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Why the Quantity of Money Still Matters

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Abstract

The operating procedure of Federal Reserve policy focuses almost exclusively on interest rates, in particular short term rates such as the federal funds rate. Conventional wisdom today interprets a low federal funds rate as an indicator of an expansionary monetary policy, and a high federal funds rate as indicative of a contractionary policy.

Our thesis is that this conventional wisdom is flawed. We develop a quantity theory model to illustrate how changes in the real money supply can impact both the price level and real output. We present data showing that when the Fed slows the rate of growth of the monetary base to approximately the growth rate of GDP, that this slowdown also impacts real variables. However, according to comments, the Federal Reserve pays little attention to the quantity of money.

Finally we asked: Since the Federal Reserve pays little attention to the quantity of money, what variables does the FOMC likely consider in deciding to alter the federal funds rate? The answer, perhaps not surprisingly, appears to be variables readily measured and easily related to by the general public – prices and capacity.

1.0 Introduction

The Federal Reserve Board of Governors appears to behave as if they believe that causation goes from interest rates to the financial markets and then to the economy, and that the quantity of money has a passive role. Bernanke (2004) clarified that when he stated: “Monetary policy works for the most part through financial markets. Central bank actions are designed in the first instance to influence asset prices and yields, which in turn affect economic decisions and thus the evolution of the economy.”

Bernanke (2004) goes on to state that: “The pricing of long-lived assets, such as long-term bonds and equities, depends on the entire expected future path of short-term interest rates as well as on the current short-term rate. Prices and yields of long-lived assets are important determinants of economic behavior because they affect incentives to spend, save, and invest. Thus, a central bank may hope to affect financial markets and economic activity by influencing financial market participants’ expectations of future short-term rates.”

Gavin (2004) makes it more clear: “Since 1982, however, measures of the quantity of money have provided little useful information about the near-term outlook for spending or inflation. Money growth has remained highly variable even as inflation has become less variable.” Gavin in discussing the quantity of money refers to M1 and M2.

Gavin (2004) further states: “This disconnect between the variability of inflation and money growth is partly due to the success of policy in reducing inflation and causing expectations of future inflation to become more stable. In this environment, the Federal Reserve has been able to keep its federal funds target rate fixed for months at a time. When the funds rate is fixed, the short-run money supply is perfectly elastic with respect to the interest rate and all changes in money demand are perfectly accommodated.”

People on the Board of Governors and in at least one of regional Federal Reserve Banks seem to have made it clear that Irving Fisher’s Quantity Theory doesn’t have a role in their implementation of monetary policy. The quantity of money seems unimportant in the Federal Reserve System.

To erase any doubt Gavin (2004) states: “We do not have to pay attention to the quantity of money today because policymakers are paying attention to its price, by focusing on inflation and inflation expectations.”

Our thesis is that Fisher’s equation of exchange remains applicable, in part, and we present evidence supporting this thesis in this paper. However we also attempt to capture the likely variables that the Federal Reserve follows to guide them in their decision on the overnight rate.

2.0 Theory -- A Suggested Mechanism for Monetary Policy

How can alterations in the money supply affect the real economy? The starting point in theoretical analysis is usually Irving Fisher’s equation of exchange. Although Fisher originally used transactions velocity, we will use income velocity, so that

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

Where M is the nominal money stock, V is the income velocity of money, P is the average level of prices, and Q is aggregate real output.

If we differentiate with respect to time, and simplify by ignoring the cross product terms, we get as an approximation

$$\frac{dM}{dt} + \frac{dV}{dt} = \frac{dP}{dt} + \frac{dQ}{dt} \tag{2}$$

Rearranging, we have

$$\frac{dM}{dt} - \frac{dQ}{dt} = \frac{dP}{dt} - \frac{dV}{dt} \tag{3}$$

The left-hand side of equation (3) is the causative variable, the rate of growth of the money supply minus the rate of growth of real output. In the Fisherian, or monetarist, view, when velocity V is constant, $dV/dt = 0$, the rate of price inflation, dP/dt , is simply a function of excess money supply growth, or

$$\frac{dM}{dt} + \frac{dV}{dt} = \frac{dP}{dt} + \frac{dQ}{dt} \tag{4}$$

We will take this as the long run equilibrium condition. However, if the price level adjusts with a lag, then in the short run $dP/dt = 0$, and velocity must adjust, or

$$\frac{dV}{dt} = \frac{dM}{dt} - \frac{dQ}{dt} \tag{5}$$

That is to say, if the money supply growth rate, dM/dt , is greater than the growth of real output, dQ/dt , then velocity moves in the opposite direction in the short run. Excess money supply growth causes velocity to slow down momentarily, until prices can adjust.

