THE IMPACT OF MONETARY DISTURBANCES ON STOCK PRICES

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(ABSTRACT)

A key issue in this paper is whether or not stock prices
may be predicted based on information obtained by predicting money
supply growth.   Based on the evidence presented in this paper the
conclusion is no.

First, there is a strong contemporaneous correlation
between money growth and stock price changes.   There is little
correlation with lagged money growth.   Information regarding
historical data on the money supply would not provide a means of
forecasting stock prices.   This information is already discounted
in the price of the stock.

Second, the evidence on expected and unexpected money
growth shows a lack of significance in the expected variable
coefficients.   This is consistent with the rational expectations
(efficient markets) theory that only unexpected changes will have
an effect on stock prices.   Further evidence is that generally
only contemporaneous unexpected money growth is strongly significant.

One way of analyzing an efficient markets-oriented model
of money's affect on stock prices is a two-step approach which was

used in this analysis. The first step was to develop a model to forecast money growth. The predicted values and residuals from the forecasting model were then used as proxies for expected and unexpected variables, respectively. In the second step, these variables then served as regressors to predict changes in the stock market price in a second equation.

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THE IMPACT OF MONETARY DISTURBANCES ON STOCK PRICES

CHAPTER I

INTRODUCTION

In recent years, there have been several studies on the
effects of money supply changes on equity prices. This paper will
look further at this area from the perspective of the Quantity
Theory of Money. I will examine the effect of a change in the
growth rate of the money stock on stock prices, accounting for the
effects of both anticipated and unanticipated money growth.

One issue is whether the portfolio effects of a money
supply disturbance affect equity prices directly. For example
suppose a representative individual has a portfolio of assets. The
quantity theory analysis focuses on the composition of this
portfolio, especially on the effect of an introduction of cash to
the other components. If the desired ratio of money to the other
balance sheet components is disturbed by an increase in money
growth, there may be an attempt to return to the desired relative
holdings of these assets by shifting out of "excess" cash into other
assets. If the shift is to stocks rather than bonds, then stock

prices rather than interest rates would respond to an initial excess

supply of money and vice versa for a decrease in money. Moreover if

this adjustment mechanism to monetary disturbance generally holds,

it may be possible to predict stock price changes.

A casual examination of figures 1 to 4 suggests there may

be a marked relationship between changes in money and stock prices.

Figures 1 to 4 plot the percent change from one month to the next in

the levels of the M1 measure of the money supply (DM1) and stock

prices (DSP) as measured by the Standard & Poors 500 stock index.

In these figures, there appears to be a relationship between their

respective growth rates. Figures 1 to 4 illustrate this

relationship for different time periods from 1969 to 1984 using

monthly data. Generally, they provide graphic evidence that there

is a positive relationship between changes in the growth of money

and stock prices.

Further evidence of a relationship between money and stock

prices is seen in Table 1. This table shows regression results in

which the percentage changes in stock prices is regressed against

the percentage change in money. This is done for contemporaneous

and lagged money changes. Table 1 provides evidence that

contemporaneous changes in money, $DM1_t$ is more highly correlated

with changes in stock prices than lagged money changes. This

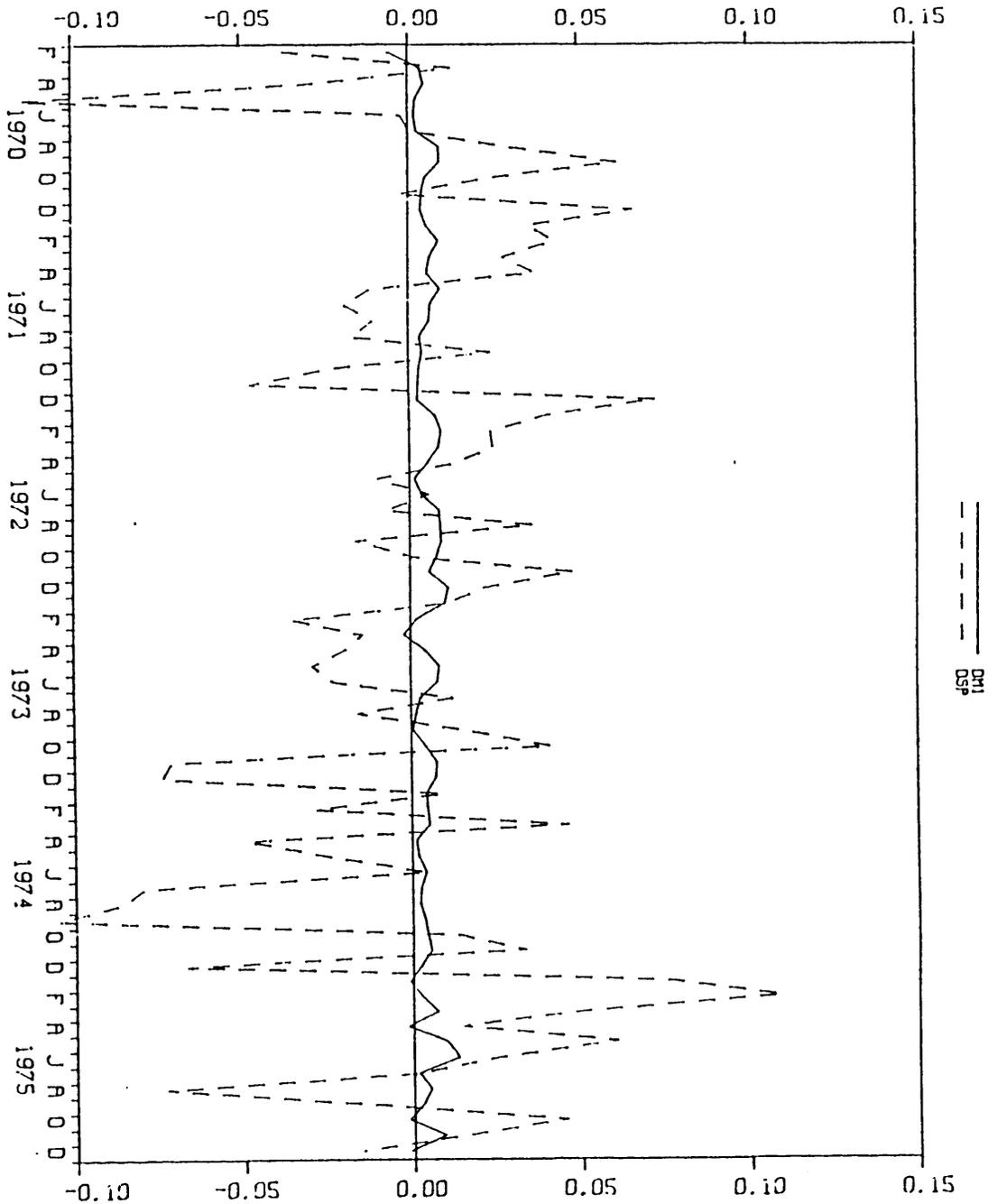evidence indicates that although there is a relationship between
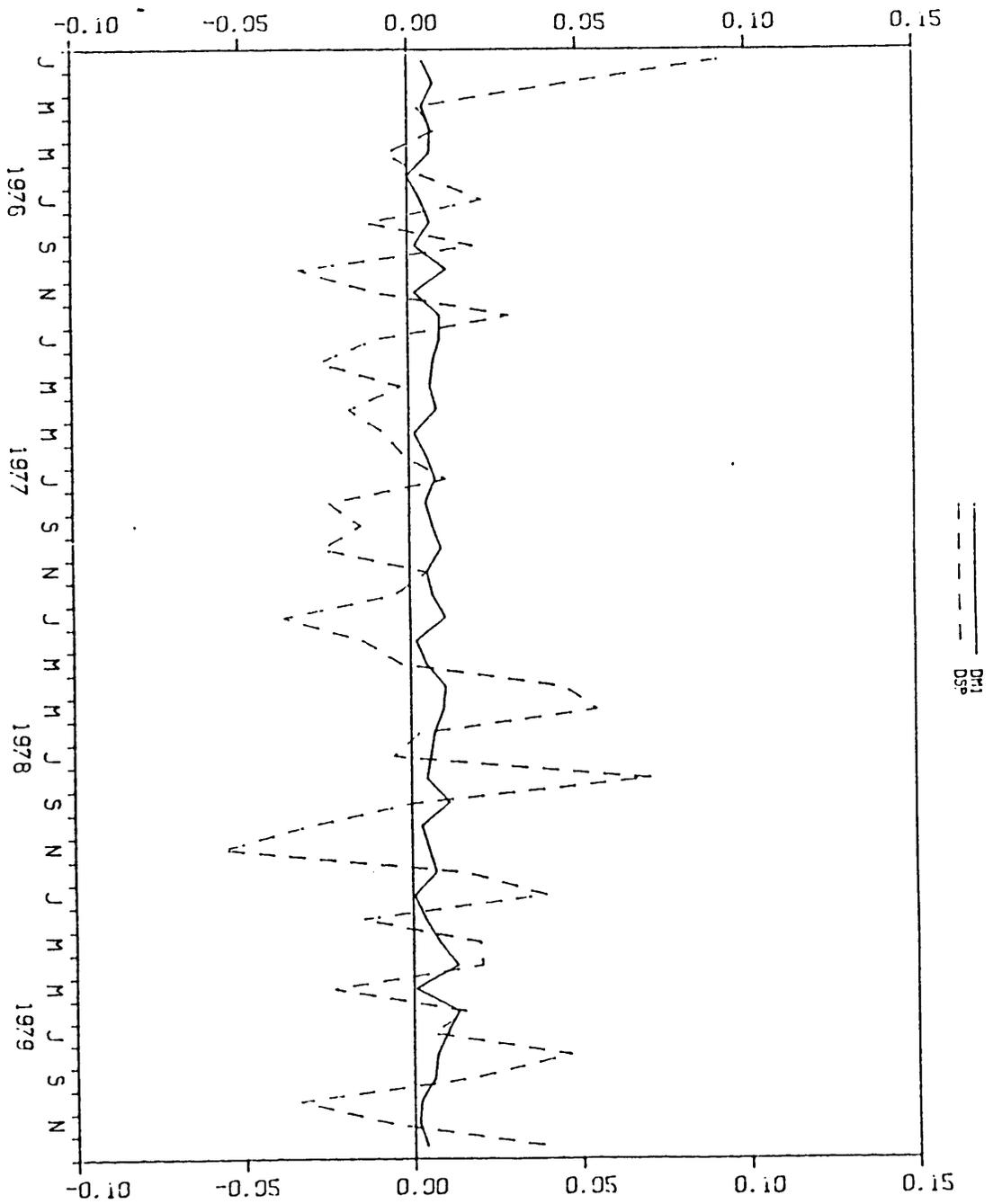
FIGURE 1

