

Post Keynesian Monetary Theory: Contrary Empirical Evidence

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INTRODUCTION

This paper examines the proposed Post Keynesian relationship between costs of production and the corresponding reaction of monetary variables. Moore (1979; 1983; 1988) and Arestis (1986) maintain that growth-rate increases in the wage bill lead to increases in the monetary base and money supply. Moore claims that changes in the wage bill are interpreted as a rise in the liquidity needs of firms which lead to a rise in the borrowing rate by firms. In response, the Federal Reserve lowers the supply price of money which helps accommodate the rising liquidity needs of the private sector. The money supply will rise due to the increase in the demand for funds by the private sector. Moore also claims but does not emphasize that raw material costs and capital costs play a similar role in money supply determination. This paper refers to this relation as the production costs hypothesis (PCH). Using an expanded data set similar to that of Moore (1979), little support for the PCH can be found. In fact, the influence of the wage bill in the determination of monetary variables is insignificant over time.

There is little doubt that Federal Reserve behavior is dependent upon the stability and direction of the economy. However a controversy remains as to both the relevant independent variables influencing money growth rates and whether the Federal Reserve actually has any direct influence over the money supply. This paper focuses on the second controversy but the analysis also addresses the first controversy. This second controversy is most easily described by examining two opposing schools of thought concerning the factors which influence monetary policy.

The first approach, called the orthodox approach, examines the roles of interest rates, expected inflation rates, deviations of output around the natural rate of output, and the size of aggregate supply and demand disturbances as they influence the growth rate of the money supply. The Federal Reserve can choose between various reaction functions by which alternative policies may have varying stabilization properties for the economy. The orthodox approach, such as Fischer (1977) and Turnovsky (1987), develops money supply reaction functions which depend on aggregate supply and demand disturbances, as well as exchange rate volatility and the minimization of the inflation rate. Since the inflation rate is an endogenous variable, a reaction function which includes the inflation rate would be considered an endogenous representation of the money supply.

The second school of thought, proposed by Basil Moore, emphasizes the specific liquidity needs of a representative firm as the primary factor influencing the behavior of the Federal Reserve. This approach maintains that changes in the money growth rate is primarily demand determined. Therefore, if the private sector requires more working capital in response to a rising wage bill, the demand for loans will rise and cause an increase in the money growth rate. The Federal Reserve's only real influence is over the supply price of money, so it is the private sector's decision to borrow money which ultimately determines the money growth

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TABLE 1
Dependent Variable - Monetary Base
1966.3 - 1986.4

Transformation	Constant	Wage Bill	Materials Price	Stock Price	Rho	R ²	DW	SSR
1. Rate of Change	2642* (993)	13.3 (9)	-5.3 (33)	24* (12.8)	0.92 (0.05)	.80	2.70	25025004
2.	2662* (960)	14.5 (9.2)	-25 (31.7)		0.91	.79	2.68	26186807
3. Percentage Rate of Change	0.01* (0.001)	0.08 (0.07)	0.06 (0.04)	0.02* (0.007)	0.47 (0.1)	.28	2.21	0.001106
4.	0.017* (0.003)	0.17 (0.15)	-0.11 (0.09)		0.44 (0.18)	.11	2.22	0.000437
Dependent Variable - Money Supply - M1								
5. Rate of Change	2.07 (1.26)	0.24* (0.06)	-0.46* (0.19)	0.47* (0.14)		.34	1.54	2370.5
6.	2.44* (1.34)	0.28* (0.05)	-0.71* (0.18)			.25	1.59	2722
7. Percentage Rate of Change	0.02* (0.003)	0.05 (0.17)	-0.01 (0.08)	0.07* (0.02)		.13	1.86	0.00909
8.	0.017* (0.004)	0.07 (0.17)	-0.13** (0.077)			.01	1.91	0.010466
Dependent Variable - M2								
9. Rate of Change	28.2* (6.6)	0.14 (0.22)	-0.72 (0.7)	0.27 (0.3)	0.70 (0.09)	.55	2.40	11354
10.	29.2* (6.8)	0.13 (0.22)	-0.9 (0.67)		0.72	.55	2.39	11473
11. Percentage Rate of Change	0.02* (0.003)	0.01 (0.12)	-0.02 (0.07)	0.03* (0.01)	0.48 (0.1)	.33	2.09	0.00352
12.	0.02* (0.003)	0.03 (0.13)	-0.08 (0.07)			.29	2.04	0.0038

