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The Money Supply and Common Stock Prices:
A Reappraisal

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The importance of the money supply as a determinant of business conditions and common stock prices is well-documented in the literature (Sprinkel, 1964, 1971; Homa and Jaffee, 1971; Hamburger and Kochin, 1972). The relationship between the money supply and common stock prices has been derived from the quantity theory of money (Friedman and Schwartz, 1960) and from the theory that the money supply is a general indicator of future economic conditions.

The quantity theory of money considers changes in the money stock to be the prime determinant of immediate changes in aggregate money demand and of eventual fluctuations in the levels of total output and/or prices. Regardless of whether changes in the money stock are the prime determinant or merely one of several causal factors of future economic conditions, the money supply is characterized as a leading indicator. While the rationale for a lag between monetary policy changes and changes in economic conditions is evident, there is considerable disagreement as to its length (Friedman and Schwartz, 1960; Sprinkel, 1971).

A number of recent studies have been based on the assumption that changes in the money supply precede changes in the aggregate level of output as do the expectations of investors in the common stocks of firms that will share in this output. There is widespread agreement on these propositions; however, the difficulty arises when a specific temporal relationship between the money supply and the stock market is assumed. Many studies have assumed that since changes in the money supply are highly correlated with future economic performance of publicly-held

corporations, they must necessarily precede changes in the aggregate level of common stock prices. On this basis it has been suggested that abnormal profits may be earned in the stock market by studying publicly-available information of money supply variations. This paper takes issue with the widely-held perception of the money-common stock relationship.

The semi-strong form of the efficient markets hypothesis states that all public information is immediately discounted in common stock prices (Fama). This hypothesis suggests that variations in the money supply will be very rapidly discounted in the valuation of common stocks if investors perceive changes in the money supply as a determinant of future corporate earnings. Changes in the money supply may precede changes in stock prices, or they may be anticipated by investors and actually materialize after variations in equity prices.

When assessing the opportunities for earning an abnormal return in the stock market with an investment strategy based on variations in the money supply, the most critical consideration is the nature of the temporal relationship. If the stock market lags the money supply, then there exists the possibility of formulating an empirically-valid rule for estimating the stock market at time $t+1$ on the basis of the current (time t) money supply. If the lag nature of the relationship is reversed, however, it is unlikely that variation in the money supply can be utilized to predict common stock price variation.

To summarize, changes in the growth rate of the money supply precede and are a determinant of the level of economic activity. Common stock prices also are a leading indicator of economic activity and are classified as such by the National Bureau of Economic Research. It is by no means a foregone conclusion, however, that the lag time between money supply changes and variations in the level of output is greater than the lag between the anticipatory changes in common stock prices and subsequent economic activity (output). Nevertheless, such a conclusion is implicit in much of the literature and is the basis for attempts at stock market prediction.

The objective of this paper is to ascertain the nature of the relationship between the money supply (M1) and the level of common stock prices (The Standard and Poor's 500 Stock Index). Neither a lead nor a lag in one variable relative to the other is assumed prior to the analysis. The study is in three sections. The first part briefly summarizes the literature. The second develops and applies regression analysis to data from 1956 through 1972. An analysis of the findings comprises the final section.

Survey of the Literature

An early effort at relating money supply variation to stock price variation is the work of Beryl Sprinkel (1964 and 1971). Sprinkel states that "since monetary changes have a longer lead over business cycle turning points than do stock prices, it follows that monetary change leads stock prices."¹ He bases this conclusion on a subjective assessment of graphed, six-month moving averages of growth rates for the two data series.² On the basis of calculated monetary growth peaks and stock price peaks, Sprinkel says that bear markets "on the average" are predicted approximately fifteen months in advance by a peak in monetary growth, and bull markets are predicted two months in advance by monetary troughs.

Homa and Jaffee (1971) test Sprinkel's theory using 1960 to 1970 data and find that monetary peaks and troughs have not been separated by a long enough time interval, thus a sell signal fifteen months prior to a peak is cancelled by a buy signal two months after a trough. Consequently, the investor would have remained in stocks for the entire period and his performance would have been identical to a buy-and-hold strategy.