MONEY AND STOCK PRICE GROWTH RATES

FIGURE 2
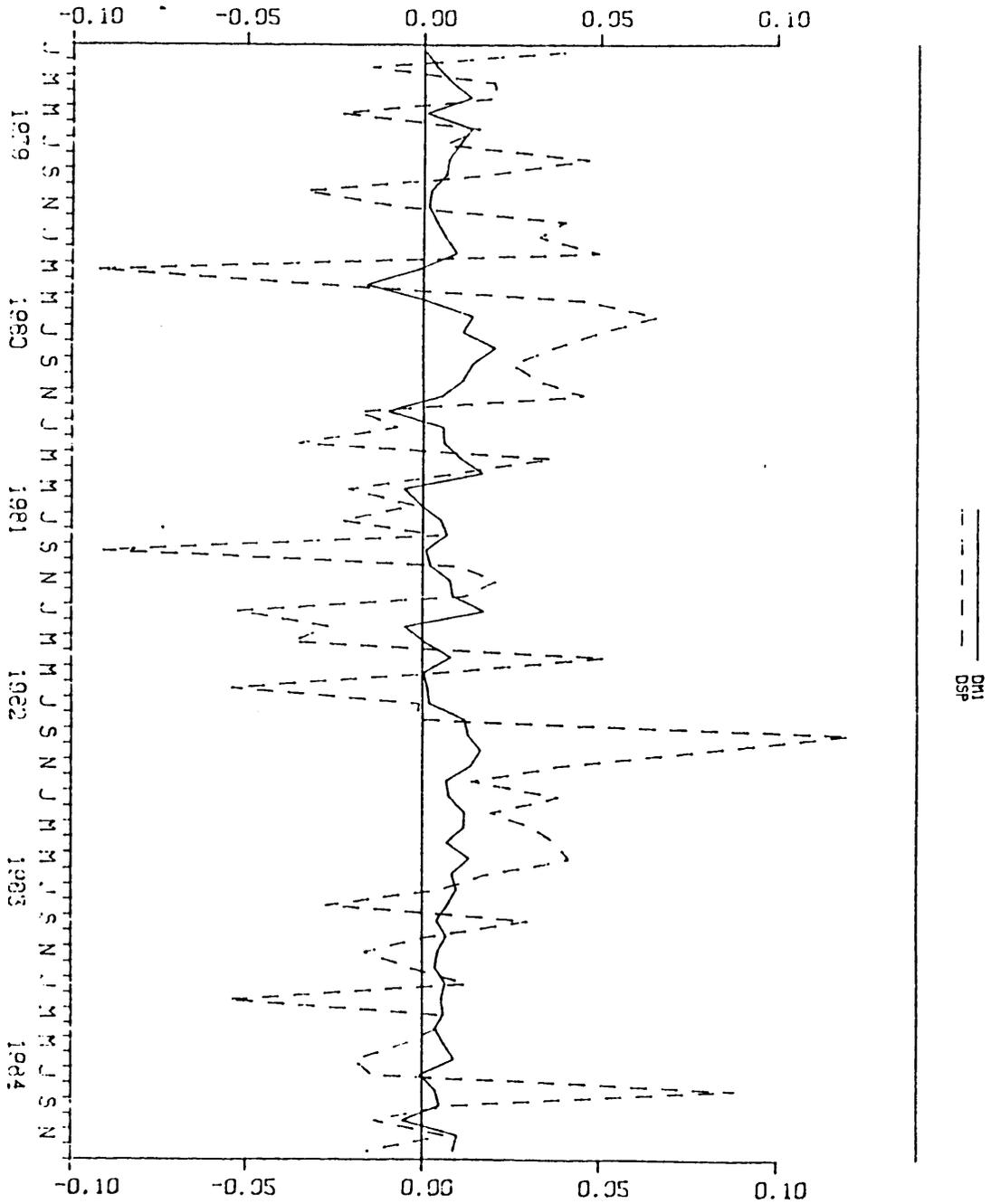
MONEY AND STOCK PRICE GROWTH RATES

FIGURE 3

MONEY AND STOCK PRICE GROWTH RATES

FIGURE 4
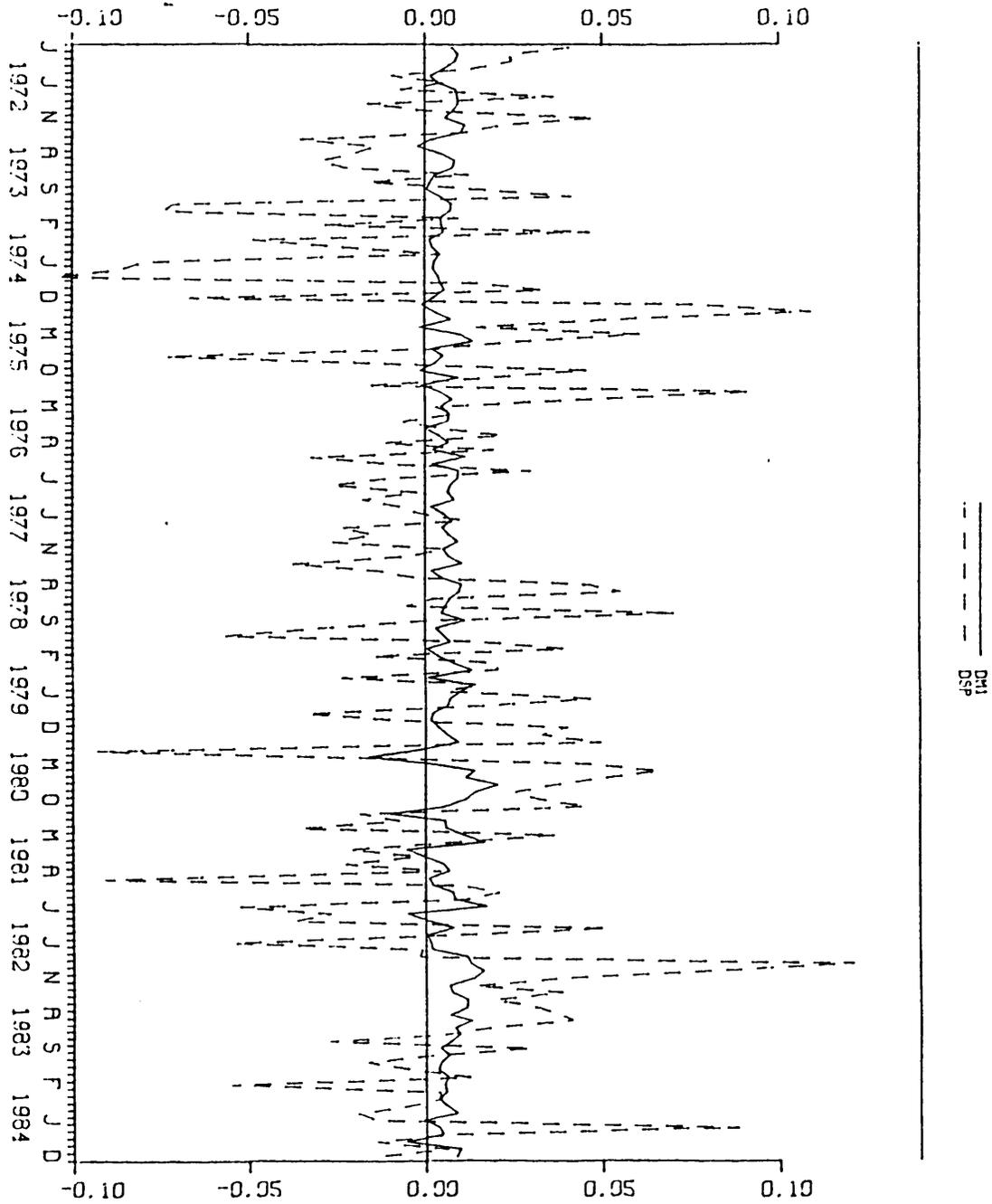
MONEY AND STOCK PRICE GROWTH RATES

Table 1

Relationship Between Growth Rates of Money and Stock Price Changes

$$DSP = a_O + B_1 DM1 + B_2 DM1_{t-1} + E_t$$

Comparing Contemporaneous and Lagged
Money Growth Effect on Stock Price Changes

Monthly	Constant	$DM1_t$	$DM1_{t-1}$	$\overline{R}^2$	DW
1/1968-12/1972	.001	.61 (2.19)*	-.73 (-.03)	.08	1.48
1/1970-12/1975	-.01	.41 (1.22)	-.24 (-.71)	.04	1.35
1/1975-12/1979	.01	-.20 (-.72)	-.10 (-.39)	.01	1.38
1/1980-12/1985	-.004	.46 (1.85)	.46 (1.23)	.09	1.67

DM1 = growth in money

= percent changes from one period to the next in the level of money, where money is defined as M1

DSP = growth rate in stock prices

= percent changes from one period to the next in the S&P 500 stock index

t-statistics in parentheses

* 95% confidence level
** 99% confidence level

money and stock prices, the market adjusts very quickly and a lag
may not exist between the occurrance of changes in money and stock
price changes. The evidence may be seen in the higher t-statistics
for contemporaneous money changes, $DM1_t$.

A related issue involves the prediction of money and
rational expections. The public may believe the money supply
process works in a certain way and further that money supply changes
affect stock prices in some manner. The public attempts to predict
future money supply changes and, based on those predictions, bids
the price of stocks towards a price they feel would be achieved by
actual money supply changes. Therefore, anticipated changes in
money are already discounted in stock prices. The stock price would
change only when there are altered expectations about the future
money supply.

