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Recent Behavior of Base Velocity

Allan H. Meltzer
Carnegie Mellon University, am05@andrew.cmu.edu

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by Allan H. Meltzer*

The Federal Reserve is back with its usual claim that the demand for money shifted in 1982. The alleged shift is used to justify a return to the money growth rates typical of the middle, and late seventies, the Burns and Miller years of highly inflationary monetary policy. This time the claim seems more substantial, or at least is more obvious to the naked eye, so it has been treated as an established fact by Wall Street and Washington.

A common explanation of the shift is that deregulation of the banking system reduced the demand for time deposits relative to the new, interest earning demand deposits. This answer may be correct, as far as it goes, but it is surely incomplete. Most of the observed decline in velocity in 1982 and early 1983 cannot be explained in that way.

The reason is that the velocity of the monetary base -- currency and total bank reserves -- declined relative to trend also. The Federal Reserve Bank of St. Louis adjusts the base by the amount of reserves released or impounded by changes in reserve requirements, so the recent regulatory changes that lowered the banks' average reserve requirement are treated by St. Louis as a release of reserves and a reduction in the demand for base money. The reduced demand for base money taken alone, has the effect of <u>increasing</u> measured base velocity. This effect of regulation takes us in the wrong direction. The introduction of super-Now accounts raises the demand for base but has too little effect on required reserves to explain the decline in base velocity.

Deregulation and other institutional changes may have increased the demand for currency to be used as vault cash (reserves) of depository institutions. Much of the recent decline in base velocity (relative to trend) is concentrated in the first quarter of 1982, well before major regulatory changes took effect, however. This timing of the drop in velocity would seem to rule out a major effect on deregulation, although deregulation may have contributed to the decline in velocity in the fourth quarter of 1982 and the first quarter of 1983.

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Other proposed explanations include the decline in expected inflation and the variability of monetary growth and of expenditure. A drop in the expected rate of inflation lowers the cost of holding cash balances, so cash balances per unit of output rise and velocity falls. Rapid accelerations and decelerations of money (or spending) introduce unanticipated changes into the growth of money and economic activity. Some of these unanticipated, transitory changes are held as cash balances. In addition, increases in the unanticipated components of money and spending increase uncertainty and, thus, lower velocity relative to trend.

Deviations from Trend: First Results

In "Strategies and Tactics for Monetary Control", Karl Brunner and I report estimates of the trend in base velocity computed from quarterly data, using time series analysis, for the period 1951-2 to 1981-3. The computed trend is .0061 per quarter or approximately 2.5% per year. For a more recent period, 1971-1 to 1981-3, the estimated trend is very similar, .0059 per quarter. I have used the trend computed for the longer period (.0061) to obtain trend values for velocity and extended the time period to include the first quarter of 1983. The observations we seek to explain are deviations from the computed trend of base velocity. Let DV denote these deviations.[1]

As a first effort to test whether there has been a systematic change in base velocity I estimated (t-values in parentheses),

$$DV = \underset{(0.22)}{-0.04} - \underset{(4.08)}{0.02}\ DB + \underset{(3.04)}{0.02}\ \hat{p} \qquad (1)$$

$$\rho = \underset{(31.31)}{0.94},\ R^2 = 0.19$$

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[1] The hypothesis is:

$$EV = V_0 e^{.0061t}$$

with EV denoting the expected (trend) value of velocity, and

$$V - EV = DV.$$

$DV = f(DB, \pi)$ where π is the expected rate of inflation and EV is independent of the expected rate of inflation. Changes in the expected rate of inflation induce one-time changes in the demand for money and in velocity.

where DB is the acceleration of the base, computed as the difference between the current rate of change and a moving twelve quarter average rate of change, $\hat{p}$ is the current (actual) rate of price change, and ρ measures first order serial correlation of the residuals.

The first effort produced findings broadly consistent with all subsequent efforts. The estimates suggest that accelerations of the base and reductions in the rate of inflation reduce velocity relative to trend; decelerations of the base and increases in inflation raise velocity relative to trend. These findings are consistent with a very large literature. Further, there is strong first-order serial correlation, a finding consistent with the often stated view that there is a lag before changes in money growth are fully reflected in the growth rate of spending. The coefficient of first-order serial correlation is close to unity, in this and most other estimates, suggesting that the equation could be estimated by taking first differences of the deviation from trend, DV, and other variables.[2] Finally, the equation suggests that most of quarterly DV is random, or at least not explained by DB, $\hat{p}$ and the lagged error.

The purpose of the estimates is to judge whether the trend of velocity has changed in recent quarters, after taking account of the factors included in (1). The answer given by the regression is that there is at most a one-time decline in the level of velocity. Two estimates of the size of the decline are shown in Table 1. The first is the error from equation (1) computed for the full period, 1952-1 to 1983-1. The second is the error computed from the same equation estimated for the shorter period, 1971-2 to 1983-1 inclusive. In both columns, the error in estimating DV becomes negative in 1981-4 and remains negative through 1983-1. Table 1 shows these residual errors.

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[2]The value of ρ suggests that DV is a random walk (hence not stationary) but ΔDV is likely to be stationary.

