Stock Market Growth Expectations, Risk Perceptions, and Ex-Ante Returns Under Uncertain Stagflation

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I. Introduction

Stock prices reflect the capitalized values of future dividends which, to a large measure, depend upon the expected rate of shareholder earnings growth. Changes in these expected growth rates and capitalization rates are likely to be related since inflation affects both their values. And, when earnings growth and inflation rates are uncertain we can expect changes in capitalization rates to additionally reflect the associated changes in risk perceptions. It follows that the net effect of inflation on the level of stock prices cannot be fully understood without knowledge of the direction and magnitude of the relationship between earnings growth and equity yields. Such knowledge of the inflation-related link between earnings growth and equity capitalization rates is also central to the determination of the amplitude of stock price fluctuations (and hence their rates of return), since increases in earnings growth increase stock prices and increases in capitalization rates decrease stock prices. The purpose of this paper is to assess the behavior and influence of growth expectations and risk perceptions in the determination of dividend yields, capitalization rates (equity yields) and common stock values under inflation.

Numerous studies have examined the empirical relation between ex-post stock returns and inflation and have uniformly found that stocks were rather poor inflation hedges (for example, *Lintner* 1975, *Jaffee-Mandelker* 1976, *Nelson* 1976, *Fama-Schwert* 1977, *Fama* 1981). No (time-series) study, however, has examined either the empirical relationship between a satisfactory measure of the (ex-ante) equity yield and inflation, or between shareholder earnings growth and inflation, or between the yield on equity and earnings growth.[1]

[1] *Fama* (1981) examines the empirical relation between ex-post stock returns, inflation, and aggregate real economic growth. *Geske-Roll* (1983) examines the relation between ex-post stock returns and earnings growth.

The need to assess the nature of the aggregate relationships between inflation and earnings growth and between equity yields and shareholder earnings growth takes on greater importance because the phenomenon of stagflation – the inverse relation between inflation and economic growth – has characterized the behavior of the U.S. economy for the post-1955 period, for both the shorter (cyclical) and longer (secular) runs, and because economic growth and the real rate of interest can be expected to be intimately related; for example, *Friedmann* (1971) assumes that the difference between them is constant and makes this assumption an important element of his monetary theory.[2] All of this suggests that inflation, or the process(es) generating it, will have had some real income effects, which in turn will have affected shareholder earnings growth and equity yields.[3] Hence, an assessment of the virtually totally neglected time-series relationships between inflation and earning per share growth and between earnings growth and equity capitalization rates is both a logical and necessary extension of the

[2] *Friedman* (1977) hypothesizes that increases in the mean-related general variability of inflation may have reduced economic efficiency and increased the unemployment rate, thus pushing the *Phillips* curve into its third phase. The decline in economic efficiency may have also reduced economic growth. Supply shocks would also produce stagflation. *Mullineaux* (1980) and *Levin-Makin* (1980) provide some empirical support for the Friedman hypothesis (see also *Azariadis* 1975 and 1977).

Fama (1981) argues that inflation was neutral in its incidence on stock returns. He assumes away any causal effect from inflation to economic growth. Since real output is made exogenous, even in the short run, he is able to reverse causation; the exogenous decline in real output growth reduces the demand for money, thus creating an excess money supply to produce inflation (and stagflation). As Fama acknowledges, empirical support for the inflation is neutral argument rests on the questionable procedure of including economic growth, monetary growth and inflation rate variables in the same equation despite the contemporaneous influences of monetary growth on the inflation rate. And instead of relating stock returns to per share earnings growth, g, as equation (1) below requires, Fama relates it to either the growth in real industrial production or to aggregate real economic growth, y. This is a source of bias since the difference $(g - y)$ and p had a strong statistically significant negative cyclical and secular relationship. That is, inflation had a significant inflation non-neutral distribution effect with the stock market being more adversely affected by inflation than the general economy. These unreported results form the subject matter of a separate paper.

[3] These real income effects of inflation can be expected to prevail in addition to the many possible redistribution effects of inflation on earnings. These redistributions would stem from the net monetary debtor position of firms, the manner in which their inventories are valued, and the reduction in the real tax depreciation shield of their taxable income, due to depreciation allowances being based on historical costs instead of (higher) replacement costs, and to the inclusion of the inflation premium portion of the interest rate as a tax deductible expense. The studies of *Hong* (1977) and *Feldstein-Summers* (1979) indicate that tax transfers due to historical-cost-based tax rules governing depreciation allowances are likely to be relatively large, making the net redistribution effect negative.

hitherto dominant focus of past studies on the effect of inflation on either distributive shares or on ex-post stock returns.[4]

This study thus seeks to empirically examine the manner in which stagflation and uncertainty have jointly affected earnings growth, capitalization rates and common stock values. More specifically, it is concerned with:

i. Determining the influence of inflation on shareholder earnings growth.

ii. Estimating the direction and magnitude of the influence of inflation non-neutral earnings growth on equity yields.

iii. Developing a tentative hypothesis about the information content of earnings growth and explaining the macroeconomic nature of the expectation generating mechanism that is likely to account for the estimated positive fractional relationship between earnings growth and equity yields.

iv. Disentangling the relative importance of inflation-related income and risk factors as explanations for the depressed state of the stock market in recent years.

Section II outlines the model used to examine the data. Section III provides the empirical evidence and develops a tentative hypothesis to explain the implied positive relationship between growth expectations and equity yields. The empirical evidence is then used to assess the relative importance of (earnings) growth and risk factors as explanations for the weak stock market performance of recent years. Section IV has a summary with some concluding comments.