This is one implication of the rational expectations theory
first developed by Muth (1961). The stock price would change only
when there are altered expectations about the future money supply.
This new expectation is really a surprise or unexpected change in
the money supply growth rate. An efficient stock market is one in
which stock prices already reflect expected changes in money supply
information. The notion that the market is efficient with respect
to money supply changes implies that only unexpected changes would
cause changes in stock prices. This would imply that even if there
are portfolio effects of money on stock prices along the lines of

the Quantity Theory, one would not be able to predict stock prices (and generate above market returns) by predicting money supply growth rate changes.

This paper will examine the effect of changes in the money supply growth rate on stock prices in two stages. First, a model will be developed for forecasting money supply changes using a "Fed reaction model". This model will be used to predict money changes. The predicted values and residuals from this model will be used as proxies respectively for expected and unexpected money growth. They will be used as regressors in attempting to explain changes in stock prices.

CHAPTER II

THE QUANTITY THEORY OF MONEY

The relationship of money and stock prices has been much
studied in the past. Many of these studies, have made use of the
Quantity Theory of Money to explain stock prices. The Quantity
Theory of Money often uses the framework of Irving Fisher's
"equation of exchange". This equation relates the money stock to
the level of expenditures in the economy during a given time
period. Stated algebraically,

$$MV = PT$$

where P is an index of prices or the price level, and T is an index
of the volume of transactions. V is the average rate of turnover or
velocity of circulation of money, M.