Notes:

- 1) Standard Errors in Parentheses
- 2) * - significant at the 1% significance level
- 3) ** - significant at the 5% significance level
- 4) Rho - correction for first order serial autocorrelation

rate. Moore (1979) contends that the Federal Reserve is required to act in a manner that satisfies the liquidity needs of the private sector and any other monetary regime will lead to economic disarray. Therefore, it is implied that alternative reaction function specifications used by Fischer and Turnovsky imply an arbitrary (exogenous) nature to monetary policy that is not consistent with fostering economic stability or even feasible. As an example, in an orthodox framework, choosing to minimize the inflation rate as a policy goal produces predictions about the direction of money growth rates which are inconsistent with Post Keynesian theory. An increase in the wage bill could be a signal of future inflation for which the orthodox rule requires a decrease in the money growth rate to counter the upward pressure on prices. Post Keynesian theory suggests that the money growth rate should increase to satisfy the liquidity needs of the private sector.

In a different scenario, both approaches can produce consistent results. Suppose that a substantial negative supply disturbance occurred such as an oil price shock. A Fischer type rule (1977) would have the Federal Reserve increase the money growth rate in order to offset the inward shift of the aggregate supply schedule. The Post Keynesian rule would also result in an expansionary monetary policy in the face of a negative supply disturbance. A rise in energy prices causes an increase in both the costs of production and liquidity needs of firms thus causing the Federal Reserve to lower the supply price of money.

This paper tests the Post Keynesian hypothesis in order to determine whether its hypothesis offers useful insights into the conduct of monetary policy. Empirical results offer little support for the PCH. In fact, results indicate that changes in the wage bill do not have a significant impact on money supply behavior. There is also some evidence to suggest that increases in raw material costs result in contractions in the money growth rate which implies an anti-inflationary policy.

Section 2 provides a brief description of Post Keynesian monetary theory and the motivation for the empirical approach. Section 3 contains the empirical results of the paper and section 4 is the conclusion.

THEORY

Moore hypothesizes that changes in the cost of production incurred by firms occur prior to any change in sales receipts, thus requiring an increase in their borrowing rate in order to finance the higher costs of production:

Increases in money wage rates, the single most important factor cost, and in raw material costs, will thus lead directly to an increase in the quantity of bank credit demanded, and so to a corresponding increase in bank deposits and in the money stock. (Moore 1983 p. 546)

In Moore (1979), the monetary base and M1 were used as dependent variables and the primary right-hand-side variables analyzed were average weekly earnings (wage bill) and the wholesale price index (raw material costs). Estimating data from 1951.2 - 1977.2, Moore obtained a positive coefficient for the wage bill using both the base and money supply as dependent variables. In order to represent raw material costs, he used the wholesale price index for farm products, industrial products, and for all products. Moore obtained positive coefficients for the wholesale price variables.

In a later article, Moore (1983) expanded his empirical work by increasing the set of variables to improve representation of the various costs of production faced by a firm. In addition to wage and raw material costs, Moore included a discussion about the cost of the capital stock, however, Moore's empirical strategy changed substantially. He used commercial and industrial loans as the dependent variable and concluded that increases in production costs led to increases in the money supply. Moore claimed that this relationship supported the PCH, however, one needs to examine the relationship between loan activity and the money before any conclusions can be made. This is discussed in the next section which incorporates the ideas from both of Moore's papers to analyze further the correlation between the base and money supply to changes in the costs of production.