II. Theoretical Framework

This study uses a valuation framework to examine the aggregate time-series relationship between anticipated inflation and growth expectations, risk perceptions, equity capitalization rates and common stock values.[5] In

[4] The extent of the influence of inflation on equity yields will be shown to critically depend upon the direction and magnitude of the relationship between dividend yields and earnings growth. Relaxing the no growth assumption reverses the effects of both inflation and growth on a growth inclusive measure of the equity yield, measured as the sum of the dividend yield and earnings growth.

[5] Ex-post stock market data have largely been used in the empirical testing of the now virtually omni-present ex-ante capital asset pricing model (CAPM). However, this one period, no physical investment CAPM, in which the level of the interest rate is exogenous, can only explain the structure of ex-ante returns at a point in time. (See, for example, *Brenner-Subrahmanyam* 1977.) Multi-period asset pricing models are limited in scope and pose problems for empirical testing. Observe, for example, the

this framework the price of a stock is expressed as the present value of all future dividends:

$$P_0 = \sum_{1}^{\infty} \frac{E_0 (1 + g_t)^t (1 + p_t)^t b_t}{(1 + k_t)^t (1 + p_t)^t} \tag{1}$$

where E_0 is current earnings, g, p, and k represent real earnings growth, inflation and real capitalization rates respectively, b is the dividend payout rate, and t is a time subscript or superscript. Alternatively (1) may be written as (2):

$$P_0 = \sum_{1}^{\infty} \frac{E_0 (1 + G_t)^t b_t}{(1 + K_t)^t} \tag{2}$$

where G and K are respectively the nominal earnings growth and capitalization rates. The macroeconomic phenomenon of stagflation in an inflation non-neutral world, as well as the likely existence of a negative net redistribution effect of inflation on shareholder earnings growth (due to the large and persistent effect of our tax laws governing depreciation allowances), suggests that the partial derivative of g with respect to p (in equation 1) ought to be negative, i. e., g' (p) < 0. It is also evident from (1) and (2) that expectations play a central role in the determination of stock prices. However, expectations of both G and K are unobservable variables. Equation (2), nevertheless, permits an estimate of the growth-related behavior of the capitalization rate once an estimate of growth expectation is obtained. This may be shown with the aid of the well-known *Gordon* (1962) stock valuation model. Assuming a constant dividend payout rate, equation (2) may be written in integral form as (3) with D_0 representing current dividends.

$$P_0 = D_0 \int_{0}^{\infty} e^{(G - K)} \, dt \tag{3}$$

Under the dual assumptions of a constant G and of $K > G$ integration of (3) yields

$$P_0 = D_0 / (K - G)$$

or

$$D_0 / P_0 = K - G \tag{4}$$

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preliminary unsuccessful *Fama-Macbeth* (1974) attempt at testing the economic content of *Merton's* (1973) multi-period model. The first serious (theoretical) attempt to link a firm's earnings growth and its systematic risk that of *Turnbull* (1977).

Equations (1) - (4) are, by definition, identities which, as in the case of, say, the quantity theory identity, can be given a causal interpretation by examining the economic interdependence of the variables appearing in (1) (for example, *Friedman* 1970, 1971). Consider the case of a differential effect of inflation non-neutral uncertain earnings growth expectations on the numerator and denominator of the dividend-price ratio; such changes in uncertain earnings growth expectations, and associated changes in risk perceptions leave the response of the dividend yield to changes in earnings growth expectations theoretically indeterminate. This relationship may be written in linear form as (5).

$$D/P = \alpha + \gamma G + u \qquad u \sim N(0, \sigma) \tag{5}$$

Substitution of (5) into (4) yields (6):

$$K = \alpha + (1 + \gamma) G + u \tag{6}$$

Thus (5) can be used to assess the influence of G on K. If γ is equal to minus unity in (5) then $K'(G) = 0$ and α provides an unbiased estimate of K. But there is no more reason to expect the coefficient of D/P on G to be necessarily equal to minus unity because of identity (4) than there is reason to expect, say, the coefficient of nominal money on real or nominal output to equal unity because of the quantity theory identity. For example, the *Baumol-Tobin* (*Baumol* 1952, *Tobin* 1956) demand for money models shows that there are economies of scale in the holding of money balances. And equations (1) and (2) suggest that G and K are not likely to be independent since they both depend on p. For example, if inflation is neutral $G'(p) = K'(p) = K'(G) = 1$. This requires that $\gamma = 0$ in (5). But inflation neutrality is also unlikely in an era of uncertain stagflation. Thus the critical questions that will be addressed are: what are the signs and magnitudes of the influence of inflation on shareholder earnings growth rates and capitalization rates, and what is the influence of the inflationary process on these crucial relationships?

The *Gordon* model estimate K has largely been used in microeconomic cross-section studies. A common, and often valid, criticism of such usage is that the constant perpetual growth assumption introduces a (measurement error) bias since such an assumption is highly questionable for abnormally high growth firms (because they cannot maintain such high growth rates forever). The model is deemed more relevant for mature and stable companies. This criticism is considerably attenuated in our aggregate time series

study because G is evidently stationary. Moreover, it is not necessary to assume that G is constant forever, since we may approximate non-linear equation (3) by (7).