Sprinkel's approach to investment timing has several other difficulties. The first is that ex ante the investor is unlikely to be able to distinguish an interim peak or trough in the money supply from a major cyclical one, and Sprinkel has not stated any rule regarding lesser peaks and troughs.

Second, a six-month moving average may be too lengthy a period to study because time tends to smooth out much of the cyclical movement and may disguise monetary policy changes. An additional weakness of this approach is that an average relationship expressed in months of lead time is meaningful for predictive purposes only when the actual observation is an average one. Sprinkel acknowledges this problem.

A more recent study by Gupta (1974) focuses on "a quantitative evaluation of the money supply as a predictor of future movements in the stock market....attempting to uncover special information implicit in the money supply."³ He implies that money supply changes precede common stock price changes and conducts a study of turning points by applying alternative filter techniques to isolate peaks and troughs in each series. Gupta found that M2 is a slightly better predictor than M1; however, based on the application of his theoretical construct to 1948-70 data he found that the ex-ante probability of correctly identifying a stock market peak was .59 and a trough .54. Thus, the probability of buying low, selling high, and thereby out-performing a buy-and-hold strategy is only .319. The implication of these results is that the money supply, when led relative to the stock market, is not a very good indicator of future turning points.

Homa and Jaffee (1971), rather than attempting to isolate peaks and troughs in the stock market, develop a multiple regression equation which relates the money supply to subsequent stock prices. Their approach contrasts with those of Sprinkel and Gupta in that it is a means

of correlating the two variables, not only for cyclical peaks and troughs, but for the intervening fluctuations, as well. The regression equation they present predicts the stock market at time $t+1$ where $+1$ is one-quarter into the future. The independent variables are the money supply at time t , growth in the money supply between t and $t+1$, and a lagged error term. The unsettling feature of their approach is that future money supply must be estimated in order for the regression to have predictive utility.

The authors conclude that the use of naive, growth-rate extrapolation to determine the money supply in time $t + 1$ led to results that were "distinctly inferior" to a buy-and-hold strategy. Homa and Jaffee feel that one must have some current predictive information on future money supply movements to be able to profitably employ the money-stocks relationship. Unfortunately, they do not further explore the implication of the temporal relationship between the two variables present in the regression equation. The regression does, in fact, suggest that the money supply does not lead, and is at least coincident with, the stock market.⁴ If the latter is the reality, then the difficulty in attempting to use current money supply information to forecast future common stock prices is obvious.

Methodology

This study employs correlation and regression techniques to ascertain the nature of the relationship between money supply changes and variation in common stock prices. The regression technique is appropriate because:

1. It allows for considerable flexibility in the specification of lagged and leading relationships among variables.
2. Percentage first differences of the data can be used to eliminate the secular growth trend that is present in both common stock prices and the money supply series.

The two variables in the study are the money supply, M1, and the Standard and Poor's 500 Stock Index (S & P 500). Financial data were obtained from the Survey of Current Business. The data were aggregated on a quarterly basis, with each observation representing the arithmetic mean of the data series for the relevant three months. This procedure was followed for two reasons. First, this method largely eliminates irregular variations in either variable which occur because of exogenous and transient developments. Second, trend influence, or direction of movement, is preserved, yet the time interval is not so long that monetary policy shifts are obscured.

All money supply data were seasonally-adjusted and expressed in annual rates of billions of dollars. The period of analysis was the first quarter of 1956 (1956-1) to the final quarter of 1972 (1972-4)--a time frame covering several complete business cycles. The period after 1964-1 is especially important to this analysis since the middle and latter part of the past decade witnessed a plethora of literature relating the stock market to the money supply. Consequently, it might be expected

that the temporal relationship of the two variables shifted once investors became apprised of a "new" technique in stock market forecasting.

Percentage first differences of the data have been calculated to eliminate secular growth. Thus, the S & P 500 growth rate is represented by $S - S_{-1} / S_{-1}$, and the money supply growth rate by $M - M_{-1} / M_{-1}$; the subscript is the lead time in quarters. Percentage rates are especially important because they not only remove the secular growth, but are also an indicator of expectations. Furthermore, the level of the S & P Index more than doubles over the period being studied, and absolute differences alone could yield misleading results.

