Stock Prices and Macroeconomic Data

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Abstract

This paper examined the relationship between the total return on the S&P 500 index and various macroeconomic variables. The independent variables were the growth rates of corporate earnings, G.N.P., money supply(M1), S&P dividend yield, seasonally adjusted C.P.I., U.S. T-Bills(3 months), and the U.S. treasury composite. The 1968-1987 period was researched using time lags of zero to four quarters. In addition, the total S&P 500 total return and the growth rate of corporate earnings were studied for the 1973-1987 and the 1981-1987 periods utilizing zero to one year time lags. This study has shown that for the period 1968 through 1987, there was no significant relationship (.05 level) between macroeconomic data and the total return on the S&P 500 index with one exception. The exception was dividend yield using a six month time lag. This is consistent with past research that has shown a relationship between dividend yield and total return. When the growth rate of earnings was singled out, a negative relationship was found from 1973-1987 and from 1981-1987. This is a surprising result and is inconsistent with long term studies which support a consistent and significant relationship. The results show that for these periods, it would have been a futile exercise for professional managers to study and attempt to predict future economic data. Predicting the future is an impossible task with a consistent degree of accuracy, but this study indicates that even if it could have been done from 1968-1987, that it would not have guaranteed superior stock market results. If no relationship exists, then is it cost effective not to study the variables? This study discourages a market timing investment approach.

Literature Review

Changes in the stock market tend to affect the economy. The reverse of this is also true or at least believed by those students and profit seekers who analyze the market. It is generally believed that changes in the economy affect the market. Numerous persistent relationships have been analyzed by students of the national economy and seekers of profit in the stock market. Three popular time series have been stock prices, corporate profits, and price-earnings ratios. Lorie and Hamilton[34] found that the one significant determinant of the level of stock prices is corporate profits. During the Great Depression in this country, corporate profits and stock prices fell by more than 75 percent. In all subsequent periods up to 1960, there was significant correspondence between major movements in the two series, with the exception being the period immediately after World War II. During this period, profits rose quickly while stock prices lagged badly for several years. If an investor could forecast profits and the ratio of prices to profits, one could obviously forecast stock prices and become extremely wealthy. Unfortunately, projecting corporate earnings consistently is next to impossible.

Reilly[43](1989) lists the unusual movement of

earnings and stock prices since 1960. The implicit assumption of investors is that over time stock prices{S&P 400} and earnings should move in tandem. Reilly mentions the periods that stock prices and earnings moved strikingly in the opposite direction. The data is listed in the following table:

<u>Year</u>	<u>Corporate Profits</u>	<u>Stock Prices</u>
1973	up 30%	down 17%
1974	up 9%	down 30%
1975	down 10%	up 32%
1977	up 7%	down 12%
1980	down 1%	up 27%
1982	down 21%	up 15%
1984	up 23%	unchanged
1985	down 15%	up 26%
1986	down 5%	up 15%
1989	unchanged	up 26%

Lorie and Hamilton[34] believe that stock prices are not determined or significantly influenced by the GNP, employment, or real income, rather they respond more to corporate profits. In the recession of 1969-1970, the

relationship between changes in nominal GNP and nominal corporate profits is surprising. While nominal GNP was rising in every quarter, corporate profits declined 21 percent between the third quarter of 1969 and the fourth quarter of 1970.

There were generally persistent high rates of return on equities between 1954 and 1965 and between 1982 and 1989 when the American economy had relatively stable prices. Lorie and Hamilton[34] found between 1965 and 1975 there was great inflation and a lower level of returns on common stocks{frequently negative returns}. Rising prices cannot always be counted on to produce rising profits and increased stock prices as Keynes [30] and Fisher [18] had predicted. However, stocks have for almost all periods produced rates of return in real terms which are superior to those on fixed-dollar assets.

