GDP). However, the FOMC lacked a nominal GDP target.[27] Given the FOMC's concern for inflationary expectations, the sensitivity of "bond-market vigilantes" to a reemergence of the inflation that followed above trend growth in the prior stop-go era meant that the

[27] The procedures are described in Section 3 in the paragraph that begins "With an interest-rate instrument and a LAW reaction function…." The objective was stable trend inflation; however, the intermediate target was stability in expected trend inflation. Only with stable growth in potential output due to steady growth in productivity and labor are these LAW with credibility procedures equivalent to nominal GDP targeting.

FOMC had to raise the funds rate promptly in response to strong real growth. That behavior largely removed the cyclical inertia in interest rates that had characterized the stop-go era.

Figure 8 shows the upward trend in nominal GDP growth that preceded the Volcker disinflation and the moderate downward trend after the Volcker disinflation. After this disinflation and prior to 2008, the main cyclical fluctuations in nominal GDP growth occurred in the last part of the 1980s and in the last part of the 1990s. Each episode arose as an echo of the prior go-stop monetary policy with the go phases initiated by FOMC concern for unwanted strength in the foreign exchange value of the dollar and an associated reluctance to raise the funds rate despite unsustainable growth rates in the real economy (Hetzel 2008a, chs. 14 and 16).

6. CONCLUDING COMMENT

This article has summarized quantity-theory views and has provided a sampling of the sort of historical narrative its proponents have used to buttress their position that inflation is a monetary phenomenon and that cyclical fluctuations derive from monetary shocks.

Appendix: The Fed's Post-2008 Quantitative Procedures

Since December 2008, when the FOMC lowered the funds rate basically to zero, the relevant monetary regime has been reserve-aggregate targeting (quantitative operating procedures). The determining fact is that the FOMC's reaction function has set the size of its asset portfolio and as a consequence the size of the monetary base. Given the public's demand for currency, bank reserves are exogenously given to the banking system. Since spring 2009, through purchases known in the market as quantitative easing but within the Fed as Large Scale Asset Purchases (LSAP), the FOMC has twice increased the size of its asset portfolio.[28] (In late 2011, reserves also increased when foreign central banks drew on the Fed's swap lines.)

For the given level of bank reserves, the banking system's desire to decrease (increase) excess reserves determines the aggregate acquisition (sale) of its assets and as a result the expansion (contraction) of bank liabilities. Growth in bank deposits and in money follows. Given a well-defined demand for real money, growth in money determines growth in nominal expenditure. Given the high level of demand by banks for excess reserves that arose in response to the uncertainty created subsequent to the failure of Lehman Brothers in September 2008 and the near-zero funds rate, since January 2009, the monetary aggregate M2 (adjusted for flight-to-safety inflows) has grown on average at a 4% annual rate. That rate of money growth has been consistent roughly with 4% growth in nominal GDP. (For details, see Hetzel 2012, postscript.)[29]

The following analysis assumes that the shock that created the 2008-2009 recession was monetary not real (see Hetzel 2012, ch. 12). It follows that the productive capacity of the economy did not contract and that the 8% unemployment rate that existed in 2012 revealed a negative output gap. At the same time, the Fed's credibility for its inflation target of 2% has set the expectational environment in which firms set dollar prices for multiple periods. As a result, core inflation has been steadied at 2%.[30] With baseline inflation of 2%, nominal GDP growth of 4% allows for 2% growth in real GDP.

Assuming that the growth rate of potential output is 2%, real GDP growth of 2% during the later stage of the economic recovery leaves the negative output gap intact. The uncertainty created by a weak labor market makes the public pessimistic about the future. That pessimism has engendered low long-term real rates of interest.[31] Moreover, it has made the natural rate of interest (the short-term real interest rate consistent with full employment) negative. A funds rate near zero

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[28] Although the LSAP purchases occurred in response to an unemployment rate in excess of 8% and core PCE inflation of less than 2%, it is unclear what the policy rule is.