As is well known, the velocity of money is not permanently fixed for all time, but its movement over time is strongly predictable. That is, it has a trend value, V_T , which is a function of its time path.

$$V_T = f(V_{T-1}, V_{T-2}, V_{T-3}, \dots) \tag{6}$$

The current value of velocity V_t , can be above the traditional value V_T , or below it. And the current value of V_t is a function of monetary policy and the growth rate of real output as shown above.

Our hypothesis, which is consistent with monetarist theories of Fisher, Friedman, and many others, is that when current velocity is below trend,

$$V_t - V_T < 0 \quad (7)$$

then spending goes up. When current velocity is above trend,

$$V_t - V_T > 0 \quad (8)$$

then spending goes down.

Spending on what? Spending on everything. Spending on financial assets, which drive stock and bond prices up and interest rates down. Spending on real output Q , which can eventually drive up the price level P , if capacity utilization gets near 100%. And spending on foreign goods and assets, which drives the dollar down and the prices of foreign currencies up. How much spending increases for each category, and how fast is, of course, difficult to predict.

Fisher in the above framework incorporated the medium of exchange function of money and M1 as the empirical measure of money. Friedman (1956) switched to M2 for his statistical analysis and the corresponding M2 store of value money function. In comparison, Gavin (2004) states that: “The role of money as our unit of account, the dollar, is at center stage in monetary policy today.”

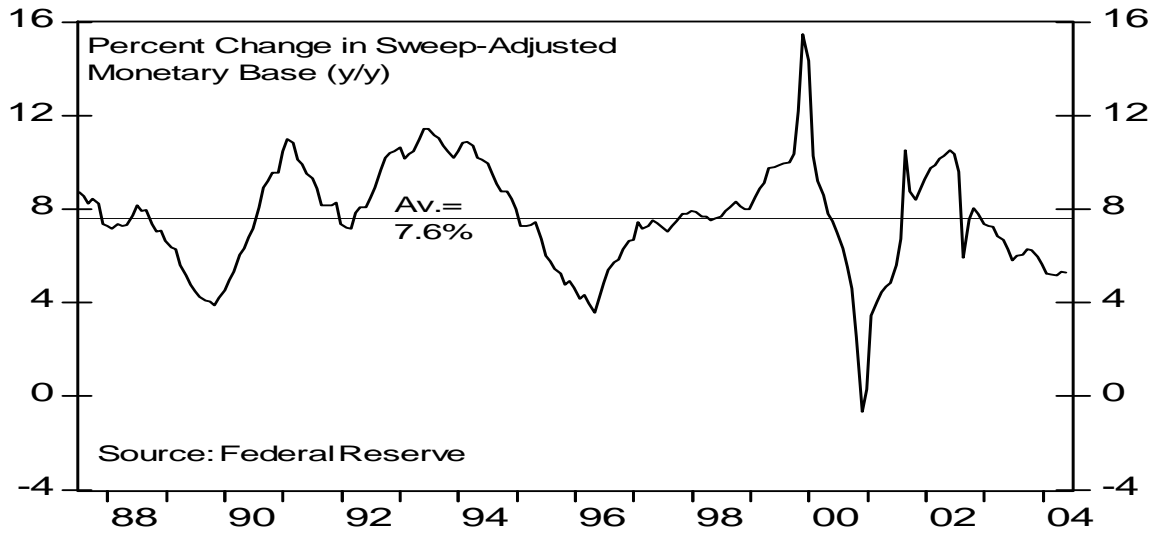
3.0 Quantity Theory of Money Assessment

In this section we evaluate our quantity theory of money model over the period since Mr. Greenspan became Chairman of the Federal Reserve in August 1987. We use the sweep-adjusted monetary base as the definition of money. This definition better represents the supply of money as the Federal Reserve can control changes in the monetary base. M1 and M2, in comparison, have greater dimensions of money demand associated with them than does the monetary base. Brunner (1961) developed the idea of using the monetary base as an indicator of monetary policy.

Causation is assumed to run from the left side of the quantity equation to the right side. Total spending is impacted by changes in the exogenous variable – money represented by changes in the monetary base. Real output growth varies considerably over different periods and theory suggests that rapid output growth is accompanied by high demand for money growth. In turn, implied inflation will be lower. A measure of money supply growth in excess of that justified by output growth can be obtained by subtracting real output growth from growth in the monetary base.

Graph 1 illustrates the change in the monetary base over the relevant time period.