Lorie and Hamilton[34] state that since 1918, there have been only three sharp market declines which were not preceded by a period of money contraction {1939-40, 1962 and 1966}. The lag time for bull markets is typically shorter and averaged two to three months. In recent times there is mounting evidence that changes in the rate of growth in the money supply lead to changes in equity prices by a shorter period or are simply coincidental.

Rogalski and Vinso[45] suggest there is a general consensus in finance that an unexpected increase or decrease in the growth rate of money results in a change in the equilibrium position of money in relation to other assets in the portfolio of investors. Because of this belief, investors try to adjust the proportion of their asset portfolios represented by money balances. It has been hypothesized that changes in the nation's money supply will cause variations in stock prices. This should mean changes in stock prices will respond to monetary disturbances with a lag (assuming the hypothesis is valid).

Rogalski and Vinso[45] found{1963-1974} information concerning the actual rate of growth of the money supply is incorporated into equity returns as espoused to by various monetary portfolio theorists. Causality does not go from money supply to stock prices but rather it grew from stock prices to money supply and conceivably back again.

Cooper[11] found money supply lags the S&P 500 Index over the period 1947-1970 by approximately one to three months. Cooper's analysis shows significant correlations only at future lags of two and three months and past eight months. Rozeff [47] ran his tests between the money supply and Fisher's index from 1947-72 and found significant future lags one, two and four months and significant past lags at zero eight and twelve

months.

Money growth throughout history has rarely been smooth. Accordingly, it is always possible to find a period of monetary deceleration in the neighborhood of a cycle peak. Poole [42] {1975} stated the procedure for defining a monetary deceleration should not be sensitive to "random" fluctuations in the money stock series. Such fluctuations could be the result of measurement error. Temporary fluctuations do not offer much economic significance. His analysis {1908-1972} took each month of the sample period and fitted least-squares time trend to the logarithm of the money stock level to provide an estimation for the rate of growth over the preceding 24 months. Having selected the maximum trend rate of money growth, Poole drew a trend line through the average level of money stock{both M1 and M2} over the period defining maximum growth (trend rate). The trend line was projected in both directions and the money stock level at the cycle peak was compared to the trend line.

Poole [42] found the evidence for the necessity of a decline in monetary growth being necessary for a business cycle peak is fairly clear. In every cycle peak he studied, there was a decline in the rate of money growth. Excluding wartime peaks in 1918 and 1945, there are two questionable abnormalities over the sample period 1908-1972. The cycle peak in May 1937 occurred very late given the substantial fall of money growth starting in 1936, and the peak in November of 1948 happened long after the marked deceleration of money growth that started in 1945. It is important to note that these findings are based on relatively small sample sizes. The period over which monthly money numbers are available contains a total of 14 business cycle peaks and there were two exceptions. Money supply is assumed to be closely tied to stock prices, but in actuality, its influence on stock prices is an offshoot of its influence on the aggregate economy.

Friedman and Schwartz [20](1963) indicated from their research that declines in the growth rate of the money supply preceded business contraction by a 20 month average for the period 1867-1960. They also found that growth rate expansions preceded expansions in the business activity by approximately eight months. The authors claim that every major contraction or expansion during the 1867-1960 period was preceded by a contraction or expansion in the money supply growth rate. Money supply was defined as bank demand deposits and time deposits plus currency in the hands of the public (M2).

Friedman and Schwartz [20](1963) hypothesized that when the Federal Reserve Bank buys or sells bonds to adjust bank reserves and eventually the money supply (M2), the immediate impact is on the change in govern-

ment bond prices. The action impacts next on corporate bond prices, then on common stocks and finally it is felt on the real goods market. Reilly [43](1989) indicates their initial effect of monetary policy is on financial markets, and only later will the impact hit the aggregate economy.

The Friedman and Schwartz [20](1963) research has been supported by Sprinkel [52](1964), Palmer [38](1970), Keran [29] (1971), Homa and Jaffee [28](1971), and Hamburger and Kochin [26] (1972). These studies indicate a strong relationship between money supply changes and stock prices, which according to Reilly (1989) implies that the money supply can be used as an indicator of stock price changes.