The initial analytic step is the correlation of the money supply and the S & P Index with all desired lags which apply to the latter. The next step is the calculation of correlation coefficients when all desired leads are attached to the latter variable. A maximum of five periods (15 months) was chosen for both the lead and lag because Sprinkel indicated that the money supply seemed to lead bear markets by nine to fifteen months and bull markets by two to three months. The calculated correlation coefficients are presented in Table 1.

Examination of these coefficients yields several interesting relationships with regard to differences between the periods before and after 1964. From 1956 to 1964, the coefficient of correlation between variations in M1 and variations in common stock prices in the following quarter is .29881. This declines to -.00292 in the 1964 to 1972 period, and neither coefficient is significant at the

Table 1

CORRELATION COEFFICIENTS: Standard and Poor's 500 versus money supply

<u>S & P INDEX</u>	<u>MONEY SUPPLY</u>	
	<u>1956-1 to 1964-2</u>	<u>1964-3 to 1972-4</u>
<u>Lead Time</u>		
-5 Quarters	-.47063	-.06864
-4 "	-.22336	-.36313
-3 "	-.06570	-.20157
-2 "	.11833	.27606
-1 "	.59196	.61036
0 "	.61027	.35829
<u>Lag Time</u>		
+1 Quarters	.29881	-.00292
+2 "	.11880	-.17532
+3 "	-.17835	.08299
+4 "	-.34042	-.11246
+5 "	-.26778	-.02412

n = 29
 $r_{.95} = .3673$
 $r_{.99} = .4705$

n = 30
 $r_{.95} = .3610$
 $r_{.99} = .4629$

95 percent confidence level. These data indicate that the money supply has not consistently led the stock market by one quarter since 1956. Note, however, that M1 variations were highly-correlated with S & P 500 variations when the two variables were approximately coincident indicators from 1956 to 1964 ($r = .61027$), leaving open the possibility that monetary changes could have had a small lead over common stock price variations for this period. In the period after 1964, the correlation coefficient fell to an insignificant .35829.

Further examination of the results presented in Table 1 indicate that a similar trend occurs in every instance where the S & P Index has lagged the money supply, except for S & P +2. The absolute values of the correlation coefficients have declined, reflecting the fact that the money supply has become a poorer anticipator of future common stock prices after 1964 than it was before 1964. Additionally, Table 1 shows that the absolute coefficient values have increased for all cases in which the S & P 500 Index has led the money supply, with the exception of S & P -5.

The correlation coefficient which occurs when the stock index leads the money supply by one quarter is the only one that is highly-significant (at the 99 percent level) both before and after 1964. In the earlier period the coefficient was .59196; this rose to .61036 after 1964. While most of the coefficients for the other leads and lags are not significant, the timing of common stock prices as a leading indicator of economic activity has shifted over the period studied relative to the money supply as a leading indicator.

The data indicate that quarterly changes in common stock prices precede changes in the money supply in the post-1964 period, while they were roughly coincident from 1956 to 1964. There are two explanations for the former relationship, and these are discussed as part of the analysis.

Examination of the graphed percentage changes of the data series confirm the conclusions drawn above. Figures 1 and 2 illustrate quarterly changes in M1 and in the S & P 500 Index. When common stock prices are rising, monetary peaks lag common stock peaks. The greater the magnitude of the increase in the S & P 500 Index, the more likely that the money supply will lag by one or more quarters. During stock market declines, however, the money supply seems to be roughly coincident rather than lead or lag.