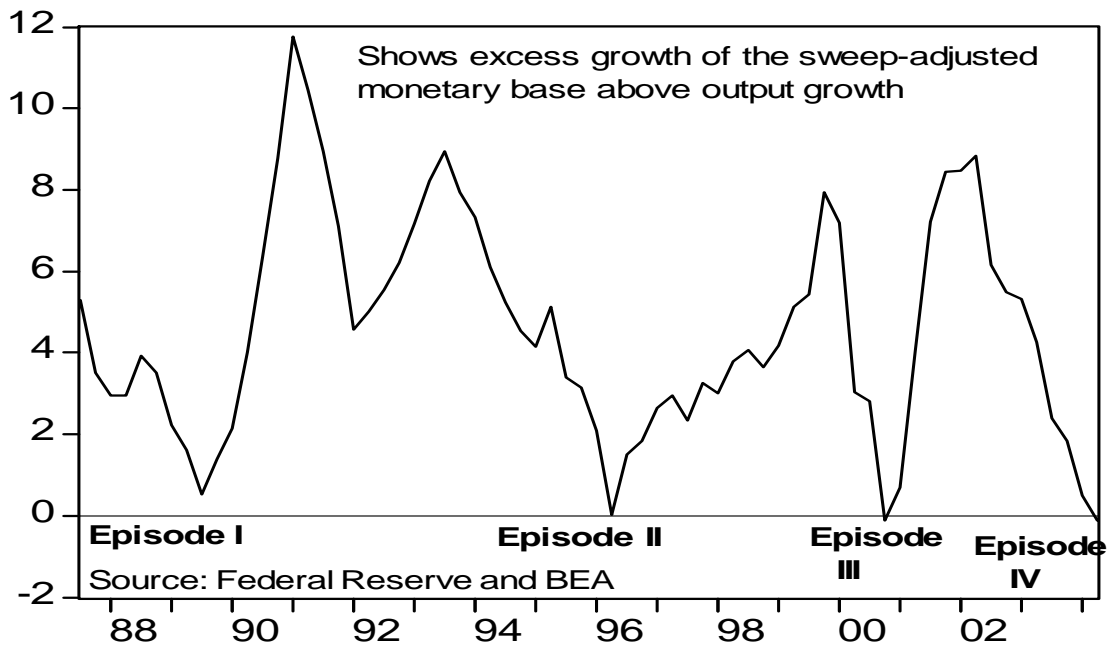
Graph 1
Percent Change in Monetary Base



Next the adjustment to growth in the monetary base for growth in output is made. This measure of excess growth of money demonstrates the degree of net inflationary pressure the central bank exerts on the economy. A sizeable positive number would suggest the Federal Reserve is allowing for upward pressure on price level.

A number approaching zero, in comparison, implies the Federal Reserve is placing downward pressure on the price level assuming prices are flexible downward. There have been four episodes in which the growth of the sweep-adjusted monetary base approximately matched real GDP growth.

Graph 2
Monetary Base Growth minus RGDP Growth



3.1 Episodes

Two of the first three episodes in which money supply growth was approximately equal to economic growth resulted in downturns in U.S. real output, while the other resulted in a stronger dollar which contributed to the economic disruption in Far East economies.

- **Episode I**

The difference between the growth of high-powered money and real GDP growth was 0.5 in 1989:3. The U.S. recession started in July 1990 – nearly one year later.

- **Episode II**

Episode two: in 1996:2 differential growth was essentially zero. Fewer excess dollars led to a pronounced rise in the price-adjusted broad dollar index of 24.8 percent from July 1995 to August 1998. The sharp increase in the dollar index helped create an environment in which the Asian currencies of Thailand, Indonesia and South Korea were allowed to float in the latter part of 1997. In August 1998 the Russian government defaulted on its debt commitments. The adjustment to similar growth rates of U.S. money supply and output growth occurred outside the U.S.

- **Episode III**

By the fourth quarter of 2000 the differential growth was approximately zero. The recession start date was March 2001.

- **Episode IV**

The sweep-adjusted monetary base and real gross domestic product are again increasing at approximately the same pace as this paper was written. Money supply additions are essentially being consumed by the real economy. The past three times this relationship occurred during the Greenspan era the result has been unfavorable for economic growth either in the U.S. or in other countries. In two of those episodes a U.S. recession followed while the third time, the mid-1990s, the episode helped create an environment for economic financial dislocation outside the U.S.

So history suggests a crunch between now and one-year from now either in the U.S. economy and/or financial markets either in the U.S. and/or outside the U.S. It could be a replay of 1996 where the economic dislocation occurs in other parts of the global economy.

3.2 Implication

Federal Reserve officials apparently believe they don't need to pay attention to the quantity of money; but an assessment of the quantity theory during the Greenspan era suggests that changes in the quantity of money relative to output growth have major influences on asset prices, economic growth and currency values. The focus of the Federal Reserve is on price-level stability. The analysis they do apparently suggests to them that there isn't a close relationship between changes in the quantity of money regardless of the money measure used, so therefore their focus is on the price of money.