[29] In the period since fall 2008, to determine the resulting growth rate for nominal expenditure (output or GDP), one must remove the inflow of funds from the money market into the too-big-to-fail banks precipitated by stress in financial markets. Such deposits are unrelated to the transactions demand for money and nominal expenditure. Those inflows occurred discretely in September 2008, in June and July 2011, and to a lesser extent at year-end 2011.

[30] Inflation shocks due chiefly to increases in energy prices boosted inflation especially starting in late 2010. The resulting transitory increase in inflation temporarily depressed output.

[31] The assumption that the origin of this pessimism lies in a negative monetary shock differentiates this view from an animal-spirits view.

combined with expected inflation of 2% creates a negative real interest rate of about 2%. The natural real interest rate must lie somewhat below this value in order to maintain a rate of real GDP growth insufficient to eliminate the negative output gap.

If the natural rate of interest lay significantly below the actual short-term real interest rate, monetary contraction would ensue. The reason is that individual banks would sell assets in an attempt to place the reserves they gained in the higher-yielding deposits offered by the Fed at an interest rate of .25%. Monetary contraction would depress nominal output growth and with inflation of 2% real growth would decline further below normal for an economic recovery. With expected inflation remaining at 2% and actual inflation steadied around 2% as a result, higher nominal GDP growth would produce higher real GDP growth through a real balance effect that stimulates nominal expenditure. Higher real growth would ultimately raise the natural interest rate.

Since December 2008, the Fed has paid to banks interest on reserves (IOR) at 25 basis points. That innovation renders more complicated the classification of the Fed's operating procedures as reserve-aggregate targeting or interest-rate targeting. Whether allowing banks to lend to the central bank (IOR) is consistent with reserve-aggregate targeting or with interest-rate targeting depends upon the FOMC's reaction function. Prior to December 2008, the FOMC implemented an interest-rate targeting regime (Hetzel 2012, ch. 14).

In a regime of interest-rate targeting, the FOMC possesses a reaction function that uses the interest rate as the policy instrument. The FOMC could then use the level of IOR as the mechanism for setting the desired interest-rate target. In this case, given the interest rate target set equal to the value of the IOR, the FOMC could expand the size of its asset portfolio without depressing short-term interest rates below its rate target (Goodfriend 2000). For example, the FOMC might want to purchase Treasury securities in order to expand the size of its asset portfolio and as a byproduct bank excess reserves as a way of providing banks a cushion against short-term funding problems. Such an initiative would be consistent with limiting the extent of the financial safety net in which banks experiencing a run have unlimited access to the discount window. Alternatively, if the FOMC wanted to use credit allocation as an instrument, it could purchase mortgage-backed securities (MBS) to lower the yield difference between mortgages and Treasury securities. (That initiative would not be a free lunch in that it would require a somewhat higher target for the interest rate to maintain inflation at target.)

