EFFECT OF INFLATION ON THE PROFITABILITY AND VALUATION OF U.S. CORPORATIONS

by

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1. Introduction

A surprising empirical result which has received some attention but no satisfactory explanation in the finance literature is the negative or close to zero correlation between the nominal market rates of return on corporate equity and the contemporaneous rates of inflation, with a much stronger negative correlation between real rates of return and inflation.[1] This finding based on annual or more frequent observations since the turn of the 20th century in the U.S. (and also for a shorter period in some other countries) has apparently characterized expected as well as unexpected inflation. Since traditional economic theory predicted that under competitive pressures, with inflation expected to continue, the firm's prices, required rates of return, and, for an unlevered company, costs, profits, dividends and stock prices would rise at the same rate as prices generally,[2] such theory would have led one to anticipate an extremely high positive correlation between the nominal market rates of return and at least expected inflation (and close to a zero correlation between the real rates of return and inflation).

Obviously, this disparity between the implications of traditional theory and the empirical findings may reflect the unreality of some

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[1] E.g., see Jaffe and Mandelker [16], Nelson [24], and Fama and Schwert [6].

[2] For a levered firm, profits, dividends and stock prices would, of course, be expected to rise more than the rate of inflation.

of the assumptions made in the development of that theory. Thus, real activity and real required rates of return may not be invariant to the general rate of inflation; all prices and costs may not be affected proportionately; major market imperfections such as taxes may affect differentially the impact of inflation on different costs, prices and realized and required returns; and the existence of net financial assets in the corporate balance sheet, not reflected in the traditional theory, and their functional dependence on the price level as well as on real activity may significantly affect the relationship between inflation and both corporate profitability and valuation.

This paper will attempt to determine whether the unexpectedly adverse effect of inflation on common stock prices and on the realized market rates of return is attributable to its impact on the expected cash flow of return (the numerator of the stock price equation), on the required rate of return or market discount factor (the denominator), or on some combination of the two.[1] In the examination of the effect of inflation on expected cash flow, a distinction will be drawn between dividends and earnings per share and between reported book earnings and estimated economic earnings per share which is theoretically more relevant to the return the market should be discounting. The latter is obviously more difficult to measure than the former. It is especially difficult to measure the required rate of return on common stock, so that two different procedures will be utilized to assess how their return is affected by inflation.

While previous studies have addressed some of the subjects covered in this paper, none has been as comprehensive or arrived at the same main

[1]In this analysis, expected cash flow and required rate of return can be measured either in nominal or real terms so long as both are measured on the same basis.

conclusions. We find that the inflation-related decline in the value of stocks is attributable at least in part to a decline in real dividends and earnings, and that this adverse impact of inflation is larger for inflation-adjusted earnings than for book earnings and dividends. The decline may also be attributable in part to a decrease in the relevant price-earnings multiple stemming from an increase in the required rate of return, the latter apparently reflecting an increase in earnings uncertainty. In attempting to reconcile these findings with the previously observed negative correlation between realized real stock market returns and the rate of even expected inflation, we find that part of this otherwise puzzling correlation is due to the effect on stock prices of changes in expected inflation whose effect in previous analyses was confounded with that of the level of expected inflation. Two other factors probably contributing to the remaining though generally not statistically significant negative correletion between real realized market returns and measures of expected inflation are the inadequacies of realized returns as a proxy for ex ante expected returns especially when the distribution of returns is not stationary, and the statistical difficulty in distinguishing satisfactorily between expected and unexpected inflation. The empirical analysis in this paper supporting these conclusions will consist of four sections examining the impact of inflation upon (a) stock returns (Part 2); (b) dividends and book earnings per share (Part 3); (c) economic earnings per share (Part 4); and (d) the required rates of return on stock (Part 5). Where theory suggests the relevance of such distinctions, attempts are made to distinguish between expected inflation, unexpected inflation, and changes in expected inflation. Another section will analyze the impact of inflation on the required rates of return on stocks from the viewpoint of modern capital asset pricing theory (Part 6). The final section will summarize the major findings of this study (Part 7).

2. Inflation and Stock Market Returns

The historical correlation between real stock market returns and contemporaneous and lagged inflation is presented for monthly, quarterly and annual data in Tables 1, 2 and 3. Inflation is measured by changes in the Consumer Price Index, and real stock returns are obtained as the sum of dividend yields and capital gains on the Standard and Poor's Composite Index of Common Stocks minus the contemporaneous inflation rate. Many of the results presented are similar to those published in earlier studies, but others are new.

For all time intervals covered and for the 1926-1978 period as a whole, the correlation between realized real returns and contemporaneous inflation has tended to be negative, usually significantly so. The largest negative impact of inflation upon real returns occurs in the 1973-78 subperiod, a time of especially pronounced inflation. However, the negative correlation between real market returns and inflation which characterizes other periods is also surprising since close to a zero correlation would be expected under the assumptions of traditional theory.[1]

The negative correlation for the post-World War II period appears to characterize both expected and unexpected inflation. Traditional theory would suggest that expected inflation should have no impact on the realized return and unexpected inflation should impact the return only to the extent that the firm's actual and, more importantly, anticipated earnings are affected by this variable. Alternative specifications

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[1]In attempting to assess the impact of inflation upon real returns in the 1926-78 period, the results may be colored by the fact that this period includes deflationary intervals as well as inflationary ones, and the effect of price changes on stock returns may well be asymmetric.

of the regressions on monthly, quarterly and annual data in the post-World War II period employ two measures of expected inflation, one based on an autoregressive forecasting model and the other using Treasury bills with maturities corresponding to return horizons (except for annual data, in which an annualized quarterly rate was used). Regardless of which measure of expectations is used in the regression specification, the results indicate a negative and generally significant impact of both expected and unexpected inflation. The negative impact of expected inflation is particularly troublesome, although this may simply reflect the inadequacy of realized returns as a proxy for ex ante expected returns, especially if the distribution of returns is non-stationary.

It should be noted that adding a small number of lagged inflation rates to the contemporaneous inflation does not change the negative impact of sustained inflation on real stock returns. In the regressions of Table 1, some specifications include five months of lagged inflation rates, and although this tends to lessen the size of the contemporaneous inflation coefficient, the impact of sustained inflation as measured by the sum of all the inflation coefficients is still usually negative, particularly in the postwar period. In the quarterly and annual regressions, three lagged quarters and three lagged years of inflation are included respectively, and as with the monthly data, the negative impact of inflation upon real returns remains. However, the possibility still exists that this finding is a consequence of the relatively brief holding periods considered thus far.

Thus we had earlier carried out an analysis on stock returns and inflation over five and ten year holding periods, though this analysis is on a nominal basis. If stock returns over a five year period are regressed on both the rates of inflation over the same period and over the preceding five years, there is some evidence that inflation over the preceding five year period may significantly increase nominal returns over the following five year period and that the effect of inflation on nominal returns over the two periods as a whole may be positive (Table 4).[1] Stronger results of this nature are obtained if ten year returns are related to inflation over the same period and over the preceding ten years. The problem with taking these results at fact value is, of course, the small number of statistically independent time series observations available (at most the number of non-overlapping periods) and the danger that we may be attributing to inflation the effect of some strongly intercorrelated variables. On the other hand, the data presented in Table 4 do provide some basis for hypothesizing that whatever the reason for the apparently depressing short-run effect of inflation on nominal stock returns, which is implicit in Tables 1,2 and 3, this effect may be offset or reversed in the longer-run, but this does not seem to be true of real returns.

An issue we have not considered in our investigation of the statistical relationship between real stock returns and inflation is whether the existence of a negative correlation is due to the effect of inflation on the level of real economic activity and the effect of any such change in real activity on corporate real earnings and perhaps even on the real discount rate or whether

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[1] The effect of inflation on nominal returns over two consecutive five year periods combined remains modestly negative during the post-World War II years.

it is due to other factors. The rate of change in the Federal Reserve Board Total Index of Industrial Production was introduced into some of the specifications in Tables 1, 2 and 3, where the period over which this rate was computed and the number of leads included was determined by the quality of the resulting fit. The contemporaneous rate of change was found to be a significant determinant of real market returns only in the annual regressions. Regardless of time period considered, the previously observed negative correlation between real returns and inflation for the 1926-1978 period as a whole is largely independent of any effect inflation may have had on the level of real economic activity. However, holding real economic activity constant does reduce the estimated effect of inflation and expected inflation on real returns especially in the post-World War II years. This is particularly true in the annual data, where inclusion of economic activity depresses the impact of expected inflation to the point of marginal statistical significance.

The effect of inflation in this period seems to be further mitigated when a linear time trend is included in the specifications, possibly reflecting a secular decline in the real required return. In particular we note that when time is included in the annual specifications (equations 23 and 24 in Table 3), the coefficients of expected inflation are pushed quite close to zero.

One other question should be raised for the interpretation of our results. Does the negative correlation between inflation and returns as measured by the S&P common stock index, which is a fairly comprehensive value-weighted index of New York Stock Exchange (NYSE) stocks, imply similar results for stocks as a whole, including stock traded on other exchanges and over-the-counter, or for marketable risky assets as a whole? In other words, does inflation depress the real value of the (nonhuman) national wealth, at least in the short-run, or simply its distribution among broad classes of common stock or between stocks and other marketable assets?

While a continuous time-series of reliable data on market returns from all stocks and from all marketable assets does not exist, two available series do permit us to roughly approximate these returns. We have used the Federal Reserve Board Flow of Funds data on the aggregate market value of all stocks at the end of each year from 1947 to 1978 adjusted for dividends and net issuance of stock (also from the Flow of Funds) as a basis for estimating the annual rates of return on all stock.[1] Similarly we have used the quarterly estimates of the market value of household net worth available for the post-World War II period on the data tapes of the MIT-Wharton (MPS) econometric model of the U.S. economy as a basis for approximating the annual rates of return on all household marketable assets (largely risky assets). It was not feasible to adjust these MPS figures for current saving or returns other than capital gains, but we believe that these omissions are not likely to affect seriously the short-run return-inflation correlations. As indicated in Tables 5 and 6, both the results for all stocks and those for all household marketable assets are reasonably close to those for NYSE stocks. However, given the deficiencies in the available data, this last result for all marketable assets is not nearly as soundly based as that for stock.

[1] One limitation of these data is the inadequacy of the information on short-term changes in the value of over-the-counter stocks but we do know that exchange stocks for which excellent data are available have accounted for the great bulk of the value of all stocks.

Among the various sample periods considered in the monthly, quarterly and annual real stock return regressions, the negative influence of inflation is most manifest in the postwar period, which has been characterized by high inflation rates, but also by the transition to higher inflation rates. This suggests that some of the effect of inflation upon stock returns may be of a transitional nature, and the regression specifications should be modified accordingly. For example, if an increase in inflation is believed detrimental to subsequent stock returns, such an increase will depress both the current price and hence the current market return of the stock. With respect to the stock return regressions, the possibility exists that the negative effect of expected and unexpected inflation may be a consequence of their action as proxies for shifts in long-run inflationary expectations -- a possibility which does not appear to have been explored in earlier studies.

In an attempt to capture these transitional effects in the return regressions, the first difference in the S&P municipal bond yield (ΔSPMUNIBY) was included in alternative forms of the specifications for the 1947-1978 period in the monthly, quarterly and annual regressions.[1] The effects of this inclusion are most striking in the monthly and quarterly regressions (equations 49-60 in Tables 1 and 2). The coefficient of ΔSPMUNIBY is always significantly negative, and the inclusion tends to depress the coefficients of inflation relative to the specifications in which ΔSPMUNIBY is omitted. In the monthly and quarterly regressions, the inclusion depresses the magnitude of the coefficient of expected inflation, and this coefficient though still negative is not statistically significant when changes in industrial production and time are included in the specification.

[1]Substantially similar results were obtained when the first difference of the rate on newly-issued AA utility bonds was used as the proxy for changes in the long-run expected inflation.

The effect of changes in the expected long-run inflation rate on real market returns is not as pronounced in the annual regressions (equations 25-36 in Table 3). Although the coefficient of ΔSPMUNIBY is still generally negative, it is never significantly so. The effects of expected inflation on real market returns are not consistent, but in those specifications where time is included, these coefficients are not significantly negative even in the absence of ΔSPMUNIBY. One possible reason for the difficulty of the annual fits is collinearity between ΔSPMUNIBY and unexpected inflation. This pairwise correlation is much more pronounced in the annual data than in the monthly or quarterly. Thus, it may be that unexpected inflation whose coefficient remains highly significant is a better proxy in the annual data for shifts in the long-run expectations than ΔSPMUNIBY.

To summarize the analysis to this point, it is our judgement that changes in the expected level of long run inflation explain at least part of the negative impact of the level of expected inflation on real returns found in earlier studies. While unexpected inflation and changes in expected inflation both negatively impact real realized returns, which is not inconsistent with economic theory, the negative impact of the level of expected inflation highlighted in earlier studies, since it appears to be inconsistent with theory, may well be a spurious statistical artifact.

A further interesting aspect of the behavior of market returns and inflation concerns the risk premium. The expected real return on the market represents the sum of the expected real return on the nominally risk-free asset plus an expected risk premium, and a corresponding relationship exists for realized returns as well. To the extent that the difference between realized returns on the market and the risk-free asset is an adequate proxy for the expected risk premium, investigation of the inflation impact on the former should yield insight into the differential impact of inflation upon stocks vis a vis risk-free assets. Analysis of the impact of inflation upon the risk premium is all the more important because the impact of inflation upon the real expected rate of return on the nominally risk-free asset is still an unresolved issue.

Table 7 contains monthly, quarterly and annual regressions in which the dependent variable is the realized return differential, computed as the stock return over the period minus the return on a Treasury bill of identical horizon purchased at the beginning of the period. The specifications represent a selected subset of those presented for real market returns in Tables 1, 2 and 3. Time and economic activity are included in some equations as is expected inflation based on the Treasury bill expectations measure. Estimations using the autoregressive expectations measure yielded similar results and hence were omitted. In general, the impact of expected inflation upon the realized return differential tends to be less negative than the impact upon the total realized return in the same specification. In fact, in the quarterly and annual estimations, when all variables are included in the specification, the coefficient of expected inflation is positive, although insignificantly so. This suggests that at least part of the estimated impact of expected inflation upon realized stock returns has been due to the impact upon returns to the nominally risk-free asset. Thus in restricting the analysis to the return differential, there is less left to explain in reconciling theory with the empirical evidence. It should be noted that while expected inflation rarely approaches statistical significance in any of these regressions, either change in expected inflation or unexpected inflation is significant in virtually all of them.

3. Dividends, Book Earnings and Inflation

Since stock prices presumably discount the expected flow of future return and this return basically takes the form of dividends and capitalized future dividends, this section of the paper will start with an examination of the relation between dividends per share and the rates of inflation. Because it is corporate earnings which make dividends possible and the level of dividend payout tends to be sticky to new developments which may be transitory, the relation between earnings and inflation will also be analyzed. We are of course interested in the latter relationship in its own right, but we are particularly interested in any significant differences which may exist between the effect of inflation on dividends and earnings. It is not clear to what extent the market relies on book earnings per share, the earnings figure which is published, or attempts to estimate and act on the basis of economic earnings per share which require appropriate adjustments for changes in the real capital assets and the real debt of the corporation. Economic earnings are theoretically more relevant to stock valuation than book earnings but involve substantially more measurement error and in practice both measures may affect stock prices. The relation between book earnings and inflation will be examined in this section, and will be followed in the next section by the estimation of economic earnings and an analysis of how inflation affects them.

The regressions of the logs of annual real dividends per share (obtained from the S&P Composite Index of Common Stocks dividend series) on the contemporaneous and lagged rates of inflation (measured by the CPI) over the period 1946 through 1978, with a time trend introduced as an additional explanatory variable, are presented in Table 8.[1] The time trend variable is added to hold constant the normal upward movement in dividends as a result of profits earned on reinvested income. We also computed these regressions including the FRB Index of Industrial Production as an additional explanatory variable to hold constant cyclical influences on dividends, but we do not present these results since the effect of inflation on dividends is not changed significantly.[2] The regressions in Table 8, including both those with first and second order serial correlation corrections, indicate that with the normal upward movement in dividends held constant, a one percentage point increase in the rate of inflation if prolonged for over two years lowers the real level of dividend payout by something in the zero to somewhat over 4% range, with the result obtained depending on the number of lags included. The positive effect of current inflation on the same year's real dividends per share, when no inflation lags are introduced, is probably mainly a reflection of the multicollinearity between inflation and time resulting in the spurious attribution to inflation of the normal upward movement in dividends over time. When inflation lags are introduced, the small effect of current inflation is probably attributable to the general stickiness in dividend payout. Since apart from statistical complications we would expect a significant positive

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[1] Quarterly regressions were also computed and gave similar qualitative results though the estimated overall impact of inflation (as measured by the sum of the current and lagged inflation coefficients) was even more variable as among the relationships with different lag structures. Linear regression implied almost the same inflation effects as the corresponding log regressions.

[2] If inflation did affect the level of real economic activity as well as the level of real dividends, we would of course be interested both in the dividend-inflation regressions with and without this additional explanatory variable.

coefficient of the time trend, the most plausible sustained effect of an inflation rate of one percentage point on real dividends is a depressant overall impact of 2% to 4%, with the lower end of this range associated with a higher correlation but the higher end with a more reasonable value of the time coefficient.[1,2]

The fact that real dividends decreased with the rate of inflation would of course tend to depress stock prices and realized rates of return, which is what was observed in Part 2 of this paper, unless the market was anticipating a future acceleration in the rate of dividend growth. However, since changes in dividend payout might be expected to lag changes in earnings, especially if the permanence of the change in earnings is uncertain, it is necessary to examine the effect of inflation on expected earnings to assess further the prospective effect of inflation on the expected flow of future dividends. The normal dividend lag might be intensified not only by the uncertainty of the permanence of the change in earnings associated with inflation but by the uncertainty of additional working capital needs which might after an appropriate time lag more appropriately be financed by external sources of funds. On the other hand, it might be expected in view of the long time lags allowed for in our analysis that corporations would have had sufficient time to adjust their dividend policy to reflect appropriately the effects of inflation.

[1] Using second and third degree Almon lags to avoid the problem of multicollinearity among the current and lagged inflation terms in Table 7 pointed to a depressant effect on dividends of about 2% associated with a sustained one percentage point rate of inflation.

[2] In assessing the impact of inflation upon dividends and book earnings, there exists the possibility that a portion of this impact is transitional in nature. Furthermore, the present analysis does not differentiate between impacts if firm managers can hedge against adverse shifts in both or either. Statistical and data limitations render these issues extremely difficult to resolve within the confines of the present study. It should be noted that it is much more difficult to introduce expected and unexpected inflation into the analysis of dividends and earnings than into the analysis market rates of return, where the effect of expectations is incorporated more rapidly.

The statistical relationships between annual real book earnings per share for corporations as a whole over the 1946-78 period (the S&P earnings series deflated by the implicit gross national product deflator) are presented in Table 9. Current inflation seems to favorably affect real book earnings in the same year, perhaps reflecting a lag of wages behind prices, but to adversely affect real book earnings in the next three years, with not much influence thereafter. The adverse effect of sustained inflation on real book earnings ranges from 3% to 5% in the best regressions fitted, a result quite close to that obtained for dividends.[1] To examine further the effects of inflation on book profits, we shall determine whether the aggregate time-series results for corporations as a whole are supported by corresponding findings for different groups of companies and subsequently whether the results for dividends and book earnings are similar to results for economic earnings.

First a sample of 224 companies was selected from the primary Compustat industrial file covering the 1958-1977 period. The primary criterion for selection was data availability and in addition, for analytical convenience, certain types of companies were excluded.[3] The sample was then divided among 13 major industries. When the number of companies in an industry exceeded 13, the largest 13 (on the basis of net worth) were selected.

[1] Again similar results were obtained from the linear as well as log regressions, from quarterly as well as annual relationships and for Almon lag structures. The results did not appear to be sensitive to the use of a CPI or gross national product deflator.

[2] A similar industry analysis is being carried out for dividends but has not yet been completed. The rationale for carrying on the analysis on an industry (and firm) basis is discussed at the beginning of the subsequent section of this paper (Part 4).

[3] These were firms which were affected by major mergers or acquisitions, had fiscal year changes or fiscal years ending other than in the fourth quarter, used inventory accounting methods other than LIFO, FIFO or average cost, or which were utilities, mining companies or conglomerates.

Second, for each of the 13 industries covered, two generalized least squares regressions, one unweighted the other weighted, were computed between the standardized book earnings per share reported on the Compustat tape deflated by the gross national product (g.n.p.) implicit price deflator and both the rates of inflation in the same year and five prior years (again measured by the g.n.p. deflator) and a time trend.[1] The standardization of the book earnings per share, which was carried out to facilitate aggregation, was accomplished by considering one standardized share in each company to be equal to $100 of that company's equity in 1958 valued in 1972 dollars.[2] The weighting was by number of standardized shares. In addition to the industry regressions, regressions for all industries combined were also computed both on a weighted basis and on an unweighted basis where each industry is treated as a single observation. Since the weighted and unweighted regressions gave similar results, only the former are presented in Table 10. Only linear (as distinguished from log) regressions were estimated for this analysis since book earnings per share were occasionally negative for individual corporations and industries.

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[1]The actual regression fitted for each industry was $\left(\frac{EPS}{PGNP}\right)_{it} = a_i + b_i \, Time_t + \sum_{k=0}^{2} C_k \, DP_{t-k}$ where EPS is earnings per share, PGNP is the g.n.p. deflator, DP is change in the g.n.p. deflator in percent, and i represents the i'th company. A similar regression was computed for all industries combined where i now represents an industry. The constant term for each industry shown in Table 9 is obtained from the corresponding industry coefficient in the all-industry or total regression.

[2]The number of standardized shares in any year (t) subsequent to 1958 is obtained by multiplying the 1958 number of standardized shares by the ratio of the actual number of shares in year t to the actual number in 1958.

The regressions described above indicate a somewhat greater number of industries with a negative than with a positive effect of inflation (estimated by the sum of the six inflation coefficients) on real book earnings per share. For all industries as a whole, the regressions points to a statistically insignificant negative impact. As the average real book earnings per standardized share over the period is 16.20, and the implied impact of a .01 increase in inflation is -36.2 (.01) = -.362, the relative decline in real book EPS is -.362/16.20 = -2.2%. There is no evidence from this analysis of a significant adverse impact of inflation on real book earnings as a whole to support the conclusion from the aggregate time series data, but there is evidence of substantial redistributional effects with some industries adversely affected and some benefitting. In the following section, we shall examine the impact of inflation on real economic earnings which in theory would be the variable most relevant to a corporation's ability to pay future dividends, though as noted earlier it is not clear that an economic earnings-inflation relationship can be expected to provide a better prediction of the effect of inflation on future dividends than a dividend-inflation relationship with appropriate time lags.