However, we have shown that there appears to be a relationship between change in the monetary base and change in real output growth. In particular when growth in the monetary base and real output growth are approximately the same, the result seems to be a change in real output which is consistent with Irving Fisher's Quantity Theory of Money. A slowdown in spending occurs, with a time lag, when monetary base growth and real output growth are approximately the same.

The complete disregard for money supply growth by Federal Reserve officials is eerily reminiscent of two earlier episodes in U.S. financial history, both of which ended badly. According to Friedman and Schwartz (1963),

the Federal Reserve in the 1920s pursued a “real bills” doctrine, adjusting the money supply and the flow of new credit according to the “needs of the economy.” Gavin’s statement that “all changes in money demand are perfectly accommodated” sounds like a restatement of the real bills doctrine. But as Friedman and Schwartz point out, the mindless application of the real bills doctrine by the Federal Reserve over the period 1929-1933 is what led to the collapse of the money supply at that time, and was a major contributor to the Great Depression.

The other episode was the Federal Reserve’s policy of fixing interest rates on government bonds, which persisted from World War II until the Treasury-Federal Reserve accord of 1951. During this period, the Federal Reserve supplied whatever amount of new money was necessary to keep interest rates on Treasury bonds at 1.5 to 1.75 percent. While nominal interest rates indeed remained stable, money supply growth and the inflation rate accelerated rapidly in the postwar years, until the policy was finally abandoned in the 1951 accord.

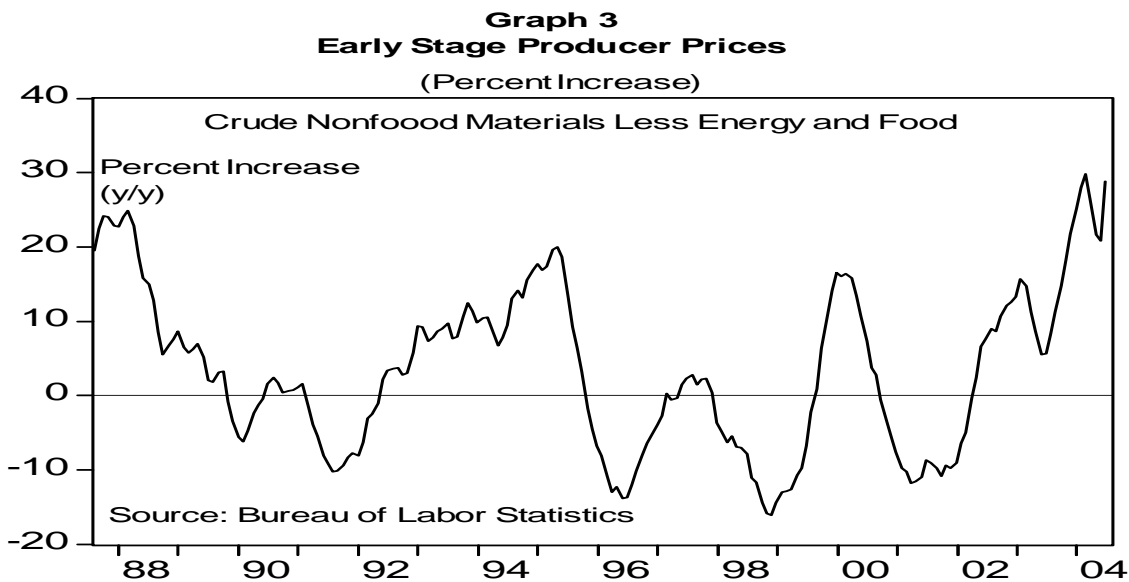
Cosgrove (2004) suggests that the Federal Reserve and other central banks need to increase the quantity of money at a more rapid pace than normal to account for the impact of disinflation due to gains of trade among developed and developing countries in the post-1980 period. That disinflation effect combined with our quantity theory application findings suggests the price level remains under downward pressure.

4.0 Federal Reserve Policy

It seems clear that the focus of the Federal Reserve is not on the quantity of money and furthermore they question the usefulness of the quantity of money. We tested some of the measures that may be an impetus for the FOMC to alter interest rates, such as the unemployment rates for prime-age males, inflation, changes in import prices and changes in unit labor costs and inflation. The idea that prices may move higher when an economy is close to or at full utilization, when there isn’t an increase in capacity, is often mentioned in the literature such as in (Gordon.)