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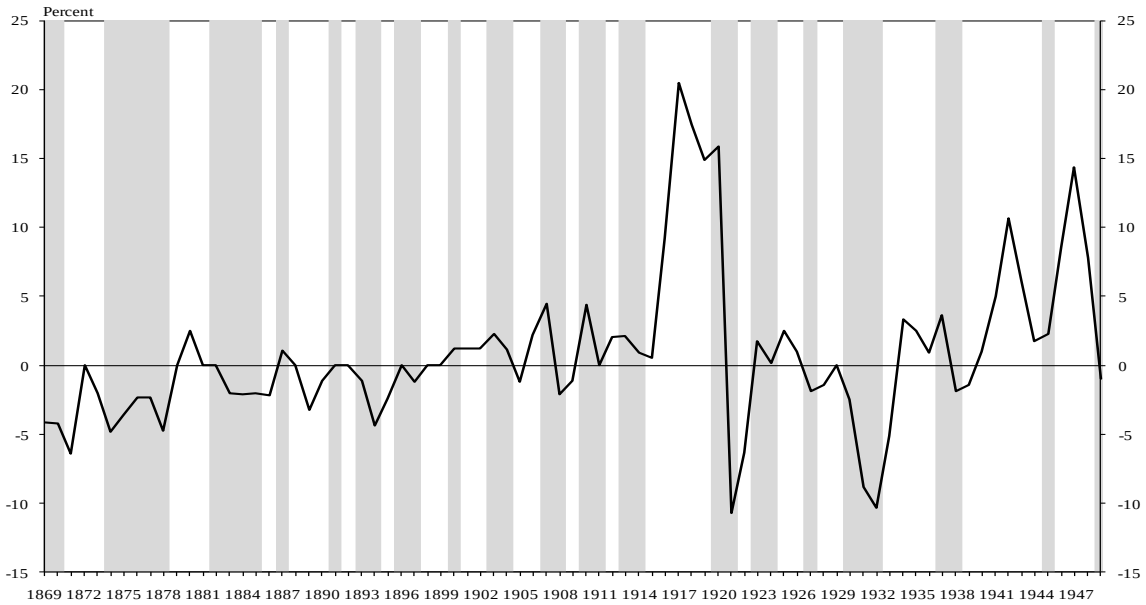
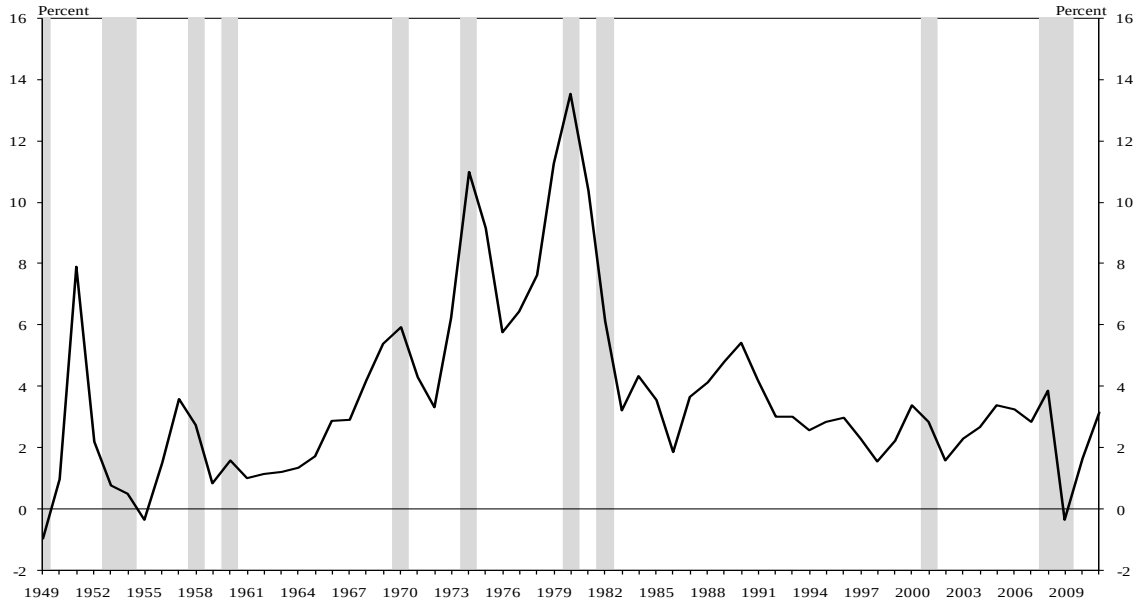
Figure 1 Inflation: 1869 - 1949