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[1] In an extension of the analyses to cover the 1930-1978 period, the results were not significantly changed. Inflation and deflation were introduced as separate variables along with either a time trend or industrial production, and the regression suggested that a 1% inflation depressed dividends by about 5%. Similarly, a 1% inflation in this period depressed deflated book earnings per share by about 4%.

4. Economic Earnings and Inflation

A number of earlier studies have attempted to adjust reported corporate book earnings to construct measures of true or economic earnings under inflation and to examine the statistical relationship of these appropriately adjusted earnings measure to contemporaneous inflation. However, there is no consensus in the findings of these studies. Thus Shoven and Bulow [27,28] concluded that the impact of their inflation adjustments upon reported profits was uneven, with no generalization possible on the effect of inflation on real economic earnings. Cagan and Lipsey [3] using a somewhat more comprehensive set of adjustments also drew no conclusions about adjusted earnings behavior, but noted that "...the inflationary environment since the mid-1960's has reduced the real profit rate, however measured, from the high level reached during the price stability of the early 1960's."

In this section of the paper, we shall attempt to improve the analysis of these earlier studies, first, by carrying on the analysis on a firm and industry as well as aggregate level to increase the number of effectively independent observations to the extent that errors are cross-sectionally uncorrelated, and second by applying more refined statistical procedures (generalized least squares) to achieve a further improvement over prior work[1]. The increase in the number of independent observations will permit us in a subsequent analysis to attempt to isolate the direct inflation effect on economic earnings after controlling for level of output, quantity of physical assets, leverage factors and secular trends, while the use of firm and industry data in that analysis will also provide the advantage of dealing with more homogeneous production processes.

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[1] The industry (and firm) results are, of course, of interest in their own right as well as a check on the reliability of the aggregate analysis.

Economic earnings are obtained by adjusting reported book earnings to reflect changes in stockholder wealth which are not recognized by conventional accounting. Two of these adjustments are used in National Income and Product Account (NIPA) accounting: the capital consumption and inventory valuation adjustments, both of which attempt to place income expense items on a replacement cost basis. The capital consumption adjustment may be expressed as $(D_t - D_t')$ where D_t and D_t' represent historical and replacement cost depreciation. The inventory valuation adjustment may be written as

$$(I_t^r - I_{t-1}^r) - (I_t^b - I_{t-1}^b) - \Pi_t^i I_{t-1}^r$$

where I_t^r is the replacement cost of inventories and I_t^b is the book value of inventories, both in current prices; Π_t^i is the inflation in the inventory price index, and thus $\Pi_t^i \; I_{t-1}^r$ is the replacement value of last period's inventory in this period's prices.

Several major adjustments are not recognized by the NIPA method, however. The depreciation in real value of the firm's monetary liabilities may be written as $\Pi_t \; NFL_{t-1}$ where Π_t is the inflation in the general price level and NFL_t is the value of the firm's net financial liabilities. To the extent that the increase in nominal value of the firm's physical assets exceeds the inflation rate, real gains accrue to the stockholders. For fixed assets, the adjustment will be $(\Pi_t^k - \Pi_t)K_{t-1}$, where K_{t-1} is the level of fixed assets at the end of the last period (at replacement value) and Π_t^k is the inflation in the appropriate capital goods price index. Similarly for inventories, there is an adjustment of $(\Pi_t^i - \Pi_t)I_{t-1}^r$.

On the liability side, stockholder wealth increases when there is a drop in the value of the firm's debt. This gives rise to an adjustment of $-(B_t - B_{t-1})$ where B_t represents the market value of the firm's debt.

Combining all of these adjustments, we may express fully-adjusted earnings (E'_t) as book earnings E_t plus the adjustments indicated:

$$E'_t = E_t + [D_t - D'_t] + [(I^r_t - I^r_{t-1}) - (I^b_t - I^b_{t-1}) - \Pi^i_t I^r_{t-1}]$$

$$+ \quad (\Pi^k_t - \Pi_t) K_{t-1} + (\Pi^i_t - \Pi_t) I^r_{t-1}$$

$$+ \quad \Pi_t NFL_{t-1} - (B_t - B_{t-1})$$

In the present analysis, we compute these adjustments for the aggregate of all firms based on the Cagan-Lipsey estimates and for individual companies using refinements of algorithms developed by Parker [25].[1] Three alternative measures of economic profits are used in this study. The first set (REPSCLA) is based on book earnings per share scaled by the ratio of Cagan-Lipsey adjusted income to book income where the adjusted income reflects only adjustments for inventory valuation, capital consumption and depreciation and purchasing power of net financial liabilities. The second measure (REPSCLB) includes all adjustments except change in market value of debt, while the third measure (REPSCLC) is inclusive of all adjustments. The reason for estimating economic earnings with and without the market value of debt adjustments lies in the size of volatility of this correction, as well as its "one-time" nature. The first measure is similar to one which has been used by Modigliani and Cohn [23] and differs from the second in that the latter includes capital gains on physical assets and land.

The differences between our EPS series and those computed from Cagan-Lipsey data stem from three considerations. Of primary importance is the sample difference: the Cagan-Lipsey figures are inclusive of all nonfinancial corporations while our sample covers only manufacturing firms. The difference lies in the transportation and utility sectors which tend to be highly levered. Thus, our adjustments relating to the decline in purchasing power of debt and changes in its market value will be of smaller magnitude.

[1] The procedures are described at greater length in a Ph.D. dissertation by Joel Hasbrouck [17].

The second major difference is due to the difference in depreciation adjustments. Our adjustment simply restates depreciation to replacement cost. Cagan and Lipsey use the NIPA capital consumption adjustment which in addition to the replacement cost correction also standardizes depreciation to the .85 Bulletin F straight line figure. As most firms have been switching to accelerated methods, the Cagan-Lipsey correction will be smaller than ours. This will also cause their capital gains estimates to be somewhat higher.

Finally, the capital gains figures for fixed assets in our study were derived using the implicit price deflator for manufacturing structures and equipment. As such, this does not fully capture the increase in land values which Cagan and Lipsey obtain from independent macro estimates.

Figures 1 and 2 depict the trend in book and economic earnings per share in 1967 dollars over the postwar period covered, with economic earnings based both on the Friend-Hasbrouck data (Figure 1) and Cagan-Lipsey data (Figure 2). Three sets of regressions are presented in Table 10 corresponding to the three measures of economic profits. Another group of real economic earnings regressions is presented in Table 11 entailing a similar analysis for individual industries based on the same 224 Compustat companies and 1958-77 period which were used in the preceding section of this paper (Part 3). Now, however, the data have been adjusted from a standardized real book earnings per share to a standardized real economic earnings per share. We did not use the overall Cagan and Lipsey inflation adjustments here but estimated the required adjustments on an individual firm basis following the procedures discussed earlier in this section. To aggregate the results on an industry basis as well as for all industries combined,[1] the weighting is by number of standardized shares where the method of standardization followed is that described in Part 3. The analysis in Table 10 is comparable to that in Table 8 for real book earnings, while Table 11 is comparable to Table 9.

[1]Corresponding relationships for the 224 individual companies in the sample were also computed, but the results do not appear to add anything to the industry analysis.

The regressions of aggregate real economic earnings per share on inflation, lagged inflation and time (Table 11) indicate that inflation persisting over a year negatively affects real economic earnings per share with fairly substantial (up to five year) time lags.[1] The linear regressions with allowance for a full five year time lag point to about a 11% depressant effect on real economic earnings as a "result" of a one percentage point sustained increase in the annual rate of inflation. (This estimate is based on the average real economic earnings per share over the period covered.) While there is not too much difference among the point estimates implied by the linear regressions employing the three different measures of economic earnings, the standard errors of these estimates are quite large. There is much more variability and even larger standard errors associated with the log regressions based on the three measures of economic earnings. Allowing for the full five year time lag, the two log regressions with the best fit imply that a one percentage point steady state increase in the annual rate of inflation resulted in a 19% to 21% decrease in real economic earnings while the third implies an even larger increase (but with a standard error so large as to include both the linear and the other two log point estimates).

While linear and log fits will tend to give somewhat similar results when the time series involved are smooth, this similarity may vanish when the series are highly volatile. The log transformation attenuates high values and exaggerates low ones, and this effect is significant in fitting the highly volatile economic earnings figures. Furthermore, as earnings represent the relatively small residual of large offsetting magnitudes, a linear

[1] Lagged inflation terms were generally included until their regression coefficients were no longer significant and the sum of the coefficients had leveled off.

disturbance assumption seems far more plausible than a multiplicative one. Consequently, it is our judgment that the linear estimate of a 11% depressant effect on real economic earnings of a one percentage point sustained increase in the annual rate of inflation is much closer to the truth than the 19% to 21% effect estimated on the basis of the best log regressions, though all of these estimates are subject to an uncomfortable margin of error. These effects are much higher than those implied by the earlier analyses of real dividends and real book earnings per share.

In addition to the first three sets of regressions in Table 10 based on different measures of real economic profits, a final set is presented substituting the value of the FRB index of industrial production for the time variable to hold constant the level of economic activity.[1] With economic activity held constant, the estimated impact of a one percentage point increase in sustained inflation on real economic earnings is not affected appreciably in the linear regressions but is reduced to 8% and 11% in the two best log regressions, which are quite close to the corresponding linear estimates.

The corresponding regressions for individual industries based on the 224 Compustat companies (Table 12), which again incorporate the effect of five annual inflation lags, were estimated by generalized least squares (gls) estimation procedures to eliminate some of the statistical deficiencies in ordinary least squares. The gls procedures allow for cross-sectional heteroscedasticity and different autocorrelation coefficients for different companies.[2] The equations in Table 11 incorporate all inflation adjustments

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[1]The time variable is not included as well because the FRB index reflects the secular as well as cyclical influences and unnecessary multicollinearity would be introduced.

[2]The model used is $E_{it} = a_i + \sum_{j=0}^{5} b_j \pi_{t-j} + C\ \text{Time} + e_{it}$ where $e_{it} = \rho_i e_{i(t-1)} + u_{it}$, $\text{Var}(u_{it}) = \sigma_i^2$ and $\text{Cov}(u_{it}\ u_{jt}) = \sigma_{ij}^2$. Modified Aitken estimates of this model were derived.

into the measure of economic earnings, with the data for individual firms weighted on the basis of the number of standardized shares.[1]

The results again point to negative industry effects more frequently than positive effects, and a substantial and statistically significant effect for all industries combined, though the variations among different industries were quite large. According to these results, a sustained 1% increase in the annual rate of inflation would be associatedwith about a 14% reduction in real economic earnings per share if all inflation adjustments are incorporated into the earnings data. This is higher than the corresponding estimate implied by the aggregate regressions. The discrepancy appears to result from sample differences and computational limitations described earlier

Thus our analysis indicates that inflation has a more substantial negative effect on real economic earnings than on real dividends or real book earnings. This implies that dividends are not depressed by inflation as much as economic earnings. There are several tenable explanations of this result including the possibility that management consciously attempts to maintain their dividend payout when stock prices are depressed by inflation or that management gears its dividend payout in some part, and perhaps more, to book than to economic earnings. We suspect that both influences are reflected in the apparently disparate effects of inflation on dividends and book earnings on the one hand and on economic earnings on the other. These differential effects may also reflect errors in the measurement

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[1]Corresponding regressions excluding changes in the market value of debt from the inflation adjustments made and regressions with equal weights assigned to the data for each firm were also estimated but the results were not substantially different.

2Assessment of the impact of inflation is subject to the same uncertainties regarding transience and differential impacts of expected and unexpected inflation that characterized the book EPS and dividend analysis.

of economic earnings, including possible overstatement of the changes in plant and equipment prices due to inadequate representation of quality improvements in the capital goods price indexes. Measurement error is of course much less of a problem for book earnings and especially dividends.

It should be noted that an expansion of the analysis of the 224 Compustat companies over the 1948-77 period is now under way in which the regressions in Table 12 are being re-estimated with real sales per share, the real level of physical assets per share and real gross debt per share included as additional explanatory variables. The rationale for these additional variables is partly to obtain further insights into the determinants of economic earnings, partly to minimize the effects of measurement errors in economic earnings in evaluating the effect of inflation on such earnings, and partly to control for the level of business activity, physical assets and debt in estimating the inflation effect.

Since we are interested for purposes of the following section in obtaining insights into how anticipated inflation affects stock prices and required returns, it is necessary to estimate the effect of anticipated inflation on the level of real economic earnings per share expected in the future. Perhaps the best available approach to this problem is to assume that the sustained effect of inflation on actual real economic earnings estimated above on the basis of up to five year time lags represents an adequate approximation to the effect of anticipated inflation on expected real economic earnings. However, another possible approach can be based on the assumption, admittedly dubious, that investors are able to forecast correctly the level of real economic earnings for up to five years in the future, so that the relationship of real expected earnings for years t+1 to t+5 to expected inflation at the end of year t in conjunction with the effect of expected inflation on stock prices at time t will indicate the nature of the effect of anticipated inflation on the required rate of return. The same three measures of economic profits discussed earlier (and used in Table 10) were employed in this analysis but only one, REPSCLA, is used in the aggregate regressions (all linear) presented in Table 13 since all three give similar results. In addition, to the extent that investors can forecast (or even estimate) real economic earnings, it is this measure of earnings which excludes capital gains on assets and liabilities that investors are most likely to estimate or project. Two measures of expected long-run inflation were also used in this analysis, one derived from an autoregressive model based on inflation in the current and preceding two years and the other from the S&P municipal bond index. In some of the regressions, a time trend, the FRB index of industrial production and past inflation rates have also been included.

The results of the analysis in Table 13 indicate that expected inflation at a point of time is significantly negatively correlated with real economic earnings. Since investors' ability to forecast real economic earnings for any considerable period of time is likely to be extremely limited, we believe that the effect of anticipated inflation on expected real economic earnings is better estimated from the relationships of actual real economic earnings to past inflation with appropriate distributed lags derived from Tables 11 and 12 On the other hand, the results presented on Table 13 suggest that the earlier analysis may overstate the effect of anticipated inflation on expected real economic earnings.

5. Required Return and Inflation

Since no reliable information on the required market rates of return on common stock exists, much less required real rates, we shall attempt to roughly estimate the effect of inflation on required returns through two procedures: First, by using the ratio of expected real earnings per share to a stock price index (E/P) as an approximation of the required real rate of return for NYSE stocks as a whole and then regressing this ratio on the rate of inflation in one or more time periods, with and without a time trend; second, by inferring the effect of inflation on required returns from its impact on per share expected return to investors and on stock prices. It might be noted that while an earnings-price ratio, even in normalized form, is likely to be a completely inadequate measure of required return for individual stocks, it is likely to be a more tenable, though still not altogether satisfactory, measure for stocks as a whole. However, in view of the potentially substantial measurement errors involved in using an E/P ratio as a proxy for the required rate of return, the second or indirect approach to inferring the effect of inflation on required return is likely to be more reliable.

Real earnings/price ratios and inflation

Table 14 presents two groups of annual regressions of expected real earnings to deflated price (E/P) ratios on inflation and expected inflation from the 1950's to the 1970's. In both groups of regressions, three measures of earnings were used including not only book earnings, but also two different measures of economic earnings. Several different measures of expected as distinguished from actual earnings are also used in these regressions. Finally, in some of these regressions, dividends are used as a proxy for normalized earnings, though obviously they would differ at least by a scale factor.

Two sets of adjustments have been used to derive economic earnings from reported earnings. One (designated as F-H) is based on the adjustments to individual company data used to derive industry as well as aggregate estimates which were discussed in an earlier section of this paper, The other is based on the Cagan-Lipsey adjustments (C-L) also referred to earlier. Much of the difference between the F-H and C-L results is due to large capital gains income in the latter's 1974 and 1975 adjusted income. Due to procedural limitations, the corresponding terms in our analysis (which unlike the C-L analysis was designed to provide adjusted earnings estimates for individual companies) were of smaller magnitude. As the large capital gains were probably only partially anticipated in the E/P ratios, the results based on the C-L adjustment may overstate the effect of inflation while ours may understate it.

In the first group of regressions in Table 14, the expected real E/P ratio at the end of year t was assumed to be $\frac{E_{t+1}}{P_t} \times \frac{CPI_t}{CPI_{t+1}}$ where E_t represents earnings for the year estimated either directly from, or by applying the C-L or F-H adjustments to, the S&P per share earnings index and P_t represents the value of the S&P index at the end of year t. The assumption made here is that at a point of time, stock prices project future real earnings per share at a level equal to that of the following year. The expected inflation rate used as an independent variable is either measured by inflation experienced in the following year , by an autoregressive model based on inflation in the current and preceding two years, or by the current rate of interest on new AA electric utility bonds.[1] Some of the regressions incorporate a time trend as an additional explanatory variable in an attempt to hold constant any secular changes in the real risk premium required on stock investment, while others incorporate the change in the Federal Reserve Board Index of industrial Production to hold constant cyclical influences.

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[1]The S&P municipal bond index yields were also used as a proxy for the expected rate of inflation but the results are not presented since they were extremely close to those obtained from the Salomon Brothers index of new AA electric utilities. The former it should be noted are available for a longer time period.

The second group of regressions in Table 14 differ from the first set in that the $\frac{E}{P}$ ratio is now an average of $\frac{E_{t+1}}{P_t} \times \frac{CPI_t}{CPI_{t+1}}$, $\frac{E_{t+2}}{P_t} \times \frac{CPI_t}{CPI_{t+2}}$ and $\frac{E_{t+3}}{P_t} \times \frac{CPI_t}{CPI_{t+3}}$, and the associated expected inflation rates are measured either by the annual average change in the CPI over the next three years or again by an autoregressive model based on current and past inflation rates or by the current bond interest rate. Clearly, much more insight into the future is assumed in this second than in the first group of regressions.

The results of this analysis are inconclusive as to the effect of inflation on the real required rate of return. To the extent that the expected real cash flow reflected in stock prices can be measured by our estimates of expected real dividends or expected real book earnings, then realized or expected inflation seems to increase the real required rate of return. However, if expected real cash flow reflected in stock prices is more appropriately measured by our estimates of expected economic earnings, the results no longer provide any clear indication of even the direction of the inflation effect on real required return. Thus, if any substantial weight is attached to the use of expected real dividends or expected real book earnings as a surrogate for expected real future cash flow, our direct estimates of the real required rate of return imply that this rate is increased by inflation. Otherwise, not much can be said about the association between inflation and required returns.

While these results seem to provide some evidence that inflation increases real required returns, they are not at all conclusive in view of the inadequacies of our E/P ratios for estimating required returns and the sensitivity of the results to the expectational assumptions made, as well as the problem of the weights to be ascribed to the dividend-based, book earnings, and economic earnings E/P ratios. We shall therefore now turn to a second empirical method of estimating the effect of inflation on real required returns which does not require direct estimates of required returns but infers the effect of inflation on such returns from its impact on per share expected returns to investors and on stock prices.

Implications of inflation impact on expected returns and stock prices

Our analysis in the preceding sections of this paper has indicated that the most likely range of percentage decline in real returns associated with a one percentage point (100 basis point) increase in the general price level would be estimated at 5% or less based on the impact of inflation on real dividends and book earnings, and in the neighborhood of 10% based on the estimated impact of inflation on real economic earnings. However the margin of error in the second of these figures is sufficiently large so that it could be appreciably higher especially if the effect of inflation on economic activity is not held constant. As a consequence, if stock prices were unaffected by inflation, a one percentage point increase in the annual rate of inflation would be expected to induce a 5% to 10% decrease in real required returns. The effect could be larger if investors' perception of future real cash returns were based only on real economic earnings and if both the effect of inflation on economic activity is not held constant and the log regressions which seem to us inferior to the linear are used as the basis for estimation. To obtain our final estimates of the effect of inflation on real required returns, we have to adjust for its effect on stock prices since regressions of percentage changes in stock prices on either the total or expected changes in the rate of inflation indicate that inflation depresses stock prices (which is, of course, the basic reason for the negative correlation between market realized rates of return and inflation discussed in Part 2). Figure 3 depicts the postwar trends in deflated stock prices and inflation.

The regressions of changes in stock prices on changes in inflation presented in Table 15 indicate that a one percentage point (100 basis points) change in the sustained annual rate of inflation over the post-World War II period is associated with anywhere from a 11% to 19% decrease in stock prices. The linear regressions point to a 15% depressant effect with three to five year inflation lags while the log regressions with a first order autocorrelation adjustment to correct for serial correlation point to a 19% effect.[1] The percent difference regressions, which are the least satisfactory in view of the extremely high standard errors, point to a 11% effect.

The implication of these results for the required rate of return may be illustrated with a simple valuation model. Let X represent next period's expected cash flow to the investor measured in current dollars. If this cash flow is growing at a real growth rate g, and there is a sustained inflation π, then the nominal growth rate is $(1+g)(1+\pi)-1$. Assume that the investor discounts the nominal cash flows at a before-tax nominal rate r_m, and that these flows are subject to proportional taxes t. If the stock will be held in perpetuity, its price may be written as

$$P = \sum_{i=1}^{\infty} \frac{X[(1+g)(1+\pi)]^{i-1}(1-t)}{[1+r_m(1-t)]^i}$$

$$P = \frac{X(1-t)}{r_m(1-t)-g-\pi}$$

When the stock is held in perpetuity, capital gains are never realized and so no capital gains tax is ever paid. If on the other hand we assume that the share is held for one year, taxes are paid annually, and are assessed at the same proportional tax rate as dividends, taxes drop out of the price expression:

[1]The log regressions in this table do not pose the same problems as the log

prices and inflation.

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[1]The log regressions in this table do not pose the same problems as the log regressions for economic earnings.

[2]It should be noted that if current long-term interest rates are used in lieu of a distributed lag of past inflation rates (Table 16), a 1% change in expected inflation appears to be associated with a 7-11% decline in real stock values.

$$P' = \frac{X}{r_m - g - \pi}$$

These two expressions represent extreme cases and we believe that actual capital gains tax incidence lies somewhere between the two assumptions.