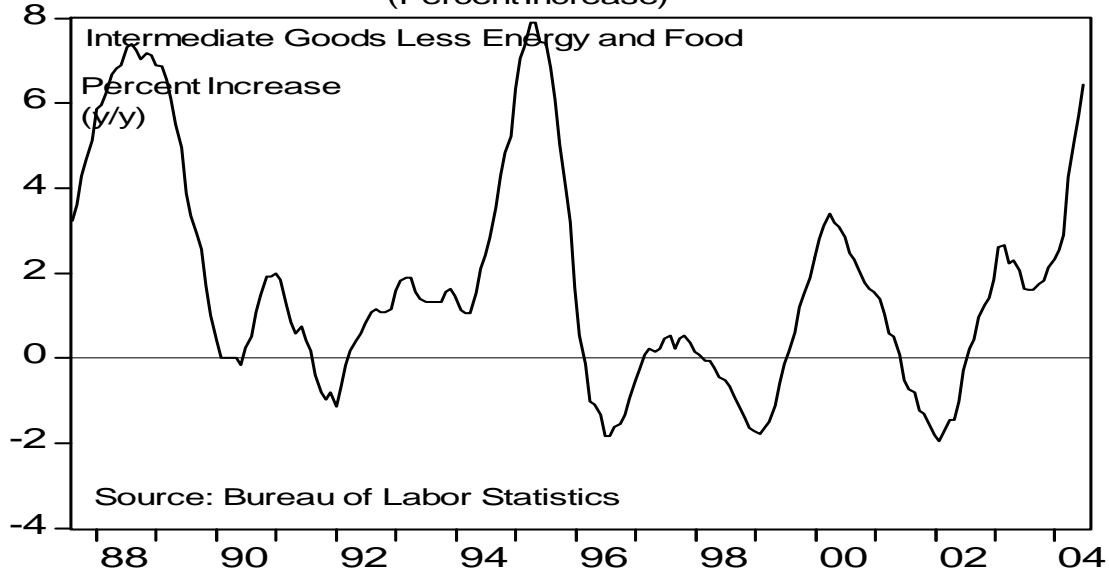
4.1 Price Changes in the Producer Supply Chain

The following provides an overview of price changes in the producer stage. At the early producer stage, price increases less energy and food, are up sharply since May 2002 when price changes moved above zero in this business cycle. Capacity utilization for this stage was in the low 80s at that time. Since then, utilization has risen to the mid 80s. However, prices are very cyclical at this stage and it is doubtful that the Federal Reserve would change their operating target in response to price changes.



Intermediate producer price changes moved above zero in August 2002 shortly after the early stage producer prices moved above zero and utilization in this stage was in the high 70s. Federal Reserve policy makers may pay more attention to price changes at this stage, but again, prices are cyclical at this stage so concern may be muted.

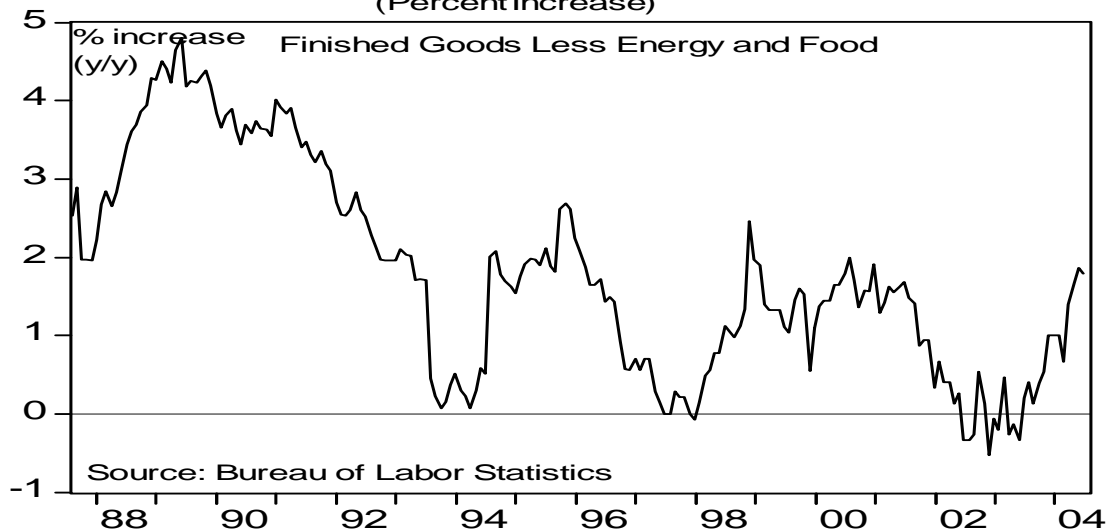
Graph 4
Intermediate Stage Producer Prices
 (Percent Increase)



Price changes have been above zero at the finished stage – less energy and food – since mid-2003 when utilization rates for this stage were in the 70s. In comparison, price changes at the early and intermediate stage of the producer supply chain moved above zero in mid-2002 so there was about a one-year lag.