$$P_0 = D_0 \cdot G^{\beta_1} \cdot K^{-\beta_2} \qquad \beta_1 = \beta_2 = 1 \tag{7}$$

where G and K are now redefined to be the geometric means of all their future values. $\beta_1 = \beta_2 = 1$ because equation (2) is an indentity and equal changes in its numerator and denominator will leave stock price unchanged. It follows that (7) may be written as (8):

$$D_0 / P_0 = G^{-\beta_1} \cdot K^{\beta_2} \tag{8}$$

In order to determine the sign and size of $K'(G)$ we can assume that

$$K = \psi G^{\phi} \tag{9}$$

K may, of course, also be influenced by higher moments of the distribution of G_t in (2) as well as by other variables (such as variables measuring the opportunity cost of holding stocks). We omit them for simplicity. Substitution of (9) into (8) yields.

$$\begin{aligned} D_0 / P_0 &= \psi G^{(\beta_2 \phi - \beta_1)} \\ &= \psi G^{(\phi - 1)} \qquad \text{since} \quad \beta^1 = \beta^2 = 1 \end{aligned} \tag{10}$$

Thus we can infer the value of ψ and ϕ in (9) from an estimate of (10). If the coefficient of G in (10) is equal to minus unity then the implied value of ϕ is zero; that is, $K'(G) = 0$ in (9). The inferences are the same as when (4) and (5) are used; only the functional form is different. We defer till the next section the development of our tentative hypothesis explaining the implied positive relation between changes in growth expectations and capitalization rates, suffice to say that we will attempt to show that stagflation and uncertainty can be expected to produce growth-related inflation-non-neutral increases in capitalization rates. These equations will also be expanded to disentangle the relative magnitudes of inflation, growth, and risk factors as determinants of equity yields.

III. The Evidence

1. *Inflation Neutrality and Growth-Related Changes in Equity Yields*

The study covers the period 1948 : 2 – 1938 : 4. The implicit deflator for GNP is used to calculate the inflation rate and the relevant stock market data is that of standard and poors 425 industrials.[6] Because of the need to work with the anticipated values of inflation and earnings growth an ARIMA filter is used to eliminate the "noise" from their time series.

All estimates in this study employ the generalized least squares procedure of *Cochrane-Orcutt* (*Cochrane-Orcutt* 1949). We begin by examining the relation between inflation and real earnings. Equation (11) estimates the relation between real per share earnings growth, g, and inflation, p, lagged up to four quarters. The F statistic indicates a statistically significant negative relationship. When no lagged variables are included, the coefficient of the current inflation rate is highly significant. The lagged variables were more highly significant for the pre-1975 subperiod. Inflation was non-neutral

$$(11) \quad g = \underset{(1.89)}{-1.24\,p_t} \quad \underset{(1.97)}{-1.37\,p_{t-3}} \quad \underset{(1.65)}{-1.09\,p_{t-4}} \quad \underset{(1.14)}{21.52}$$

$$R^2 = 0.08$$
$$SE = 11.34$$
$$DW = 1.86$$
$$\varrho = 0.95$$
$$F = 3.15$$

in its incidence on per share earnings growth. This is consistent with the estimated lagged relation between inflation and aggregate real economic growth.

Next, we provide estimates in Table 1 of the relation between the dividend yield, D/P, and nominal growth expectations, G^e, in order to derive a relation between growth expectations and equity yields, K (equations 4 and 5).

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[6] Our results were found to be invariant to the use of alternative price indexes (the CPI and the WPI) to calculate the inflation rate. It is pointed out, however, that, in principle, the implicit deflator for GNP is considered more appropriate than, say, the CPI because our primary concern is not with the impact of inflation on the consumer. Instead, the analysis is embedded in a valuation model of firm stock price determination in which the costs and returns that influence the uncertain earnings growth expectations are those of a vast array of consumption and investment goods and services, both private and public. Hence, stock prices must be related to a more comprehensive price index.

Table 1
Effect of Earnings Growth on Dividend Yields

Line	Period	GS^e_t	GS^e_{t+2}	GL^e_t	GL^e_{t+2}	cons.	$R^2/SE/DW$	ϱ
1	1955 : 1 1983 : 4	0.0005 (0.18)				3.68 (11.94)	0.14 0.33 1.62	0.91
2				0.005 (0.18)		3.71 (10.42)	0.14 0.33 1.62	0.91
3			– 0.005 (2.01)			3.73 (12.17)	0.17 0.32 1.73	0.93
4					– 0.05 (2.01)	4.04 (11.37)	0.17 0.32 1.73	0.93
5	1955 : 1 1974 : 4		– 0.008 (2.43)			3.36 (21.88)	0.34 0.30 1.70	0.79
6					– 0.08 (2.43)	3.83 (14.72)	0.34 0.30 1.70	0.79
7	1947.1 – 1954.4		– 0.015 (2.03)			5.83 (8.94)	0.49 0.41 1.79	0.91
8					– 0.15 (2.03)	6.67 (8.06)	0.49 0.41 1.79	0.91

ϱ is the autoregressive parameter. t statistics appear in parentheses.

Two empirical measures of growth expectations, GS^e and GL^e, are employed. GS^e is the ARIMA forecast. However, its time series has numerous negative values with a large variance. It is unlikely that long run earnings growth expectations were either negative or had such a large variance, expecially for an evidently stationary time series. That would be irrational. Accordingly, we generate a mean-regressive variance-reducing long run growth expectation variable GL^e estimated as

$$(12) \qquad GL^e = \bar{GS}^e + \lambda\,(GS^e - \bar{GS}^e) \qquad \lambda = 0.10$$

$$\bar{GS}^e = \text{sample mean of } GS^e$$

By construction, GL^e is also unbiased in that $\bar{GL}^e = \bar{GS}^e = \bar{G}$; the use of future unknown data through the use of the sample mean in (12) is "innocuous" in the sense that its only effect is to reduce the variance of GS^e (GL^e and GS^e being, by construction, perfectly correlated). Values of λ in excess of 0.2 produced negative values of GL^e. The conclusions of this study are not significantly sensitive to the choice of alternative values of λ.