Writing the nominal discount rate as the sum of a real required return, ρ_m, and the inflation premium, the stock price equations become

$$P = \frac{X(1-t)}{\rho_m (1-t) - g - \pi t}$$

and

$$P' = \frac{X}{\rho_m - g}$$

The question now arises as to what extent the inflation-induced decline in stock prices can be attributed to the impact of inflation upon the parameters of these valuation expressions. In working with the first model, there will be a direct effect stemming from the appearance of inflation in the denominator of the right-hand side, a consequence of nominal taxation. This direct effect is perverse, implying that an increase in inflation should increase stock prices, assuming that X, ρ_m and g are unaffected by inflation.

In this model, there will also be an indirect effect due to shifts in the personal tax rate, since inflation, with no change in the schedule of nominal tax rates, increases the effective tax rate on real personal income.[1] Such an increase, however, will exert a stimulating influence on stock prices, since $\partial p/\partial t > 0$, still holding X, ρ_m and g constant. Thus the direct effect of a tax increase is contrary to the empirical evidence. In the second model, neither taxes nor inflation appear explicitly, although there remain indirect effects which will be discussed presently.

In both models, the primary factor causing the drop in stock prices is the inflation-induced decrease in the current and subsequent cash flows measured by X and g. Despite the obvious importance of this consideration, however, the reduction in stock prices is clearly greater than the decrease in real dividends and book earnings and probably greater than the decrease in real economic earnings. Actually, if we use our empirical results in conjunction with either of the two valuation models to examine the first year's impact of inflation on the variables determining stock prices, the significant increase in the first year's real dividends and earnings (economic as well as book) associated with a significant decline in stock prices points to an appreciable increase in the real required rate of return unless there is a very marked decline in the expected real growth rate (g). However, we are also interested in the implications for the required rate of return of a change in the level of sustained or steady-state inflation which according to our empirical results is associated with a substantial decrease in real dividends and earnings as well as in stock prices.

In the first valuation expression, which assumed indefinite deferral of capital gains taxes, the direct inflation and tax effects appear to work in a

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[1] An estimated average increase between 1950 and 1978 of three percent in the effective rate of personal taxation is documented in Joel Hasbrouck, op. cit.

perverse direction. This suggests that the empirical findings can only be reconciled by an inflation-induced increase in the real before-tax required rate of return. Even if we adopt the extreme position that the depressant effects of inflation upon economic earnings and stock price have been equal, the impacts of the direct inflation and tax effects must still be offset by an increase in the real before-tax discount rate. In the second valuation model, however, which assumed annual payment of capital gains taxes, only if the decline in stock prices exceeded the decline in earnings is an increase in the real required rate of return suggested assuming, in the absence of contradictory evidence that g does not change as a result of inflation. There would appear to be only two possible theoretical explanations for such an increase, an indirect tax effect and an increase in uncertainty of equity returns.[1,2]

Since taxes are levied on nominal gains, investors may "demand" a higher before-tax real rate of return in order to maintain their after-tax real return. As cited in section 6, however, empirical and theoretical studies of the Fisher Effect on risk-free assets suggest that the expected real before-tax risk-free rate of return is either unaffected or depressed by an increase in expected inflation. Yet another indirect tax effect is implicit in the uncertainty model as a result of the introduction of risk. Under an uncertainty model, higher tax rates reduce the variance as well as the level of after-tax return to the investor. As a result of this uncertainty, as implied by the capital asset pricing theory discussed in Part 6 of this paper, the required risk premium might be expected to be decreased by higher personal tax rates. Consequently, it does not appear that the effect of inflation upon taxes can be used to explain the empirical evidence. On the other hand, the effective corporate tax rates may have increased, accounting for at least part of the

[1]It should be noted that the effect of inflation on the propensity to save does not seem to help explain the apparent increase in the real required rate of return on stock, since empirical studies generally point to a rise in the propensity to save associated with uncertain inflation. See Howard [18] and Juster and Wachtel [20].

[2]This increased uncertainty of real return might reflect unexpected shifts in relative prices among countries and within the country and any rise in the relative importance of debt.

negative impact of inflation upon economic EPS vis a vis book.

The second factor behind the rise in the real required rate of return is uncertainty, and since tax considerations are not useful in explaining the empirical evidence we believe the rise in the real required rate of return to be attributable to a real or perceived increase in the riskiness of investment in common stocks. There is strong theoretical and empirical evidence in support of a relationship between inflation and risk. We shall briefly review these developments here, with a view toward elucidating not only the connection between risk and level of inflation, but also that between risk and change in the level. The latter relationship is important in addressing the question of whether the inflation-induced increase in risk is a necessary and permanent consequence of higher sustained levels of inflation, or a transitional phenomenom, which will decline in importance as economic agents become more acclimated to the higher levels.

The differentiation between transitional and sustained effects is not one that lends itself easily to empirical resolution. Over the post-World War II period, there is strong correlation between the level and first difference of inflation, rendering statistical differentiation of the two difficult. In addition, inflation-related uncertainties may be dichotomized according to whether or not they derive from greater uncertainty in policy variables. Uncertainties stemming from policy may be a necessary consequence of neither the level nor the change in the rate of inflation, despite the fact that a strong statistical relationship may exist. For these reasons, our classification of relationships between inflation and uncertainty as sustained or transitional, and causal or coincidental, must rest largely on the underlying theory.

Of central importance here is the connection between the level and uncertainty of inflation, or alternatively, between expected inflation and the variance of unexpected inflation.

Empirical studies by Logue and Willet [22] and Foster [8] have found a strong relationship between the level and variability of inflation, but of course not all of this variability may be unanticipated. Additional support comes from cross-sectional survey data. In his reworking of the Livingston data, Carlson [4] suggests a relationship between level of inflation and dispersion of expectations across respondents.

The underlying causes of the level-variability or level-uncertainty re;ationships are unclear. Logue and Willet attribute this behavior to the greater instability of monetary policy which has been associated with the inflation of recent experience. If the increase in the uncertainty about unexpected inflation derives from this source, then output will be affected as well. Barro has shown that the variance of output is partially dependent on the variance of the money supply [1]. This risk will be non-diversifible, and hence will unambiguously increase the risk premium, although since the rate of growth in the monetary base is a policy variable, this source of inflation-related uncertainty could, in theory and in the long run, be eliminated.

The increase in the variance of unanticipated inflation directly affects the required rate of return on stocks as a whole, as well be shown in Section 6. In addition, however, the increase in variance will impact returns in certain firm- and industry-specific ways. If firms engage in nominal contracting, increased uncertainty about inflation will result in increased uncertainty in the firm's earnings.

Another firm-specific risk derives from relative price differentials. Vining and Elwertowski have empirically established that under high inflation there is a greater dispersion of the specific price indices composing the overall index [29].

That this may result from the greater variance in unanticipated inflation in demonstrated in a theoretical model by Parks [26]. To the extent that this variability in relative prices is unforeseen, it will cause greater uncertainty in the firm's spread between input and output prices and consequently greater uncertainty in the firm's earnings. Although these specific risks are, in theory at least, diversifiable, such risks may be important in determining required risk premiums since most investors do not hold well-diversified portfolios.

These causal relationships may be summarized as follows. Increased uncertainty about the rate of growth of the monetary base will result in increased uncertainty of output and inflation. An increase in the variance of unanticipated inflation may, in addition, be associated with greater risk from price dispersion. To the extent that this increased risk arises from increased unpredictability of the money supply, this risk is not necessarily a permanent fixture of higher inflation, but nevertheless has been important from a historical viewpoint. A further source of recent uncertainty lies in exogenous shocks, such as the jumps in petroleum prices. To determine whether or not an increase in riskiness is apparent in earnings and market returns, we carried out four different types of regressions.

First, we regressed for the 1947-78 period quarterly real book earnings per share (the reported S&P Composite Stocks data deflated by the CPI) on the FRB index of industrial prodution of the same quarter, on a time trend, and on quarterly dummies, and then regressed each of the absolute values of the residuals and the ratios of the squares of the residuals to the mean square error from the first set of regressions on each of the percent change in the CPI from the beginning to the end of the quarter and from the beginning to the end of the year.

The inflation coefficients in the latter set of regressions were uniformly positive and significant (Table 17)[1], generally pointing to an increase in unexplained real book earnings with increased inflation. The statistical significance of the effect of inflation on the absolute values of the residuals was tested by the usual t-statistic,[2] while the significance of the inflation effect on the ratios of the squares of the residuals to the mean square error was tested by the Breusch-Pagan Test statistic [2]. [3,4]

A related analysis of the book EPS data was performed in an attempt to clarify the transitional nature of the inflation-related uncertainty, but, for reasons of brevity, only a textual summary of this analysis will be reported. Various combinations of levels and first differences of inflation, contemporaneous and lagged, were employed in the residual regressions. Indentification of level and transitional effects was rendered difficult both by the statistical correlation between the level and first difference, and also by the need to specify the regression in such a manner as to avoid linear combinations between the two.

[1]More than half were significant at the .95 level and all but one at the .9 level.

[2]Glesjer [15] has shown in Monte Carlo simulations that at the 5% level of statistical significance the t-statistic for this probability distribution is an adequate approximation of the significance of the regression coefficient.

[3]This is assymptotically distributed as chi-square. See Hasbrouck [17] for further details.

[4]The objection may be raised that in identifiying the residual of the EPS regression as the uncertain component, we are implicitly assuming that in forming his expectations, the investor has access to a full sample period of data from which to estimate the relationship. In fact, only data available at the point when expectations were formed should be used, and this suggests use of a rolling expectations generation mechanism in which the forecasting equation is reestimated each period using only available data. The analysis was repeated using such a rolling extimation procedure in which the dependent variables in the expectation generating equation were quarterly dummies and either time or the industial production index. This equation was estimated over the forty quarters preceding the forecast, an expectation was computed (assuming perfect foreknowledge of the industrial production index, if used), and a mean-square forecasting error was computed. These mean-square forecasting errors were then regressed against inflation and a uniformly positive relationship was found. Since normality cannot be assumed, however, the question of significance remains unclear.

From these results it was clear that a strong inflation effect exists, but it is not one that can be classed as permanent or transitory on the basis of the empirical analysis.

Second, for the 1947-76 period, we regressed both real and nominal[1] monthly realized returns (again computed from the S&P Composite Index deflated by the CPI) on percentage changes in the FRB Index of industrial production over the next six, twelve and eighteen months and a time trend and then regressed each of the absolute values of the residuals and ratios of the squares of the residuals to the mean square error on each of the measures of inflation used in Table 14 and also on two expected inflation variables, one estimated from an autoregressive model, the other from 90 day Treasury bill rates. Again all of the inflation effects, shown in Table 18, were positive and generally significant.[2]

This analysis is now subject to the same question that arose in the EPS analysis, namely, to what extent is the inflation-related increase in risk transitional. Unfortunately, an attempt to empirically resolve this issue for the market return data was no more successful than the EPS attempt. When levels and first differences of inflation were introduced into the residual specifications, the presence of a positive inflation effect was manifest but the effect could not be classed as transitory or permanent. A second question arises here concerning the exact nature of the inflation-related uncertainty. In Section 2, it was demonstrated that the first differences of the municipal bond yield, a proxy for changes in the long-run expected rate of inflation, was a signficant determinant of monthly returns. It is therefore plausible that the increase in

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1 Although inflation is of primary importance in the postwar period, we believe that additional risk would be associated with deflation as well. When the analysis was extended to cover 1926-1946, the magnitude (absolute value) of the rate of price change was found to be a significantly positive determinant of market variance.

2 The results for nominal returns will be useful for the analysis in Part 6.

market return variability associated with inflation simply reflects increased volatility of expectations. To test this hypothesis, a further analysis was performed. Real market returns were first regressed against time, economic activity and also the first difference of the municipal bond yield. The residuals from this regression were then analyzed in a manner identical to that used in table 18 Relative to the analysis performed with the first difference of the municipal bond yield omitted, the impact of the level of inflation upon risk was slightly lower, but still significant.

So far, we have essentially used only the variance (or similar measure of dispersion) of a proxy for the market portfolio of all risky assets as a basis for measuring the impact of inflation on corporate risk. While this is consistent with the implications of the capital asset pricing model (CAPM), several recent studies have indicated that unique or company-specific as well as common market risks influence the required return and pricing of individual risky assets.[1] As a result, two other types of regression analysis have been carried out to examine the relationship between inflation and the level of company-specific risks.

Thus, for the 1947-78 period, we selected all 404 NYSE common stocks for which complete data were available for the entire period from the Rodney White Center data base, computed real realized monthly market rates of return, and then regressed the variance, σ_{it}^2, of these real returns for security i in year t on the rate of inflation in that same year.[2] The inflation coefficients in 93 percent of the 404 regressions were positive: 66 percent had t-statistics over 1.5 and 50 percent over 2.0. Pooling these individual stock data in an additive linear model in which the impact of inflation was assumed identical for all stocks, although the intercepts were permitted to differ, yielded an inflation coefficient of .065 with a t-statistic of 13.9.[3]

Finally, we carried out a test of the effect of inflation on our ability to forecast real book earnings per share for the 251 Compustat companies for which we had the required annual data for the period 1958-77.[4] For this test we first extimated expected real earnings per share for any year in the 1963-77 period, and then regressed the weighted average

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[1] E.g., Friend, Westerfield and Granito [11] and Friend and Westerfield [10].

[2] $\sigma_{it}^2 = \frac{1}{11} \sum_{j=1}^{12} (P_{i,t,j} - \bar{P}_{i,t})^2$ where $P_{i,t,j}$ is the real return for security i, year t, month j, and $\bar{P}_{i,t}$ is the average for security i, year t.

[3] A pooled multiplicative model was also fitted relating variance to inflation with similar qualitative results.

[4] The basis for selection of these companies was discussed earlier.

of the squared forecasting errors for the individual company stocks for each year on the rate of inflation for that year. The weighting was by number of standardized shares discussed earlier. Two different measures of expected real earnings per share for a year were used, the first based on a regression of real earnings per share on time over the preceding five year period, the second based on a regression of real earnings per share on real sales per share over the preceding five year period (where the sales deflator is the most relevant available specific good price index).[1] The results of this analysis in Table 19 are uniform in indicating statistically significant effects of inflation in making more difficult the forecasting of real earnings per share.

While there are statistical limitations in all the analyses carried out in this section,[2] the consistency of the results appears to provide strong evidence that inflation has increased the riskiness of investment in common stocks.[3] We shall in the next section attempt to determine whether modern corporate asset pricing theory can be used to cast any light on the quantitative relationship between both risk and personal taxation and the required rate of return for risky assets as a whole. It should be noted that such theory is deficient for a number of reasons, including its failure to incorporate the effect on required returns of company-specific risks.

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[1]The second of these measures assumes perfect forecasting of real sales for a year ahead so that it might be expected to understate the effect of inflation on expected book earnings.

[2]It might be noted that we did not present data on the relationship between inflation and uncertainty about economic earnings though superficially they seem to provide similar but even stronger results than obtained for book earnings and market rates of return. The reason is that measurement errors in the estimates of economic earnings and the rate of inflation would be positively correlated introducing the problem of spurious correlation.

[3]We note that some of the uncertainties which we believe to be reflected in the market-variance and inflation relationship may be associated with the transition to higher rates of inflation. Once these higher rates become the established norm, it is possible that these uncertainties would diminish.

6. Required Return and Capital Asset Pricing Theory

To analyze the theoretical relationship between the required rate of return on risky assets as a whole and inflation under modern capital asset pricing theory, we shall start with a simple transformation of the aggregate equilibrium relationship between the relative demand for risky assets and the market price of risk under uncertain inflation developed by Friend, Landskroner and Losq [12]:

$$(1) \quad E(r_m) = r_f + \sigma_{m\pi} + \alpha C(1-t) \; [(1-h)\,\sigma_m^2 + \frac{h}{\alpha}\,\sigma_{mh} - \frac{\sigma_{m\pi}}{\alpha(1-t)}\,]$$

where $E(r_m)$ is the expected or required nominal rate of return on the market portfolio of all risky, marketable assets, r_f is the risk-free nominal rate of return, $\sigma_{m\pi}$ is the covariance between the market return and the rate of inflation, α is the ratio of the value of risky to all marketable assets, C is the market's Pratt-Arrow measure of relative risk aversion, t is the effective tax rate on investor income, h is the ratio of human wealth to total wealth (both human and non-human or marketable), σ_m^2 is the variance of return on the marketable portfolio and σ_{mh} is the covariance between the market return and the return on aggregate human wealth. The assumptions necessary for the derivation of (1) include, in addition to those normally required for the development of the CAPM, arithmetic Weiner processes for r_m, r_π and r_h; constant relative risk aversion; and taxes which represent the same proportion of income regardless of the level of net worth.[1]

[1]The constant relative risk aversion assumption is based on empirical analysis of the available data (see Friend and Blume [9]). The constant proportionality tax assumption is of course a crude approximation which has been introduced in (1) for analytical convenience. However, it is possible to obtain a relationship similar to though somewhat more complex than (1) by making the alternative assumption that the tax rate is a function of the level of net worth but not of its composition (Friend and Blume [9]).

Equation (1) can be converted into a useful equilibrium demand relationship expressed in terms of real rather than nominal returns by substituting the assumption of arithmetic Weiner processes for real returns (ρ_m and ρ_f) on the market portfolio and on the nominally risk-free asset rather than for nominal returns and by the additional assumption that $\sigma_{mh} = 0$.[1] This relationship can be written as[2]

$$(2) \quad E(\rho_m) = E(\rho_f) + C\,[\alpha(1-t)(1-h)(\sigma^2_{\rho_m} + \sigma^2_\pi + 2\sigma_{\rho_m\pi}) - \sigma^2_\pi - \sigma_{\rho_m\pi}]$$

which for convenience can also be expressed as

$$(3) \quad E(\rho_m) = E(\rho_f) + C[a\,\sigma^2_{\rho_m} - (1-a)\,\sigma^2_\pi - (1-2a)\,\sigma_{\rho_m\pi}]$$

where $a = \alpha(1-t)(1-h)$.

To obtain analytical insights into how $E(\rho_m)$ is affected by inflation, i.e., to determine $\frac{d\,E(\rho_m)}{d\pi}$, it is necessary to integrate supply considerations with the demand relationship presented in Eq. (3),[3] but the resulting model is too complex to reach a tractable solution unless some completely unrealistic simplifying assumptions are made.[4] As a result, we shall use a more convenient form of Eq. (3) where the expression in brackets is expressed in nominal terms,[5]

$$(4) \quad E(\rho_m) = E(\rho_f) + C\left[a\,\sigma^2_m - \sigma_{m\pi}\right],$$

[1]The assumption that $\sigma_{mh} = 0$ is based on the empirical evidence (Fama and Schwert [6]). It should be noted that the assumption of Weiner processes for real returns is approximately equivalent to the corresponding assumption for nominal returns. The real-nominal Wiener process correspondence can be made exact if geometric processes are employed.

[2]In deriving this equation from (1), it should be noted that ρ_m is defined as $\frac{r_m - \pi}{1+\pi}$ and that, under the assumptions made, $\sigma^2_m = \sigma^2_{\rho_m} + \sigma^2_\pi + 2\,\sigma_{\rho_m\pi}$ and $\sigma_{m\pi} = \sigma^2_\pi + \sigma_{\rho_m\pi}$.

[3]This can be done most expeditiously by assuming that the real cash flow produced by risky assets as a whole, $E(X_m)$, follows an arithmetic Wiener process, the real value of the risk-free asset supplied by the Government is fixed at V_f, and the real value of risky assets $V_m = \frac{E(X_m)}{E(\rho_m)}$ so that $\alpha = \frac{V_m}{V_m + V_f}$

[4]See Hasbrouck [17].

[5]In the absence of a nominally risk-free asset, (4) may be written as $E(\rho_m) = E(\rho_o) + Ca\sigma^2_m$, where $E(\rho_o)$ is the expected real return on the asset which is uncorrelated with the market.

and simply compare two solutions for $E(\rho_m)$, one based on estimated initial values of a and σ_m^2 in the absence of significant inflation, the second based on what appears to be plausible recent values of a and σ_m^2 when the expected annual rate of inflation was of the rough order of magnitude of 10%. In both cases, $\sigma_{m\pi}$ is taken to be zero, and $E(\rho_f)$ and C are assumed to be unchanged by inflation.

The assumption that $\sigma_{m\pi}$ is zero is based on the empirical evidence which suggests either a zero or a small negative value that would be completely dominated by σ_m^2.[1] Moreover, for our purposes this is a conservative assumption since the use of a negative $\sigma_{m\pi}$ would somewhat increase our estimate of the impact of inflation on $E(\rho_m)$. The assumption that $E(\rho_f)$ is not systematically affected by inflation is consistent with much of the empirical evidence (see Fama [5] and Gibson [13,14]). Other viewpoints however, as summarized by Levi and Makin [21], would suggest a negative inflation impact on $E(\rho_f)$.[2] While the assumption that C is unaffected by inflation cannot be tested effectively from the empirical data available, given the margin of error in estimating the theoretical constructs required, there is no obvious reason why risk aversion as distinguished from risk should be affected by inflation.

To determine how $Ca\sigma_m^2$ and therefore under our assumptions $E(\rho_m)$ are affected by inflation, we have to estimate the value of C and the effect of inflation on α, t and h, the determinants of $a = \alpha(1-t)(1-h)$. The value of C

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[1] $\sigma_{m\pi}$ was estimated as Cov (RM [T] , UDP1MAR [T]) where RM is the nominal market return and UDP1MAR is unanticipated inflation from the autoregressive model described in the notes to Table 1. Estimated using monthly data, 1947-1978, $\hat{\sigma}_{m\pi} = -.000003$. This is much smaller than $a\ \sigma_m^2 = (.25)\ (.0014) = 0.00035$.

[2] Should the behavior of $E(\rho_f)$ deviate from our assumption, the subsequent analysis would in any case apply without modification to the risk differential, $E(\rho_m) - E(\rho_f)$.

has been estimated at about 2 by Friend and Blume [9] using a model in which investment decisions are not affected by human wealth. However, using their data and a model that incorporates human wealth, which corresponds to Eqs. (1)-(4), the estimate of C becomes roughly 6, based on a value of .9 for α,[1] .8 for (1-t) and .35 for (1-h).[2] The base estimate for h is derived from the data tape associated with the MPS model by applying an assumed capitalization rate of 10% to real wages and salaries to obtain the real value of human wealth, while the base estimate of (1-t) is estimated as the ratio of disposable income to personal disposable income from the same source reduced by 10% to approximate the weighted harmonic mean of (1-t) for individual investors which theory suggests is the more appropriate value to use.[3]

We shall make two estimates of how $Ca\sigma_m^2$ and therefore $E(\rho_m)$ are likely to be affected by an increase in the annual rate of inflation from close to zero to 10%. This increase might be compared with the rise in the actual rate of inflation as measured by the CPI from 2.8% as an average for 1965-67, before the break in the stock market and the subsequent onset of inflationary pressures, to 9.6% for 1976-79, and to a higher figure in recent months. The two estimates of the change in $Ca\sigma_m^2$ differ only in their estimates of the change in $a = \alpha(1-t)(1-h)$ associated with a 10% rate of inflation. The first estimate

[1]See Friend and Blume [9].