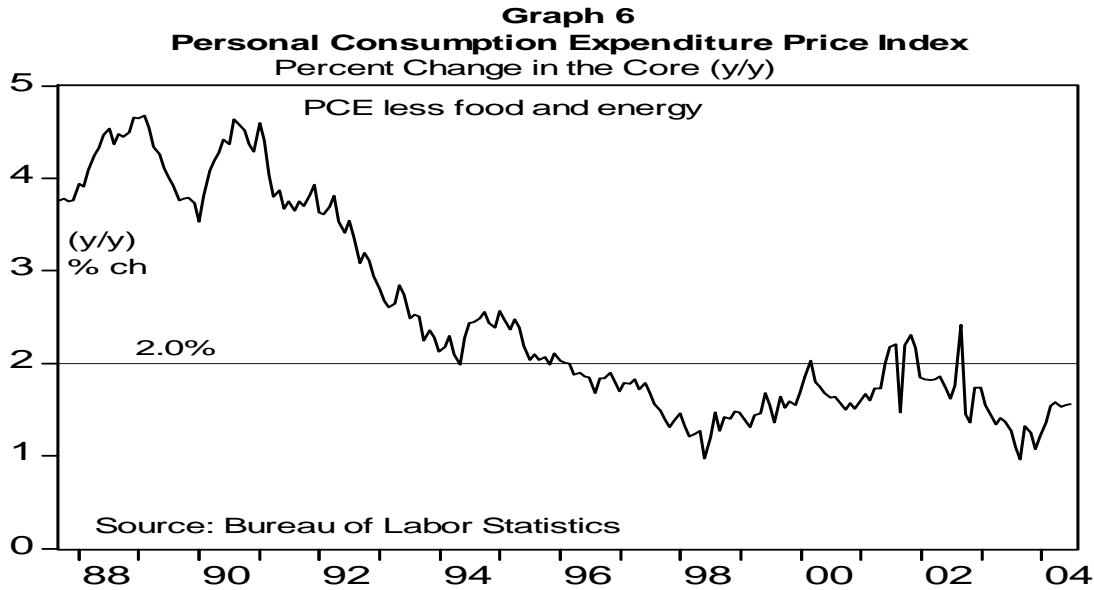
Prices at this point in the supply chain are one stage removed from consumer prices so the Federal Reserve may be concerned about price increases at this stage.

Graph 5
Finished Goods Producer Prices
 (Percent Increase)

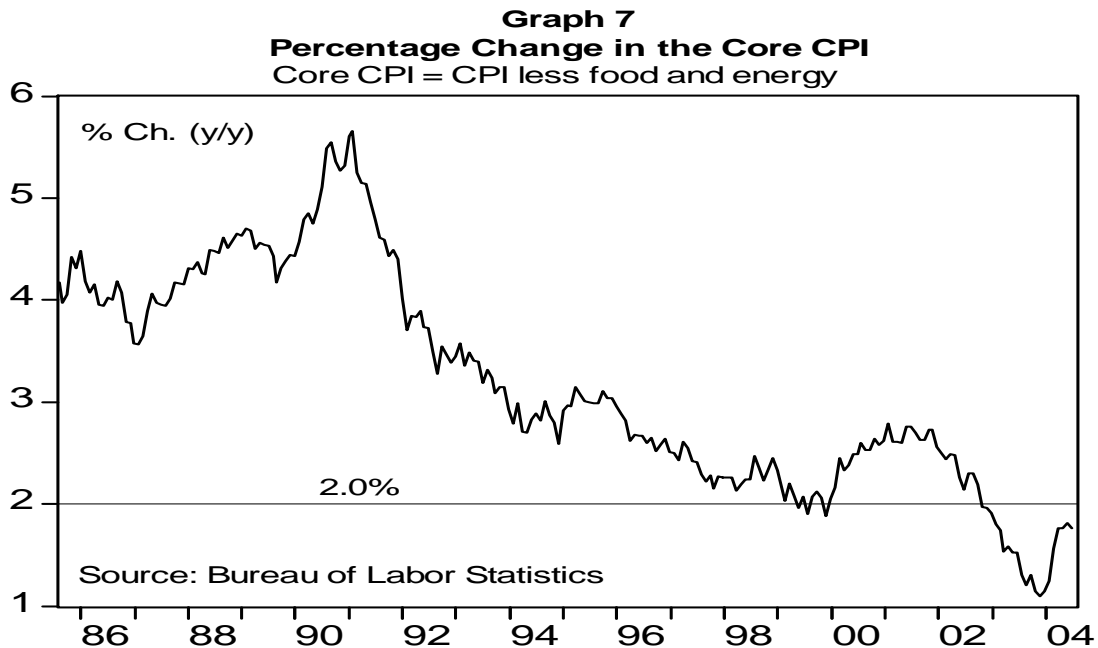


4.2 Price Changes in the Consumer Supply Chain

The PCE deflator less energy and food is one price measure referred to in the popular press as a measure that Federal Reserve officials watch. It seems well behaved at this point – 36 months into this business cycle expansion as of September 2004.