There is an indication of a structural break in the relation between D/P and G^e around 1955. Accordingly, separate estimates for the pre- and post-1955 subperiods are provided in Table 1. The relationship is insignificant for current values of GS^e and GL^e. It is negative and significant for both at a forward lag of two quarters. This could be due to an anticipatory response of dividends and stock prices based on information contained in the distributed lag relationship between earnings growth and inflation in equation (11). Even if the numerator of the dividend yield, D/P, adjusts with a lag to changes in growth expectations, such lagged reactions should not introduce any bias because they will already be incorporated into efficient stock prices, the denominator of the dividend yield. There is clear evidence in these equations of a structural break around 1955 in that both the slope coefficient and intercept estimates are significantly different. Log-Linear estimates of (10) yield virtually identical results.

What is the reason for this implied downward shift in the capitalization rate [that is, a decline in the value of α in equations (5) and (6)] around 1955? The capitalization rate is made up of a risk free rate and a risk premium and the evidence suggests that a high value of the latter is a likely explanation for the high value of K, since interest rates were low (and trendless) in this period, and the mean values of both acutal and expected returns were higher in the pre-1955 period. The averages of the risk premiums, measured by subtracting the Treasury bill rate from K, were 11.19 and 4.47 respectively for the pre- and post-1955 periods. This explanation is consistent with the consensus assumption of widespread uncertainty in the immediate postwar years. The expected postwar slump failed to materialize, and there was pervasive concern and uncertainty about the anticipated rate of inflation as well as about the ability of the government to deal with it. The upsurge in (and advancement of) expenditure in anticipation of the U.S. involvement in the Korean War symbolized this pervasive uncertainty. Judging from the high volatility of monetary and fiscal aggregates, as well as of inflation and economic growth, this increased uncertainty was apparently amply jus-

tified. The standard deviation of the actual rate of inflation p was 3.61 and 2.97 respectively for the pre- and post-1955 sub-periods. Even the coefficient of variation was markedly higher in the pre-1955 period, being respectively 1.76 and 0.66 for the pre- and post-1955 periods.

The signs and sizes of the negative coefficients in Table 1 imply [through equations (5) and (6)] that the capitalization rate, K, increased by only a fraction when inflation non-neutral growth expectations increased. For the post-1955 period K' (GL^e) is equal to 0.95 (line 4, Table 1). This implied fractional value of K' (GL^e) of 0.95 suggests that the growth-related fractional increase in K had effect of dampening the fluctuations of stock prices due to changes in growth expectations because, ceteris paribus, increases in growth rates and capitalization rates respectively increase and decrease stock prices. The impled greater stabilizing influence in the post-1955 period is borne out by the lower variance of stock returns.[7]

2. *A Tentative Hypothesis*

We are thus led to inquire into the economics of the estimated positive relationship between growth expectations and the capitalization rate, which is made up of the sum of the risk free rate and risk premium. In what way then are changes in growth expectations related to changes in (actual and anticipated) risk free interest rates and risk premia?

The potency of the effect of money on prices and output is now widely accepted, the logical force of classical macroeconomic rational expectation models notwithstanding (*Gordon* 1976, *Shiller* 1978, *B. Friedmann* 1979, *Solow* 1979, *Small* 1979, and *Stein* 1980). There seems to be disagreement only about whether money only matters or whether money also matters, and about the size of its (short and long run) lagged impact on output and prices, with the former lag being shorter. Also widely accepted is the positive effect of anticipated inflation on interest rates (the *Fisher* effect), though there is

[7] Our results of respective negative and positive relationships between growth expectations and dividend and equity yields have implications for the continuing occasional use, apparently on grounds of convenience, of the dividend yield as a measure of the yield on equity. The dividend yield provides a (downward) biased measure of the equity yield because it omits the influence of growth [equation (4)], which accounts for most of the variation of K. The results of this study suggest that is use is also potentially dangerous because the oppositely signed coefficients of D/P and K on G^e would have led one to the implausible and counterfactual conclusion that the expected return on equity declined when growth expectations increased. The use of the earnings yield is subject to the same limitations because it, too, assumes zero growth.

some debate about whether nominal rates rise by the full amount of the rise in anticipated inflation (because the real rate may not be constant). Stop-go anti-inflationary monetary growth has also been typical of the postwar conduct of monetary policies which possibly increased uncertainty and risk premia. These various empirical assumptions are now utilized to explain the growth-related increase in the capitalization rate.

Aggregate economic growth and corporate earnings growth are correlated. We should, therefore, also expect (under a money also matters assumption) a relation between the latter and monetary growth. This is observed in Table 2, eq. (1). Equation (2) shows the longer lagged relation between inflation and monetary growth. Even though significant advances have apparently been made, the precise nature of the transmission mechanism governing the effect of monetary and fiscal policies on prices and output is not yet well understood (see, for example, *Laidler* 1978). However, the relation between the rates of growth of money, income and prices is by now a well established empirical regularity, as the results in Table 2 indicate. Changes in monetary growth are followed with a small lag by changes in real earnings growth and with a longer lag by changes in inflation. If it is assumed that inflation expectations are conditioned by the current and past (distributed lag) experience of inflation rates, as well as by the behavior of the process(es) perceived to be generating them, then the estimates in Table 2 suggest (assuming a money-inflation relation) that money-induced lagged increases in earnings growth can be expected to be followed, with a further lag, by (variable) increases in inflation rates, thus producing an increase in inflation expectations.[8] The presumed existence of the *Fisher* effect then implies an increase, by not necessarily the same amount, in interest rates, which will tend to push up capitalization rates and produce a positve relation between growth expectations and capitalization rates.