[2]It should be noted that the base estimate of C(1-h) is the same regardless of whether the model incorporating a C value of 2 or that of 6 is used, so that the estimate of $E(\rho_m)$ is unaffected by the choice of model under the other assumptions made.

[3]See Friend and Blume [9] both for the theoretical justification of the weighted harmonic mean and for the empirical basis of the 10% adjustment factor.

assumes that the average values of α, (1-t), and (1-h) over the 1947-78 period (.9, .8 and .35 respectively) would not be changed significantly by the increase in inflation. The second estimate assumes that α, (1-t) and (1-h) would each be decreased by .05, which seems larger than the likely effect of a 10% rate of inflation on these three parameters.[1] It should be noted that these values of α, (1-t) and (1-h) are based on data for households only. The inclusion of institutional investors would not affect α very much but would substantially increase both (1-t) as a result of their close to tax-free status and (1-h) since h=0 for institutions. As a result, our estimates of a and the change in a tend to understate somewhat both the required real risk differential and the change in the differential associated with inflation.

Thus, we estimate that the effect of a 10% rate of inflation would reduce a by at most .06 (from .252 to .191). In contrast, a 10% increase in the expected annual rate of inflation would according to Eqs. 6-8 in Table 17C (estimated from monthly data on the 1947-78 period) result in an increase of .0014 in σ_m^2 from .0010 in the absence of inflation to .0022.[2] With C=6, $E(\rho_m) - E(\rho_f)$ would be increased from .0015 on a monthly basis (in the absence of inflation) to somewhere between .0028 and .0036 (with 10% annual inflation), or from 1.8% (1.8 percentage points) to between 2.8% and 3.4%

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[1]The effect of inflation on (1-t) and (1-h) are estimated by regressing each of them on the rate of inflation over the 1947-78 period. The computed annual regressions were

(1) $(1-t)_T = .898 - .054\ DP_T - .070\ DP_{T-1} - .0012\ TIME_T$ (R2C=.716; DW=1.72;
(134.0) (-1.0) (-1.0) (-3.2) RHO = 0.499)

(2) $(1-h)_T = .404 - .155\ DP_T - .097\ DP_{T-1} - .0015\ TIME_T$ (R2C=.754; DW=1.92;
(32.4) (-2.7) (-1.7) (-2.7) RHO = 0.712)

[2]The transformed variable used in the Breusch-Pagan analysis, which is the dependent variable in these equations, is $G2 = \hat{\varepsilon}^2/\hat{\sigma}^2$ (or the square of the error term in the regression of the market rate of return on output and time divided by the mean square error of the market rate of return regression).

on an annual basis.[1]

The consequences of these parameter shifts for stock prices may be illustrated using the valuation models developed in section 5. The expected real rate of return is given in (4) and for simplification purposes we will let $\sigma_{m\pi}=0$ though the empirical evidence suggests a small negative covariance between realized market returns and the unexpected rate of inflation. The first price expression, which followed from the assumption of indefinite deferral of capital gains taxes, becomes

$$P= \frac{X(1-t)}{[E(\rho_f)+ Ca\sigma_m^2](1-t) -g- \pi t}$$

The second price expression, which followed from the assumption of regular payment of capital gains taxes becomes

$$P' = \frac{X}{E(\rho_f)+ Ca\sigma_m^2 -g}$$

Using parameter estimates previously discussed, it is possible to compute the derived impact of inflation upon prices, although the analysis remains highly sensitive to parameter values.

Assume t=.15, (1-h)=.35, α=.9. and a market price of risk of 2, which imply that C=7.5. If in addition $E_{(\rho f)}$ =.02 and g=.01, on an annual basis, the effect of going from a 3% to 10% sustained inflation would be to cause the P/E multiple to drop by 22% in the first model, and by 35% in the second model.[2]

[1] The effect of inflation on α cannot be estimated in the same fashion since comparable annual data do not exist. In any case, it is clear that we have over-estimated the depressant effect of inflation on a. These estimated real risk differentials seem lower than the estimates implied by realized nominal rates of return since the turn of the century (see Friend and Blume [9] and Ibbotson and Sinquefeld [19]). This might reflect an understatement of the estimates of C or σ_m^2 (the latter in the absence of inflation).

[2] The shift from a 3% to a 10% inflation should cause σ_m^2 to move from .00133 to .00223, based on a representative estimation (equation 7 in Table 18c).

We have used in this example a real growth rate g which probably errs on the low side, an expected real return on the nominally-risk free asset, ρ_f , which probably errs on the high side, and a market price of risk which probably errs on the low side. Making any of these changes increases the inflation impact.

The above analysis assumes that (1-t) and (1-h) remain fixed. On the basis of the regression estimations presented in the text, an increase of seven percentage points in the sustained inflation rate should be associated with a .01 drop in (1-t) and a .02 drop in (1-h). These parameter shifts suggest a decrease in the P/E multiple of 13% in the first valuation model and a decrease of 30% in the second valuation model. The margin of error in these estimations is high, however, and the declines in the parameters may be larger. If (1-t) and (1-h) drop by .03 and .05, respectively, the first valuation model suggests an increase of 13%, and the second would suggest a decrease of 23%, in the P/E multiple.

Thus, these results obtained from the implementation of our theoretical model are sufficiently sensitive to the values of the parameters assumed that the only strong conclusion that can be drawn is that the results of the empirical model are not clearly inconsistent with the results of our theoretical analysis. In summary, the personal income tax effect of change in the inflation rate upon real required before-tax market returns seems small and negative. Of greater potential importance is the positive tax effect on stock prices when capital gains taxation is deferred. The impact of inflation upon market variance both increases the before-tax rate of return and depresses stock prices.

However, we suspect that part of the increase in the required real return has little to do with the version of the CAPM developed in this section, reflecting instead the increase in unique (as distinguished from market) risks associated with inflation.[1]

[1] While the analysis of this section has been directed toward establishing an inflation-related increase in the real required return on equity, we note that the effect on the average cost of capital is more problematic. If leverage increased as a result of inflation, a rise in the weight of debt, which has a lower required rate of return than equity totally apart from the corporate tax effect, might more than offset the increase in the cost of equity, resulting in a net decrease in the real overall cost of capital, even if the real cost of debt were to increase.

7. Conclusion

Inflation has depressed not only stock prices and realized real market rates of return on stock, but also real dividends and earnings per share. However, while the decline in real dividends and in real book earnings per share associated with a one percentage point increase in sustained inflation appears to be of the same general order of magnitude, roughly about 5%, the decline seems to be somewhat more than double for real economic earnings per share, about 11%-14% depending on the sample studied. There is also strong evidence, although it is not conclusive, that inflation increases the uncertainty of real return on stock investment which would be expected to be associated with a significant increase in the real required rate of return and in the risk premium. On the basis of the empirical implementation of our theoretical model, the 7% growth in the inflation rate from the second half of the 1960s to the latter part of the 1970s appears to have been associated with an increase of 0.7 to 1.1 percentage points in the risk premium.

The implications of our theoretical model for the effects of inflation on price/earnings multiples are, however, less clear. The analysis is highly sensitive to tax assumptions and parameter choice, and the computations admit to changes in price-earnings multiples ranging from substantially negative to slightly positive. On the basis of our empirical analysis, the increase in price-earnings multiples associated with a one percentage point of sustained inflation was in the range of 0 to 5 percent, which is well within the range suggested by the theoretical analysis.

The negative impact of the level of expected inflation on realized returns seems smaller than suggested in the previous literature, once changes in expected inflation are incorporated into the analysis of market returns, and may simply reflect remaining statistical limitations of this analysis. We have deferred to a subsequent study the implications of the structure of the corporate balance sheet (i.e., the comparative importance of plant and equipment, inventories, cash, net receivables, short-term and long-run debt) as well as the level of output and relative price shifts for the impact of inflation on earnings, dividends, required returns and stock prices.

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Table 1. Inflation and NYSE Returns, Monthly

EQU	PERIOD	DEP VAR	CONST	DP[T]	DP[T-1]	DP[T-2]	DP[T-3]	DP[T-4]	DP[T-5]	DX[T+12]	DX[T+6]	EDP1MAA[T-1]	EDP1MIB[T-1]	TIME[T]	UDP1MAA[T]	UDP1MIB[T]	SUM	R2C	DW
1.	1926.02-1978.12	RRM[T]	0.009	-0.941													-0.941	0.009	1.796
			(3.5)	(-2.4)													(-2.4)		
2.	1926.02-1978.12	RRM[T]	0.010	-0.554	-0.332	-0.504	-0.331	0.221	-0.026								-1.526	0.015	1.803
			(3.8)	(-1.2)	(-0.7)	(-1.0)	(-0.7)	(0.5)	(-0.1)								(-2.7)		
3.	1926.02-1977.12	RRM[T]	0.004	-0.921						0.084	0.122						-0.921	0.057	1.867
			(1.5)	(-2.4)						(2.9)	(4.2)						(-2.4)		
4.	1926.02-1977.12	RRM[T]	0.005	-0.568	-0.311	-0.505	-0.315	0.244	-0.013	0.083	0.121						-1.467	0.063	1.874
			(1.8)	(-1.3)	(-0.6)	(-1.1)	(-0.7)	(0.5)	(0.0)	(2.9)	(4.2)						(-2.6)		
5.	1926.02-1977.12	RRM[T]	0.007	-0.852						0.085	0.123			-0.001			-0.852	0.058	1.868
			(1.3)	(-2.1)						(2.9)	(4.2)			(-0.6)			(-2.1)		
6.	1926.02-1977.12	RRM[T]	0.006	-0.559	-0.305	-0.498	-0.308	0.250	-0.004	0.083	0.121			0.000			-1.424	0.063	1.874
			(1.1)	(-1.2)	(-0.6)	(-1.0)	(-0.7)	(0.5)	(0.0)	(2.9)	(4.2)			(-0.2)			(-2.3)		
7.	1926.02-1940.12	RRM[T]	0.009	0.203													0.203	0.000	1.769
			(1.3)	(0.2)													(0.2)		
8.	1926.02-1940.12	RRM[T]	0.008	0.382	-0.048	-0.276	-0.713	0.126	-0.091								-0.619	0.004	1.776
			(1.1)	(0.3)	(0.0)	(-0.2)	(-0.6)	(0.1)	(-0.1)								(-0.4)		
9.	1926.02-1940.12	RRM[T]	0.003	0.267						0.119	0.148						0.267	0.072	1.861
			(0.4)	(0.3)						(2.1)	(2.7)						(0.3)		
10.	1926.02-1940.12	RRM[T]	0.002	0.369	0.100	-0.183	-0.711	0.128	-0.131	0.117	0.149						-0.427	0.073	1.866
			(0.2)	(0.3)	(0.1)	(-0.1)	(-0.6)	(0.1)	(-0.1)	(2.1)	(2.6)						(-0.3)		
11.	1926.02-1940.12	RRM[T]	0.036	0.668						0.149	0.177			-0.030			0.668	0.092	1.903
			(2.0)	(0.7)						(2.6)	(3.1)			(-2.0)			(0.7)		
12.	1926.02-1940.12	RRM[T]	0.035	0.602	0.259	0.022	-0.609	0.218	0.023	0.149	0.177			-0.029			0.514	0.091	1.901
			(1.9)	(0.5)	(0.2)	(0.0)	(-0.5)	(0.2)	(0.0)	(2.6)	(3.0)			(-1.9)			(0.3)		
13.	1947.01-1972.12	RRM[T]	0.011	-1.136													-1.136	0.014	1.951
			(4.6)	(-2.1)													(-2.1)		
14.	1947.01-1972.12	RRM[T]	0.014	-0.739	-0.771	-0.142	-0.317	0.383	-0.755								-2.341	0.031	1.940
			(4.9)	(-1.2)	(-1.2)	(-0.2)	(-0.5)	(0.6)	(-1.4)								(-2.9)		
15.	1947.02-1972.12	RRM[T]	0.013									-2.000			-0.759			0.021	1.960
			(4.7)									(-2.5)			(-1.3)				
16.	1947.01-1972.12	RRM[T]	0.013										-2.061			-0.859		0.022	1.962
			(4.8)										(-2.6)			(-1.5)			
17.	1947.01-1972.12	RRM[T]	0.006	-0.937							0.187						-0.937	0.067	2.043
			(2.3)	(-1.8)							(4.2)						(-1.8)		
18.	1947.01-1972.12	RRM[T]	0.008	-0.733	-0.677	-0.020	-0.131	0.561	-0.576		0.178						-1.578	0.076	2.026
			(2.4)	(-1.3)	(-1.1)	(0.0)	(-0.2)	(1.0)	(-1.1)		(3.9)						(-1.9)		
19.	1947.02-1972.12	RRM[T]	0.007								0.181	-1.336			-0.762			0.069	2.043
			(2.3)								(4.0)	(-1.7)			(-1.3)				
20.	1947.01-1972.12	RRM[T]	0.007								0.180		-1.331			-0.829		0.068	2.044
			(2.3)								(3.9)		(-1.7)			(-1.5)			
21.	1947.01-1972.12	RRM[T]	0.018	-0.899							0.189			-0.003			-0.899	0.071	2.052
			(1.8)	(-1.7)							(4.3)			(-1.2)			(-1.7)		
22.	1947.01-1972.12	RRM[T]	0.019	-0.698	-0.647	-0.009	-0.139	0.548	-0.610		0.180			-0.003			-1.554	0.080	2.034
			(1.9)	(-1.2)	(-1.1)	(0.0)	(-0.2)	(0.9)	(-1.1)		(3.9)			(-1.2)			(-1.9)		
23.	1947.02-1972.12	RRM[T]	0.018								0.183	-1.283		-0.003	-0.733			0.072	2.051
			(1.8)								(4.0)	(-1.6)		(-1.2)	(-1.3)				
24.	1947.01-1972.12	RRM[T]	0.019								0.181		-1.334	-0.003		-0.778		0.073	2.054
			(1.9)								(4.0)		(-1.7)	(-1.3)		(-1.4)			

Table 1 (continued).

EQU	PERIOD	DEP VAR	CONST	DP[T]	DP[T-1]	DP[T-2]	DP[T-3]	DP[T-4]	DP[T-5]	DX[T+6]	EDP1MAR[T-1]	EDP1MTB[T-1]	TIME[T]	UDP1MAR[T]	UDP1MTB[T]	SUM	R2C	DW
25.	1973.01-1978.12	RRM[T]	0.031 (2.5)	-5.061 (-3.1)												-5.061 (-3.1)	0.118	2.033
26.	1973.01-1978.12	RRM[T]	0.019 (1.0)	-5.354 (-3.1)	-0.080 (0.0)	1.651 (0.9)	-2.457 (-1.4)	1.841 (1.1)	1.110 (0.7)							-3.289 (-1.1)	0.171	1.948
27.	1973.01-1978.12	RRM[T]	0.028 (1.7)								-4.639 (-2.0)			-5.159 (-3.0)			0.118	2.042
28.	1973.01-1977.11	RRM[T]	0.036 (1.7)									-6.520 (-2.0)			-5.287 (-3.0)		0.154	2.198
29.	1973.01-1978.06	RRM[T]	0.018 (1.4)	-3.838 (-2.2)						0.220 (1.8)						-3.838 (-2.2)	0.157	2.167
30.	1973.01-1978.06	RRM[T]	-0.024 (-0.9)	-3.895 (-2.3)	1.065 (0.6)	2.124 (1.2)	-1.799 (-1.0)	3.158 (1.8)	2.000 (1.2)	0.372 (2.5)						2.654 (0.7)	0.246	2.183
31.	1973.01-1978.06	RRM[T]	0.010 (0.5)							0.246 (1.9)	-2.636 (-1.0)			-3.965 (-2.3)			0.159	2.207
32.	1973.01-1977.11	RRM[T]	0.003 (0.1)							0.264 (1.6)		-1.755 (-0.4)			-4.573 (-2.5)		0.188	2.341
33.	1973.01-1978.06	RRM[T]	-0.062 (-0.3)	-3.755 (-2.1)						0.205 (1.6)			0.013 (0.4)			-3.755 (-2.1)	0.156	2.172
34.	1973.01-1978.06	RRM[T]	-0.201 (-0.9)	-3.725 (-2.1)	1.245 (0.7)	2.253 (1.2)	-1.672 (-0.9)	3.306 (1.9)	2.095 (1.2)	0.358 (2.4)			0.028 (0.8)			3.502 (0.9)	0.250	2.209
35.	1973.01-1978.06	RRM[T]	-0.092 (-0.4)							0.231 (1.7)	-2.396 (-0.9)		0.016 (0.5)	-3.876 (-2.2)			0.160	2.221
36.	1973.01-1977.11	RRM[T]	-0.028 (-0.1)							0.265 (1.6)		-1.559 (-0.3)	0.005 (0.1)		-4.520 (-2.4)		0.185	2.343
37.	1947.01-1978.12	RRM[T]	0.012 (4.9)	-1.906 (-3.9)												-1.906 (-3.9)	0.038	1.983
38.	1947.01-1978.12	RRM[T]	0.014 (4.9)	-1.551 (-2.8)	-0.581 (-1.0)	0.187 (0.3)	-0.771 (-1.4)	0.795 (1.4)	-0.639 (-1.2)							-2.559 (-3.7)	0.052	1.960
39.	1947.02-1978.12	RRM[T]	0.013 (4.8)								-2.359 (-3.6)			-1.593 (-2.8)			0.040	1.980
40.	1947.01-1977.11	RRM[T]	0.015 (5.1)									-2.870 (-4.1)			-1.629 (-3.0)		0.051	2.015
41.	1947.01-1978.06	RRM[T]	0.006 (2.4)	-1.562 (-3.2)						0.204 (4.8)						-1.562 (-3.2)	0.094	2.091
42.	1947.01-1978.06	RRM[T]	0.007 (2.1)	-1.469 (-2.7)	-0.503 (-0.9)	0.258 (0.5)	-0.605 (-1.1)	1.035 (1.9)	-0.446 (-0.9)	0.202 (4.6)						-1.731 (-2.4)	0.105	2.067
43.	1947.02-1978.06	RRM[T]	0.007 (2.2)							0.202 (4.6)	-1.700 (-2.6)			-1.465 (-2.7)			0.094	2.088
44.	1947.01-1977.11	RRM[T]	0.007 (2.3)							0.197 (4.5)		-1.901 (-2.7)			-1.533 (-2.9)		0.099	2.112
45.	1947.01-1978.06	RRM[T]	0.017 (1.9)	-1.377 (-2.7)						0.205 (4.8)			-0.002 (-1.2)			-1.377 (-2.7)	0.098	2.097
46.	1947.01-1978.06	RRM[T]	0.016 (1.9)	-1.362 (-2.5)	-0.415 (-0.7)	0.315 (0.6)	-0.573 (-1.0)	1.060 (1.9)	-0.435 (-0.8)	0.206 (4.7)			-0.002 (-1.2)			-1.410 (-1.8)	0.108	2.074
47.	1947.02-1978.06	RRM[T]	0.016 (1.8)							0.206 (4.7)	-1.396 (-2.0)		-0.002 (-1.2)	-1.363 (-2.4)			0.097	2.099
48.	1947.01-1977.11	RRM[T]	0.018 (2.0)							0.200 (4.5)		-1.608 (-2.2)	-0.002 (-1.3)		-1.407 (-2.6)		0.103	2.120

Table 1 (continued).

EQU	PERIOD	DEP VAR	CONST	ΔSHMUNIBY[T]	DP[T]	DP[T-1]	DP[T-2]	DP[T-3]	DP[T-4]	DP[T-5]	DX[T+6]	EDP1MAR[T-1]	EDP1MTB[T-1]	TIME[T]	UDP1MAR[T]	UDP1MTB[T]	SUM	R2C	DW
49.	1947.02-1978.12	RRM[T]	0.012	-7.898	-1.581												-1.581	0.115	1.973
			(5.0)	(-5.8)	(-3.3)												(-3.3)		
50.	1947.02-1978.12	RRM[T]	0.014	-7.749	-1.235	-0.590	0.254	-0.648	0.689	-0.695							-2.226	0.126	1.954
			(5.0)	(-5.7)	(-2.2)	(-1.1)	(0.5)	(-1.2)	(1.3)	(-1.3)							(-3.3)		
51.	1947.02-1978.12	RRM[T]	0.013	-7.848								-1.945			-1.342			0.117	1.973
			(4.9)	(-5.7)								(-3.1)			(-2.5)				
52.	1947.02-1977.11	RRM[T]	0.015	-8.327									-2.651			-1.263		0.140	2.022
			(5.3)	(-6.1)									(-3.8)			(-2.4)			
53.	1947.02-1978.06	RRM[T]	0.006	-7.786	-1.253						0.194						-1.253	0.169	2.086
			(2.5)	(-5.8)	(-2.7)						(4.7)						(-2.7)		
54.	1947.02-1978.06	RRM[T]	0.007	-7.700	-1.166	-0.526	0.330	-0.432	0.928	-0.510	0.192						-1.425	0.177	2.064
			(2.2)	(-5.7)	(-2.2)	(-1.0)	(0.6)	(-0.9)	(1.8)	(-1.0)	(4.5)						(-2.0)		
55.	1947.02-1978.06	RRM[T]	0.007	-7.779							0.192	-1.320			-1.214			0.169	2.085
			(2.2)	(-5.8)							(4.6)	(-2.1)			(-2.3)				
56.	1947.02-1977.11	RRM[T]	0.008	-8.094							0.183		-1.694			-1.223		0.181	2.117
			(2.5)	(-6.1)							(4.3)		(-2.4)			(-2.3)			
57.	1947.02-1978.06	RRM[T]	0.018	-7.837	-1.051						0.195			-0.003			-1.051	0.173	2.095
			(2.1)	(-5.9)	(-2.2)						(4.8)			(-1.4)			(-2.2)		
58.	1947.02-1978.06	RRM[T]	0.017	-7.775	-1.062	-0.432	0.418	-0.430	0.952	-0.481	0.197			-0.003			-1.035	0.181	2.075
			(2.1)	(-5.8)	(-2.0)	(-0.8)	(0.8)	(-0.8)	(1.8)	(-0.9)	(4.6)			(-1.3)			(-1.4)		
59.	1947.02-1978.06	RRM[T]	0.018	-7.847							0.197	-0.960		-0.003	-1.093			0.173	2.096
			(2.1)	(-5.9)							(4.7)	(-1.4)		(-1.4)	(-2.0)				
60.	1947.02-1977.11	RRM[T]	0.020	-8.205							0.188		-1.293	-0.003		-1.104		0.186	2.130
			(2.3)	(-6.1)							(4.4)		(-1.7)	(-1.5)		(-2.1)			

DP	Monthly inflation in CPI.
RRM	Real return on S&P 500. (Dividend yield plus capital gains minus DP.)
EDP1MAR	Expected value of DP next period, based on an autoregressive forecasting model with 5 lagged months and estimated over the preceding 40 months.
UDP1MAR	Unexpected inflation using the autoregressive expectations proxy.
EDP1MTB	Expected value of DP next period based on one-month Treasury bill yields.
UDP1MTB	Unexpected inflation using the T-bill expectations proxy.
TIME	Initialized to .01 in 1924.01; incremented by .01 each month thereafter.
DX	6-month rate of change in the Federal Reserve Board total industrial production index.
SUM	Sum of the DP coefficients.
R2C	R^2 corrected for degrees of freedom.
DW	Durbin-Watson statistic.