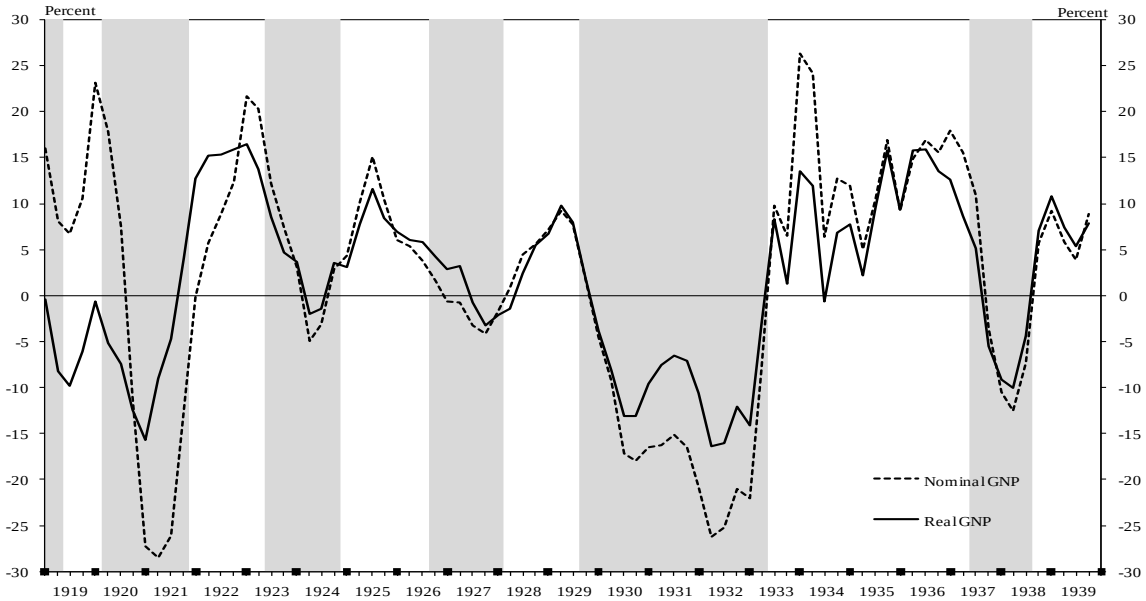
Notes: Annual percentage change in the CPI. Data from Officer and Williamson (2012). Shaded areas represent NBER recessions.

Figure 2 Inflation: 1949 - 2011



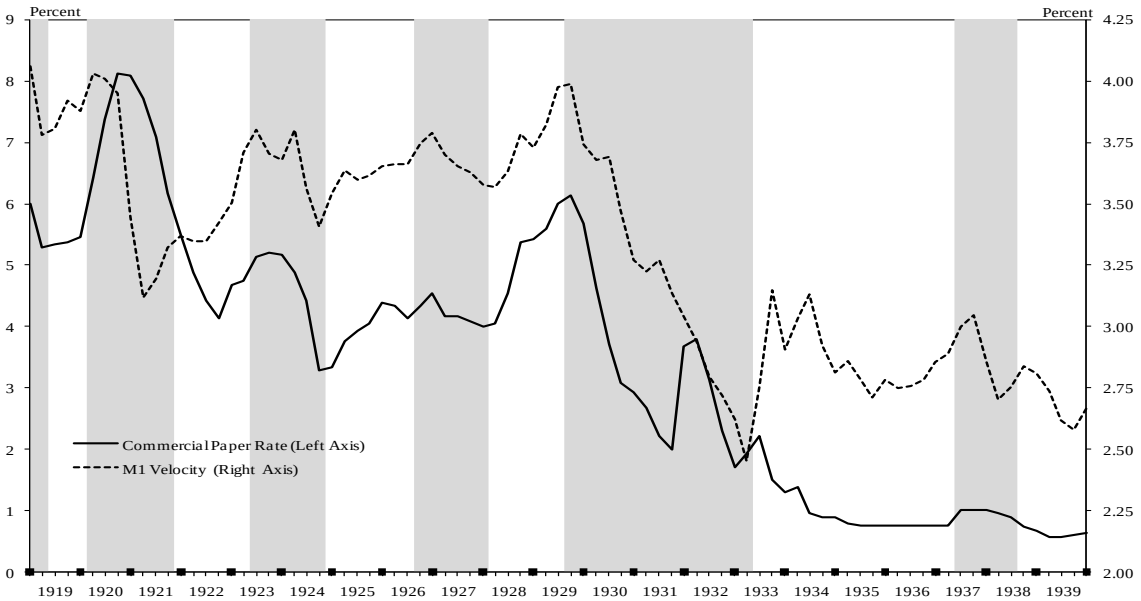
Notes: Annual percentage change in the CPI. Data from Officer and Williamson (2012). Shaded areas represent NBER recessions.