However, both inflation forecasts and earnings per share forecasts are probablistic estimates and there are reason to expect these changes in earnings growth and inflation expectations to be associated with increases in uncertainty, and hence with increases in risk premia and capitalization rates. First, *Logue-Willet* (1976) have found (using international cross-section data) a positive relation between the mean and the variability of inflation. We find a similar statistically significant relation using U.S. time-series data. Equation (13) is an estimate of the positive relation between the seven-period moving standard deviation of the inflation rate, $SD\,(p)$ and its

[8] This assumes that the (inflation) expectations generating mechanism is not only backward-looking but also forward-looking.

Table 2
Effect of Money on Earnings and Inflation: 1955 : 1 - 1983 : 4

lag	Earnings on Money	Inflation on Money	Inflation on Money
0		0.08 (1.83)	0.06 (1.37)
− 1	0.94 (2.86)	− 0.06 (1.41)	− 0.08 (1.63)
− 2	0.60 (1.64)	0.07 (1.41)	0.06 (1.34)
− 3	0.81 (2.23)	0.07 (1.52)	0.07 (1.50)
− 4	0.07 (0.21)	0.13 (2.82)	0.15 (3.15)
− 5		0.13 (2.73)	0.14 (3.07)
− 6		0.14 (2.99)	0.15 (3.16)
− 7		0.15 (3.10)	0.18 (3.69)
− 8		0.20 (4.09)	0.22 (4.51)
1			− 0.09 (1.99)
cons	− 10.41 (1.34)	0.59 (0.92)	0.76 (1.40)
$\bar{R}^2/F$	0.06 2.71	0.34 7.22	0.43 9.33
$SE/DW/\varrho$	10.79 1.81 0.85	1.45 1.94 0.57	1.47 1.86 0.47

$\bar{R}^2$ = adjusted R^2.

seven-period moving mean, $MN(p)$. Their trends were also positively related.

(13) $$SD(p) = \underset{(3.38)}{0.15}\, MN(p) + \underset{(2.34)}{0.61} \qquad R^2 = 0.14,\ SE = 0.27,\ DW = 1.81,\ \varrho = 0.86$$

This implied mean-related decline in the ability to accurately anticipate inflation can be expected to increase market risk premia when inflation expectations increase (see also *Friedman*, 1977).

Second, stop-go monetary growth has characterized the conduct of post-war monetary policies. Thus, if the rise in earnings growth was at least in part, money-induced, with expectations of higher inflation to follow, an eventual anti-inflationary monetary deceleration or contraction can be (rationally) expected. This is indicated in equation (3) Table 2, which regresses the inflation rate on past, present, and future values of monetary growth. The significant negative coefficient on the future monetary growth variable is consistent with the hypothesis of an anti-inflationary monetary policy reaction function. Thus, this money-induced increase in growth expectations can be expected to have been associated with an increased degree of uncertainty is sustainability, which raise will risk premia and capitalization rates when growth expectations increase. A further (simple) test of this stop-go monetary growth hypothesis may be conducted by regressing the seven-period moving standard deviation of monetary growth $SD(M)$, on its seven-period moving mean $MN(M)$. The estimated pre-1975 relation in equation (14) is positive and significant. Their trends were also found to be positively related. The estimate for the full period (equation 15) has two dummy variables, one for the period 1975 : 1 - 1980 : 1 and another for 1980 : 2 - 1983 : 4

(14) $$SD(M) = \underset{(2.02)}{0.15}\, MN(M) + \underset{(3.89)}{1.80} \qquad R^2 = 0.04,\ SE = 0.52,\ DW = 1.41,\ \varrho = 0.84$$

(15) $$SD(M) = \underset{(1.41)}{0.08}\, MN(M) + \underset{(1.42)}{0.66}\, D_{75} + \underset{(3.91)}{2.38}\, D_{80} + \underset{(3.05)}{1.58} \qquad R^2 = 0.13,\ SE = 0.52,\ F = 5.76,\ DW = 1.50,\ \varrho = 0.88$$

Thus, the estimated positive relation between growth expectations and capitalization rates is to be expected if we follow the consensus belief that

the increased growth expectation is in partly money-induced. This monetary expansion, however, also causes an increase in inflation expectations (Table 2, eq. 2) and through the *Fisher* effect, an increase in interest rates and equity capitalization rates. But the positive relationship between the respective means and variabilities of monetary growth and inflation (eqs. 13, 14 and 15) also produce increases in market risk premia, due to declines in the public's ability to accurately forecast future monetary growth and inflation rates.[9] Risk premia can be expected to increase further because of the associated increased doubt about the sustainability of the higher (money-induced) earnings growth forecast (Table 2, Eqs. 1 and 3). Accordingly, both interest rate expectations as well as risk premia increase when growth expectation increase. This provides an unambiguous explanation of the estimated positive relation between growth expectations and capitalization rates.

3. *The Anaemic Stock Market*

Higher inflation was associated with increases in the variabilities of inflation and monetary growth. Thus, there is good reason to expect an increase in inflation-related uncertainty.[10] Since these inflation level-related increases in uncertainty were also evidently associated with increases in uncertainty over the ex-post real rate, risk averse investors will have also demanded higher risk premia. This, ceteris paribus, will have increased interest rates by more than the increase in anticipated inflation.