T-statistics are in parentheses.

Table 2. Inflation and NYSE Returns, Quarterly

EQU	PERIOD	DEP VAR	CONST	DP[T]	DP[T-1]	DP[T-2]	DP[T-3]	DX[T+2]	DX[T+4]	EDP1QAR[T-1]	EDP1QTB[T-1]	TIME[T]	UDP1QAR[T]	UDP1QTB[T]	SUM	R2C	DW
1.	1926.1-1978.4	RRM[T]	0.029 (3.0)	-0.902 (-1.5)											-0.902 (-1.5)	0.011	2.213
2.	1926.1-1978.4	RRM[T]	0.033 (3.3)	-0.192 (-0.3)	-0.996 (-1.3)	-0.559 (-0.7)	0.146 (0.2)								-1.602 (-2.1)	0.027	2.243
3.	1926.1-1977.4	RRM[T]	0.019 (1.9)	-0.883 (-1.5)				0.056 (0.5)	0.310 (2.9)						-0.883 (-1.5)	0.055	2.221
4.	1926.1-1977.4	RRM[T]	0.024 (2.3)	-0.169 (-0.2)	-0.910 (-1.2)	-0.597 (-0.8)	0.031 (0.0)	0.058 (0.5)	0.306 (2.9)						-1.645 (-2.2)	0.070	2.256
5.	1926.1-1977.4	RRM[T]	0.031 (1.6)	-0.729 (-1.2)				0.058 (0.5)	0.312 (2.9)			-0.011 (-0.7)			-0.729 (-1.2)	0.057	2.226
6.	1926.1-1977.4	RRM[T]	0.028 (1.4)	-0.142 (-0.2)	-0.891 (-1.2)	-0.578 (-0.8)	0.052 (0.1)	0.058 (0.5)	0.307 (2.9)			-0.004 (-0.2)			-1.560 (-1.8)	0.070	2.257
7.	1926.1-1940.4	RRM[T]	0.039 (1.4)	1.574 (0.9)											1.574 (0.9)	0.014	2.466
8.	1926.1-1940.4	RRM[T]	0.029 (1.0)	2.743 (1.5)	-2.086 (-1.1)	-2.051 (-1.1)	0.233 (0.1)								-1.160 (-0.5)	0.065	2.599
9.	1926.1-1940.4	RRM[T]	0.029 (1.0)	1.526 (0.9)				-0.057 (-0.3)	0.420 (2.0)						1.526 (0.9)	0.078	2.351
10.	1926.1-1940.4	RRM[T]	0.019 (0.7)	2.706 (1.5)	-1.662 (-0.9)	-2.155 (-1.2)	-0.163 (-0.1)	-0.042 (-0.2)	0.413 (2.0)						-1.275 (-0.5)	0.120	2.508
11.	1926.1-1940.4	RRM[T]	0.108 (1.5)	2.076 (1.2)				0.013 (0.1)	0.491 (2.3)			-0.209 (-1.2)			2.076 (1.2)	0.099	2.453
12.	1926.1-1940.4	RRM[T]	0.085 (1.2)	3.071 (1.6)	-1.451 (-0.8)	-2.066 (-1.1)	-0.167 (-0.1)	0.014 (0.1)	0.474 (2.2)			-0.173 (-1.0)			-0.612 (-0.2)	0.132	2.594
13.	1947.1-1972.4	RRM[T]	0.038 (4.7)	-1.859 (-2.5)											-1.859 (-2.5)	0.055	1.830
14.	1947.1-1972.4	RRM[T]	0.042 (4.7)	-1.200 (-1.4)	-1.190 (-1.4)	0.665 (1.0)	-0.640 (-1.1)								-2.365 (-2.7)	0.077	1.796
15.	1947.2-1972.4	RRM[T]	0.042 (4.9)							-2.385 (-2.8)			-1.403 (-1.7)			0.069	1.799
16.	1947.1-1972.4	RRM[T]	0.043 (4.8)								-2.435 (-2.8)			-1.318 (-1.6)		0.072	1.853
17.	1947.1-1972.4	RRM[T]	0.020 (2.3)	-1.216 (-1.7)				0.563 (4.0)							-1.216 (-1.7)	0.181	2.045
13.	1947.1-1972.4	RRM[T]	0.022 (2.2)	-0.889 (-1.1)	-0.634 (-0.8)	0.625 (1.0)	-0.506 (-0.9)	0.546 (3.8)							-1.404 (-1.6)	0.186	2.014
19.	1947.2-1972.4	RRM[T]	0.023 (2.4)					0.544 (3.8)		-1.536 (-1.8)			-0.966 (-1.2)			0.183	2.020
20.	1947.1-1972.4	RRM[T]	0.022 (2.2)					0.545 (3.7)			-1.428 (-1.7)			-1.058 (-1.3)		0.181	2.048
21.	1947.1-1972.4	RRM[T]	0.053 (1.8)	-1.146 (-1.6)				0.572 (4.1)				-0.023 (-1.2)			-1.146 (-1.6)	0.190	2.072
22.	1947.1-1972.4	RRM[T]	0.058 (1.9)	-0.754 (-0.9)	-0.612 (-0.7)	0.567 (0.9)	-0.597 (-1.0)	0.552 (3.8)				-0.025 (-1.2)			-1.397 (-1.6)	0.196	2.046
23.	1947.2-1372.4	RRM[T]	0.064 (2.0)					0.549 (3.8)		-1.502 (-1.8)		-0.029 (-1.4)	-0.799 (-1.0)			0.195	2.053
24.	1947.1-1972.4	RRM[T]	0.063 (2.0)					0.543 (3.7)			-1.492 (-1.8)	-0.027 (-1.3)		-0.866 (-1.1)		0.193	2.044

Table 2. (continued).

EQU	PERIOD	DEP VAR	CONST	DP[T]	DP[T-1]	DP[T-2]	DP[T-3]	DX[T+2]	EDP1QAR[T-1]	EDP1QTB[T-1]	TIME[T]	UDP1QAR[T]	UDP1QTB[T]	SUM	R2C	DW
25.	1973.1-1978.4	RRM[T]	0.138 (2.1)	-7.311 (-2.3)										-7.311 (-2.3)	0.192	1.771
26.	1973.1-1978.4	RRM[T]	0.084 (1.0)	-9.324 (-2.6)	3.889 (1.0)	-1.169 (-0.3)	2.271 (0.6)							-4.334 (-1.0)	0.220	1.917
27.	1973.1-1978.4	RRM[T]	0.115 (1.6)						-6.059 (-1.7)			-8.159 (-2.4)			0.199	1.809
28.	1973.1-1978.1	RRM[T]	0.084 (1.1)							-4.994 (-1.3)			-12.277 (-3.7)		0.391	2.312
29.	1973.1-1978.2	RRM[T]	0.018 (0.3)	-2.315 (-0.7)				1.229 (2.9)						-2.315 (-0.7)	0.415	1.974
30.	1973.1-1978.2	RRM[T]	-0.110 (-1.3)	-4.027 (-1.3)	6.293 (1.8)	2.214 (0.7)	-0.161 (-0.1)	1.658 (3.7)						4.319 (1.1)	0.470	2.187
31.	1973.1-1978.2	RRM[T]	-0.086 (-1.1)					1.636 (3.9)	3.010 (0.8)			-3.093 (-1.1)			0.501	2.205
32.	1973.1-1978.1	RRM[T]	-0.050 (-0.6)					1.133 (2.9)		1.236 (0.3)			-7.173 (-2.2)		0.526	2.371
33.	1973.1-1978.2	RRM[T]	0.078 (0.1)	-2.381 (-0.7)				1.237 (2.8)			-0.029 (-0.1)			-2.381 (-0.7)	0.393	1.971
34.	1973.1-1978.2	RRM[T]	-0.344 (-0.5)	-3.799 (-1.2)	6.449 (1.8)	2.385 (0.7)	-0.291 (-0.1)	1.645 (3.6)			0.109 (0.4)			4.745 (1.1)	0.443	2.193
35.	1973.1-1978.2	RRM[T]	-0.250 (-0.4)					1.622 (3.7)	3.283 (0.8)		0.076 (0.3)	-2.932 (-1.0)			0.475	2.208
36.	1973.1-1978.1	RRM[T]	0.394 (0.6)					1.133 (2.8)		0.028 (0.0)	-0.204 (-0.6)		-8.052 (-2.2)		0.502	2.445
37.	1947.1-1978.4	RRM[T]	0.042 (4.8)	-2.474 (-3.7)										-2.474 (-3.7)	0.096	1.803
38.	1947.1-1978.4	RRM[T]	0.043 (4.4)	-2.185 (-2.5)	-0.613 (-0.7)	0.459 (0.6)	-0.254 (-0.4)							-2.592 (-3.3)	0.097	1.785
39.	1947.2-1978.4	RRM[T]	0.045 (4.7)						-2.724 (-3.6)			-2.139 (-2.7)			0.098	1.786
40.	1947.1-1978.1	RRM[T]	0.046 (4.7)							-3.032 (-3.9)			-2.506 (-3.0)		0.121	1.834
41.	1947.1-1978.2	RRM[T]	0.018 (2.0)	-1.645 (-2.6)				0.715 (5.3)						-1.645 (-2.6)	0.264	2.034
42.	1947.1-1978.2	RRM[T]	0.016 (1.6)	-1.724 (-2.2)	-0.070 (-0.1)	0.498 (0.7)	-0.171 (-0.3)	0.726 (5.2)						-1.466 (-1.9)	0.261	2.031
43.	1947.2-1978.2	RRM[T]	0.018 (1.8)					0.713 (5.1)	-1.667 (-2.3)			-1.615 (-2.2)			0.260	2.032
44.	1947.1-1978.1	RRM[T]	0.018 (1.7)					0.707 (5.1)		-1.703 (-2.3)			-2.011 (-2.6)		0.270	2.038
45.	1947.1-1978.2	RRM[T]	0.046 (1.8)	-1.339 (-1.9)				0.730 (5.3)			-0.020 (-1.1)			-1.339 (-1.9)	0.269	2.052
46.	1947.1-1978.2	RRM[T]	0.044 (1.6)	-1.432 (-1.7)	0.054 (0.1)	0.454 (0.7)	-0.218 (-0.4)	0.744 (5.3)			-0.020 (-1.1)			-1.132 (-1.4)	0.267	2.047
47.	1947.2-1978.2	RRM[T]	0.048 (1.8)					0.729 (5.2)	-1.321 (-1.7)		-0.021 (-1.2)	-1.282 (-1.6)			0.266	2.052
48.	1947.1-1978.1	RRM[T]	0.049 (1.8)					0.720 (5.2)		-1.406 (-1.8)	-0.022 (-1.2)		-1.659 (-2.0)		0.277	2.057

Table 2 (continued).

EQU	PERIOD	DEP VAR	CONST	ΔSPMUVIBY[T]	DP[T]	DP[T-1]	DP[T-2]	DP[T-3]	DX[T+2]	EDP1QAR[T-1]	EDP1QTB[T-1]	TIME[T]	UDP1QAR[T]	UDP1QTB[T]	SUM	R2C	DW
49.	1947.2-1978.4	RRM[T]	0.040	-8.213	-1.915										-1.915	0.187	1.765
			(4.7)	(-3.8)	(-2.9)										(-2.9)		
50.	1947.2-1978.4	RRM[T]	0.041	-8.290	-1.582	-0.570	0.699	-0.506							-1.959	0.189	1.741
			(4.3)	(-3.8)	(-1.9)	(-0.6)	(0.8)	(-0.8)							(-2.5)		
51.	1947.2-1978.4	RRM[T]	0.042	-8.133						-2.108			-1.682			0.188	1.753
			(4.6)	(-3.8)						(-2.9)			(-2.2)				
52.	1947.2-1978.1	RRM[T]	0.045	-8.838							-2.612			-1.887		0.224	1.797
			(4.8)	(-4.1)							(-3.4)			(-2.3)			
53.	1947.2-1978.2	RRM[T]	0.018	-6.722	-1.254				0.661						-1.254	0.321	1.987
			(2.0)	(-3.4)	(-2.0)				(5.0)						(-2.0)		
54.	1947.2-1978.2	RRM[T]	0.015	-6.740	-1.278	-0.025	0.891	-0.480	0.681						-0.892	0.321	1.985
			(1.4)	(-3.3)	(-1.6)	(0.0)	(1.1)	(-0.8)	(5.0)						(-1.1)		
55.	1947.2-1978.2	RRM[T]	0.018	-6.727					0.663	-1.234			-1.273			0.319	1.989
			(1.8)	(-3.3)					(4.9)	(-1.7)			(-1.8)				
56.	1947.2-1978.1	RRM[T]	0.019	-7.415					0.634		-1.442			-1.561		0.338	1.994
			(1.9)	(-3.7)					(4.7)		(-1.9)			(-2.1)			
57.	1947.2-1978.2	RRM[T]	0.054	-6.939	-0.830				0.679			-0.025			-0.830	0.330	2.016
			(2.1)	(-3.5)	(-1.2)				(5.1)			(-1.5)			(-1.2)		
58.	1947.2-1978.2	RRM[T]	0.059	-7.045	-0.801	0.203	1.120	-0.685	0.717			-0.033			-0.163	0.336	2.025
			(2.2)	(-3.5)	(-1.0)	(0.2)	(1.4)	(-1.1)	(5.3)			(-1.8)			(-0.2)		
59.	1947.2-1978.2	RRM[T]	0.053	-6.946					0.681	-0.801		-0.025	-0.858			0.327	2.018
			(2.1)	(-3.5)					(5.1)	(-1.0)		(-1.5)	(-1.1)				
60.	1947.2-1978.1	RRM[T]	0.060	-7.713					0.651		-0.974	-0.029		-1.095		0.350	2.032
			(2.3)	(-3.8)					(4.8)		(-1.2)	(-1.7)		(-1.4)			

DP	Quarterly inflation in CPI.
RRM	Real return on S&P 500. (Dividend yield plus capital gains minus DP.)
EDP1QAF	Expected value of DP next period, based on an autoregressive forecasting model with 6 lagged quarters and estimated over the preceding 40 quarters.
UDP1QAF	Unexpected inflation using the autoregressive expectations proxy.
EDP1QTB	Expected value of DP next period based on one-quarter treasury bill yields.
UDP1QTB	Unexpected inflation using the T-bill expectations proxy.
TIME	Initialized to .01 in 1924 I; incremented by .01 each quarter thereafter.
DX	2-quarter rate of change in the Federal Reserve Board total industrial production index.

Table 3. Inflation and NYSE Returns, Annual

EQU	PERIOD	DEP VAR	CONST	DP[T]	DP[T-1]	DP[T-2]	DP[T-3]	DX[T]	DX[T+1]	EDP1YAR[T-1]	EDP1YTBQ[T-1]	TIME[T]	UDP1YAR[T]	UDP1YTBQ[T]	SUM	R2C	DW
1.	1927-1978	RRM[T]	0.118 (3.2)	-1.131 (-1.7)											-1.131 (-1.7)	0.054	1.941
2.	1928-1978	RRM[T]	0.101 (2.5)	-1.374 (-1.6)	0.599 (0.6)	-0.177 (-0.2)	0.288 (0.3)								-0.664 (-0.7)	0.051	1.978
3.	1927-1977	RRM[T]	0.079 (2.3)	-1.888 (-3.0)				0.966 (3.9)	0.204 (0.8)						-1.888 (-3.0)	0.287	1.668
4.	1928-1977	RRM[T]	0.040 (1.1)	-2.599 (-3.3)	1.163 (1.3)	-0.370 (-0.4)	1.045 (1.4)	1.154 (4.5)	0.168 (0.7)						-0.760 (-0.9)	0.331	1.726
5.	1927-1977	RRM[T]	0.058 (0.9)	-2.014 (-2.9)				0.979 (3.9)	0.205 (0.8)			0.084 (0.4)			-2.014 (-2.9)	0.283	1.651
6.	1928-1977	RRM[T]	0.042 (0.6)	-2.594 (-3.2)	1.165 (1.2)	-0.367 (-0.4)	1.048 (1.3)	1.154 (4.5)	0.168 (0.7)			-0.005 (0.0)			-0.748 (-0.7)	0.323	1.726
7.	1927-1940	RRM[T]	0.129 (1.5)	1.989 (1.0)											1.989 (1.0)	0.070	2.207
8.	1928-1940	RRM[T]	0.077 (0.7)	2.645 (0.9)	-1.273 (-0.4)	-0.579 (-0.2)	-0.473 (-0.2)								0.320 (0.1)	0.099	2.670
9.	1927-1940	RRM[T]	0.028 (0.3)	-0.835 (-0.5)				1.368 (3.0)	0.020 (0.0)						-0.835 (-0.5)	0.401	1.271
10.	1928-1940	RRM[T]	-0.020 (-0.2)	-0.601 (-0.3)	-0.496 (-0.2)	-0.649 (-0.3)	-0.380 (-0.2)	1.490 (3.2)	-0.196 (-0.5)						-2.126 (-0.8)	0.340	2.026
11.	1927-1940	RRM[T]	0.482 (3.1)	0.028 (0.0)				1.617 (4.8)	0.391 (1.3)						0.028 (0.0)	0.535	2.132
12.	1928-1940	RRM[T]	0.458 (1.4)	0.064 (0.0)	-0.255 (-0.1)	0.658 (0.3)	0.245 (0.1)	1.660 (3.7)	0.371 (0.7)						0.712 (0.2)	0.325	2.165
13.	1947-1978	RRM[T]	0.201 (4.3)	-3.109 (-3.3)								-4.517 (-3.2)			-3.109 (-3.3)	0.254	2.323
14.	1947-1978	RRM[T]	0.183 (3.2)	-4.161 (-3.2)	1.363 (1.2)	-0.679 (-0.7)	0.767 (0.8)					-4.285 (-1.5)			-2.710 (-2.1)	0.265	2.411
15.	1948-1978	RRM[T]	0.186 (3.7)							-2.747 (-2.4)			-3.764 (-3.1)			0.257	2.265
16.	1951-1977	RRM[T]	0.180 (3.5)								-3.351 (-3.0)			-7.265 (-4.2)		0.430	2.498
17.	1947-1977	RRM[T]	0.045 (0.8)	-2.231 (-2.6)				1.522 (4.0)	1.095 (2.7)						-2.231 (-2.6)	0.525	1.989
18.	1947-1977	RRM[T]	0.025 (0.4)	-3.112 (-2.5)	1.308 (1.3)	0.152 (0.2)	-0.512 (-0.6)	1.691 (4.3)	1.213 (2.4)						-2.164 (-2.0)	0.515	1.880
19.	1948-1977	RRM[T]	0.001 (0.0)					1.775 (4.6)	1.059 (2.8)	-1.329 (-1.4)			-3.360 (-3.4)			0.563	1.901
20.	1951-1977	RRM[T]	-0.010 (-0.2)					1.821 (3.8)	0.975 (2.2)		-1.342 (-1.3)			-5.680 (-3.8)		0.587	2.002
21.	1947-1977	RRM[T]	0.144 (1.3)	-1.770 (-1.8)				1.546 (4.0)	1.164 (2.8)			-0.307 (-1.0)			-1.770 (-1.8)	0.519	2.086
22.	1947-1977	RRM[T]	0.093 (0.8)	-2.475 (-1.6)	0.988 (0.9)	0.390 (0.4)	-0.680 (-0.7)	1.711 (4.3)	1.337 (2.4)			-0.225 (-0.7)			-1.777 (-1.5)	0.498	1.928
23.	1948-1977	RRM[T]	0.136 (1.2)					1.850 (4.9)	1.164 (3.0)	-0.379 (-0.3)		-0.443 (-1.3)	-2.511 (-2.2)			0.559	1.969
24.	1951-1977	RRM[T]	0.155 (1.0)					2.102 (4.0)	1.177 (2.4)		-0.078 (-0.1)	-0.557 (-1.1)		-4.095 (-2.0)		0.575	2.029

Table 3 (continued).