Fisher (1911) used the framework of this equation to study
the relationships between the stocks of money, M, and prices, P.
Much of the Fisher analysis evolved into the modern Quantity Theory

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[1] See Cooper (1972), Hamburger and Kochin (1972), Homa and Jaffee
(1971), Rozeff (1974), and Sprinkel (1964, 1971)

of Money. He found that the equation represents a statement of the
influences on the value of money. Fisher's analysis led him to
conclude that changes in the quantity of money generally would not
lead to a change in the equilibrium values of either the volume of
transactions or the velocity of money. He therefore concluded that
we could expect the price level to change directly with changes in
the quantity of money. For Fisher, this was the essential basis for
the Quantity Theory. It implies that the value of money is directly
related to the quantity of money.

This is not to say that T and V would not change at all.
Fisher recognized that during "transition" periods, immediately
after a change in M, T and V will temporarily be affected. The
quantity theory may not hold true strictly and absolutely during
transition periods.

Fisher's concept of money was that money is a commodity
that has no utility to its holder except to facilitate exchange.
Milton Friedman (1956, 1959, 1969) further analyzed the quantity
theory in this tradition. But Friedman conceived money as a
commodity that yields utility to its holder according to different
functions it serves. For the ultimate wealth-owning individual,
Friedman saw money as one of many assets in a portfolio, "on a par
with bonds, equities, houses, consumer durable goods, and the like"
(1959). For a business enterprise, money serves as a capital good,
yielding services which are combined with other assets and labor to

produce an output. In either case, in Friedman's model, money performs a service and as such, there will be desired balances held in the economy.

In equilibrium, a wealth-owning individual would hold a portfolio of assets, including money, with desired levels for each asset. Friedman (1969), Rozeff (1974), Sprinkel (1964) and others argue that a disturbance, such as an unexpected increase in the growth rate of money causes a disequilibrium in this portfolio. An unexpected increase in the growth rate of money supply would make actual money balances higher than desired balances relative to other assets in the portfolio.

Wealth holders as a group attempt to return to their desired money positions by trading money for other assets. The other assets include the bonds, equities, houses, etc., referred to earlier. As money is spent on other assets, their price is bid up and market participants as a whole attempt to increase their holdings from a temporarily fixed pool of assets. This is what Friedman (1969) refers to as the liquidity effect and what he describes as the first effect of a money shock.

Because of the liquidity effect, prices of securities are bid up and interest rates driven down. Friedman stresses that the change in money must be unexpected or else the initial effect would be on prices and interest rates would not drop.

Friedman describes two other later effects of money surprises which have an effect on stock prices. Friedman's second monetary effect is the income and price level effect. According to theory, increased purchasing of other assets tends to increase asset prices relative to services. This induces increased purchases of services leading to an increase in nominal income. This, in turn, leads to greater business investment as businesses respond to a greater demand for services and to increased earnings. Earnings has been seen by many economists as a determinant of stock prices unrelated to the liquidity portfolio effect described above. The increased investment leads to more borrowing, which forces real interest rates up relative to their initial position. Interest rates are also seen as a determinant of stock prices.

Friedman's third monetary effect is the price anticipation effect. According to theory, incomes rise due to the money supply increases. An increase in income increases demand for products. In the short run, marginal costs are rising and, with an increase in demand, prices rise. As people begin to anticipate price increases (and a reduced value of money), they as lenders demand a premium over the real interest rate. This premium is meant to compensate for the loss of real purchasing power they expect to suffer over the life of the loan as the real loan principal value goes down. This inflation expectations premium is added to the real rate to give the

nominal interest rate. This premium tends to push nominal market rates above their previous level.

Changes in nominal interest rates have an inverse relationship with stock prices. For a given nominal earnings stream, an increase in the interest rate available in the market will force the price of the stock to decrease to a point at which the expected return will be the same as that available in the market for an investment of comparable risk. The opposite effects on interest rates and stock prices are true for a decrease in the money supply. Thus, the price anticipation effect of a change in money provides for an inverse relationship between changes in money and stock prices.

At this point it might be helpful to discuss the theoretical determinants of stock prices since monetary surprises affect many of them, as seen above.

CHAPTER III

THE DETERMINANTS OF COMMON STOCK PRICES

The value of a common stock (CS) to an investor can be seen as the present value (PV) of the future dividends he expects to receive. Weston and Brigham (1980) discuss the following series of equations (1-6), starting with the dividend model (1) below.

$$PV_{cs} = \frac{d1}{(1+K_t)^1} + \frac{d2}{(1+K_t)^2} + \ldots$$

$$(1) \qquad = \sum_{t=1}^{\infty} \frac{dt}{(1+K_t)^t}$$

where d_t and K_t are the dividend for time t and investor required rate of return, respectively, for common stock CS. K_t varies with time and the risk associated with the specific stock. (See also Van Horne and Glassmire (1972)).

Unlike bond interest, common stock dividends generally are not expected to remain constant. This fact, coupled with the greater uncertainty about common stock dividends, adds to the complexity of the determinants of common stock prices. Taking growth (which may be negative) and uncertainty into consideration, we arrive at the following valuation equation found also in Malkiel and Quandt (1972):

$$(2) \qquad PV_{cs} = \sum_{t=1}^{\infty} \frac{do(1+g)^t}{(1+i_t+P_k)^t}$$

where g is the expected growth rate of earnings for the firm and

d_o is dividend at time zero. The required rate is further broken into the riskfree interest rate, i_t, and the stock specific risk premium, P_k. As Fisher (1930) argued, the normal risk-free rate can be further divided into the real rate, r_t, and the expected inflation rate, π_t. The resulting equation is

$$(3) \qquad PV_{cs} = \sum_{t=1}^{\infty} \frac{do(1+g)^t}{(1+r_t+ \pi_t+P_k)^t}$$

Dividends are equal to the proportion K, of earnings paid out to common stock holders times earnings, E.

$$(4) \qquad PV_{cs} = \sum_{t=1}^{\infty} \frac{KEo(1+g)^t}{(1+r_t+ \pi_t+P_k)^t}$$

If all earnings are paid out to the owners of the firm, K=1 and the equation becomes:

$$(5) \qquad PV_{cs} = \sum_{t=1}^{\infty} \frac{Eo(1+g)^t}{(1+r_t+ \pi_t+P_k)}$$

or more generally

$$(6) \qquad PV_{cs} = \sum_{t=1}^{\infty} \frac{E_t}{(1+i_t+P_k)}$$

a model described by Hamburger and Kochin (1972).

Monetary surprises affect many of the determinants of stock prices. The initial effect, the portfolio effect, would directly affect the stock price while the income and price effect and the price anticipation effect would affect stock prices through their effects on interest rates and earnings. The portfolio effect would be expected to be short-lived in influence, being replaced by the influence of the income and price and the price anticipation effects.

In terms of theory discussed earlier, a change in money causes a positive change in income. This causes a positive change in earnings and concommitantly a positive change in stock prices in accordance with the stock price model. A change in money also causes a positive change in price anticipations which causes a positive change in nominal interest rates through a Fisher relation. This causes a negative effect on stock prices. Also, increasing prices would have a downward effect on real earnings, which would have a negative effect on stock prices.[1] It is not clear what would be the net effect of money changes on stock prices in the absense of the portfolio effect.