Table 1

Residual Error in DV Computed from Equation 1

Quarter	1951-2 to 1983-1	1971-2 to 1983-1
1981-4	-.114	-.072
1982-1	-.333	-.189
-2	-.233	-.253
-3	-.218	-.282
-4	-.305	-.349
1983-1	-.270	-.334

The columns are essentially the same. Both suggest that the residual remained in a narrow range and has not increased. These data suggest that a one-time drop in the level of velocity of about -0.3 may have occurred early in 1982.

Even this conclusion is much less than a certainty. The standard errors of estimate for the two equations are 0.13 for the longer period and 0.17 for the shorter, so the residual error is within a range that can arise from sampling error. The conclusion that the level of velocity has changed is an interpretation of the persistence of the error, not the size.

To gain some perspective about size, note that the average level of base velocity is about 17.15 for the five quarters ending in 1983-1. The average residual error (0.28) is about 1.6% of the level for this period, but it is nearly three times the trend increase in velocity at recent levels. In 1983-1, base velocity is 1.36 (almost 8%) below its previous trend, but most of the decline is predicted by the variability of monetary policy, the decline in inflation, and the lagged residual (including effects of lagged responses to inflation and monetary policy.)

Some Further Results

The measurement of DB and inflation are open to obvious criticisms. To see whether these criticisms affect the result, I replace DB and $\hat{p}$, in equation

(1), with DBMA2 and π in equation (2). DBMA2 is the residual from an ARIMA (0, 1, 2) model for ℓn B and π is the expected rate of inflation computed from an ARIMA (0, 1, 1) model estimated on computed quarterly rates of price change of the GNP deflator.

$$DV = \underset{(0.67)}{-0.23} \; \underset{(3.70)}{- 0.016DBMA2} \; \underset{(0.49)}{- 0.010\pi} \qquad (2)$$

$$\rho = \underset{(16.85)}{0.94}, \; R^2 = 0.21$$

The measure of current expected inflation has no significant effect on DV. In other respects the equation is similar to equation (1) in its implications.

A further step permits unanticipated changes in spending to affect DV. DYAR1 is the difference between actual ℓn GNP and the value predicted using an AR1 time series model.

$$DV = \underset{(1.20)}{-0.45} \; \underset{(4.42)}{- 0.017DBMA2} \; \underset{(3.41)}{+ 0.005 \; DYAR1} \; \underset{(0.88)}{+ 0.018\pi} \qquad (3)$$

$$\rho = \underset{(21.06)}{0.96}, \; R^2 = 0.38$$

The residuals from equation (2) and (3) and the standard errors of estimate for the two equations is shown in Table 2. These are not substantially different from the residuals reported in Table 1. They suggest, at most, that there may

Table 2

Residuals from Equations (2) and (3)

Quarter	Equation (2)	Equation (3)
81-4	-0.09	-0.03
82-1	-0.29	-0.28
82-2	-0.29	-0.32
82-3	-0.22	-0.19
82-4	-0.28	-0.23
83-1	-0.16	-0.16
Standard Error	$\pm$ 0.17	$\pm$ 0.15

have been a one-time drop in the level of base velocity of about 1.5%. The inference is a bit weaker, given the possible tendency of the residual to decline. There is no evidence of a substantial change in the behavior of velocity once allowance is made for the effects of unstable monetary policies, the decline in inflation, and lagged effects.

A Change in Trend?

The persistence of the negative error, and the relative large decline in measured velocity may be the start of a lower "trend" in velocity. A lower trend rate of increase could occur, for example, if the instability of monetary policy encourages people to hold more money (here mainly currency) per dollar of GNP. My previous estimates are based on the assumption that the trend has remained unchanged. Is there evidence of a change in trend?

Table 3 presents some data for earlier (old) and more recent (current) estimates for the ARIMA 011 model, with a constant, used to compute the trend.

Table 3

	Old	Current
1951-2 to 1961-1	.0073	.0067
1961-1 to 1971-1	.0055	.0051
1971-1 to 1981-3	.0059 $\pm$ .0012	
1971-1 to 1983-1		.0044 $\pm$ .0018

The hypothesis that the trend has changed is rejected for the sample observations. Measuring "trends" always depends on starting and ending points chosen, so a different sample may give a different result.

Conclusion

There is no doubt that base velocity declined in 1982 and early 1983 and is lower than the value expected from its prior trend. The issue is whether the trend of base velocity has changed, or whether there has been a one-time drop in base velocity, or whether the recent behavior of base velocity is consistent

with its past behavior when account is taken of the factors determining that behavior.

There is, as yet, no reliable evidence of a change in trend. Arguments that base growth can be raised to offset the faster trend rate of increase in base velocity appear to rest on a weak foundation, or no foundation at all.

There is slightly more evidence suggesting a one-time decline in the level of velocity in the first quarter of 1982. The evidence is weak and consists mainly of a persistent residual equal to about -0.3, 1.5% of the recent value of base velocity. If true, this finding might have been used to justify a one-time increase in the level of the monetary base in early 1982, but it cannot serve as the reason for faster base growth now.

Most of the decline in base velocity appear to be the result of the variability of monetary policy, a decline in the expected and actual rates of inflation and the delayed effect of past changes in these and possibly other factors. The analysis suggests that a more reliable consistent monetary policy that reduced the variability of the base would also reduce the variability of base velocity.