The basic form of the equation to be estimated is:

$$MB_t = a_0 + a_1WB_t + a_2RM_t + a_3SP_t + u_t \quad (1)$$

TABLE 2

Dependent Variable - Monetary Base
(1966.3 - 1973.1)

Transformation	Constant	Wage Bill	Materials Price	Stock Price	Rho	R ²	DW	SSR
1. Rate of Change	611** (94)	-0.23 (10)	402** (56)	50.5** (11)		.77	1.61	85192
2.	636* (155)	9.7 (11.6)	319* (75)		0.50	.69	2.00	1172675
3. Percentage Rate of Change	0.01* (0.001)	-0.04 (0.07)	0.51* (0.08)	0.04* (0.008)		.68	1.87	0.00016
4.	0.01* (0.002)	0.01 (0.09)		0.57* (0.15)	0.44	.42	1.89	0.00024
(1973.2 - 1979.3)								
5. Rate of Change	1067* (207)	36.6* (7.9)	29 (25)	16 (23)		.48	1.95	2989352
6.	1089* (210)	37.7* (7.7)	18.8 (20.6)			.49	1.91	3057322
7. Percentage Rate of Change	0.01* (0.002)	0.19* (0.08)	0.04 (0.04)	0.0007 (0.01)		.16	1.83	0.00020
8.	0.01* (0.002)	0.19* (0.08)	0.04 (0.028)			.21	1.93	0.00022
(1979.4 - 1986.4)								
9. Rate of Change	3004* (670)	23.7 (18.5)	-105 (67.5)	31.8 (25.7)	0.62 (0.2)	.48	2.1	15774719
10.	3139* (673)	23.4 (18.7)	-119** (67)		0.63	.47	2.2	16784840
11. Percentage Rate of Change	0.02* (0.002)	0.09 (0.14)	-0.05 (0.07)	0.03* (0.01)		.11	1.39	0.00044
12.	0.02* (0.002)	0.17 (0.15)	-0.11 (0.096)		0.43	.11	2.22	0.00044

Notes:

- 1) Standard Errors in Parentheses
- 2) * - significant at the 1% significance level
- 3) ** - significant at the 5% significance level
- 4) Rho - correction for first order serial correlation

where MB is the monetary base, WB is the wage bill, RM is the price of raw materials, and SP is stock prices. The intent of (1) is to examine the sensitivity of the base to changes in the specific components of the costs of production for the average firm.

The variable, SP, is represented by common stock prices for industrial companies. This variable is a proxy for capital costs (machinery, factories, etc.). As an example, an increase in stock prices signals an increase in expected profits which suggests that firms may expand in the future. This expansion will be financed by retained earnings as well as borrowing from the financial sector. Stock prices are intended to capture this borrowing effect.

It is interesting to point out that in Moore (1988), the strict endogenous argument for the money supply was relaxed as Moore discussed the asymmetry of Federal Reserve control of the money supply. Moore maintains that the Federal Reserve can increase the money supply by engaging in open market operations. However, the Federal Reserve's attempt at reducing the money supply can be thwarted as banks avoid the reduction of reserves through open market operations by borrowing at the discount window.

EMPIRICAL RESULTS

The data set was obtained from the Citibase datatape. The variables used in this analysis are:

MB - monetary base adjusted for required reserves changes - FMFBA.

DM - money supply - FM1 converted to quarterly values by averaging.

DM2 - money stock M2 - FM2.

WB - wage bill - national income wages and salaries - GWY.

IM - raw materials cost - producer price index intermediate materials - PWIMSA.

SP - stock prices - NYSE common stock price - industrial - FSNIN.

The estimation of (1) is approached from two different perspectives. First, the entire sample set, 1966.3 - 1986.4, is used to estimate (1) which provides an analysis of the economy over a twenty year period. Considering that the economy has experienced shifts in the direction of policy, supply disturbances of considerable size, and business cycle occurrences of significant magnitude, it is reasonable to expect that the parameter estimates from (1) may not be stable over shorter intervals of time. Accordingly the data must be analyzed from a second perspective.