It may be hard to distinguish the portfolio effects from other influences of money changes on stock prices. If expectations are formed regarding the relationship between money changes and the

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[1] See Gordon (1983) and Summers (1981) for a discussion and analysis of the negative relationship between both expected and unexpected inflation and stock prices.

final price adjustments affecting stocks, the initial portfolio
effect of a change in money may not be reflected in the stock
price. This is an important implication of rational expectations.

The theory of efficient markets (or rational expectations
as applied to financial markets) is based on the assumption that the
stock market reflects all available information. Expectations
reflected in market behavior will be optimal forecasts using all
available information. Expectations are formed as part of
optimizing behavior in which people act as rational optimizers in
making investment decisions. The theory implies that people will
eliminate systematic mistakes in forecasting as they strive to
maximize returns.

The theory has been found to have an important role in
explaining relationships in macroeconomics, especially in analyzing
the effects of unexpected versus expected changes in variables. In
the areas of money and interest rates, and money and stock prices,
the efficient markets concept has recently been used to model
expected and unexpected money supply growth and their effects on
other macroeconomic variables. See Makin (1981); Mishkin (1981,
1982, 1983); Rozeff (1974); and Tanner and Trapani (1977).

Rozeff applied rational expectations theory in analyzing
the relationship between stock prices and money growth. He found
evidence that a major part of stock price changes reflect
expectations of future money growth.

CHAPTER IV

TWO STEP MODEL FOR EXAMINING THE EFFECT OF EXPECTED

AND UNEXPECTED MONEY GROWTH ON STOCK PRICE CHANGES

Previous Models

One way of analyzing an efficient markets-oriented model of

money's affect on stock prices is a two-step approach. The first

step is to develop a model to forecast money growth. The predicted

values and residuals from the forecasting model are then used as

proxies for expected and unexpected variables, respectively.[1] In

the second step, these variables then serve as regressors to predict

changes in the stock market price in a second equation.[2]

One way to forecast money growth is to specify an equation

which attempts to model the policy reactions of the Federal Reserve

Board in its decisions affecting changes in money supply growth

rates. Two similar models are exhibited in Barro (1977) and Tanner

and Trapani (1977).

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[1] For examples of this specification of expected and unexpected
variables, see Attfield, Demery and Duck (1981a,b), Barro (1977, 1978,
1981b), Barro and Rush (1980), Fair (1979), Gordon (1982), Lawrence
(1983), Leiderman (1979, 1980), Makin (1982), Mishkin (1982a,b), Sargent
(1976a) and Wogin (1980). For a thorough analysis of this econometric
technique, see Hoffman, Low and Schlagenhauf (1984) and Pogan (1984).

[2] See Barro (1977, 1979), Barro and Rusk (1980), Small (1979),
Tanner and Trapani (1977) for examples of users of the two-step procedure.

In 1977 Robert Barro published a study of the effects of unexpected money growth on unemployment in the U.S. As a first step in his analysis, he specified a model of the money supply process. Using annual observations, he found three variables to have a systematic effect on money growth. The three variables and his arguments for their inclusion are as follows.

1) <u>A measure of Federal Government expenditure relative to "normal"</u>. Government expenditure is financed by a combination of taxes and selling bonds. The Government's goal is to minimize the costs of raising funds by the two methods. Based on institutional factors and this goal, only increases in government expenditure relative to normal would tend to induce monetary growth through purchase of the bonds by the Federal Reserve.

Algebraically, the variable would be:

FEDV = log (FED) - log(FED) *

where FED is real Federal Government expenditure and log(FED) * is the normal value of this expenditure. This normal expenditure is estimated on the basis of an adaptive formula where $\log(\text{FED}) *_t$ is an exponentially declining distributed lag of log(FED).

2) <u>Lagged unemployment rate</u>. This reflects two factors. First, a positive relationship in the response by the authorities to a change in unemployment. Second, an increase (decrease) in the unemployment rate would decrease (increase) government revenue from a given money growth.

3) <u>Two lagged values of money growth.</u> This would reflect elements of serial dependence on lagged adjustment not picked up by the other variables.

Barro's money growth forecasting model is

$$(7) \quad DM_t = a_0 + a_1 DM_{t-1} + a_2 DM_{t-2} + a_3 FEDV_t + a_4 UN_{t-1},$$

where

$$DM_t = \log(M)_t - \log(M)_{t-1}$$

= the growth rate of money, M_t [3]

$$UN_{t-1} = \log(U/(1-U))_{t-1}$$

= a measure of the unemployment rate where U equals the annual average unemployment rate in the total labor force.

In the above model, the predicted values of DM_t are used to proxy expected money growth (percent changes in money). The residuals from the model are proxies for the unexpected changes in money. These two variables are then used in the second step (second regression) to test the relationship between expected and unexpected changes in money and unemployment. These, along with two other "real" variables were used

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[3] Testing both M_1 and M_2, Barro found M_1 to provide a better fit in predicting unemployment.

as regressors to forecast unemployment. They could also be used as predictors of other macroeconomic variables, including stock prices.

A relatively naive but simpler model of money growth could be designed using only lagged money growth variables. These models were found by both Barro (1977) and Tanner and Trapani (1977) to have much poorer statistical fits than models which included other macro variables.

First Step: The money growth forecasting model

To quantify the notions of expected and unexpected money growth, a model for forecasting money similar to Barro will be used. The model will attempt to forecast money growth based on theoretical "Federal Reserve policy reactions". The predicted values and residuals from this model will then be used as predictors of stock price changes.

One model specification tried is the following.

(8) $\quad DM1_t = a_0 + B_1 DM1_{t-1} + B_2 DM1_{t-2} + B_3 DOY + B_4 U_{t-1}$

where $\quad DM1 = $ the growth rate of M1 from one period to the next

$\qquad DOY = $ the U.S. deficit divided by the previous period's real GNP.

$\qquad U_{t-1} = $ the unemployment rate during the previous period.

This is a simplified version of the Barro money equation which was developed by Tanner and Trapani (1977) to forecast stock prices. They found that changes in government spending offset by tax revenues generally were not highly correlated with changes in money growth. They found DOY to be better than the FEDV variable used in the Barro model, equation (7).

Tanner and Trapani used quarterly data. This paper uses monthly and quarterly data. For the monthly analysis, quarterly real GNP data are distributed into a monthly series using factors based on a monthly series for real industrial production.

Slightly better explanatory power is achieved in the second step of the analysis by modifying equation (8) and specifying the unemployment variable as the percent change in the unemployment rate. This yields better results than the unemployment rate or first differences of unemployment.

(9) $\quad DM1_t = a_o + B_1DM1_{t-1} + B_2DM1_{t-2} + B_3DOY + B_4DU_{t-1}$

where DU_t = the percent change in the unemployment rate from one period to the next.

Both equations (8) and (9) are intended only to predict changes in money growth. As such they do not contain data which is unavailable at time t. They are also not an attempt to fully specify all the determinants of the money supply process.

Second Step: Stock Price Prediction Model

The expected and unexpected changes in money growth, as predicted by equations (8) or (9), are used as predictors of changes in stock prices in equation (10) below.

(10) $DSP = a_o + b_1 E(DM1) + B_2(DM1 - E(DM1)) + E_t$

Equation (10) is not intended to be a fully specified model of all the determinents of stock price changes. The model is only used to study the relative significance of expected and unexpected money growth in explaining stock price changes. The model includes the following variables.