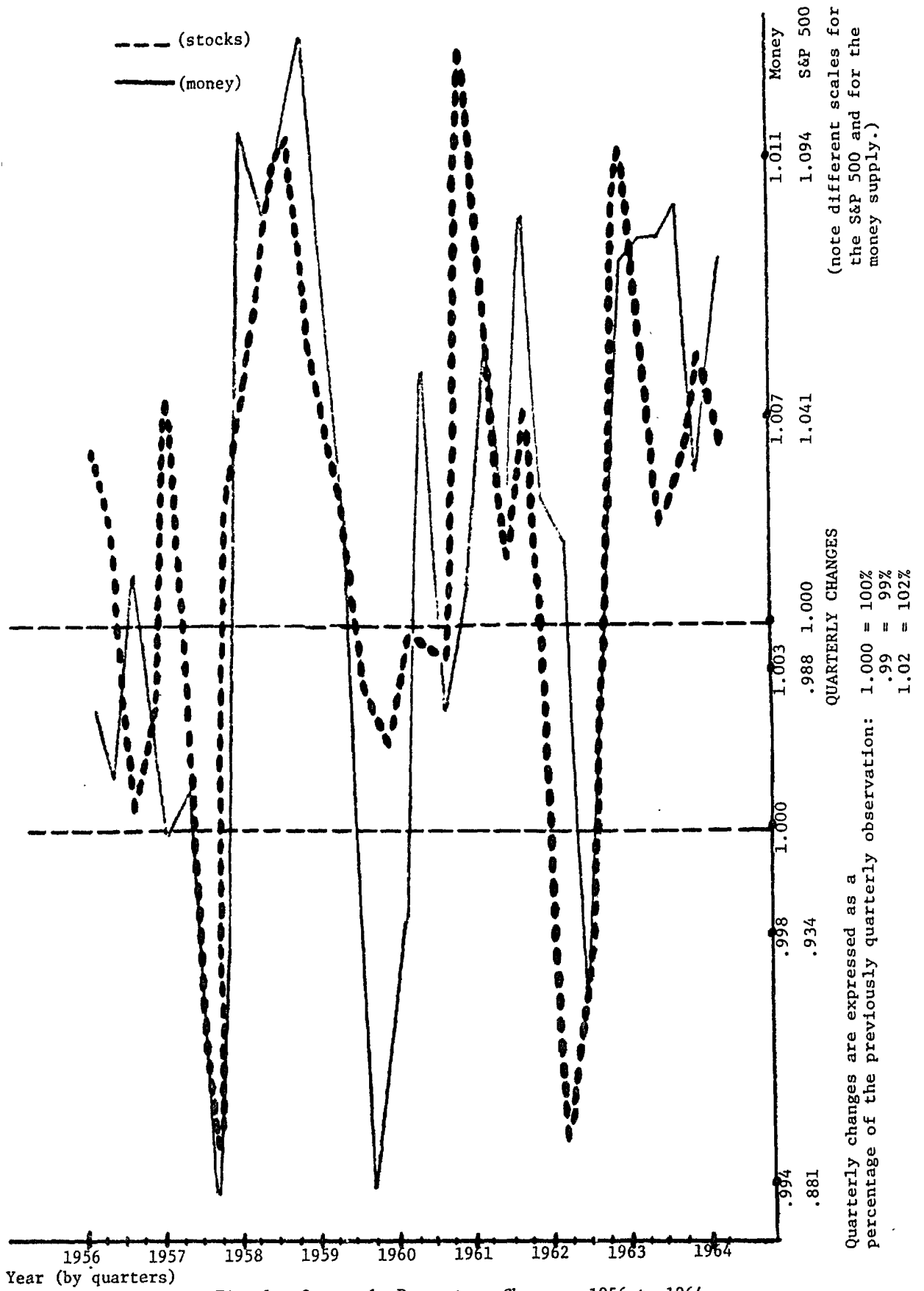


Fig. 1. Quarterly Percentage Changes, 1956 to 1964.