EQU	PERIOD	DEP VAR	CONST	ΔSPMUNIBY[T]	DP[T]	DP[T-1]	DP[T-2]	DP[T-3]	DX[T]	DX[T+1]	EDP1YAR[T-1]	EDP1YTBQ[T-1]	TIME[T]	UDP1YAR[T]	UDP1YTBQ[T]	SUM	R2C	DW
25.	1948-1978	RRM[T]	0.198	-3.822	-2.919											-2.919	0.253	2.352
			(4.1)	(-0.8)	(-2.7)											(-2.7)		
26.	1948-1978	RRM[T]	0.181	-4.177	-4.389	2.750	-1.591	0.891								-2.340	0.276	2.492
			(3.1)	(-0.8)	(-2.9)	(1.5)	(-1.2)	(0.9)								(-1.7)		
27.	1948-1978	RRM[T]	0.183	-3.424							-2.534			-3.472			0.259	2.301
			(3.5)	(-0.7)							(-2.1)			(-2.7)				
28.	1951-1977	RRM[T]	0.180	-0.748								-3.312			-7.151		0.413	2.515
			(3.4)	(-0.2)								(-2.9)			(-3.7)			
29.	1948-1977	RRM[T]	0.048	-0.583	-2.295				1.501	1.076						-2.295	0.500	1.998
			(0.8)	(-0.1)	(-2.4)				(3.7)	(2.5)						(-2.4)		
30.	1948-1977	RRM[T]	0.030	-1.481	-4.498	3.996	-1.495	0.410	1.819	0.746						-1.587	0.517	1.947
			(0.5)	(-0.3)	(-3.0)	(2.2)	(-1.1)	(0.4)	(4.5)	(1.3)						(-1.4)		
31.	1948-1977	RRM[T]	-0.001	0.619					1.789	1.077	-1.341			-3.393			0.541	1.916
			(0.0)	(0.2)					(4.5)	(2.7)	(-1.4)			(-3.3)				
32.	1951-1977	RRM[T]	-0.017	2.432					1.858	1.057		-1.420			-5.938		0.565	2.002
			(-0.3)	(0.6)					(3.8)	(2.2)		(-1.4)			(-3.8)			
33.	1948-1977	RRM[T]	0.172	-1.372	-1.467				1.541	1.147			-0.393			-1.467	0.494	2.091
			(1.3)	(-0.3)	(-1.2)				(3.8)	(2.6)			(-1.0)			(-1.2)		
34.	1948-1977	RRM[T]	0.202	-2.770	-3.474	4.295	-1.612	0.363	1.902	0.843			-0.550			-0.427	0.517	2.048
			(1.6)	(-0.7)	(-2.2)	(2.4)	(-1.3)	(0.4)	(4.8)	(1.5)			(-1.6)			(-0.3)		
35.	1948-1977	RRM[T]	0.138	-0.236					1.845	1.158	-0.366		-0.447	-2.491			0.536	1.964
			(1.1)	(-0.1)					(4.6)	(2.9)	(-0.3)		(-1.3)	(-2.0)				
36.	1951-1977	RRM[T]	0.145	0.474					2.095	1.183		-0.156	-0.529		-4.224		0.548	2.027
			(0.8)	(0.1)					(3.8)	(2.4)		(-0.1)	(-0.9)		(-1.8)			

DP — Annual inflation in CPI.

RRM — Real return on S&P 500. (Dividend yield plus capital gains minus DP.)

EDP1YAR — Expected value of DP next period, based on an autoregressive forecasting model with 3 lagged years and estimated over the preceeding 20 years.

UDP1YAR — Unexpected inflation using the autoregressive expectations proxy.

EDP1YTBQ — Expected value of DP next period based on annualized 3-month Treasury bill yields.

UDP1YTBQ — Unexpected inflation using the T-bill expectations proxy.

TIME — Initialized to .01 in 1924; incremented by .01 each month thereafter.

DX — Annual rate of change in the Federal Reserve Board total industrial production index.

Table 4

Inflation and N.Y.S.E Stock Returns
Five and Ten Year Holding Periods, 1900-77

Equation	FROM	TO	HOLD. PER.	OVER LAP?	NO. OBS.	DEP. VAR.	CONST.	DP(T)	DP(T-1)	Sum	R2C	DW
1.	1900	1977	5	YES	73	RM(T)	.086 (7.2)	.167 (0.6)		.167 (0.6)	.005	.49
2.	1900	1977	5	NO	15	RM(T)	.074 (2.2)	.522 (0.6)		.522 (0.6)	.026	2.87
3.	1900	1977	5	YES	73	RM(T)	-.021 (-.3)	.003 (0.1)	.095 (2.0)	.098 (1.5)	.053	.55
4.	1900	1977	5	YES	15	RM(T)	-.019 (-.1)	.059 (0.3)	.035 (0.2)	.094 (0.4)	.015	2.97
5.	1900	1940	5	YES	36	RM(T)	.071 (4.3)	.274 (0.8)		.274 (0.8)	.016	.57
6.	1900	1940	5	NO	8	RM(T)	.070 (2.3)	.038 (0.1)		.038 (0.1)	.001	2.26
7.	1900	1940	5	YES	36	RM(T)	-.005 (-.1)	.026 (0.4)	.047 (0.8)	.073 (.8)	.021	.59
8.	1900	1940	5	NO	8	RM(T)	-.001 (-0)	.008 (.1)	.058 (.6)	.066 (.5)	.052	2.67
9.	1947	1977	5	YES	26	RM(T)	.181 (10.7)	-2.26 (-4.9)		-2.26 (-4.9)	.482	.55
10.	1947	1977	5	NO	6	RM(T)	.172 (5.4)	-1.85 (-2.4)		-1.85 (-2.4)	.470	.88
11.	1947	1977	5	YES	26	RM(T)	.213 (3.2)	-.441 (-10.3)	.355 (7.7)	-.087 (-1.5)	.792	2.17
12.	1947	1977	5	NO	6	RM(T)	.223 (3.8)	-.424 (-10.5)	.331 (6.7)	-.092 (-1.9)	.585	2.09
13.	1900	1977	10	YES	68	RM(T)	.086 (10.2)	.194 (.8)			.010	.24
14.	1900	1977	10	NO	7	RM(T)	.096 (3.1)	.-247 (-.3)			.014	2.26
15.	1900	1977	10	YES	68	RM(T)	-.114 (-2.5)	.059 (3.0)	.102 (5.1)	.161 (4.7)	.312	.31
16.	1900	1977	10	NO	7	RM(T)	-.126 (-.6)	.021 (0.3)	.153 (1.5)	.173 (1.1)	.275	2.04

The form of the regressions in this table is

$$RM(T) = CONST + a\ DP(T)$$

or

$$RM(T) = CONST + a\ DP(T) + b\ DP(T-1)$$

RM is the nominal NYSE market return on an annual basis. It is computed using the Cowles investment relatives prior to 1926 and the S&P 500 relatives thereafter.

DP is the inflation at annual rates computed from the NBER historical consumer price index prior to 1914 and the BLS CPI thereafter.

Table 5

Inflation and All Stock Returns

Annual Data

EQU	PERIOD	DEP VAR	CONST	DP[T]	DP[T-1]	DX[T]	DX[T+1]	SUM	R2C	DW
1.	1947-1978	RMTOT[T]	0.200 (4.7)	-2.319 (-2.6)				-2.319 (-2.6)	0.181	2.361
2.	1947-1978	RMTOT[T]	0.192 (4.3)	-2.886 (-2.6)	0.745 (0.8)			-2.142 (-2.3)	0.192	2.332
3.	1947-1977	RMTOT[T]	0.071 (1.4)	-1.108 (-1.1)	0.231 (0.3)	-0.207 (-0.5)	1.886 (4.4)	-0.877 (-1.1)	0.490	2.208

RMTOT(T) annual market return (nominal) computed from FRB flow - of - funds data $= \left(\frac{M_T - \frac{1}{2} I_T}{M_{T-1} + \frac{1}{2} I_T}\right) - 1 + \frac{D_T}{M_{T-1}}$

where M_T = total market value of all stock at the end of year T, I_T = new issues during year T, and D_T = dividends paid during year T; DP_T = annual inflation in CPI (year-end-to-year-end); and $DX_T = \frac{X_T}{X_{T-1}} - 1$, where

X_T is the average level of the FRB total industrial production index.

Table 6

Inflation and Marketable Asset Returns

Quarterly

EQU	*PERIOD*	*DEP VAR*	*CONST*	*DP[T]*	*DP[T-1]*	*DX[T]*	*DX[T+1]*	*DX[T+2]*	*TIME[T]*	*SUM*	*R2C*	*DW*	*RHO*
1.	1952.3-1978.4	*RW[T]*	0.020 (6.5)	-0.160 (-0.9)						-0.160 (-0.9)	0.367	1.338	0.599
2.	1952.3-1978.4	*RW[T]*	0.022 (6.0)	-0.168 (-0.9)	-0.177 (-0.9)					-0.345 (-1.3)	0.368	1.356	0.617
3.	1952.3-1978.4	*RW[T]*	-0.014 (-0.9)	-0.387 (-1.8)	-0.399 (-1.9)				0.023 (2.4)	-0.787 (-2.4)	0.394	1.388	0.562
4.	1952.3-1978.2	*RW[T]*	-0.002 (-0.1)	-0.126 (-0.6)	-0.209 (-1.0)	0.111 (2.5)	0.125 (2.8)	0.057 (1.2)	0.012 (1.2)	-0.335 (-1.0)	0.445	1.346	0.518

$RW(T) = \frac{W_T}{W_{T-1}} - 1$ where W_T is nominal household wealth from the MPS model; $DP(T) = \frac{CPI_T}{CPI_{T-1}} - 1$ (quarterly inflation); $DX(T) = \frac{X_T}{X_{T-1}} - 1$ = quarterly change in FRB total industrial production index; and TIME(T) = time trend .01 in 1924 I (T increase .01 each quarter). The equations are fitted using a Cochrane - Orcutt autocorrelation correction.

RHO is the autocorrelation coefficient from the Cochane-Orcutt procedure.

Table 8 Inflation and Deflated Dividends Per Share

Annual Data

EQU	PERIOD	DEP VAR	CONST	DP[T]	DP[T-1]	DP[T-2]	DP[T-3]	DP[T-4]	TIME[T]	SUM	R2C	DW	RHO	RHO2
1.	1946-1978	LOG RSPDIVS[T]	0.923 (2.9)	1.067 (2.6)					-0.089 (-0.1)	1.067 (2.6)	0.844	1.458	0.826	
2.	1946-1978	LOG RSPDIVS[T]	0.720 (3.0)	0.928 (2.4)	-0.737 (-3.0)				0.403 (0.7)	0.191 (0.4)	0.828	1.617	0.793	
3.	1946-1978	LOG RSPDIVS[T]	0.526 (2.8)	0.226 (0.6)	-0.915 (-4.2)	-0.838 (-3.3)			0.978 (2.2)	-1.527 (-2.3)	0.809	1.364	0.775	
4.	1946-1978	LOG RSPDIVS[T]	0.456 (2.4)	0.051 (0.1)	-1.011 (-3.7)	-0.932 (-3.0)	-0.159 (-0.5)		1.178 (2.4)	-2.051 (-1.7)	0.778	1.272	0.759	
5.	1946-1978	LOG RSPDIVS[T]	1.011 (2.9)	0.119 (0.2)	-0.488 (-1.5)	-0.514 (-1.5)	0.227 (0.7)	0.657 (2.4)	-0.137 (-0.2)	0.002 (0.0)	0.752	1.172	0.863	
6.	1946-1978	LOG RSPDIVS[T]	0.606 (2.1)	0.981 (2.2)					0.547 (0.8)	0.981 (2.2)	0.801	1.865	1.093	-0.279
7.	1946-1978	LOG RSPDIVS[T]	1.090 (2.6)	1.225 (3.9)	-1.664 (-5.3)				-0.190 (-0.2)	-0.439 (-1.1)	0.794	1.201	0.705	0.174
8.	1946-1978	LOG RSPDIVS[T]	0.634 (1.4)	0.486 (1.5)	-1.425 (-5.5)	-0.828 (-4.0)			0.803 (0.9)	-1.767 (-3.1)	0.774	1.848	1.032	-0.130
9.	1946-1978	LOG RSPDIVS[T]	0.021 (0.1)	-0.421 (-1.0)	-1.954 (-5.4)	-1.518 (-5.2)	-0.728 (-2.7)		2.343 (4.8)	-4.621 (-3.9)	0.745	1.753	1.113	-0.319
10.	1946-1978	LOG RSPDIVS[T]	0.574 (0.9)	0.008 (0.0)	-1.206 (-2.4)	-0.892 (-2.3)	-0.138 (-0.4)	0.424 (1.5)	0.904 (0.6)	-1.803 (-1.0)	0.714	1.678	1.191	-0.268

$RSPDIVS_T$ dividends / shr for the S&P composite index deflated by the consumer price index.

DP_T $(CPI_T/CPI_{T-1}) - 1$.

$TIME_T$ .01 in 1924; incremented by .01 each year thereafter.

Equations 1-5 are fitted with a first order Cochrane-Orcutt autocorrelation correction; Equations 6-10 are fitted with a second order correction.

RHO and RHO2 are, respectively, the first and second order autocorrelation coefficients from the Cochrane-Orcutt procedure.

Table 9 Inflation and Deflated Book Earnings Per Share

Annual Data

EQU	PERIOD	DEP VAR	CONST	DP[T]	DP[T-1]	DP[T-2]	DP[T-3]	DP[T-4]	DP[T-5]	TIME[T]	XIPTAVG[T]	SUM	R2C	DW	RHO
1.	1947-1978	REPS[T]	2.873	6.799						8.042		6.799	0.746	1.573	0.622
			(8.7)	(1.8)						(4.3)		(1.8)			
2.	1948-1978	REPS[T]	2.512	8.423	-12.548					11.547		-4.126	0.775	1.896	0.534
			(7.2)	(2.9)	(-4.3)					(6.0)		(-1.0)			
3.	1949-1978	REPS[T]	2.459	7.977	-12.264	-1.680				12.095		-5.966	0.734	1.847	0.493
			(6.9)	(2.1)	(-3.9)	(-0.5)				(5.3)		(-0.9)			
4.	1950-1978	REPS[T]	2.123	9.973	-20.184	-0.389	-9.485			15.938		-20.044	0.716	2.043	0.708
			(3.0)	(2.1)	(-5.4)	(-0.1)	(-2.7)			(3.8)		(-2.0)			
5.	1951-1978	REPS[T]	2.280	12.792	-23.000	4.579	-9.906	3.243		13.851		-12.291	0.672	1.892	0.635
			(3.3)	(2.4)	(-4.7)	(0.9)	(-2.7)	(0.8)		(2.8)		(-0.9)			
6.	1952-1978	REPS[T]	1.766	13.947	-26.222	5.091	-14.475	3.384	-4.957	17.619		-23.232	0.622	2.004	0.692
			(1.7)	(2.3)	(-4.5)	(0.7)	(-2.4)	(0.7)	(-1.0)	(2.5)		(-1.2)			
7.	1952-1978	REPS[T]	1.393	4.435	-16.274	1.740	-11.715	2.002	-3.456		0.044	-23.268	0.636	1.711	0.665
			(1.8)	(0.7)	(-3.3)	(0.3)	(-2.4)	(0.5)	(-0.9)		(3.8)	(-1.8)			

EQU	PERIOD	DEP VAR	CONST	DP[T]	DP[T-1]	DP[T-2]	DP[T-3]	DP[T-4]	DP[T-5]	LOGXIPT[T]	TIME[T]	SUM	R2C	DW	RHO
8.	1947-1978	LOG REPS[T]	1.120	1.348							1.805	1.348	0.739	1.537	0.387
			(15.6)	(1.5)							(4.4)	(1.5)			
9.	1948-1978	LOG REPS[T]	1.043	1.787	-2.963						2.586	-1.176	0.775	1.880	0.515
			(14.0)	(2.7)	(-4.5)						(6.2)	(-1.3)			
10.	1949-1978	LOG REPS[T]	1.031	1.584	-2.900	-0.484					2.749	-1.800	0.734	1.896	0.479
			(13.4)	(1.9)	(-4.1)	(-0.6)					(5.5)	(-1.2)			
11.	1950-1978	LOG REPS[T]	0.973	1.885	-4.346	-0.128	-2.014				3.476	-4.604	0.713	2.017	0.612
			(8.3)	(1.7)	(-5.1)	(-0.2)	(-2.5)				(4.5)	(-2.2)			
12.	1951-1978	LOG REPS[T]	0.995	2.700	-4.658	0.479	-2.110	0.506			3.203	-3.583	0.664	1.894	0.573
			(7.5)	(1.8)	(-4.0)	(0.4)	(-2.4)	(0.6)			(3.3)	(-1.3)			
13.	1952-1978	LOG REPS[T]	0.983	2.580	-5.140	1.010	-2.816	0.762	-0.732		3.353	-4.336	0.609	1.915	0.605
			(5.5)	(1.8)	(-3.7)	(0.6)	(-2.0)	(0.7)	(-0.7)		(2.6)	(-1.2)			
14.	1952-1978	LOG REPS[T]	-3.092	0.197	-3.181	-0.132	-2.695	0.602	-0.998	1.073		-6.207	0.612	1.783	0.817
			(-2.4)	(0.1)	(-3.0)	(-0.1)	(-2.5)	(0.8)	(-1.1)	(3.6)		(-2.1)			

$REPS_T$ book earnings/shr for S&P composite Index deflated by the CPI.

DP_T $(CPI_T/CPI_{T-1}) - 1$

TIME .01 in 1924; incremented by .01 each year thereafter.

$XIPTAVG_T$ annual average, FRB total Industrial production Index.

Table 10

Inflation and Deflated Book EPS Panel Estimations

Annual Data, 1958-1977

INDUSTRY	WEIGHT	CONST	TIME	DP_T	DP_{T-1}	DP_{T-2}	DP_{T-3}	DP_{T-4}	DP_{T-5}	SUM	R^2C	No Co's	AVG REPS
Food	0.053	8.38 (5.3)	0.666 (3.6)	-9.13 (-0.6)	-18.72 (-1.3)	20.50 (1.1)	-30.18 (-1.7)	11.78 (0.6)	-18.07 (-0.8)	-43.81 (-1.5)	.871	13	14.91
Textiles	0.011	9.03 (3.9)	0.036 (0.2)	61.53 (2.0)	-93.22 (-3.1)	23.94 (0.6)	-22.35 (-0.6)	-42.81 (-1.3)	-59.74 (-2.1)	-132.66 (-2.1)	.880	7	8.33
Lumber & Wood	0.011	4.49 (0.8)	1.508 (3.3)	356.72 (4.9)	-358.27 (-3.8)	271.66 (2.3)	-128.90 (-1.1)	180.78 (1.3)	-70.69 (-0.7)	251.30 (2.9)	.888	4	20.03
Paper	0.035	7.96 (1.7)	0.427 (1.2)	132.63 (5.4)	-29.20 (-1.3)	50.43 (1.6)	3.65 (0.1)	2.13 (0.1)	-27.31 ((-0.8)	132.33 (2.1)	.723	10	11.84
Chemicals	0.132	15.65 (4.8)	0.383 (1.3)	47.54 (2.4)	-61.58 (-3.1)	-4.76 (-0.2)	-23.89 (-1.0)	-0.31 (-0.0)	10.07 (0.4)	-32.92 (-1.0)	.891	13	15.68
Petroleum	0.310	9.66 (6.4)	0.604 (3.3)	98.45 (6.4)	-64.02 (-4.2)	-0.63 (-0.3)	-40.59 (-2.2)	-16.74 (-0.8)	58.83 (2.6)	35.29 (1.6)	.945	13	15.32
Rubber & Plastics	0.024	13.40 (7.6)	0.188 (1.0)	28.01 (0.8)	-83.04 (-2.6)	-29.74 (-0.7)	-55.70 (-1.5)	21.17 (0.5)	-66.98 (-1.4)	-186.28 (-2.7)	.916	7	14.39
Stone, Clay Etc.	0.035	10.81 (5.2)	0.176 (0.82)	48.24 (1.7)	-57.88 (-2.1)	29.25 (0.8)	28.79 (0.9)	-17.32 (-0.4)	-5.93 (-0.1)	25.15 (0.5)	.734	13	11.99
Ferrous Metals	0.107	8.97 (3.6)	-0.062 (-0.3)	121.50 (4.9)	-8.38 (-0.4)	24.60 (0.8)	-43.93 (-1.5)	-25.12 (-0.7)	-10.40 (-0.3)	8.26 (1.3)	.717	12	7.64
Non-Ferrous Metals	0.035	9.61 (3.9)	0.120 (0.5)	152.01 (4.0)	-71.96 (-1.7)	-38.48 (-0.7)	-14.59 (-0.3)	5.23 (0.1)	-126.24 (-2.3)	-94.04 (-1.8)	.722	5	9.93
Machinery	0.066	3.65 (0.9)	2.457 (7.3)	49.17 (1.4)	-41.36 (-1.3)	43.64 (1.0)	12.02 (0.3)	52.76 (1.1)	-47.64 (-0.9)	68.59 (1.0)	.988	13	36.08
Electrical Machinery	0.049	13.79 (4.3)	0.640 (2.2)	0.06 (0.0)	-98.49 (-2.8)	-12.70 (-0.3)	46.67 (1.1)	-23.31 (-0.5)	-59.82 (-1.2)	-143.59 (-2.1)	.877	13	19.72
Motor Veh. & Parts	0.139	22.05 (3.4)	0.057 (0.1)	-41.66 (-0.9)	-186.40 (-3.8)	-34.51 (-0.5)	38.71 (0.7)	-88.51 (-1.3)	-97.89 (-1.4)	-410.25 (-6.2)	.932	13	20.69
TOTAL				79.45 (4.5)	-71.98 (-4.2)	17.87 (0.8)	-24.08 (-1.1)	-18.79 (-0.8)	-18.67 (-0.7)	-36.20 (-1.0)	.902	214	16.20

Table 10 (Continued).

Two types of regressions were run.

(1) $$REPS_{it} = a_i + b_i \; TIME_t + \sum_{\ell=0}^{5} c_\ell \; DP_{t-\ell} + \varepsilon_{it}$$

$$\varepsilon_{it} = \rho_i \varepsilon_{it-1} + u_{it}$$

$$E[u_{it}^2] = \sigma_i^2 \; ; \; E[u_{it} \, u_{jt}] = 0 \quad i \neq j$$

$i = 1 \ldots, n$ companies

$t = 1958\text{–}1977$

(2) $$REPS_{jt} = p_j + q_j \; TIME_t + \sum_{\ell=0}^{5} r_\ell \; DP_{t-\ell} + \varepsilon_{jt}$$

$$\varepsilon_{jt} = \rho_j \varepsilon_{jt-1} + u_{jt}$$

$$E[u_{jt}^2] = \sigma_j^2 ; \; E[u_{jt} \, u_{it}] = 0 \quad i \neq j$$

$j = 1, \ldots 13$ industries

$t = 1958\text{–}1977$

Specification (1) was run for each of 13 industries: the DP coefficients and the SUM (of these coefficients) were taken from these regressions. The R2C and the number of companies used also refer to these individual industry regressions.

Specification (2) is a weighted total regression over all industries. The weight, intercept and time trend coefficient are reported alongside each industry.

Variables

The dependent variable in all cases is book earnings/standardized share (1972 $)

TIME = 1 in 1958; incremented 1 each year thereafter.

DP $(PGNP_t / PGNP_{t-1}) - 1$, where PGNP is the GNP deflator.

AVG REPS is the average of the dependent variable (over all companies/industries.)