The original data set is divided into three parts with each period reflecting a very different description of the economy. The 1966.3 - 1973.1 period was the end of a very stable period in U.S. history in that there were no business cycles of measurable importance. The subsequent period, 1973.2 - 1979.3, however, was characterized by two recessions of considerable magnitude and the occurrence of simultaneous bouts of inflation and unemployment. It is apparent that this second period experienced macroeconomic phenomena that were markedly different from the first period. The third period, 1979.4 - 1986.4, was initiated by the Federal Reserve announcement that monetary policy was to change to the targeting of aggregate reserves. The targeting of non-borrowed reserves ended in 1982. The decision to single out this period is prompted more by Federal Reserve policy than by economic climate. This period experienced a severe depression in the early 1980s but was followed by sustained growth for close to seven years. As presented below, there appears to be structural shifts in the parameters in (1).

Estimating the model over the entire period (Table 1) provides little support for the PCH. Using the monetary base and M2 as dependent variables, the stock price variable was found to be the only significantly positive variable. The wage bill is consistently insignificant in rates of change and percentage rates of change. Excluding the stock price variable from the analysis results in the similar conclusions regarding the insignificant wage bill.

Using M1 as the dependent variable (rates of change) yields a significantly positive coefficient for the wage bill but a significantly negative coefficient for raw material costs. When estimating the model in percentage rates of change, I find that the wage bill becomes insignificant but material costs remain significantly negative at the 5% significance level. An increase in raw material costs leads to a *reduction* in the growth rate for M1. This suggests that the Federal Reserve is following an anti-inflationary policy. This result is contrary to the PCH.

Estimating the model over the three sub-periods reveals

TABLE 3

Dependent Variable - Money Supply - M1
(1966.3 - 1973.1)

Transformation	Constant	Wage Bill	Materials Price	Stock Price	Rho	R ²	DW	SSR
1. Rate of Change	2.23 (0.76)	0.004 (0.05)	0.68* (0.34)	0.16** (0.05)	0.57	.63	1.66	18.9
2.	2.26*	0.03	0.54		0.63	.51	1.53	26.5
3. Percentage Rate of Change	0.01* (0.003)	-0.03 (0.14)	0.31* (0.18)	0.05** (0.01)	0.50 (0.22)	.53	1.56	0.000455
4.	0.01* (0.005)	-0.006 (0.16)	0.36 (0.25)		0.62	.36	1.48	0.000628
(1973.2 - 1979.3)								
5. Rate of Change	1.28 (1.04)	0.14** (0.04)	0.13 (0.13)	0.19 (0.11)		.37	1.49	76.3
6.	1.55 (1.07)	0.15* (0.04)	0.01 (0.1)			.33	1.24	85.8
7. Percentage Rate of Change	0.009* (0.004)	0.27* (0.15)	-0.001 (0.07)	0.02 (0.02)		.05	1.37	0.000700
8.	0.01* (0.004)	0.26** (0.14)	-0.04 (0.05)			.08	1.28	0.000732
(1979.4 - 1986.4)								
9. Rate of Change	7.2 (4.6)	0.14 (0.15)	-0.8** (0.39)	0.55** (0.26)		.23	1.89	1674.78
10.	9.7* (4.8)	0.13 (0.16)	-1.03* (0.4)			.14	2.03	1976
11. Percentage Rate of Change	0.01 (0.008)	0.37 (0.49)	-0.37 (0.23)	0.12** (0.04)		.23	2.29	0.005599
12.	0.02** (0.01)	0.34 (0.55)	-0.40 (0.26)			.02	2.48	0.007326

Notes:

- 1) Standard Errors in Parentheses
- 2) * - significant at the 1% significance level
- 3) ** - significant at the 5% significance level
- 4) Rho - correction for first order serial correlation