Another measure often used in the popular press is the core CPI. It also remains slightly under the 2 percent benchmark inflation number.



Price pressures are occurring at various stages along the producer and consumer price chain. Which price trends concern the Federal Reserve or which price measure creates a situation where the Federal Reserve may contemplate a change in the federal funds target rate?

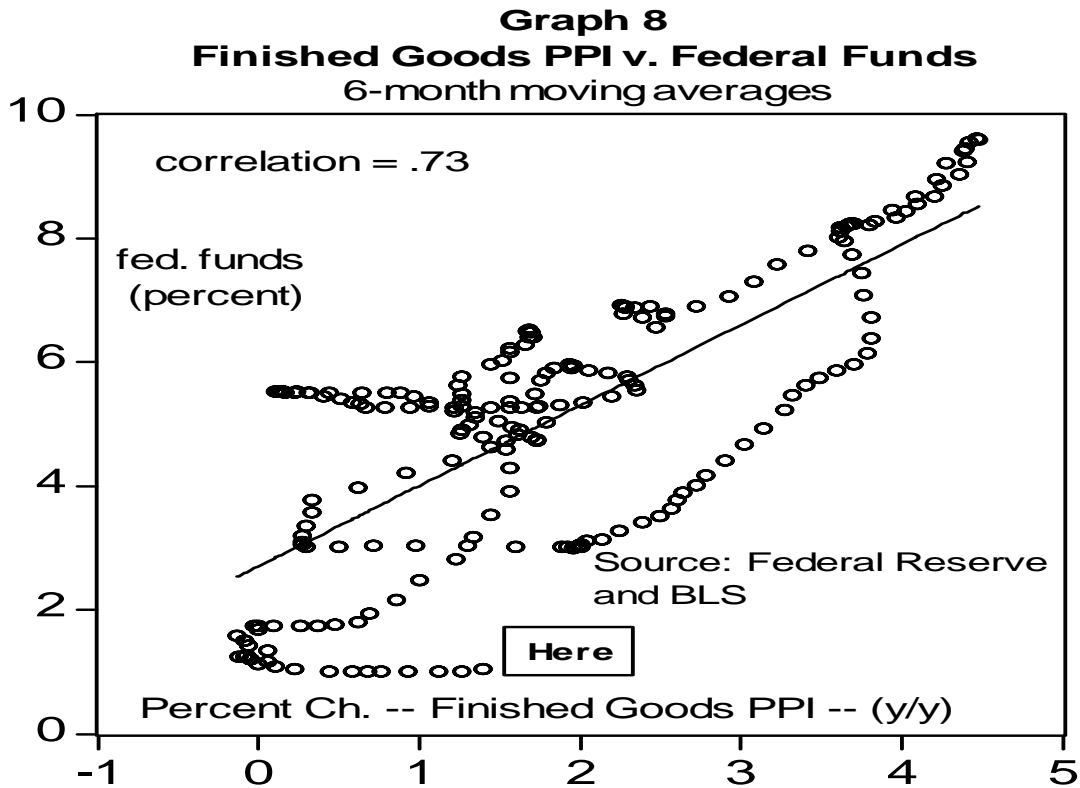
4.3 Importance of Price Measures

The simple correlation between the change in the federal funds rate and the year-over-year change in each of the above price series since Mr. Greenspan became Chairman is one method of evaluating the price series that best correlate with moves in the overnight rate.

Table I	
Simple Correlation	
Aug. 1997 to present (205 observations)	
Federal Funds	
Early Stage	-0.138442
Intermediate	0.333806
Finished	0.727726
Core CPI	0.678631
Core PCE	0.612099