But quite clearly everything else did not remain unchanged, as evidenced by the phenomenon of uncertain stagflation. These simultaneous increases in inflation and inflation uncertainty could have operated through a couple of potentially important channels to produce the observed declines in real economic growth and the real rate of interest. First, these mean-related increases in the general variability of inflation were also associated with increases in the relative variability of inflation (*Vining-Elwertowski* 1976,

[9] Forecasting errors may still be unbiased, but they can be expected to be of a larger magnitude. For example, a statistically significant positive relationship was estimated between the absolute value of ARIMA inflation forecast errors and their respective predicted values, as well as between the absolute value of these forecast errors and the actual inflation rate. Accordingly, risk averse economic agents will demand larger risk premia.

[10] The variability of real economic growth also increased with increase in the level of inflation. All this uncertainty was apparently reflected in inflation-related declines in the index of consumer sentiment, and also in increases in its variability. We follow here the consensus assumption that increased variability implies increased uncertainty (see, for example, *Friedman* 1977; *Levi-Makin* 1980).

Parks 1978). The implied greater uncertainty about general and relative prices may account for the evident inflation-related decline in the rate of growth of real investment expenditures.[11] Second, there can also be declines in productivity and temporary increases in unemployment in such circumstances due to the impairment of the market price system as a coordinator of economic activity (*Friedman* 1977). *Azariadis* (1975, 1977) argues further that variability of monetary phenomena (and hence also variability of inflation) will permanently affect the level of unemployment in a world of incomplete markets, risk averes employees, and insurance-providing implicit labor contracts. In addition, there could also have been some negative policy-induced effects due to the operation of stop-go monetary policies in a regime of wage-price stickiness (*Hall* 1975). This is likely to have produced asymmetric price and output responses to monetary expansions and contractions, with prices being relatively more sensitive to monetary expansions and real output being relatively more sensitive to monetary contractions. And finally, the net redistribution effect of inflation on corporate earnings appears to have been negative due primarily to the strong and persistent negative influence of the historical-cost-based tax treatment of depreciation allowances (*Hong* 1977, and *Feldstein-Summers* 1979). This array of negative investment, productivity, policy, and redistribution effects of higher and more uncertain inflation would seem to readily account for the post-1965 decline in real earnings growth, as well as for the growth related fractional decline in the equity yield.

What are the relative magnitudes of these risk and real effects of higher and more uncertain inflation on equity yields? Subtracting p from both sides of (5) we have $k'(g) = K'(G)$, which was estimated to be less than unity (0.92). And $g^{e\prime}(p^e)$ is estimated to be a statistically significant – 1.06 (table 3, eq. 2). We show below that our estimates of $g^{e\prime}(p^e)$ and of $k'(g^e)$ indicate that the negative real effects of uncertain inflation on equity yields equalled the sum of the positive *Fisher* and risk premium effects, thus substantially reducing the equilibrium risk-adjusted real yield on equity. The relative magnitudes of these risk and real effects of higher and more uncertain inflation may by ascertained by extending (5) and expressing K in terms of p^e. Since $G^e = (g^e + p^e)$ equation (5) may be written as:

$$K = \alpha + (1 + \gamma)\ (g^e + p^e) + u \tag{5.1}$$

or

$$k = \alpha + (1 + \gamma) \cdot g^e + \gamma \cdot p^e + u \qquad k = K - p^e$$

[11] See, for example, *Cox-Ingersoll-Ross* (1977) and *Nickell* (1977) for a formal treatment of risk, investment and aggregate demand.

Table 3
Effect of Inflation on Real Earnings Growth

Dep. Var.	p^e	cons.	$R^2/SE/DW$	ϱ
gs^e	−1.18 (1.98)	6.35 (1.91)	0.03 10.02 1.81	0.54
gl^e	−1.02 (16.18)	6.37 (19.16)	0.71 1.00 1.81	0.54

$gs^e = GS^e - p^e$
$gl^e = GL^e - p^e$

Writing the reduced-form estimate of the effect of p^e on g^e as

$$g^e = \psi + \xi . p^e + v \qquad v \sim (0, \sigma) \tag{16}$$

and substituting (15) into (5.1) yields

$$K = (\alpha + \psi + \psi\gamma) + (1 + \gamma + \xi + \gamma\xi)\, p^e + (u + v) \tag{17}$$

With γ and ξ previously estimated to be -0.05 and -1.02 respectively, equation (17) indicates that $dK/dp^e - 0.02$ (and $dk/dp^e = -1.02$). These values are insignificantly different from the reduced-form coefficient of k on p^e of -0.94 that was estimated (as a check on our results).

We have argued that the risk premium can be expected to systematically increase with increases in p^e, because of inflation-related increases in uncertainty. Thus, increases in p^e will, ceteris paribus, cause market yields to increase by more than the increase in p^e. If k^* is defined as the risk-free equivalent real yield on equity, and θ is their risk premium, then the nominal equity yield, K, may be written as:

$$K = k^* + \theta + p^e \tag{18}$$

Accordingly, the total effect of p^e on K is:

$$dK/dp^e = k^{*\prime}(p^e) + \theta'(p^e) + 1$$

where $\theta'(p^e) > 0$, and $k^{*\prime}(p^e) < 0$, due to stagflation and a negative net redistribution effect. Since $k = K - p^e$, it follows that $dk/dp^e = k^{*\prime}(p^e) + \theta'(p^e)$. With dK/dp^e estimated to be -0.02, the implied value of $k^{*\prime}(p^e)$ is negative, substantially larger (absolutely) than the risk premium effect, $\theta'(p^e)$, and about as large as the sum of the *Fisher* and risk premium effects, $[1 + \theta'(p^e)]$. Estimates based on short run growth expectations, GS^e, reduce even more the relative importance of the risk premium effect.[12]