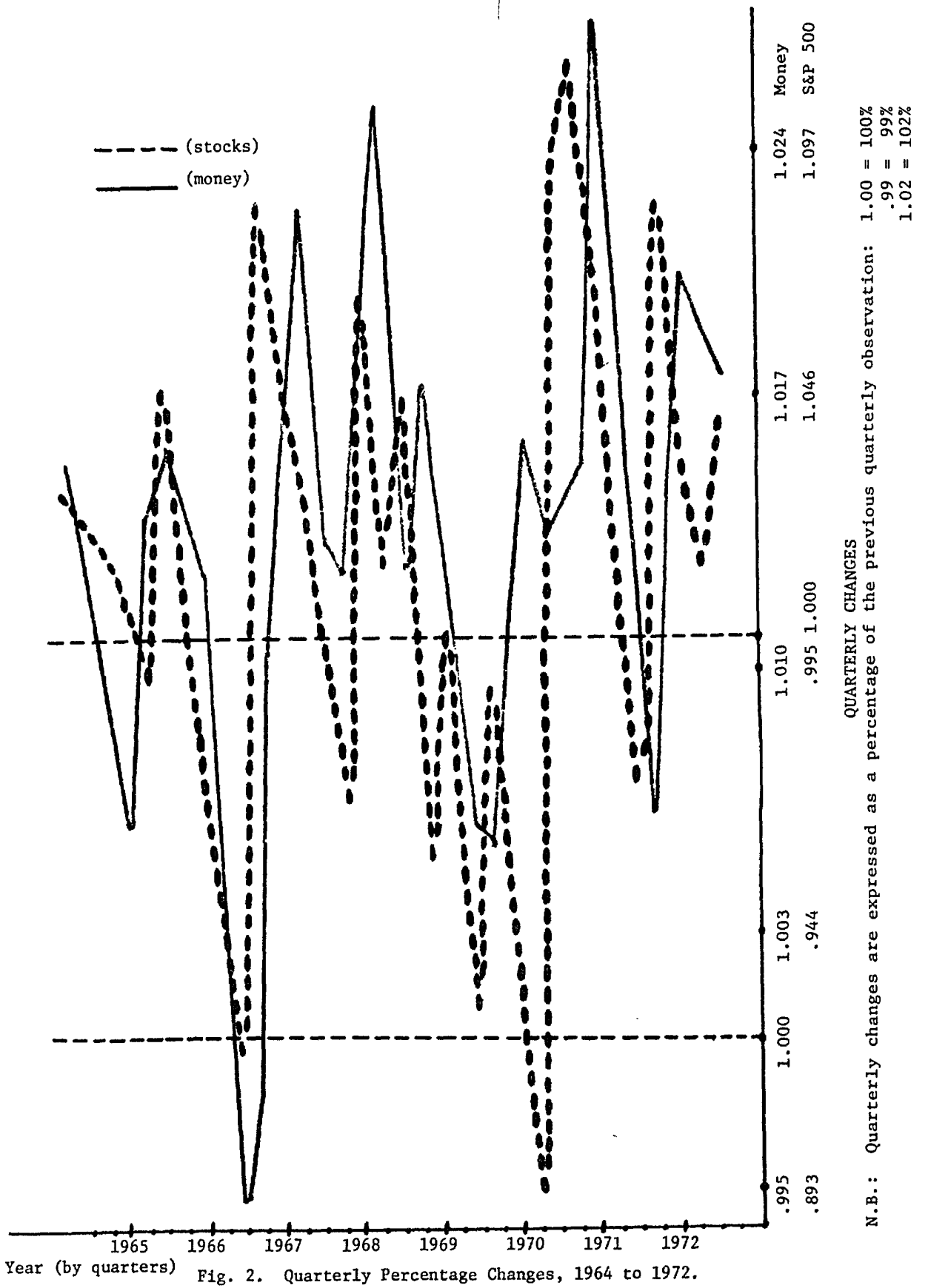


Fig. 2. Quarterly Percentage Changes, 1964 to 1972.

Analysis

There are two explanations for the empirical results presented in the previous section. One is that the stock market, as represented by the S & P Index, has increased its efficiency in incorporating relevant new information bearing on the valuation of equities since 1964. The second explanation relates to a shrinking of the lag between monetary policy changes and their subsequent economic impact.

It is especially noteworthy that since 1964 the stock market seems to have become more efficient at anticipating economic trends than the money supply, if efficiency is defined in terms of the greatest lead time. The veritable plethora of stock market behavior studies has undoubtedly been a major factor. For example, the concepts of systematic and un-systematic risk⁵ may have increased the efforts of security analysts and portfolio managers in predicting broad market movements.⁶ These market movements are likely to be strongly correlated with later economic activity.

It seems probable that these studies, coupled with an increasingly visible monetarist school, have also encouraged security analysts to attempt to consciously anticipate changes in the money supply as perceived indicators of future economic movements. Whether the anticipation of this variable, alone, has been a significant factor in the realignment of the timing of the money-common stocks relationship is a difficult question to answer. It is likely that it has not been the most significant variable. Corporate earnings, inflation, unemployment,

and a host of other economic variables are also determinants of common stock prices. In any case, it is important to recognize that the behavior of buyers and sellers of common stocks since 1964 has been such that they appear to be anticipating the money supply whether consciously or not.