1) <u>DSP</u>. The dependent variable is the growth rate in stock prices as measured by percentage changes in the S&P 500 stock index. Algebraically this is

$$DSP = (SP_t - SP_{t-1})/SP_{t-1}$$

2) <u>E(DM1)</u>. The expected growth rate in the money supply where money is defined as M1. The expected money growth values are proxied by the predicted values from the money forecasting model, either (9) or (10).

3) <u>DM1-E(DM1)</u>. The unexpected growth rate in the money supply. This is the difference between actual and predicted, e.g., the residuals from the money forecasting model.

Equation (10) was estimated using different specifications for the money growth forecasting model (equations (8) or (9)). See Table 4 for the results using monthly data for different periods of time ranging from 1968 to 1985. Table 5 shows results using quarterly data and equations (8) and (9) to generate the money growth variable. This was done to compare quarterly results with the monthly results of Table 4.

A test of whether expected or unexpected growth in money (or both) are significant in explaining changes in stock prices is the t-test. The t-test tests whether a coefficient is different from zero. This is done by comparing the t-ratio to the critical value of the t-statistic. The critical values may be set at different confidence levels, usually 95% or 99%. If the calculated "t" is above the critical value for, say the 95% level, then the null hypothesis that the coefficient is zero may be rejected with a 95% confidence level. Tables 2 to 5 show the "t's" in parentheses with "*" and "**" indicating 95 and 99 percent confidence levels respectively.

Results

Results from estimating equations (8) and (9) are shown in Tables 2 and 3, respectively. Slightly better R^2s are found using equation (8) which specifies the unemployment variable as the unemployment rate. The signs of the coefficients are generally correct with both equations.

The important results for this study are reflected in

the t-tests in Tables 4 and 5. Tables 4 and 5 estimate equation

(10) varying the money growth equation specifications, time periods

tested, and frequency of time period. The t-test in both tables

provide evidence that DM1-E(DM), the unexpected variable, is much

more significant than DM1, expected money growth. In all cases, the

coefficient for DM1-E(DM1) has a much higher t-statistic than the

 coefficient for expected money growth. In most cases, the coeffi-

cient for unexpected money growth is significantly different from

zero. The coefficient has a t-value greater than the 95% confidence

level six times out of twelve and the 99% level once. By contrast,

the coefficient for expected money growth, E(DM1), is never found to

be significant. A comparison between Table 4 and 5 show that quarterly

data provide higher R^2s than monthly data but provide similar evidence

regarding the significance of the coefficients.

Figures 5 and 6 plot the three variables in equation (10)

(percent change in expected and unexpected money and stock prices).

This is done using quarterly data generated in equation (8) which

is estimated for the two time periods Q1/1975-Q4/1979, (Figure 5)

and Q1/1980-Q4/1985, (Figure 6). Figures 5 and 6 generally show

a stronger relationship between stock price changes and unexpected

money growth.

The last half of the 1970's provided interesting data.

The R^2's show a much poorer fit than for other periods and there

is generally a lower level of significance in either variable. One

possible reason is the strong negative influence of inflation on stock

Table 2

- Tanner and Trapani Model (Equation 8)
  specification to forecast money growth

$$DM1 = a_0 + B_1 DM1_{t-1} + B_2 DM1_{t-2} + B_3 DOY_t + B_4 U_{t-1}$$

Monthly	Constant	$DM1_{t-1}$	$DM1_{t-2}$	DOY	U_{t-1}	R^2	DW
1/1968-12/1972	-.01	-.15 (-1.27)	-.44 (-3.82)**	2.87 (2.72)**	.26 (1.54)	.32	1.50
1/1970-12/1974	-.03	-.19 (-1.78)	-.51 (-4.87)**	3.31 (3.34)**	.74 (2.64)*	.43	1.63
1/1975-12/1979	.02	-.25 (-2.50)*	-.59 (-5.90)**	2.71 (4.32)**	-.04 (-.21)	.49	1.61
1/1980-12/1985	.01	-.16 (-1.56)	-.43 (-4.12)**	1.15 (3.16)**	.27 (1.97)*	.33	1.44

DM1 = the growth rate of M1 from one period to the next

$$= (M1-M1_{t-1})/M1_{t-1}$$

DOY = the U.S. deficit divided by the previous period's real GNP

U_{t-1} = the unemployment rate during the previous period

t-statistics in parenthesis
* 95% confidence level
** 99% confidence level

Table 3

Modified Tanner and Trapani Model (Equation 9)
specification to forecast money growth

$$DM1 = a_o + B_1 DM1_{t-1} + B_2 DM1_{t-2} + B_3 DOY_t + B_4 DU_{t-1}$$

Monthly	Constant	$DM1_{t-1}$	$DM1_{t-2}$	DOY	DU_{t-1}	R^2	DW
1/1968–12/1972	.01	−.16 (−1.32)	−.45 (−3.81)**	2.58 (2.45)*	−.04 (−.79)	.30	1.50
1/1970–12/1974	.01	−.17 (−1.51)	−.50 (−4.49)**	2.86 (2.75)**	−.06 (.18)	.35	1.53
1/1975–12/1979	1.52	−.24 (−2.47)*	−.59 (−6.03)**	2.73 (4.53)**	−.07 (−1.33)	.50	1.63
1/1980–12/1985	.02	−.15 (−1.36)	−.40 (−3.78)**	1.11 (2.99)**	−.05 (−.88)	.30	1.45

DM1 = the growth rate of M1 from one period to the next

= $(M1-M1_{t-1})/M1_{t-1}$

DOY = the U.S. deficit divided by the previous period's real GNP

DU_{t-1} = the growth in the unemployment rate during the previous period

= $((U-U_{t-1})/U_{t-1})_{t-1}$ where U is the unemployment rate

t-statistics in parenthesis
* 95% confidence level
** 99% confidence level

Table 4

$$DSP = a_0 + B_1(E(DM1)) + B_2(DM1 - E(DM1)) + E_t$$

1. Using equation (8) to generate expected and
unexpected growth in money

Monthly	Constant	E(DM1)	DM1-E(DM1)	$\overline{R}^2$	DW	$\overline{R}^2_m$
1/1968-12/1972	.01	.65 (1.34)	.57 (1.73)	.08	1.47	.32
1/1970-12/1974	-.01	.18 (.35)	.64 (1.41)	.04	1.37	.43
1/1975-12/1979	.01	.16 (.46)	-.36 (-1.04)	.02	1.51	.49
1/1980-12/1985	.01	-.14 (-.30)	.68 (2.12)*	.06	1.69	.33

2. Using equation (9) to generate expected and
unexpected growth in money

Monthly	Constant	E(DM1)	DM1-E(DM1)	$\overline{R}^2$	DW	$\overline{R}^2_m$
1/1968-12/1972	-.003	.44 (.87)	.68 (2.06)*	.08	1.49	.30
1/1970-12/1974	.003	-.21 (-.38)	.81 (1.96)*	.07	1.42	.35
1/1975-12/1979	.01	-.05 (-.12)	-.16 (-.46)	.004	1.45	.50
1/1980-12/1985	.01	-.62 (-1.34)	.86 (2.81)**	.12	1.81	.30

DSP = Percent change from one period to the next in the S&P 500 stock index

E(DM1) = Expected growth in money, the predicted values generated by relevant money forecasting equation (8) or (9)
= E(DM1) where DM1 is the percent change in the level of M1 from one period to the next