According to this evidence, the main reason for the depressed state of the stock market was neither "market irrationality" (*Modigliani-Cohn* 1979), nor even the phenomenon of risk-induced increases in capitalization rates outpacing earnings (*Malkiel*, 1980). The dominant reason was the inflation-related sharp decline in expected real earnings growth. These negative real effects of inflation also lowered the real yield on equity but by a fraction of the decline in real earnings growth. Such simultaneous fractional declines in real equity yields dampened the effects on stock prices of declines in the rate of growth of real earnings an pevented a "free fall"in equity values. These estimated declines in equity yields are in accord with numerous estimates of inflation-related declines in ex-post equity returns (for example, *Lintner* 1975, *Jaffee-Mandelker* 1976, *Nelson* 1976, *Fama-Schwert* 1977). Such conformity between ex-ante and ex-post equity returns is to be expected in a rational and evidently efficient market.[13]

IV. Summary and Conclusions

The empirical issues addressed in this study are centered around the estimate of a statistically significant strong negative relationship between inflation and shareholder earnings growth expectations, and around the estimate of a statistically significant negative coefficient of less than unity of the dividend yield on shareholder earnings growth expectations. The latter implies that these increases in inflation non-neutral growth expectations produced fractional increases in equity capitalization rates, thus tending to

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[12] The uncertainty stemming from the combination of high and variable inflation has a two-fold effect on K; first, it increases K directly by inducing increases in risk premia; second, it lowers K indirectly through the consequent negative real effects of uncertain inflation. A full-blown dynamic simultaneous equation system is, however, not yet at hand to help us disentangle such complications. *Levi-Makin* (1979) make a constructive beginning.

This paper has emphasized income effects. *Carmichael* and *Stebbing* (1983) argue that regulatory and tax factors have triggered substitution between assets to produce qualitatively similar results for bonds and bills.

[13] *Hendershott* (1980) also estimates a small risk premium effect.

dampen growth-induced fluctuations in common stock prices. There is also strong evidence of a structural shift around 1955 in this relation between growth rates and capitalization rates, in that for the post-1955 postwar period a given level of anticipated growth was associated with a lower capitalization rate (by about three percent). This may be attributed to the higher variability in the pre-1955 postwar period of some of the major economic aggregates in general and of the inflation rate in particular.

What is the likely economic reason for this implied positive relation between growth anticipations and equity capitalization rates? A simultaneous examination of the nature of the empirical relation between monetary growth, inflation and earnings growth on the one hand, and of the stochastic nature of their respective time series on the other, provides us with some insights into the likely nature of the process influencing inflation, interest rate, and earnings growth expectations, as well as that shaping risk perceptions and capitalization rates. If increases in monetary growth are perceived to produce, with some lag, increases in earnings growth, as well as increases in the inflation rate with an even further lag, then the *Fisher* effect implies an increase in market interest rates and equity capitalization rates. Moreover, if the higher monetary and price changes are associated with increases in perceived risk, due to the evident positive relation between their respective moving means and variances, then these money-induced increases in growth expectations will be associated with increases in not only inflation rates and (risk free) interest rates but also with increases in risk premia, thus unambiguously accounting for the growth-related fractional increases in equity capitalization rates.

The combination of our findings of inflation-related declines in real earnings growth and of growth-related fractional declines in real equity yields provides us with a rational explanation for the depressed state of the stock market over the post-1955 period of generally accelerating inflation. The increases in the general and relative variabilities of inflation associated with higher inflation expectations will have induced some increases in risk premia. This, ceteris paribus, will have caused interest rates to rise by more than the increase in anticipated inflation. But everything else did not evidently remain unchanged. The higher inflation, and associated greater inflation uncertainty, evidently had substantial negative real effects made up of a negative income effect (stemming from policy reactions and negative effects on investment and productivity), as well as a negative net redistribution effect (due primarily to the historical-cost-based tax rules governing depreciation allowances) – a double whammy. These negative income and redistribution effects of inflation produced substantial declines in real

equity yields. The impact of the negative real effects on equity yields was deduced to be substantially larger than the positive risk premium effect and about as large as the sum of the (positive) *Fisher* and risk premium effects. The sharp inflation-induced decline in real shareholder earnings growth was thus the main reason for the depressed state of the stock market with the growth-related fractional decline in the real yield an equity serving instead to prevent a "free fall" in equity values.

This inflation-related decline in equity yields accords with the evident inflation-related decline in ex-post equity returns. Such conformity between ex-ante and ex-post equity returns is to be expected in a rational and evidently efficient market. The policy implication that emerges from our analysis is that non-inflationary economic policies also have to be more stable. Such policies can be expected to reduce the inflation-induced changes in risk premia and its associated negative real effects, thereby increasing equity values and stimulating capital formation.

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Zusammenfassung

Wachstumserwartungen für den Aktienmarkt, wahrgenommene Risiken und ex ante-Rendite unter ungewissen Stagflationsbedingungen

Die in dieser Studie untersuchten empirischen Fragen sind im Umfeld einer geschätzten, starken negativen Beziehung zwischen Inflation und Aktienrenditeerwartungen und eines geschätzten negativen Koeffizienten von Effektivverzinsung und Aktienrenditeerwartung – beide statistisch bedeutend – von unter eins angesiedelt. Der Koeffizient impliziert, daß diese erhöhten nichtinflationsneutralen Wachstumserwartungen zu Bruchteilerhöhungen der Eigenkapitalausstattungsfaktoren geführt und somit wachstumsinduzierte Schwankungen der Stammaktienkurse tendenziell gedämpft haben.