TABLE 4

Dependent Variable - M2
1966.3 1973.1

Transformation	Constant Bill	Wage Price	Materials Price	Stock	Rho	R ²	DW	SSR
1. Rate of Change	33.5 (2809)	-0.07 (0.15)	0.1 (1.2)	0.3** (0.17)	0.99	.76	1.69	276
2.	19.8 (16.5)	0.04 (0.17)	0.34 (1.34)		0.92	.75	1.65	285.7
3. Percentage Rate of Change	0.02* (0.007)	-0.01 (0.14)	-0.005 (0.2)	0.03* (0.01)	0.80	.69	1.65	0.000616
4.	0.02* (0.009)	0.0005 (0.16)	0.06 (0.25)		0.83	.62	1.48	0.000760
1973.2 - 1979.3								
5. Rate of Change	27.9 (9)	0.01 (0.22)	-0.22 (0.66)	-0.2 (0.4)	.78	.55	1.78	862
6.	26.4* (7.9)	0.13 (0.21)	-0.5 (0.49)		.77	.56	1.73	892.5
7. Percentage Rate of Change	0.03* (0.005)	0.05 (0.18)	-0.14 (0.1)	-0.004 (0.02)	.56	.43	1.73	0.000702
8.	0.02* (0.005)	0.06 (0.17)	-0.13 (0.07)		.53	.45	1.73	0.000709
1979.4 - 1986.4								
9. Rate of Change	47.3* (8.5)	-0.01 (0.28)	-1.88* (0.73)	0.5 (0.5)	.23	2.11	5670	
10.	49.7* (8.3)	-0.02 (0.28)	-2.01* (0.71)			.23	1.99	5645
11. Percentage Rate of Change	0.02* (0.004)	-0.1 (0.25)	-0.05 (0.1)	0.04** (0.022)		.05	2.10	0.001420
12.	0.02* (0.004)	-0.12 (0.25)	-0.06 (0.12)			-0.02	1.93	0.001600

Notes:

- 1) Standard Errors in Parentheses
- 2) * - significant at the 1% significance level
- 3) ** - significant at the 5% significance level

some period specific support for Moore's hypothesis. Table 2 presents the sub-period estimates of the model using the monetary base as the dependent variable. In the 1966.3 - 1973.1 period, it is found that both the intermediate price index and the stock price are significantly positive in rates of change and percentage rates of change. The wage bill, however, continues to be insignificant in both transformations. In this first period, the Federal Reserve appears to be employing changes in intermediate prices and capital costs as a gauge for monetary policy. Moore's contention that the nominal wage is the relevant variable is disputed; the other components of the cost structure for the firm substantiates the basic theme of accommodating monetary policy.

In the second period, 1973.2 - 1979.3, the fit of the regression falls but the wage bill becomes significantly positive for both transformations. Testing for the stability of the wage coefficient over the first and second period results in F-statistics of 5.01 in rates of change and 4.4 in percentage rates of change. Both are significant at the 5% significance level suggesting that the wage bill's influence on the behavior of the base has been unstable over the first two time periods.

The last period, 1979.4 - 1986.4, results in very little support for the PCH. The only variable that is significant is the stock price variable in percentage rates of change.

Using M1 as the dependent variable for the three sub-periods (Table 3) results in a similar set of conclusions when compared to the monetary base. The intermediate goods price index and the stock price variable are significantly positive for both transformations in the first period while the wage bill is insignificant. The wage bill is again only significant in the middle period.

Table 4 reports the results using M2 as the dependent variable. The results indicate even less support period-by-period for the PCH. The wage bill is insignificant for all the sub-periods with the coefficients turning negative. There also is a negative coefficient for intermediate materials in rates of change in the last period.

Post Keynesian analysis suggests that loan activity should be highly influential in determining money growth rates since the hypothesis maintains that the money supply is demand determined. I had access to a limited time series for commercial and industrial loans and found that this variable has no significant impact on the behavior the base or various money supply definitions. Meulendyke (1988) confirms this result. This offers further damaging evidence to the PCH.

CONCLUSIONS

The PCH has been tested in a Post Keynesian framework by emphasizing solely the various factors affecting the cost structure of the firm. At this level of analysis, there is little support for the PCH. The only support for the wage-bill argument occurs in the 1973.2 - 1979.3 period which is coincident with the series of oil price disturbances of the same period. The results of this paper suggest that the behavior of M1, M2, and the monetary base is not consistent with a demand determined theory of money growth. The Federal Reserve appears to have far more control over money growth rates than Moore is willing to admit. The results do indicate, however, that Federal Reserve policy is sensitive to prospects of future inflation as suggested by the negative coefficient for the intermediate price index.

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