Figure 3 Real and Nominal GNP Growth Rates: 1919 - 1939



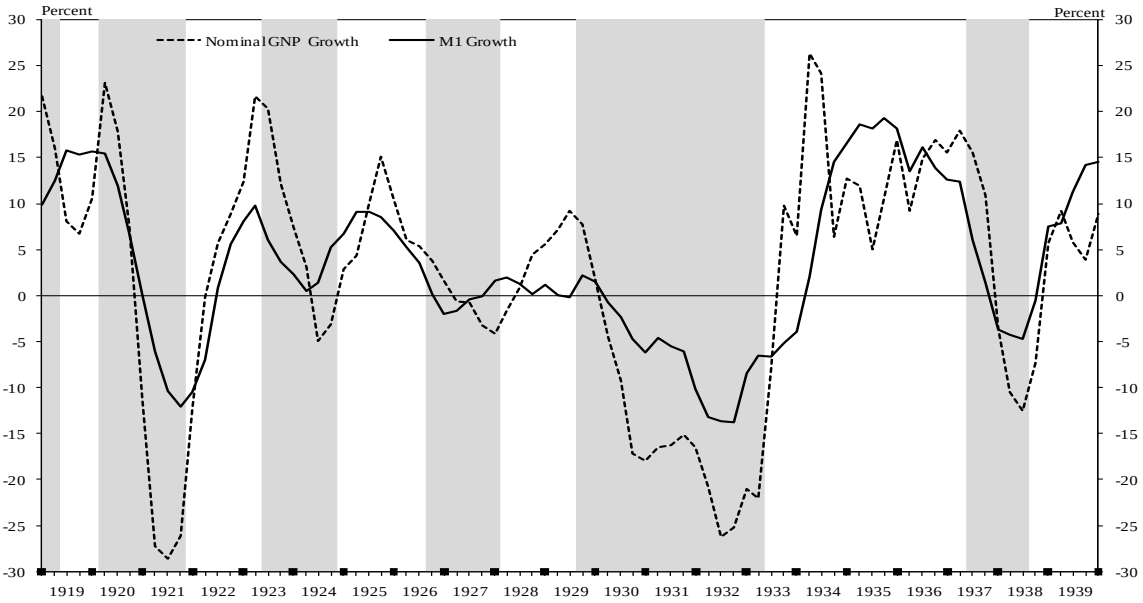
Notes: Quarterly observations of four-quarter percentage changes in real and nominal GNP growth. Rising cross-hatching indicates inflation and falling cross-hatching indicates deflation. Data from Balke and Gordon (1986), Appendix B. Shaded areas represent NBER recessions. Heavy tick marks indicate fourth quarter.

Figure 4 M1Velocity and Commercial Paper Rate



Notes: Quarterly observations of M1 Velocity: GNP divided by M1. Data for GNP are from Balke and Gordon (1986), Appendix B. M1 is from Friedman and Shwartz (1970). Shaded areas represent NBER recessions. Heavy tick marks indicate fourth quarter.

Figure 5 M1 and Nominal GNP Growth: 1919 - 1939



Notes: Quarterly observations of four-quarter percentage changes in nominal GNP and M1 growth. Data for GNP are from Balke and Gordon (1986), Appendix B. M1 is from Friedman and Shwartz (1970). Shaded areas represent NBER recessions. Heavy tick marks indicate fourth quarter.