Several studies question these studies based on the conclusions reached and the statistical techniques used. Miller [35](1972) questioned the Keran [29] and the Hamberger and Kochin [26] studies on statistical ground. Pesando [39](1974) also questioned the validity of these studies.

Auerbach [1](1976) removed the trend and cyclical components of money and found a weak relationship between stock returns and changes in the M1 money supply series. These results are consistent with the EMH. Rozeff [47](1974) found that money supply changes are important, but that stock prices actually lead the money supply. Hafer [24](1986) studied weekly money supply data to test both anticipated and unanticipated money growth. Hafer found that anticipated monetary changes had no impact on stock prices, while positive unanticipated changes had a significant impact. Hafer's research supports the EMH.

Economic cycles alternate between expansion and recession. This is well documented in the literature. Michael Hayes [25] {1977} found there is a close and direct relationship between stock market cycles and economic cycles. The stock market will tend to anticipate business conditions approximately six months to one year. The National Bureau of Economic Research includes stock prices, as a leading index of business conditions. Stock prices will tend to top out about eight months before the peak in industrial activity and prices will generally reach bottom and begin to rise approximately six months prior to the beginning of an economic recovery.

The Fisherian [18] assumption is that real rates of return are independent of inflationary expectations. Both Keynes and Fisher [34] believed that inflation is advantageous to holders of common stocks because it will reduce the burden on corporations to service and repay their debt. Gultekin [22] studied the relationship between common stock returns and inflation in twenty six countries for the postwar period. His results did not

support the Fisher hypothesis. His results showed real rates of return on equities and expected inflation rates are independent. The nominal common stock returns vary in one to one correspondence with expected inflation. Fisher, [18] who was an early monetarist, believed that the real and monetary sectors of the economy are largely unrelated. Fisher hypothesized the expected real rate is determined by real factors in the economy, such as productivity of capital and time preference of savers. It is essentially independent of the expected inflation rate. Gultekin found no support for the Fisher hypothesis in his study.

Gultekin's [22] results were interesting. Using time series regressions, Gultekin found that no reliable positive relationship between nominal stock returns and inflation rates exist between the periods 1/1947 and 12/1979. Regression coefficients were predominantly negative. He also found that the equity return and inflation relationship is not stable over time and there are differences among countries (26 countries in total study). Countries which had higher rates of inflation generally had higher nominal stock returns and real rates in most countries have been declining since the mid 1960's. The relationship between common stock returns and inflation in other countries is as confusing as the findings in the U.S. Most studies since the 1960's in the U.S.A. show little support for the Fisher hypothesis.

The classical investment theorists of J.B. Williams [54], Graham [21], Dodd and Cottle [34] described inflation as a proportionate increase in all prices and incomes. The real rate of return on claims to production (common stocks) was believed to be unaffected by the rate of inflation. The empirical evidence of Bodie [5], Fama and Schwert [15], Joffe [34] and Mandelker and Nelson [34] indicate that real equity returns are adversely affected by both the expected and unexpected components of the rate of inflation. The evidence is inconsistent with both the classical view and with the Fisher hypothesis that assets would be priced to reflect the expected components of inflation.

Gultekin [23] performed a second study in 1983 by incorporating inflation expectations into a model. Contrasting to earlier research, this study used data from the Livingston [23] survey of expectations to test the Fisher Effect as a model which relates expected stock returns to expected inflation. The findings are remarkably different from the previous studies which used *ex post* data. The data from the Livingston [23] surveys indicate a positive one-to-one relationship between expected equity returns and expected inflation. It was also discovered that the expected real return on stocks is not constant over time but is positively related to expected inflation. This research is contrary to earlier research by Mundell [36] and others. The

periods used were 6/1952 to 12/1979.