The second explanation for the temporal relationship between the money supply and common stocks since 1964 relates to the lag between quarterly monetary changes and variations in economic activity. The money supply has anticipated subsequent economic activity in a shorter amount of lead time after 1964 than before.⁷ It is worth noting that the quarterly variations in the money supply series in the years since 1964 have been consistently greater (and invariably positive) than in the earlier period. Whether this development is responsible for a shorter lag between monetary policy and its economic impact is the subject of further research. Indeed, there is still considerable debate about whether or not monetary policy is the major determinant of economic activity.

Conclusion

This study has shown that variations in the money supply do not anticipate economic activity with a lead time longer than that provided by variations in the Standard and Poor's 500 Common Stock Index. Regression analysis suggests that quarterly common stock price changes and M1 changes were roughly coincident from 1956 to 1964. In the subsequent period, however, common stock prices appear to lead monetary changes consistently.

It is hoped that this paper clears up the confusion concerning the temporal relationship of money and common stock prices. The empirical results firmly support the semi-strong form of the efficient markets hypothesis. Unless the temporal relationship alters its present configuration, the formulation of a superior market-timing strategy on the basis of current money supply information does not appear possible.

FOOTNOTES

1. B.W. Sprinkel, Money and Markets: A Monetarist's View. (Homewood, Ill.: Irwin, 1971), p. 217.
2. Data from 1920 through 1969 are presented in Sprinkel's more recent book. See Sprinkel, Ibid., p. 223.
3. M.J. Gupta, "Money Supply and Stock Prices," Journal of Financial and Quantitative Analysis, Jan. 1974, p. 58.
4. For a critique of the Homa and Jaffee approach and a suggestion that money supply variations may not lead common stock price changes, see J.E. Pesando, "The Supply of Money and Common Stock Prices," Journal of Finance, June 1974.
5. J.H. Lorie and M.T. Hamilton, The Stock Market: Theories and Evidence (Homewood, Ill.: Irwin, 1971).
6. Increased emphasis in predicting broad stock market and economic movements need not be at the expense of efforts to find under-priced securities.
7. Ceteris paribus, this would change the timing of the money supply-common stocks relationship from a leading or coincident to a lagging one.

REFERENCES

- Cagan, P. and Gandolfi, A. "The Lag in Monetary Policy as Implied by the Pattern of Monetary Effects on Interest Rates." American Economic Review, May 1969, pp. 277-84.
- Fama, E.F. "Efficient Capital Markets: A Review of Theory and Empirical Work." Journal of Finance, May 1970, pp. 383-417.
- Friedman, M.A., and Schwartz, A.J. "Money and Business Cycles." Review of Economics and Statistics, February 1963, pp. 32-79.
- Gibson, W.E. "The Lag in the Effect of Monetary Policy on Income and Interest Rates." Quarterly Journal of Economics, May 1970, pp. 288-300.
- Gupta, M.J. "Money Supply and Stock Prices: A Probabilistic Approach." Journal of Financial and Quantitative Analysis, Jan. 1974, pp. 57-68.
- Hamburger, M.J., and Kochin, L.A. "Money and Stock Prices: The Channels of Influence." Journal of Finance, May 1972.
- Homa, K.E., and Jaffee, D.W. "The Supply of Money and Common Stock Prices." Journal of Finance, December 1971, pp. 1045-66.
- Keran, M.W. "Expectations, Money, and the Stock Market." Review, Federal Reserve Bank of St. Louis, January 1971, pp. 16- 31.
- Lorie, J.H., and Hamilton, M.T. The Stock Market: Theories and Evidence. (Homewood, Ill.: R.D. Irwin, Inc., 1973).
- Palmer, M. "Money Supply, Portfolio Adjustments, and Stock Prices." Financial Analysts Journal, July-August 1970, pp. 19-22.
- Pesando, J.E. "The Supply of Money and Common Stock Prices: Further Observations of the Econometric Evidence." Journal of Finance, June 1974, pp. 909-21.
- Sprinkel, B.W. Money and Stock Prices. Homewood, Ill.: R.D. Irwin, Inc., 1964.
- Sprinkel, B.W. Money and Markets: A Monetarist View. Homewood, Ill. R.D. Irwin, Inc., 1971.