Table 11
Deflated Economic EPS and Inflation
Annual, 1955-1977

EQU	DEP VAR	CONST	DP[T]	DP[T-1]	DP[T-2]	DP[T-3]	DP[T-4]	DP[T-5]	TIME[T]	XIP/AVG[T]	SUM	R2C	DW	RHO
1.	REPSCLA[T]	2.085 (1.1)	9.783 (1.2)						11.767 (1.5)		9.783 (1.2)	0.633	1.553	0.694
2.	REPSCLA[T]	1.776 (1.2)	13.372 (2.2)	-23.636 (-3.8)					16.519 (2.5)		-10.264 (-1.3)	0.695	2.223	0.709
3.	REPSCLA[T]	0.542 (0.5)	0.152 (0.0)	-18.373 (-2.7)	-18.963 (-2.1)				26.771 (4.2)		-37.185 (-2.6)	0.674	1.955	0.566
4.	REPSCLA[T]	-0.341 (-0.4)	2.414 (0.3)	-29.231 (-3.2)	-13.918 (-1.5)	-16.243 (-1.9)			34.039 (5.9)		-56.978 (-3.9)	0.646	2.010	0.384
5.	REPSCLA[T]	-0.514 (-1.5)	7.465 (1.3)	-17.915 (-2.1)	-39.377 (-3.7)	18.187 (1.7)	-46.866 (-4.8)		36.842 (14.5)		-78.506 (-10.0)	0.637	2.490	-0.095
6.	REPSCLA[T]	-0.751 (-1.6)	6.036 (1.0)	-19.685 (-2.5)	-31.530 (-3.2)	3.876 (0.4)	-28.903 (-2.9)	-13.877 (-2.5)	38.559 (11.2)		-84.084 (-8.1)	0.594	2.980	0.176
7.	REPSCLA[T]	-1.050 (-3.0)	-13.568 (-2.0)	-2.085 (-0.2)	-35.337 (-2.7)	11.342 (0.8)	-31.027 (-2.4)	0.019 (0.0)		0.088 (16.0)	-70.656 (-11.3)	0.594	1.939	-0.289
8.	REPSCLB[T]	0.444 (0.2)	68.115 (4.0)						16.422 (1.5)		68.115 (4.0)	0.694	1.436	0.492
9.	REPSCLB[T]	-0.279 (-0.2)	81.518 (6.0)	-53.449 (-4.0)					26.705 (3.7)		28.069 (1.7)	0.724	2.077	0.296
10.	REPSCLB[T]	-3.255 (-2.6)	44.171 (3.3)	-26.627 (-2.3)	-56.210 (-4.0)				51.475 (6.2)		-38.666 (-1.9)	0.722	2.184	0.369
11.	REPSCLB[T]	-3.495 (-2.5)	46.014 (3.3)	-31.183 (-1.9)	-52.615 (-3.2)	-6.171 (-0.4)			53.382 (5.5)		-43.956 (-1.8)	0.677	2.237	0.364
12.	REPSCLB[T]	-3.671 (-2.7)	48.126 (3.4)	-23.491 (-1.3)	-67.123 (-2.9)	12.704 (0.6)	-25.952 (-1.1)		55.281 (5.7)		-55.735 (-2.0)	0.635	2.200	0.264
13.	REPSCLB[T]	-3.663 (-3.9)	32.915 (2.0)	-7.246 (-0.3)	-60.716 (-2.3)	11.446 (0.4)	-18.012 (-0.7)	6.730 (0.5)		0.120 (8.1)	-34.883 (-2.0)	0.595	2.259	-0.077
14.	REPSCLB[T]	-3.957 (-2.6)	47.743 (3.1)	-23.927 (-1.3)	-65.933 (-2.8)	8.373 (0.4)	-21.340 (-0.9)	-9.726 (-0.6)	57.578 (5.4)		-64.810 (-2.0)	0.590	2.444	0.321
15.	REPSCLC[T]	4.068 (1.1)	140.655 (3.9)						-12.511 (-0.6)		140.655 (3.9)	0.500	1.631	0.355
16.	REPSCLC[T]	1.489 (1.0)	183.990 (8.2)	-138.421 (-6.1)					15.063 (1.6)		45.569 (2.0)	0.668	1.920	-0.234
17.	REPSCLC[T]	-1.335 (-0.9)	135.863 (5.9)	-79.837 (-3.2)	-79.139 (-3.3)				39.572 (3.7)		-23.113 (-0.8)	0.683	2.108	-0.181

Table 11 (Continued).

EQU	DEP VAR	CONST	DP[T]	DP[T-1]	DP[T-2]	DP[T-3]	DP[T-4]	DP[T-5]	TIME[T]	XIPTAVG[T]	SUM	R2C	DW	RHC
18.	REPSCLC[T]	-1.373	128.711	-69.306	-90.505	8.417			39.843		-22.683	0.641	2.092	-0.124
		(-0.8)	(4.5)	(-1.8)	(-2.2)	(0.3)			(3.4)		(-0.7)			
19.	REPSCLC[T]	-2.481	117.996	-13.591	-182.484	116.433	-116.784		50.555		-78.429	0.624	2.360	-0.044
		(-1.7)	(5.0)	(-0.4)	(-4.2)	(2.7)	(-2.9)		(4.6)		(-2.3)			
20.	REPSCLC[T]	-2.478	118.355	-13.905	-185.467	122.273	-125.110	8.084	50.294		-75.770	0.579	2.304	-0.076
		(-1.6)	(4.5)	(-0.4)	(-3.7)	(2.4)	(-2.4)	(0.3)	(4.4)		(-2.2)			
21.	REPSCLC[T]	-3.265	92.783	1.752	-176.086	109.956	-103.929	11.801		0.121	-63.722	0.584	2.399	-0.172
		(-2.2)	(3.3)	(0.0)	(-3.6)	(2.2)	(-2.1)	(0.5)		(5.0)	(-2.3)			

EQU	DEP VAR	CONST	DP[T]	DP[T-1]	DP[T-2]	DP[T-3]	DP[T-4]	DP[T-5]	LOGXIPI[T]	TIME[T]	SUM	R2C	DW	RHC
22.	LOG REPSCLA[T]	0.912	1.734							2.728	1.734	0.665	1.584	0.723
		(2.2)	(1.1)							(1.6)	(1.1)			
23.	LOG REPSCLA[T]	0.866	2.363	-4.312						3.553	-1.949	0.702	2.151	0.736
		(2.5)	(1.9)	(-3.4)						(2.4)	(-1.2)			
24.	LOG REPSCLA[T]	0.596	-0.588	-3.202	-4.177					5.846	-7.966	0.680	1.907	0.554
		(2.8)	(-0.3)	(-2.3)	(-2.2)					(4.5)	(-2.7)			
25.	LOG REPSCLA[T]	0.397	-0.085	-5.781	-2.996	-3.876				7.542	-12.736	0.654	2.003	0.305
		(2.6)	(-0.1)	(-3.1)	(-1.5)	(-2.3)				(7.2)	(-4.7)			
26.	LOG REPSCLA[T]	0.339	0.310	-3.001	-8.583	3.242	-9.259			8.261	-17.290	0.644	2.735	-0.038
		(5.0)	(0.3)	(-1.9)	(-4.3)	(1.7)	(-5.0)			(16.3)	(-11.1)			
27.	LOG REPSCLA[T]	0.281	0.255	-3.540	-6.971	0.496	-6.028	-2.846		8.665	-18.634	0.600	3.140	0.217
		(3.0)	(0.2)	(-2.5)	(-3.8)	(0.3)	(-3.3)	(-2.7)		(12.7)	(-9.1)			
28.	LOG REPSCLA[T]	-4.781	-2.132	-0.261	-6.763	3.228	-6.034	0.780	1.490		-11.182	0.599	1.660	-0.224
		(-13.7)	(-1.7)	(-0.1)	(-2.8)	(1.3)	(-2.5)	(0.7)	(17.7)		(-10.3)			
29.	LOG REPSCLB[T]	0.640	8.253							3.754	8.253	0.682	1.655	0.569
		(1.5)	(3.0)							(1.9)	(3.0)			
30.	LOG REPSCLB[T]	0.569	9.382	-5.892						4.920	3.490	0.682	2.080	0.502
		(1.7)	(3.6)	(-2.3)						(2.9)	(1.1)			
31.	LOG REPSCLB[T]	0.039	2.929	-2.234	-9.832					9.488	-9.137	0.689	2.230	0.466
		(0.1)	(1.0)	(-0.9)	(-3.2)					(4.9)	(-2.0)			
32.	LOG REPSCLB[T]	-0.064	3.422	-3.770	-8.832	-2.205				10.314	-11.386	0.648	2.324	0.451
		(-0.2)	(1.1)	(-1.1)	(-2.6)	(-0.7)				(4.4)	(-2.0)			

Table 11 (Continued).

EQU	DEP VAR	CONST	DP[T]	DP[T-1]	DP[T-2]	DP[T-3]	DP[T-4]	DP[T-5]	TIME[T]	XIPIAVG[T]	SUM	R2C	DW	RHO
33.	LOG REPSCLB[T]	-0.249 (-0.9)	3.035 (1.1)	-0.432 (-0.1)	-15.468 (-3.6)	5.187 (1.3)	-10.604 (-2.5)			11.946 (6.2)	-18.282 (-3.4)	0.622	2.694	0.315
34.	LOG REPSCLB[T]	-6.843 (-6.3)	1.367 (0.5)	3.208 (0.9)	-13.454 (-3.0)	6.784 (1.5)	-8.282 (-1.8)	2.182 (0.9)	1.968 (7.6)		-8.195 (-2.4)	0.583	2.636	0.123
35.	LOG REPSCLB[T]	-0.376 (-1.2)	2.986 (1.1)	-0.764 (-0.2)	-15.096 (-3.6)	3.804 (1.0)	-9.411 (-2.3)	-2.753 (-1.0)		12.838 (5.8)	-21.234 (-3.3)	0.580	2.942	0.389
36.	LOG REPSCLC[T]	1.717 (2.4)	20.177 (2.5)							-3.687 (-0.9)	20.177 (2.5)	0.262	1.868	0.236
37.	LOG REPSCLC[T]	1.250 (3.0)	27.755 (4.2)	-23.171 (-3.5)						1.008 (0.4)	4.584 (0.7)	0.419	1.960	-0.213
38.	LOG REPSCLC[T]	0.289 (0.7)	11.631 (1.9)	-3.683 (-0.6)	-26.660 (-4.3)					9.340 (3.3)	-18.712 (-2.5)	0.589	2.087	-0.149
39.	LOG REPSCLC[T]	0.246 (0.5)	4.157 (0.6)	6.036 (0.7)	-38.104 (-4.0)	8.855 (1.2)				9.637 (2.7)	-18.255 (-1.9)	0.562	2.054	0.079
40.	LOG REPSCLC[T]	0.026 (0.1)	4.405 (0.7)	15.183 (1.6)	-53.771 (-4.5)	28.743 (2.4)	-24.356 (-2.1)			11.740 (3.6)	-29.797 (-3.0)	0.559	2.371	0.015
41.	LOG REPSCLC[T]	0.030 (0.1)	4.485 (0.6)	15.180 (1.5)	-54.479 (-4.1)	30.095 (2.2)	-26.256 (-1.9)	1.815 (0.3)		11.661 (3.5)	-29.160 (-2.9)	0.519	2.315	-0.015
42.	LOG REPSCLC[T]	-7.084 (-3.3)	3.079 (0.4)	16.479 (1.6)	-50.435 (-3.7)	29.663 (2.1)	-23.157 (-1.7)	4.245 (0.6)	2.075 (4.0)		-20.127 (-3.0)	0.529	2.388	-0.168

$REPSCLA_T$ — Earnings/shr, S&P 500 deflated by CPI, where earnings reflect inventory valuation, depreciation and purchasing power of debt adjustment. (This variable is computed by scaling REPS (Table 8) by the ratio of adjusted income to reported income from the Cagan-Lipsey study.)

$REPSCLB_T$ — As above, but earnings now reflect all adjustments except changes in the market value of debt.

$REPSCLC_T$ — As above, but earnings are now inclusive of all adjustments.

DP_T — $(CPI_T/CPI_{T-1}) - 1$.

$TIME_T$ — .01 in 1946; incremented by .01 each year thereafter.

$XIPIAVG_T$ — Annual average of FRB total industrial production index.

(Averages over 1955-1977: $\overline{REPS}$ = 4.82; $\overline{REPSCLA}$ = 5.00; $\overline{REPSCLB}$ = 6.73; $\overline{REPSCLC}$ = 6.86.)

Table 12

Panel Estimations on Inflation and Deflated Economic EPS
Annual Data, 1958-1977

INDUSTRY	WEIGHT	EPS	CONST	TIME	DP[T]	DP[T-1]	DP[T-2]	DP[T-3]	DP[T-4]	DP[T-5]	SUM	R2C
FOOD+BEVG	0.053	10.542	6.067	0.787	108.03	-255.16	304.23	-268.09	195.83	-381.87	-297.03	0.61
			(1.65)	(2.42)	(2.02)	(-4.64)	(4.23)	(-4.03)	(2.51)	(-4.87)	(-3.33)	
TEXTILES	0.011	4.494	7.562	0.108	257.28	-246.14	-22.96	-88.81	-81.77	-273.68	-462.09	0.80
			(3.88)	(0.509)	(3.51)	(-2.98)	(-0.221)	(-0.87)	(-0.692)	(-2.65)	(-4.36)	
LUMBER+WD	0.010	20.531	7.001	1.669	907.17	-275.92	-26.07	-321.93	373.17	-136.98	519.44	0.80
			(0.551)	(1.61)	(5.22)	(-1.18)	(-0.0868)	(-1.04)	(1.09)	(-0.558)	(2.69)	
PAPER	0.037	7.818	6.730	0.497	245.15	-58.97	21.05	-51.11	4.30	-196.70	-36.27	0.72
			(2.16)	(1.75)	(6.3)	(-1.55)	(0.415)	(-1.12)	(0.0805)	(-3.46)	(-0.49)	
CHEMICALS	0.119	12.494	14.026	0.260	119.97	-66.35	-83.07	-62.19	-65.57	-104.47	-261.68	0.78
			(7.6)	(1.26)	(2.75)	(-1.45)	(-1.41)	(-1.13)	(-1.02)	(-1.64)	(-4.04)	
PETROLEUM	0.309	10.037	7.709	0.616	203.84	-72.90	-91.11	-126.41	35.95	-3.92	-54.55	0.93
			(4.55)	(3.11)	(6.93)	(-2.27)	(-2.23)	(-3.22)	(0.787)	(-0.0921)	(-1.24)	
RUBBER	0.022	10.723	13.091	0.184	639.28	-415.85	-23.20	-396.86	333.36	-385.16	-248.43	0.94
			(4.64)	(0.683)	(7.35)	(-3.86)	(-0.17)	(-2.89)	(2.13)	(-3.11)	(-2.26)	
STON+GLAS	0.036	8.414	9.594	0.275	204.84	-170.36	37.60	-92.81	9.81	-140.45	-151.36	0.68
			(5.25)	(1.34)	(4.91)	(-3.75)	(0.645)	(-1.67)	(0.151)	(-2.32)	(-3.09)	
FERR.METAL	0.129	3.336	4.588	0.266	183.77	-79.72	19.24	-162.11	29.87	-126.35	-135.29	0.53
			(3.03)	(1.42)	(4.87)	(-1.96)	(0.368)	(-3.27)	(0.516)	(-2.3)	(-2.36)	
NONFER.MET	0.046	6.487	6.012	0.440	341.18	-127.65	-50.92	-58.74	33.37	-297.11	-159.87	0.67
			(2.02)	(1.56)	(5.86)	(-1.63)	(-0.508)	(-0.571)	(0.292)	(-3.62)	(-2.44)	
MACHINERY	0.060	19.105	11.060	1.162	152.37	-307.79	8.07	-294.49	105.22	-374.24	-710.86	0.97
			(3.89)	(4.31)	(1.77)	(-3.28)	(0.0672)	(-2.57)	(0.786)	(-2.99)	(-5.13)	
ELEC.MACH.	0.045	16.017	14.329	0.555	136.91	-334.16	-102.49	-93.30	-1.27	-278.32	-672.62	0.89
			(4.82)	(1.98)	(1.29)	(-2.93)	(-0.698)	(-0.671)	(-0.0078)	(-1.8)	(-4.03)	
MOTOR VEH	0.125	13.433	23.415	-0.466	-87.45	-607.01	-266.66	-108.50	-78.18	-270.67	-1418.47	0.88
			(3.15)	(-0.76)	(-0.654)	(-4.45)	(-1.51)	(-0.656)	(-0.406)	(-1.39)	(-6.34)	
TOTAL	1.000	10.490			136.749	-91.159	-5.873	-88.515	3.624	-105.252	-145.426	0.801
					(5.52)	(-3.43)	(-0.171)	(-2.73)	(0.228)	(-2.92)	(-3.86)	

Organization and specifications are identical to those given in Table 9. See notes to that table. The dependent variable here is deflated economic earnings/standardized share, where earnings are net of all adjustments.

Table 13

Expected Deflated Economic EPS and Inflation

Annual Data

EQU	PERIOD	DEP VAR	CONST	DP[T]	DP[T-1]	DP[T-2]	DP[T-3]	DP[T-4]	EDP1Y[T]	SPMUNIBY[T]	TIME[T]	XIPTAVG[T+1]	SUM	R2C	DW	RHO
1.	1954-1976	REPSCLA[T+1]	2.774 (2.7)							-56.682 (-2.9)	23.373 (4.3)		-56.682 (-2.9)	0.688	2.130	0.543
2.	1953-1975	REPSCLA[T+2]	2.477 (2.5)							-44.587 (-1.9)	23.023 (3.6)		-44.587 (-1.9)	0.648	1.666	0.504
3.	1952-1974	REPSCLA[T+3]	2.245 (1.4)							7.965 (0.3)	13.127 (1.5)		7.965 (0.3)	0.616	1.592	0.667
4.	1951-1973	REPSCLA[T+4]	1.396 (0.6)							50.932 (1.9)	8.772 (0.8)		50.932 (1.9)	0.551	1.254	0.780
5.	1950-1972	REPSCLA[T+5]	3.179 (2.5)							-39.798 (-1.4)	20.259 (2.7)		-39.798 (-1.4)	0.640	1.400	0.639
6.	1954-1976	REPSCLA[T+1]	1.744 (1.7)							-40.987 (-2.8)		0.054 (5.4)	-40.987 (-2.8)	0.738	2.437	0.595
7.	1953-1975	REPSCLA[T+2]	0.803 (0.7)							-37.817 (-2.3)		0.061 (4.9)	-37.817 (-2.3)	0.729	2.014	0.652
8.	1952-1974	REPSCLA[T+3]	-6.460 (-1.6)							1.589 (0.1)		0.089 (4.0)	1.589 (0.1)	0.715	2.433	0.942
9.	1951-1973	REPSCLA[T+4]	-8.415 (-2.0)							34.937 (1.8)		0.032 (3.9)	34.937 (1.8)	0.737	1.884	0.954
10.	1950-1972	REPSCLA[T+5]	-5.341 (-1.3)							-42.086 (-2.4)		0.094 (4.9)	-42.086 (-2.4)	0.749	1.899	0.955
11.	1954-1976	REPSCLA[T+1]	-0.823 (-1.2)	-16.932 (-2.6)	-37.444 (-4.0)	4.925 (0.5)	-28.880 (-2.8)	-14.329 (-2.5)		6.177 (0.3)	40.883 (11.6)		-86.483 (-5.9)	0.593	2.802	0.246
12.	1953-1975	REPSCLA[T+2]	0.997 (1.8)	-50.969 (-6.8)	37.277 (4.5)	-49.952 (-4.4)	-0.715 (-0.1)	-2.050 (-0.3)		-31.946 (-1.8)	37.873 (15.2)		-98.354 (-7.6)	0.590	2.518	-0.074
13.	1952-1974	REPSCLA[T+3]	2.928 (1.6)	-3.308 (-0.2)	23.573 (1.4)	-25.541 (-1.3)	4.978 (0.4)	-14.525 (-1.3)		-30.391 (-0.8)	19.698 (1.7)		-45.213 (-1.1)	0.483	1.571	0.583
14.	1951-1973	REPSCLA[T+4]	2.695 (0.4)	18.551 (1.2)	-22.562 (-1.5)	10.628 (0.6)	-7.808 (-0.9)	8.565 (0.8)		60.187 (2.0)	-1.213 (0.0)		67.561 (1.4)	0.507	1.218	0.868
15.	1951-1972	REPSCLA[T+5]	2.964 (1.4)	-5.704 (-0.2)	-7.070 (-0.3)	-3.982 (-0.2)	-7.049 (-0.6)	3.032 (0.2)		-24.593 (-0.6)	21.113 (1.7)		-45.366 (-0.9)	0.447	1.354	0.607
16.	1954-1976	REPSCLA[T+1]	-0.213 (-0.4)	-16.036 (-2.4)	-10.138 (-0.8)	-6.129 (-0.4)	-17.422 (-1.2)	-7.455 (-1.1)		-19.079 (-1.1)		0.083 (18.0)	-76.259 (-6.7)	0.590	1.909	-0.357

Table 13 (Continued).