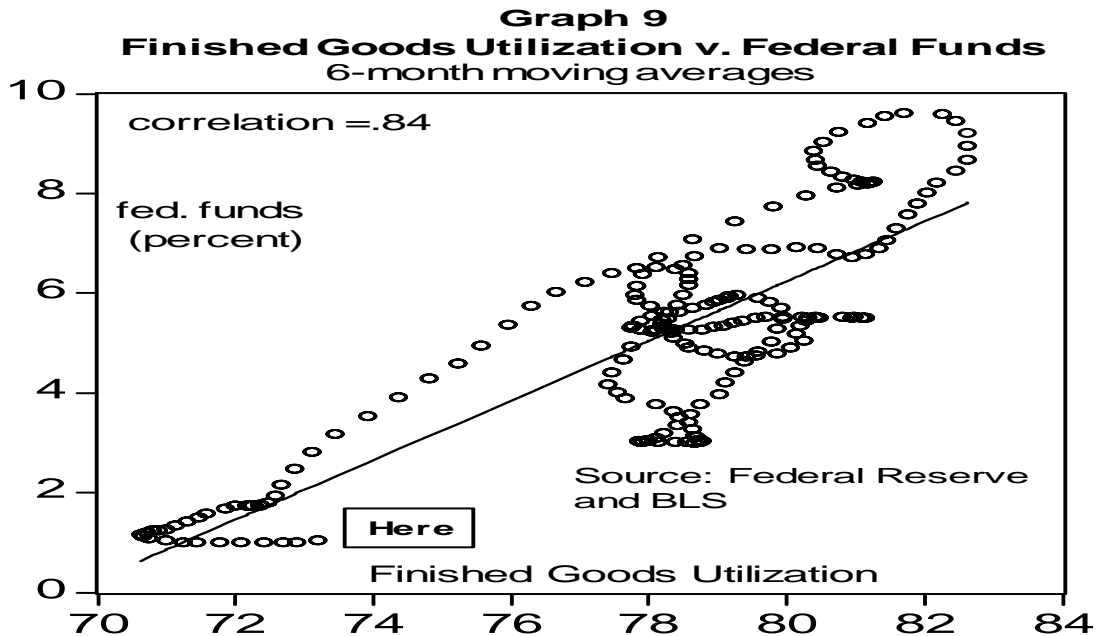
The federal funds rate clearly does not move with the most cyclical price measures – producer prices at the early and intermediate stages. But the federal funds rate does tend to move with the change in the finished producer price index less energy and food as well as the core CPI. One might have expected the highest correlation with the change in the core PCE since that series is supposedly one price series that FOMC members watch.

Graph 8 illustrates movement of the change in the finished goods core PPI and the overnight rate. The current location marked by “here” may be considered an outlier by FOMC members relative to their experience during the Greenspan era. In turn that suggests the preference of the FOMC is to move the funds rate toward their zone of experience which means a higher funds rate at this stage of the business cycle.



4.4 Funds Rate and Supply Constraints

Gordon discussed supply issues, and one measure of supply limitations is capacity utilization. The concept is that a producer's costs per unit increase more rapidly at higher rates of utilization, leading to more rapid increases in producer prices. The measure of finished goods utilization relative to the federal funds rate has a correlation of .84.



This suggests the FOMC follows utilization rates fairly closely, in particular the utilization rate at the finished goods level in the Greenspan era. As recently as 2000, the federal funds rate was 6.5 percent and it appears that the federal funds rate was reduced in conjunction with a decline in finished goods utilization. Currently the finished goods utilization is moving higher suggesting that the FOMC may increase the overnight rate. In contrast, the correlation between the utilization rate and federal funds rate was much lower in the 17-year pre-Greenspan period, suggesting that this relationship is unique to the Greenspan era.

Other factors representing supply constraints such as unemployment rate of prime-age workers, import prices, unit labor costs and utilization rates at other stages of the production process were evaluated and most measures of supply constraints had a low correlation with the funds rate in the Greenspan era. An exception is the change in nonfarm business sector unit labor costs which has a simple correlation of .71 with the federal funds rate. This has a similar correlation as the finished core producer price series, suggesting again that the Greenspan era FOMC focuses on current supply constraint issues in implementing monetary policy.

5.0 Summary

Behavior of productive capacity at the finished stage, core finished producer price changes and changes in unit labor costs have moved together much of the time with changes in federal funds rates during the Greenspan era -- but not before. Members of the FOMC may watch many variables in implementing monetary policy but it appears supply considerations receive the most consideration in their decision-making framework.

Further, writings by Federal Reserve officials suggest they believe that behavior of the quantity of money is irrelevant to their framework of monetary policy implementation. To the contrary, our analysis suggests that changes in the quantity of money less real output growth remain very important to economic growth.

So what are the instruments and objectives of Federal Reserve policy today? If we take them at their word, many Fed officials ignore the growth rate of the money supply completely, while focusing entirely on interest rate targeting. Their dual objectives, according to the Humphrey-Hawkins Act, are full employment and price stability.

Yet our analysis of the four recent episodes where monetary base growth slowed to zero, relative to real GDP growth, as well as the earlier historical episodes, suggests money growth rates are still relevant. Greenspan's success in bringing down long run inflation, as well as the correlations between the federal funds rate and the PPI and utilization, suggest that the Federal Reserve, while saying publicly it is ignoring the money supply, is implicitly admitting its importance.

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