DM1-E(DM1) = Unexpected growth in money, the residuals (from equation (8) or (9))

R^2_m = R_2 for equation (8) or (9)

Table 5

$$DSP = a_o + B_1(E(DM1)) + B_2(DM1-E(DM1)) + E_t$$

1. Using equation (8) to generate expected and
expected growth in money

Quarterly	Constant	E(DM1)	DM1-E(DM1)	$\overline{R}^2$	DW	$\overline{R}^2_m$
Q1/1975-Q4/1979	.01	.40 (.83)	-1.53 (-2.12)*	.26	1.92	.66
Q1/1980-Q4/1985	.01	.87 (1.34)	1.72 (2.39)*	.26	1.30	.56

2. Using equation (9) to generate expected and
unexpected growth in money

Quarterly	Constant	E(DM1)	DM1-E(DM1)	$\overline{R}^2$	DW	$\overline{R}^2_m$
Q1/1975-Q4/1979	-.01	.36 (.58)	-.71 (-1.11)	.10	1.77	.56
Q1/1980-Q4/1985	.004	.97 (1.53)	1.65 (2.18)*	.25	1.32	.58

DSP	= Growth in stock prices
	= Percent change from one period to the next in the S&P 500 stock index
E(DM1)	= Expected growth in money, the predicted values generated by relevant money forecasting equation (8) or (9)
	= E(DM1) where DM1 is the percent change in the level of M1 from one period to the next
DM1-E(DM1)	= Unexpected growth in money, the residuals (from equation (8) or (9))
R^2_m	$=R^2$ for equation (8) or (9) used to generate E(DM1) and DM1-E(DM1)

t-statistics in parenthesis
* 5% significance level
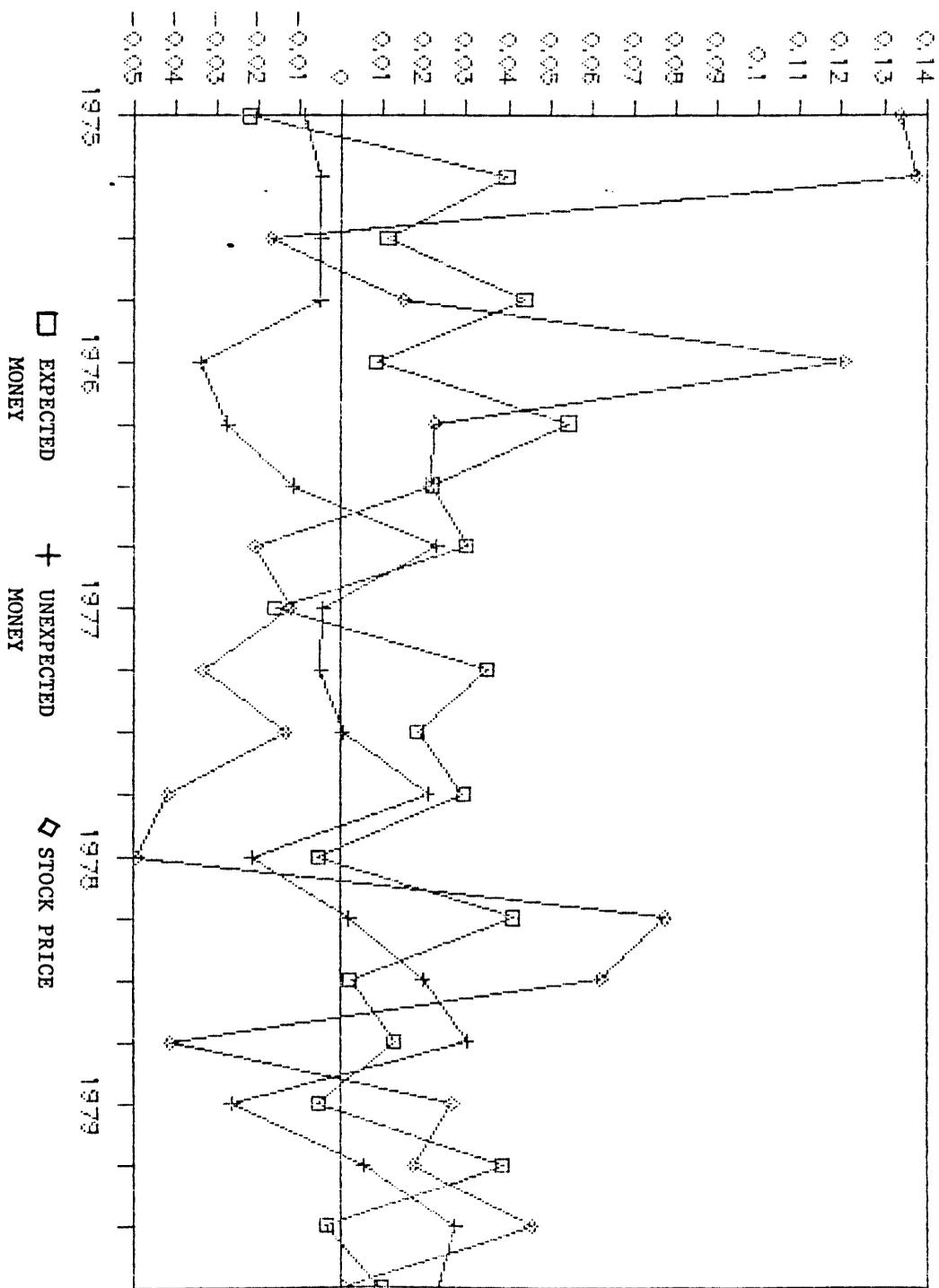** 1% significance level