The Gultekin/Livingston [23] study found that the Fisher Equation holds much better for ex ante expectations than for ex post stock returns. If economists sampled in the Livingston survey are representative of the market, then findings do not support the view of Modigliani and Cohn [34]. They asserted during inflationary periods investors capitalize equity earnings at a rate that parallels the nominal interest rate rather than the correct real rate. In addition, Gultekin [23] found that expected real returns on common stocks over time are not constant and contrary to the Mundell Effect [36], they are positively correlated with expected inflation.

Nelson [37], Bodie [5], Joffe [34] and Mandelker and Fama [15] and Schwert [50] all have presented present evidence that monthly returns to a broad group of New York Stock Exchange common stocks are negatively related to both the expected and unexpected components of the Consumer Price Index from 1953 to 1981. Schwert [50] analyzed the reaction of equity prices to new information concerning inflation. He based his 1981 study on returns to the Standard and Poor's composite portfolio from 1953 to 1978. It showed that the stock market reacts negatively to the announcement of unexpected inflation (CPI) although the magnitude of the reaction is small. The stock market seems to respond at the time of the CPI announcement approximately one month after the price data are collected by the Bureau of Labor Statistics.

The stock market tends to react to unexpected inflation around the time when the CPI is announced, and the stock market does not appear to react to unexpected inflation during the time when the CPI is sampled (several weeks before the announcement date). However, the reaction of aggregate stock returns to unexpected inflation is not strong. Coefficients of unexpected inflation are small and negative for the 15 trading days around the announcement date. Leakage of information does occur which foreshadows the subsequent announcement.

Fama [15] formulates reasoning why the stock market reaction to unexpected inflation is so weak. He believes that unexpected inflation is contemporaneously correlated with unexpected movements in important "real" variables like capital expenditures and real GNP. The correlation between stock returns and unexpected inflation is spurious.

Brick and Thompson [8] found the bond market is much more efficient than the stock market. They found that individual series (1958-65 and 1966-73) follow a random walk and there is no evidence of a significant relationship over time between long and short rates.

These results are consistent with the findings of Wood [55], Hamburger and Lata [27], Fand [16], Cargill and Meyer [10], Pippenger and Phillips [41] and Pippenger [40] in that the adjustment process in bonds is extremely rapid.

Pesando [39] believes there is a great inability for quantitative forecasting models to generate accurate ex ante forecasts of stock prices. According to Pesando, one should not place undue confidence in the quantitative estimates which try to predict the impact of fluctuations in the money supply on common stock prices.

Dividend Affect

Brennan [7] (1970) found that in the presence of differential taxes on dividends and capital gains, equities with high dividend yields will have higher expected returns (before taxes) than securities with low dividend yields. Black and Scholes [3] assumes that dividend yield is related to expected return which seems logical, but they also make the assumption that the relationship is linear.

Black and Scholes [2] (1973) arbitrarily constructed 25 intermediate portfolios and ranked them in terms of yield. They used monthly data on dividends, prices and returns for stocks listed on the New York Stock Exchange from January 1926 to March 1966. Each intermediate portfolio was started by investing an equal amount of money in each security in the portfolio. All portfolios were revised each year because the characteristics of the equities in the universe did change over time.

Black and Scholes [2] constructed portfolios whose expected return was the quantity they wanted to estimate. In order to avoid bias, they selected stocks for the portfolio at each point in time using only data that was available at the time. Finally, they created an estimator by selecting the smallest possible variance of return, subject to the first two selection criteria. By limiting variances early, they may have confounded the results.

Black and Scholes [2] found that the coefficient of the dividend yield did not appear significantly different from zero, even though the significance was biased upward. They concluded that they were unable to show that variances in dividend yield lead to variance in stock returns. Because their analysis measured returns without taking into account taxation, they concluded that a tax-exempt investor may not gain significantly by emphasizing high yield stocks over low yield stocks, other things being equal.