Figure 6 Real and Nominal GDP Growth Rates: 1952 - 1981

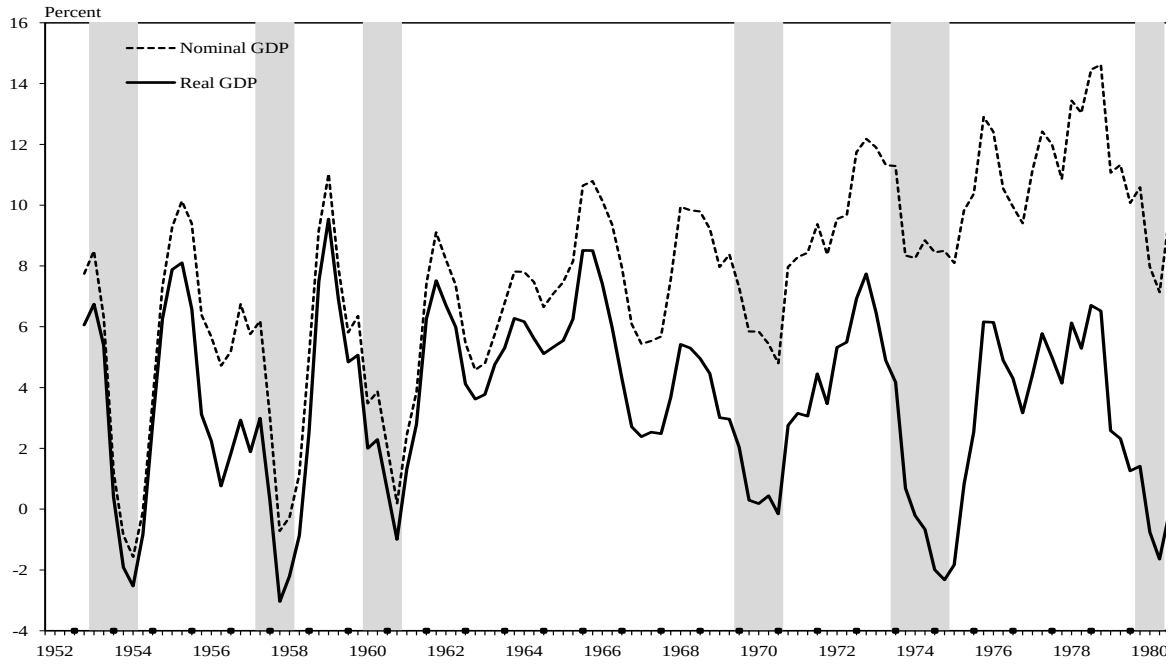


Figure 7 M1 and Nominal GDP Growth: 1952 - 1981

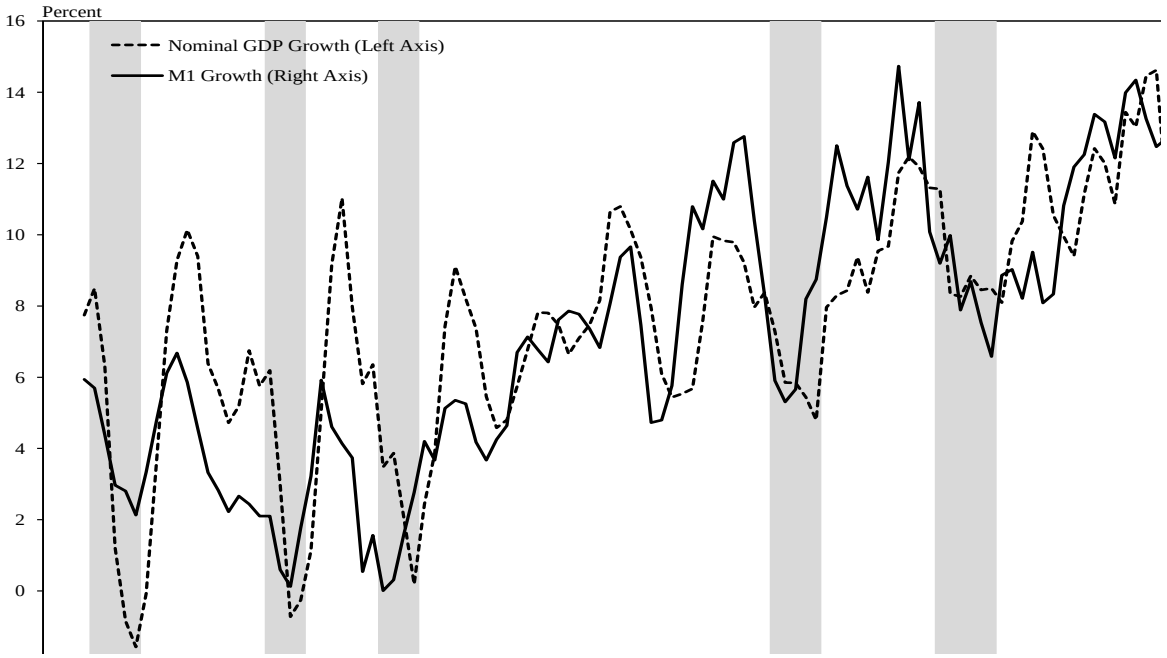
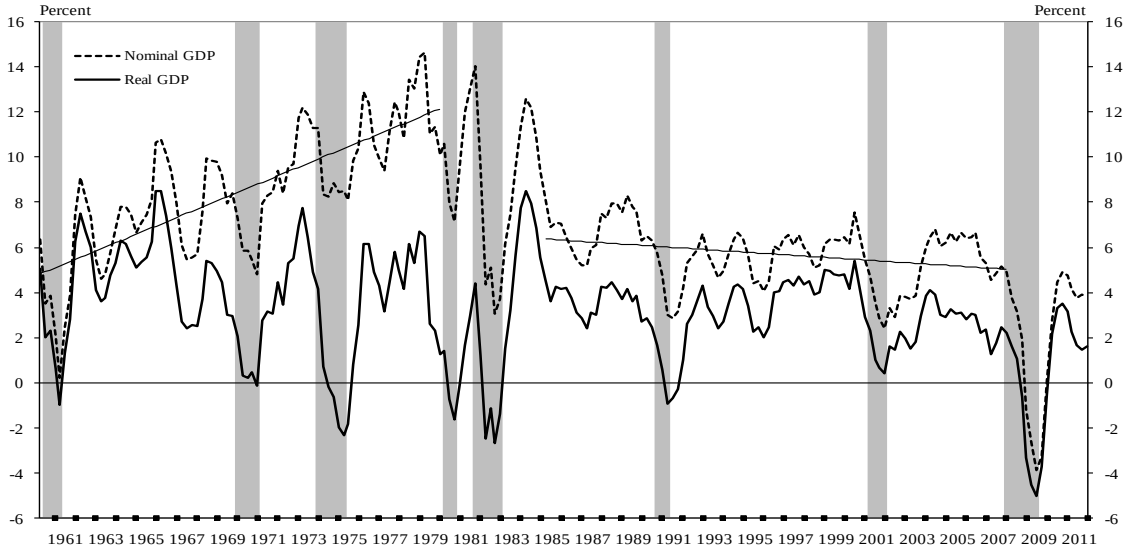


Figure 8 Growth Rates of Nominal and Real GDP



Notes: Quarterly observations of four-quarter percentage changes of real and nominal GDP. Trend lines fit to observations from 1960Q1 to 1979Q4 and 1985Q1 to 2007Q4. Shaded areas represent NBER recessions. Data from Haver. Heavy tick marks indicate fourth quarters.