FIGURE 5

EXPECTED AND UNEXPECTED MONEY AND STOCK PRICE GROWTH RATES
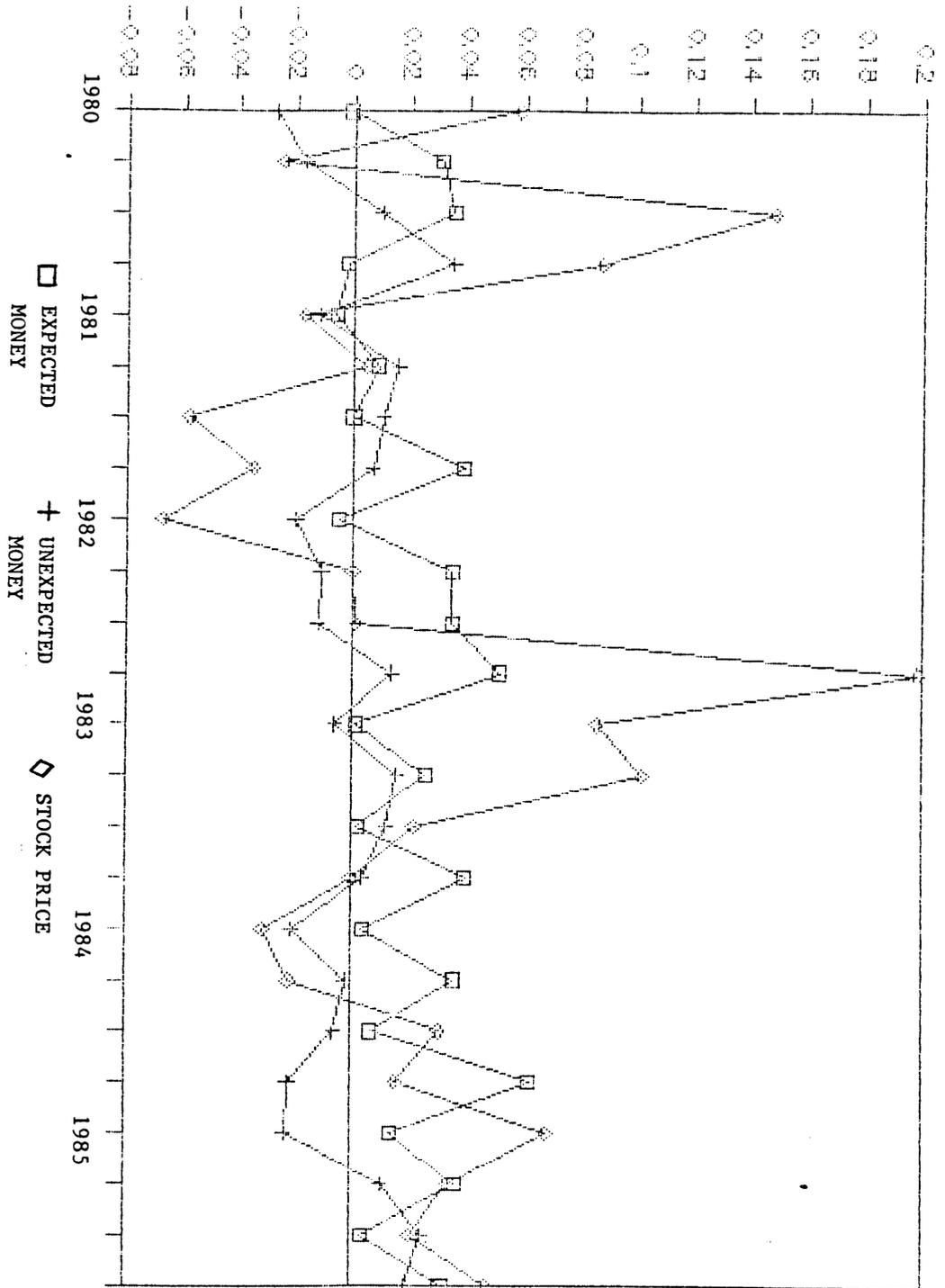
FIGURE 6

EXPECTED AND UNEXPECTED MONEY AND STOCK PRICE GROWTH RATES

market prices during this period which may overshadow the influence
of money. Also, the sign for the unexpected money growth coefficient
is negative. One explanation is that during this time of increasing
fears regarding inflation, an unexpected change in money could have
a negative relationship with stock prices because of the expectation
regarding money's positive relationship with inflation.

Table 6 shows results from regressing DSP against $M1DU_t$
and $M1DU_{t-1}$ where M1DU is the unexpected money growth variable
as generated by equation (9). With this specification, lagged M1DU
is found to be generally not significantly different from zero and
in all but one case has a t-value less than the contemporaneous
variable. The most significant variable is $M1DU_t$, the contemporaneous
unexpected money growth.

This analysis has been conducted by varying the different
aspects of the model in order to check the robustness of the results.
This is necessary due to the uncertainties involved in determining the
appropriate model for determining the expectations of money growth.

Table 6

$$DSP = a_o + B_1 M1DU_t + B_2 M1DU_{t-1} + E_t$$

Comparing contemporaneous and lagged unexpected
money growth effect on stock price changes using
equation (9) to generate money growth

Monthly	Constant	$M1DU_t$	$M1DU_{t-1}$	$\overline{R}^2$	DW
1/1968-12/1972	.01	.45 (1.31)	.07 (.20)	.07	1.54
1/1970-12/1975	-.01	.59 (1.19)	-.001 (-.04)	.03	1.38
1/1975-12/1979	.01	-.03 (-.10)	-.19 (-.57)	.01	1.66
1/1980-12/1985	-.01	.73 (2.19)*	.23 (.67)	.09	1.52

M1DU = Unexpected growth in money

= DM1-E(DM1)

t-statistics in parentheses

* 95% confidence level
** 99% confidence level

CHAPTER V

CONCLUSIONS

A key issue in this paper is whether or not stock prices

may be predicted based on information obtained by predicting money

supply growth. Based on the evidence presented in this paper the

conclusion is no.

First, there is a strong contemporaneous correlation between

money growth and stock price changes. There is little correlation

with lagged money growth. Information regarding historical data on

the money supply would not provide a means of forecasting stock

prices. This information is already discounted in the price of the

stock.

Second, the evidence on expected and unexpected money

growth shows a lack of significance in the expected variable coeffi-

cients. This is consistent with the rational expectations (efficient

markets) theory that only unexpected changes will have an effect on

stock prices. Further evidence is that generally only contemporaneous

unexpected money growth is strongly significant.

Another issue relates to whether the portfolio effects of

a change in the money growth rate cause stock prices to change. It

is hard to distinguish between the portfolio effects and the other

two effects, income and price effects and the price anticipation or

inflation effects.

The evidence presented in this paper indicates there is

a strong relationship between money growth and stock price changes.

And as Friedman (1969) predicts, it is the unexpected component of money changes which is most strongly correlated with stock price changes. -The signs (except for the anomalous data of the late 1970s) are all correctly positive. This is consistent with the notion that an increase in the money supply disturbs the balance of wealth holders' asset portfolios. In an attempt to correct the imbalance, the wealth holder trades money for other assets including common stocks, bidding up the price of the stock. This is the case of an increase change in money. The price is bid down in the case of a decrease in money.

There is, however, a related empirical question that must be answered before we may say that the positive relationship between the money growth variables and stock price changes is due solely to portfolio effects. That is, what about the influence of the income and price and the price anticipations effects of money disturbances on stock prices? Based on the above positive relationship, we may rule in favor of portfolio effects when considering the following.

The influence of the income and price and price anticipation effects, through their positive relationship with interest rates, would have an inverse relationship with stock prices. That is, the income and price effects of a monetary disturbance means that a money disturbance would have a positive relationship with real interest rates. The price anticipations effect of a money disturbance affects the nominal interest rate in the same direction. The interest rate has an inverse relationship with stock prices. For a given earnings stream, an increase in the interest rate available in the

market will cause the price of the stock to decrease to a point where the expected return will be the same as that the wealth-owner could achieve elsewhere. This of course takes into consideration the risk characteristics of a given stock. This inverse relationship between money and stock prices was not evidenced in the data except in the late 1970s, a time of high rates of inflation.

This leaves unanswered the effect of the income and price effect of money disturbances on earnings. According to Friedman (1969) a change in money growth would affect, with a positive relationship, income and price level. This in turn affects earnings positively. Earnings have a positive relationship with stock prices. For a given market interest rate expected by the wealth-owner, a change in earnings will cause a change in the same direction in the price of the stock, as the price of the stock is bid to the price that gives the wealth-owner the same return which could be achieved elsewhere in the market. Thus a change in money growth could have a similar influence on stock prices irrespective of portfolio effects.

Money disturbances have both portfolio as well as income and price effects, which in turn impact either directly or indirectly stock prices. This study cannot distinguish between the direct portfolio effect on stock prices and the income and price effects on stock prices through their influence on earnings. They would both have a similar positive relationship with stocks.

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