Dividend yields are viewed by some practitioners as predictors of future price movements. When the Dow

Jones Industrials drops below a 3% yield, it spells trouble for stocks. Boesel of T. Rowe Price (WSJ 11-2-89) says anything below this level tells you that stock prices always decline sharply when the dividend yield drops below a 3% yield. He bases his view on six decades of stock-market data. There have been eight times when the market (Dow Jones Industrials) dropped below the 3% yield for at least two consecutive months: 1929, 1933, 1961, 1965, 1968, 1971, 1972, 1987. Perritt confirmed that in each instance, a sharp drop in stock prices began within a year. [WSJ 11-2-89]

Fama and French [14] used dividend/price ratios (D/P), which they called dividend yields, to forecast returns on New York Stock Exchange stocks (both value and equal-weighted portfolios) from one month to four years. Their tests confirmed the existing evidence that predictable (expected) components of return are a small fraction of short-horizon return variances. Regressions of returns on yields only explained less than 5% of monthly or quarterly return variances. The results also added statistical power to the evidence that the predictable component of returns is a larger fraction of the variation of long-horizon returns. Regressions (returns) on D/P explain more than 25% of the variances of two to four year returns. Research on annual returns has shown the same long term result including research by Rozeff [49] (1984), Shiller [51] (1984), Flood, Hodrick and Kaplan [19] (1986), Campbell and Shiller [51] (1987). Neither the hypothesis nor the evidence shows that D/P is predictive of returns. Fama and French [14] are adding evidence that forecast power will increase with return horizon. They also found that estimated shocks to expected returns are indeed associated with opposite shocks to prices.

Fama and French [14] found like stock returns, dividend changes are more variable in the beginning of their samples. The standard deviations of year-to-year changes (in the logs of annual dividends) on the value and equal-weighted portfolios for 1957-1986 are about 25% of those for 1927-1956, and after 1940 returns were 2.4 times as variable as dividend changes. The variability of dividends declined relative to earnings variability.

Litner [31] (1956) postulated a firm's target dividend $D^*_{(t)}$ for year t is a constant fraction of earnings E_t , $D^*_{(t)} = KE_{(t)}$. Linter formulated an adjustment model to account for the change in the actual dividends. Fama and French [14] found the speed of adjustment (annual S&P earnings and dividends) to be inconsistent with differing periods.

Blume [4] (1980) using 1936-1976 quarterly data, Bradford and Gordon [6] (1980) using 1926-1978 monthly data, and Stone and Bartter [53] (1979) using 1947-1970 monthly data all concluded a significant relationship between returns and dividend yields. Miller

and Scholes [35] (1981) argue the observed relationship between common stock returns and dividend yields is attributable to "survivability bias". They argue that when a firm declares a zero dividend after it has paid dividends, it is not recorded on the CRSP tapes as having declared a dividend. The firm is then in the zero-dividend group, and its future performance distorts the results in favor of the consistent dividend paying securities. Miller and Scholes [35] argue that the dividend yield effects are attributable entirely to the "information effect".

Litzenberger and Ramaswamy [32] claim that the data clearly indicate there is a positive but non-linear association between common stock returns and dividend yields. They claim that the research is based solely on information that would have been available to the investor *ex ante*. Therefore the investor is free from any potential information effects that Miller and Scholes [35] argue are contained in dividend yield variables which anticipate the occurrence (or lack thereof) of a dividend. The conclusion of past research is that significant yield effects cannot be tied to the "information content effect."

Unemployment is considered a lagging economic indicator and as such, will give us no insight into future stock prices. Unemployment information will be run just to confirm past results which were statistically consistent.

Methodology

Data on the Standard and Poor's 500 Index (S&P 500) was obtained through the use of the Compustat software package. Compustat is a subsidiary of Standard and Poor's Corporation. The data on all independent variables were taken from survey of current business from United States of America publications. The SPSS statistical package was implemented for results of t-scores.

The first tests that were run were the Durbin-Watson scores. The Durbin Watson test will indicate if there is autocorrelation present in the data. Durbin-Watson scores from 1.8 to 2.10 show no autocorrelation affects.

Results & Conclusions

The data clearly showed that no autocorrelation was present. The data also indicates there is no significance between the S&P 500 and the independent variables. The surprise was a lack of relationship between earnings and the level of the S&P 500.