Eine gleichzeitige Untersuchung der Art von empirischer Beziehung zwischen Geldmengenwachstum, Inflation und Gewinnwachstum einerseits und der stochastischen Art ihrer jeweiligen Zeitreihen andererseits gewährt uns gewisse Einblicke in die wahrscheinliche Art des Prozesses, der Inflation, Zinssatz und höhere Renditeerwartungen beeinflußt, sowie desjenigen Prozesses, der für wahrgenommene Risiken und die Kapitalausstattungsfaktoren verantwortlich ist. Wenn der Eindruck besteht, daß ein verstärktes monetäres Wachstum mit einer gewissen zeitlichen Verzögerung höheres Renditewachstum sowie – mit einer weiteren zeitlichen Verzögerung eine höhere Inflationsrate erzeugt, dann impliziert der *Fisher*-Effekt eine Erhöhung der Marktzinssätze und der Eigenkapitalausstattungsfaktoren.

Die Kombination unserer Erkenntnisse der inflationsbezogenen Rückgänge des realen Renditezuwachses und der wachstumsbezogenen Bruchteilrückgänge der realen Eigenkapitalverzinsung liefert uns eine rationale Erklärung für den gedrückten Aktienmarkt während der Zeit nach 1955 mit einer sich allgemein beschleunigenden Inflation.

Die sich aus unserer Analyse ergebende politische Implikation ist, daß nichtinflationäre Wirtschaftspolitiken auch stabiler sein müssen. Es ist davon auszugehen, daß solche Politiken die inflationsinduzierten Änderungen bei den Risikozuschlägen und die damit einhergehenden negativen realen Auswirkungen verringern und dadurch den Eigenkapitalwert erhöhen und die Kapitalbildung anregen.

Summary

Stock Market Growth Expectations, Risk Perceptions, and Ex-Ante Returns Under Uncertain Stagflation

The empirical issues addressed in this study are centered around the estimate of a statistically significant strong negative relationship between inflation and shareholder earnings growth expectations, and around the estimate of a statistically significant negative coefficient of less than unity of the dividend yield on shareholder earnings growth expectations. The latter implies that these increases in inflation non-neutral growth expectations produced fractional increases in equity capitalization rates, thus tending to dampen growth-induced fluctuations in common stock prices.

A simultaneous examination of the nature of the empirical relation between monetary growth, inflation and earnings growth on the one hand, and of the stochastic nature of their respective time series on the other, provides us with some insights into the likely nature of the process influencing inflation, interest rate, and earnings growth expectations, as well as that shaping risk perceptions and capitalization rates. If increases in monetary growth are perceived to produce, with some lag, increases in earnings growth, as well as increases in the inflation rate with an even further lag, then the *Fisher* effect implies an increase in market interest rates and equity capitalization rates.

The combination of our findings of inflation-related declines in real earnings growth and of growth-related fractional declines in real equity yields provides us with a rational explanation for the depressed state of the stock market over the post-1955 period of generally accelerating inflation.

The policy implication that emerges from our analysis is that non-inflationary economic policies also have to be more stable. Such policies can be expected to reduce the inflation-induced changes in risk premia and its associated negative real effects, thereby increasing equity values and stimulating capital formation.

Résumé

Attentes de croissance du marché des titres, perceptions de risque et revenus ex-ante sous une stagflation incertaine

Les résultats empiriques abordés dans cette étude se concentrent sur deux estimations: d'une part, d'une relation statistique importante, fortement négative, entre l'inflation et les attentes de croissance des bénéfices d'actionnaires; d'autre part, d'un coéfficient statistique important, négatif de moins d'une unité du dividende, rapporté d'attentes de croissance des bénéfices d'actionnaires. Ce dernier implique que les hausses de l'inflation d'attentes de croissance non-neutres ont fait croître partiellement les taux de capitalisation du capital propre, c'est-à-dire que les fluctuations des prix des actions différées ordinaires, induites par la croissance, se sont réduites.

Nous avons examiné simultanément la nature de la relation empirique entre la croissance monétaire, l'inflation et la croissance des revenus d'une part, et la nature stochastique de leurs séries chronologiques, d'autre part. Cet examen nous a donné

un bon aperçu de la nature probable du processus influencant l'inflation, le taux d'intérêt et les attentes de croissance des revenus ainsi que des perceptions de risque et des taux de capitalisation. Si des augmentations de la croissance monétaire paraissent entraîner avec un certain retard des hausses de la croissance des revenus, ainsi que des hausses du taux d'intérêt, avec un retard encore plus prononcé, l'effet de *Fisher* implique une hausse des taux d'intérêt du marché et des taux de capitalisation du capital propre.

En combinant nos conclusions de baisses de la croissance des revenus réels, liées à l'inflation, et de diminutions partielles des revenus du capital propre, liées à la croissance, nous pouvons expliquer rationnellement la crise du marché des titres après 1955, période caractérisée par une inflation générale accélérée.

L'implication politique qui résulte de notre analyse est la suivante: des politiques économiques non-inflationnistes doivent être également plus stables. De telles politiques peuvent permettre de réduire les modifications des primes de risque, induites par l'inflation et ses effets négatifs réels associés, donc augmentant les valeurs de capital propre et stimulant la formation de capital.