When incorporating lag factors of 6 months and one year, the only significant plus (+) score was S&P dividend yield at the six month lag factor. It is interesting to note, the lack of significance at the one year time

Table I
t-Statistics

Dependent Variable t Statistics - Total return of S&P 500 Index >2

<u>Independent Variables: (% changes)</u>	<u>1968-1987</u>	<u>6 Month Lag</u>	<u>1 Year Lag</u>
Seasonally adjusted C.P.I.	.1649419	1.487525	1.727027
U.S. treasury composite (LT interest rate)	1.027	.7776	-.3824
U.S. T-Bills (3 month Bills)	-.4166	-1.3748	-.4737
S&P Dividend Yield	-.1660	*3.162242	1.4982
GNP	-.7294	.6620	-.7478
Money Supply	1.7107	.7592	.3254
Corporate Earnings	-.2862	.5580	.2207

Durbin Watson Statistics

Independent Variables	1.858	1.967	1.902
Dependent Variable = Total Return for S&P 500 (monthly)			
Independent Variable -> growth rate of S&P 500 earnings (monthly)			
1973 to 1987 period	-7.8224	-.3050	-.7881
Durbin Watson Statistic	1.82091	1.874	1.912
0 lag	-7.822428	1.80	1.80
1981 to 1987 period	-4.6155	-.9218	-.5880
Durbin Watson Statistic	1.811	1.8001	1.8487

lag level. There was not only no significance for corporate earnings, but the relationship was slightly negative (-). Multicollineality may be a feasible explanation.

The 1973-1987 and 1981-1987 periods were run independently matching the growth rate of earnings with the S&P 500 prices. Current data showed significant negative relationships and no relationship was found using time lags, albeit negative relationships were still found.

The period 1967 through 1987 was selected in order to see which variables would hold over approximately six market cycles which were radically different. As a nation, we went from an inflationary war in Vietnam to a disinflationary peace time era. If a relationship exists from macroeconomic variables over these market cycles, then it can be concluded that the relationship is indeed quite powerful. Notice the second group of data which showed negative (-) relationships using corporate S&P earnings as the control variable. 1973 to 1987 incorporated wild inflation and low inflation, while 1981 and 1987 incorporated falling interest rates and low inflation. The negative (-) relationship using lag factors is inconsistent with the literature, and even suggests there may be no merit in studying earnings momentum.

This study does shed light on the market timing approach. It supports William Sharpe's [43] (1975) research which studied the 1929-1972 period and concluded that a market timer must be "perfect" 74% of

the time in order to beat a buy and hold strategy.

This study shows that even if analysts were correct in calling ex ante independent variable results, it would not have guaranteed superior stock market results for the 1968-1987 period. The study implies that for this period, research associated with these independent variables was unnecessary. In fact, analysts would not have been cost effective incurring research expense during this period. A pure value investment approach could have been formulated by a computer. Indexing would have been another cost effective approach to implement during this period. This research questions whether the millions of dollars spent on the ex ante predictions of macroeconomic variables is even necessary.

This study has tremendous ramifications for huge pension accounts which pay millions of dollars a year for professional money management. There must be consistent evidence that a manager can beat the market on a risk adjusted basis over long periods, before justification can be given to managers who continue to implement an *ex ante* predictive investment style utilizing macroeconomic variables.

Suggestions for Future Research

There is a need for continued research in the area of macroeconomic variables and the stock market. This research did not incorporate international data which is

a recommended area of future research. My research showed no significant domestic relationship between various macroeconomic variables and the stock market for the 1967 through 1987 time period. We do not know if these non-relationships would surface if we utilize foreign data. This study concentrated solely on American data.

Wall Street spends millions of dollars on the analysis of macroeconomic data and it is vital to determine if this is a cost effective approach. If future research exhibits similar statistical insignificance, then investors can argue that Wall Street is practicing cost inefficiency within their research departments.

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