EQU	PERIOD	DEP VAR	CONST	DP[T]	DP[T-1]	DP[T-2]	DP[T-3]	DP[T-4]	EDP1Y[T]	SPMUN1BY[T]	TIME[T]	X1PTAVG[T+1]	SUM	R2C	D*	RHO
17.	1953-1975	REPSCLA[T+2]	0.341 (0.6)	-31.109 (-3.9)	24.850 (2.6)	-36.820 (-2.7)	1.601 (0.2)	-8.713 (-1.3)		-29.183 (-1.5)		0.078 (15.0)	-79.374 (-6.1)	0.581	1.559	-0.233
18.	1952-1974	REPSCLA[T+3]	0.882 (0.6)	-10.231 (-0.9)	13.728 (0.9)	-23.226 (-1.6)	-0.304 (0.0)	-12.030 (-1.5)		-21.023 (-0.7)		0.061 (3.8)	-53.087 (-1.9)	0.528	1.840	0.494
19.	1951-1973	REPSCLA[T+4]	-2.078 (-0.8)	0.097 (0.0)	-14.915 (-1.1)	-6.469 (-0.5)	-6.628 (-0.9)	-1.959 (-0.2)		42.703 (1.6)		0.058 (2.1)	12.879 (0.3)	0.537	1.615	0.940
20.	1951-1972	REPSCLA[T+5]	-7.258 (-1.1)	11.007 (0.9)	-5.609 (-0.5)	7.965 (0.7)	-3.089 (-0.5)	2.537 (0.3)		-45.559 (-1.9)		0.093 (4.0)	-32.748 (-1.0)	0.525	1.739	0.969
21.	1954-1976	REPSCLA[T+1]	1.658 (1.3)						-18.687 (-2.9)		19.574 (3.4)		-18.687 (-2.9)	0.693	1.876	0.633
22.	1953-1975	REPSCLA[T+2]	1.376 (1.6)						-21.469 (-3.2)		22.376 (4.8)		-21.469 (-3.2)	0.696	1.820	0.491
23.	1952-1974	REPSCLA[T+3]	3.424 (1.4)						11.964 (1.2)		6.637 (0.5)		11.964 (1.2)	0.629	1.590	0.764
24.	1951-1973	REPSCLA[T+4]	4.135 (1.8)						17.677 (1.8)		3.734 (0.3)		17.677 (1.8)	0.646	1.766	0.764
25.	1950-1972	REPSCLA[T+5]	2.489 (2.1)						-11.259 (-0.8)		16.695 (2.5)		-11.259 (-0.8)	0.624	1.512	0.612
26.	1954-1976	REPSCLA[T+1]	0.942 (0.8)						-12.273 (-2.3)			0.047 (4.3)	-12.273 (-2.3)	0.730	2.206	0.658
27.	1953-1975	REPSCLA[T+2]	0.484 (0.5)						-14.394 (-2.8)			0.053 (5.2)	-14.394 (-2.8)	0.742	2.086	0.635
28.	1952-1974	REPSCLA[T+3]	-6.652 (-1.6)						0.223 (0.0)			0.090 (3.5)	0.223 (0.0)	0.715	2.442	0.945
29.	1951-1973	REPSCLA[T+4]	-7.932 (-1.5)						7.010 (1.0)			0.085 (3.7)	7.010 (1.0)	0.723	2.481	0.954
30.	1950-1972	REPSCLA[T+5]	-4.951 (-1.5)						-5.475 (-0.6)			0.085 (4.1)	-5.475 (-0.6)	0.716	2.377	0.97[illegible]
31.	1954-1976	REPSCLA[T+1]	-1.441 (-2.2)	-89.555 (-3.1)	-32.590 (-5.4)	-1.358 (-0.2)	-22.305 (-3.0)	-24.373 (-4.2)	64.412 (2.4)		46.843 (10.3)		-105.769 (-8.1)	0.593	3.018	0.469
32.	1953-1975	REPSCLA[T+2]	0.161 (0.4)	-65.314 (-1.6)	29.519 (3.4)	-49.256 (-4.1)	-7.740 (-0.9)	1.813 (0.3)	8.963 (0.7)		37.457 (12.7)		-82.016 (-8.4)	0.584	2.780	0.034

Table 13 (Continued).

EQU	PERIOD	DEP VAR	CONST	DP[T]	DP[T-1]	DP[T-2]	DP[T-3]	DP[T-4]	EDPIY[T]	SPMUNIBY[T]	TIME[T]	XIPTAVG[T+I]	SUM	R2C	DW	RHO
33.	1952-1974	REPSCLA[T+3]	5.161	124.902	31.936	-4.484	7.929	1.755	-116.115		-4.697		45.923	0.488	1.436	0.848
			(0.9)	(1.1)	(1.8)	(-0.2)	(0.8)	(0.1)	(-1.1)		(-0.2)		(0.9)			
34.	1951-1973	REPSCLA[T+4]	2.366	-98.396	-25.643	-7.981	-9.412	-9.815	108.368		20.271		-42.879	0.484	1.350	0.573
			(1.7)	(-0.8)	(-1.4)	(-0.5)	(-0.9)	(-0.9)	(0.9)		(1.9)		(-1.1)			
35.	1951-1972	REPSCLA[T+5]	2.236	-292.629	-42.282	-3.530	-10.351	2.010	312.766		21.964		-34.017	0.454	1.699	0.486
			(1.9)	(-1.0)	(-1.1)	(-0.2)	(-1.0)	(0.2)	(0.9)		(2.3)		(-0.8)			
36.	1954-1976	REPSCLA[T+1]	-0.659	-83.207	-18.933	-0.317	-17.887	-13.373	65.179			0.082	-68.538	0.592	1.959	0.023
			(-1.7)	(-2.3)	(-2.2)	(0.0)	(-1.6)	(-2.4)	(1.9)			(14.1)	(-8.6)			
37.	1953-1975	REPSCLA[T+2]	-0.436	-106.995	29.992	-53.128	9.112	-10.351	61.472			0.079	-69.898	0.581	1.977	-0.472
			(-1.4)	(-2.8)	(2.9)	(-3.7)	(0.9)	(-1.8)	(1.7)			(17.4)	(-10.0)			
38.	1952-1974	REPSCLA[T+3]	0.317	-70.850	3.288	-26.644	-0.891	-13.826	53.869			0.065	-55.054	0.525	1.985	0.356
			(0.3)	(-0.8)	(0.2)	(-1.8)	(-0.1)	(-1.6)	(0.6)			(4.5)	(-2.3)			
39.	1951-1973	REPSCLA[T+4]	0.292	-150.253	-20.080	-17.471	-4.937	-13.907	147.948			0.064	-58.700	0.537	1.536	0.541
			(0.2)	(-1.6)	(-1.4)	(-1.5)	(-0.7)	(-1.6)	(1.6)			(4.0)	(-2.3)			
40.	1951-1972	REPSCLA[T+5]	0.534	-179.937	-30.675	-2.150	-8.574	1.885	192.795			0.054	-26.657	0.501	1.977	0.605
			(0.4)	(-0.8)	(-1.0)	(-0.2)	(-1.0)	(0.2)	(0.7)			(3.1)	(-0.8)			

$REPSCLA_T$ — EPS deflated by CPI, reflecting inventory, depreciation and purchasing power of debt adjustments. See notes to Table 10 for computational method.

DP_T — $(CPI_T/CPI_{T-1}) - 1$.

$EDPIY_T$ — Expected inflation over next year from autoregressive model.

$SPMUNIBY_T$ — S&P average municipal bond yield.

$TIME_T$ — .01 in 1946; incremented by .01 each year thereafter.

$XIPTAVG_T$ — Annual average of FRB total industrial production index. This is always chosen to be contemporaneous with the dependent variables.

SUM — Sum of the coefficients of the following variables: DP, SPMUNIBY, EDPIY.

The equations are fitted with a first-order Cochrane-Orcutt autocorrelation correction.

Table 14

Inflation, E/P ratios and Dividend Yields

One and Three Years Ahead

Annual Data,

E/P Ratios One Year Ahead

EQU	PERIOD	DEP VAR	CONST	DP(T)	DP(T-1)	DP(T-2)	DP1Y(T)	DXRND(T)	EDP1Y(T)	RAA(T)	TIME(T)	SUM	R2C	DW	RHO1
1.	1957-1976	EPADJFH(T)	0.048 (7.7)	0.137 (1.3)				0.064 (1.3)				0.137 (1.3)	0.162	1.958	0.156
2.	1957-1976	EPADJFH(T)	0.047 (9.7)	0.354 (3.2)	-0.238 (-1.5)	-0.014 (-0.1)		0.104 (2.1)				0.102 (1.2)	0.317	1.954	-0.142
3.	1957-1976	EPADJFH(T)	0.046 (3.7)	0.322 (1.8)	-0.248 (-1.5)	-0.015 (-0.1)		0.090 (1.6)			0.017 (0.2)	0.059 (0.3)	0.293	1.972	-0.074
4.	1957-1976	EPADJFH(T)	0.047 (9.9)				0.184 (2.2)	0.022 (0.6)				0.184 (2.2)	0.276	1.964	0.249
5.	1957-1976	EPADJFH(T)	0.066 (5.4)				0.317 (2.8)	0.013 (0.4)			-0.108 (-1.6)	0.317 (2.8)	0.339	1.993	0.160
6.	1957-1976	EPADJFH(T)	0.047 (7.9)					0.072 (1.5)	0.142 (1.5)			0.142 (1.5)	0.170	1.983	0.111
7.	1957-1976	EPADJFH(T)	0.055 (7.2)					0.211 (3.7)	0.414 (3.3)		-0.109 (-2.0)	0.414 (3.3)	0.214	2.049	-0.482
8.	1957-1976	EPADJFH(T)	0.065 (4.3)					0.011 (0.3)		-0.138 (-0.7)		-0.138 (-0.7)	0.114	1.840	0.380
9.	1957-1976	EPADJFH(T)	0.052 (3.9)					-0.006 (-0.1)		-0.626 (-1.8)	0.203 (1.8)	-0.626 (-1.8)	0.227	1.687	0.271
10.	1957-1976	EPADJC(T)	0.003 (0.2)	1.378 (4.1)				0.801 (3.5)				1.378 (4.1)	0.345	2.320	-0.422
11.	1957-1976	EPADJC(T)	0.040 (2.2)	2.191 (6.3)	-2.961 (-1.5)	1.996 (6.0)		0.186 (1.6)				1.227 (3.6)	0.618	1.644	0.304
12.	1957-1976	EPADJC(T)	-0.093 (-1.8)	1.222 (2.9)	-2.974 (-9.8)	1.196 (3.0)		0.098 (1.1)			0.910 (2.8)	-0.557 (-0.8)	0.608	2.188	0.446
13.	1957-1976	EPADJC(T)	0.018 (2.0)				1.367 (9.0)	0.399 (3.7)				1.367 (9.0)	0.642	2.493	-0.605
14.	1957-1976	EPADJC(T)	0.051 (2.5)				1.706 (7.0)	0.381 (3.9)			-0.211 (-1.7)	1.706 (7.0)	0.627	2.532	-0.733
15.	1957-1976	EPADJC(T)	0.002 (0.1)					0.837 (3.7)	1.366 (4.3)			1.366 (4.3)	0.359	2.361	-0.452

Table 14 (Continued).

EQU	PERIOD	DEP VAR	CONST	DP[T]	DP[T-1]	DP[T-2]	DP1Y[T]	DXEND[T]	EDP1Y[T]	RAA[T]	TIME[T]	SUM	R2C	DW	RHO
16.	1957-1976	EPADJC[T]	-0.012					0.744	1.093		0.132	1.093	0.341	2.340	-0.393
			(-0.3)					(2.7)	(1.7)		(0.5)	(1.7)			
17.	1957-1976	EPADJC[T]	-0.017					0.456		1.388		1.388	0.156	2.053	-0.172
			(-0.3)					(1.8)		(2.1)		(2.1)			
18.	1957-1976	EPADJC[T]	-0.036					-0.007		-4.854	2.004	-4.854	0.423	1.770	0.392
			(-0.5)					(0.0)		(-3.1)	(3.8)	(-3.1)			
19.	1957-1976	EPBOOK[T]	0.130	0.204				-0.036				0.204	0.728	1.020	0.980
			(1.5)	(2.1)				(-1.5)				(2.1)			
20.	1957-1976	EPBOOK[T]	0.049	0.292	0.135	0.132		-0.026				0.559	0.650	0.805	0.830
			(3.3)	(2.4)	(1.5)	(1.1)		(-1.0)				(2.8)			
21.	1957-1976	EPBOOK[T]	-0.117	0.125	0.133	-0.109		-0.027			0.647	0.149	0.616	1.279	0.893
			(-1.3)	(0.9)	(1.7)	(-0.7)		(-1.2)			(1.9)	(0.5)			
22.	1957-1976	EPBOOK[T]	0.159				-0.041	-0.065				-0.041	0.700	0.964	0.979
			(1.8)				(-0.5)	(-2.9)				(-0.5)			
23.	1957-1976	EPBOOK[T]	-0.046				-0.062	-0.058			0.483	-0.062	0.683	1.046	0.819
			(-1.0)				(-0.7)	(-2.6)			(2.7)	(-0.7)			
24.	1957-1976	EPBOOK[T]	0.143					-0.037	0.179			0.179	0.727	1.040	0.982
			(1.5)					(-1.5)	(2.0)			(2.0)			
25.	1957-1976	EPBOOK[T]	-0.078					-0.032	0.179		0.524	0.179	0.703	1.253	0.872
			(-1.3)					(-1.4)	(2.2)		(2.5)	(2.2)			
26.	1957-1976	EPBOOK[T]	0.102					-0.062		0.192		0.192	0.702	0.956	0.969
			(1.5)					(-2.7)		(0.7)		(0.7)			
27.	1957-1976	EPBOOK[T]	-0.052					-0.058		0.140	0.447	0.140	0.681	1.086	0.839
			(-1.0)					(-2.5)		(0.6)	(2.2)	(0.6)			

Table 14 *(Continued). E/P Ratios Three Years Ahead.

EQU	PERIOD	DEP VAR	CONST	DP[T]	DP[T-1]	DP[T-2]	DP3Y[T]	DXEND[T]	EDP3Y[T]	RAA[T]	TIME[T]	SUM	R2C	DW	RHO1
28.	1957-1974	EPADJFH3[T]	0.062 (9.3)	-0.058 (-0.5)				-0.069 (-2.0)				-0.058 (-0.5)	0.206	1.581	0.499
29.	1957-1974	EPADJFH3[T]	0.064 (7.9)	-0.115 (-0.8)	0.163 (0.8)	-0.212 (-0.9)		-0.053 (-1.3)				-0.165 (-0.8)	0.214	1.721	0.447
30.	1957-1974	EPADJFH3[T]	0.047 (2.6)	-0.229 (-1.2)	0.169 (0.8)	-0.352 (-1.4)		-0.055 (-1.2)			0.116 (1.0)	-0.411 (-1.4)	0.227	1.828	0.309
31.	1957-1974	EPADJFH3[T]	0.057 (7.4)				0.048 (0.3)	-0.061 (-2.2)				0.048 (0.3)	0.197	1.592	0.548
32.	1957-1974	EPADJFH3[T]	0.076 (2.5)				0.189 (0.7)	-0.075 (-2.1)			-0.111 (-0.7)	0.189 (0.7)	0.202	1.644	0.558
33.	1957-1974	EPADJFH3[T]	0.061 (9.3)					-0.067 (-1.9)	-0.042 (-0.4)			-0.042 (-0.4)	0.201	1.572	0.503
34.	1957-1974	EPADJFH3[T]	0.056 (2.4)					-0.069 (-1.9)	-0.067 (-0.5)		0.030 (0.2)	-0.067 (-0.5)	0.189	1.586	0.503
35.	1957-1974	EPADJFH3[T]	0.074 (5.4)					-0.073 (-2.3)		-0.218 (-1.1)		-0.218 (-1.1)	0.245	1.655	0.451
36.	1957-1974	EPADJFH3[T]	0.067 (9.5)					-0.097 (-2.6)		-0.921 (-3.9)	0.243 (3.4)	-0.921 (-3.9)	0.379	2.145	-0.174
37.	1957-1974	EPADJC3[T]	0.157 (2.9)	-0.522 (-1.3)				-0.153 (-1.7)				-0.522 (-1.3)	0.428	1.848	0.869
38.	1957-1974	EPADJC3[T]	0.107 (2.4)	-0.548 (-1.2)	0.628 (1.2)	0.158 (0.2)		-0.111 (-1.1)				0.238 (0.3)	0.414	1.710	0.778
39.	1957-1974	EPADJC3[T]	-0.057 (-1.6)	-1.074 (-2.5)	0.644 (1.2)	-0.411 (-0.7)		-0.088 (-0.8)			0.881 (3.6)	-0.842 (-1.3)	0.476	1.908	0.199
40.	1957-1974	EPADJC3[T]	0.059 (3.9)				0.956 (3.3)	-0.106 (-1.4)				0.956 (3.3)	0.545	1.650	0.377
41.	1957-1974	EPADJC3[T]	0.072 (1.1)				1.078 (1.6)	-0.120 (-1.2)			-0.081 (-0.2)	1.078 (1.6)	0.504	1.674	0.392
42.	1957-1974	EPADJC3[T]	0.141 (3.1)					-0.142 (-1.5)	-0.379 (-1.0)			-0.379 (-1.0)	0.418	1.762	0.833
43.	1957-1974	EPADJC3[T]	-0.047 (-1.3)					-0.126 (-1.2)	-0.655 (-2.0)		0.811 (3.9)	-0.655 (-2.0)	0.529	1.739	0.235

Table 14 (Continued).

EQU	PERIOD	DEP VAR	CONST	DP[T]	DP[T-1]	DP[T-2]	DP3Y[T]	DXEND[T]	EDP3Y[T]	RAA[T]	TIME[T]	SUM	R2C	DW	RHO
44.	1957-1974	EPADJC3[T]	0.142					-0.113		-0.456		-0.456	0.404	1.670	0.773
			(2.0)					(-1.3)		(-0.5)		(-0.5)			
45.	1957-1974	EPADJC3[T]	-0.004					-0.083		-1.510	0.926	-1.510	0.521	1.827	0.150
			(-0.1)					(-0.8)		(-1.9)	(3.6)	(-1.9)			
46.	1957-1974	EPBOOK3[T]	0.056	0.401				-0.079				0.401	0.601	1.471	0.595
			(5.9)	(2.9)				(-1.9)				(2.9)			
47.	1957-1974	EPBOOK3[T]	0.053	0.235	0.402	-0.153		-0.056				0.484	0.555	1.435	0.730
			(3.6)	(1.4)	(2.0)	(-0.6)		(-1.5)				(1.6)			
48.	1957-1974	EPBOOK3[T]	0.021	0.172	0.392	-0.190		-0.058			0.150	0.374	0.506	1.544	0.788
			(0.3)	(0.8)	(1.9)	(-0.6)		(-1.5)			(0.5)	(0.9)			
49.	1957-1974	EPBOOK3[T]	0.200				-0.304	-0.109				-0.304	0.527	1.393	0.973
			(1.8)				(-1.1)	(-3.1)				(-1.1)			
50.	1957-1974	EPBOOK3[T]	-0.090				-0.492	-0.083			0.792	-0.492	0.566	1.495	0.789
			(-1.3)				(-1.8)	(-2.3)			(2.7)	(-1.8)			
51.	1957-1974	EPBOOK3[T]	0.055					-0.073	0.403			0.403	0.627	1.492	0.592
			(6.5)					(-1.9)	(3.4)			(3.4)			
52.	1957-1974	EPBOOK3[T]	0.053					-0.073	0.397		0.009	0.397	0.579	1.494	0.589
			(1.6)					(-1.8)	(2.4)		(0.1)	(2.4)			
53.	1957-1974	EPBOOK3[T]	0.040					-0.108		0.563		0.563	0.532	1.167	0.779
			(1.3)					(-2.7)		(1.4)		(1.4)			
54.	1957-1974	EPBOOK3[T]	-0.104					-0.102		0.260	0.633	0.260	0.528	1.336	0.861
			(-0.9)					(-2.8)		(0.6)	(1.4)	(0.6)			

Table 14 (Continued). Dividend Yields, One and Three Years Ahead.

EQU	PERIOD	DEP VAR	CONST	DP[T]	DP[T-1]	DP[T-2]	DP1Y[T]	DP3Y[T]	DXEND[T]	EDP1Y[T]	EDP3Y[T]	HAA[T]	IMM[T]	SUM	R2C	DW	RHO1
55.	1947-1977	DIVY1[T]	0.043	-0.039					-0.048					-0.039	0.741	1.525	0.886
			(4.2)	(-0.9)					(-4.3)					(-0.9)			
56.	1947-1977	DIVY1[T]	0.040	0.021	-0.102	0.047			-0.056					-0.034	0.728	1.911	0.855
			(5.1)	(0.5)	(-2.8)	(1.6)			(-5.5)					(-0.5)			
57.	1947-1977	DIVY1[T]	-0.052	0.004	-0.112	0.036			-0.057				0.186	-0.072	0.704	2.110	0.908
			(-0.8)	(0.1)	(-3.0)	(1.2)			(-5.7)				(1.4)	(-0.9)			
58.	1947-1977	DIVY1[T]	0.040				0.031		-0.050					0.031	0.739	1.445	0.889
			(3.7)				(0.6)		(-4.2)					(0.6)			
59.	1947-1977	DIVY1[T]	0.009				0.028		-0.050				0.063	0.028	0.711	1.484	0.912
			(0.1)				(0.5)		(-4.1)				(0.4)	(0.5)			
60.	1947-1977	DIVY1[T]	0.043						-0.049	-0.042				-0.042	0.743	1.554	0.885
			(4.2)						(-4.3)	(-1.0)				(-1.0)			
61.	1947-1977	DIVY1[T]	-0.043						-0.049	-0.050			0.165	-0.050	0.718	1.690	0.925
			(-0.4)						(-4.4)	(-1.2)			(0.9)	(-1.2)			
62.	1957-1976	DIVY1[T]	0.023						-0.046			0.193		0.193	0.576	1.753	0.704
			(2.9)						(-3.9)			(1.8)		(1.8)			
63.	1957-1976	DIVY1[T]	0.002						-0.047			0.147	0.053	0.147	0.548	1.967	0.738
			(0.1)						(-4.0)			(1.2)	(0.8)	(1.2)			
64.	1947-1975	DIVY3[T]	0.037	0.017					-0.046					0.017	0.770	2.025	0.866
			(4.3)	(0.4)					(-4.2)					(0.4)			
65.	1947-1975	DIVY3[T]	0.031	0.105	-0.049	0.100			-0.050					0.155	0.755	2.069	0.868
			(4.4)	(2.7)	(-1.5)	(3.9)			(-5.7)					(2.5)			
66.	1947-1975	DIVY3[T]	0.002	0.100	-0.055	0.096			-0.050				0.060	0.141	0.721	2.125	0.888
			(0.0)	(2.4)	(-1.5)	(3.6)			(-5.7)				(0.5)	(1.9)			
67.	1947-1975	DIVY3[T]	0.040					-0.046	-0.045					-0.046	0.770	2.040	0.860
			(4.2)					(-0.4)	(-4.0)					(-0.4)			
68.	1947-1975	DIVY3[T]	-0.031					-0.078	-0.044				0.145	-0.078	0.740	2.154	0.905
			(-0.4)					(-0.7)	(-4.0)				(0.9)	(-0.7)			
69.	1947-1975	DIVY3[T]	0.038						-0.046		0.013			0.013	0.769	2.037	0.866
			(4.3)						(-4.2)		(0.3)			(0.3)			
70.	1947-1975	DIVY3[T]	-0.008						-0.046		0.008		0.092	0.008	0.738	2.153	0.899
			(-0.1)						(-4.2)		(0.2)		(0.6)	(0.2)			
71.	1957-1975	DIVY3[T]	0.021						-0.052			0.230		0.230	0.536	1.709	0.745
			(1.9)						(-3.7)			(1.7)		(1.7)			
72.	1957-1975	DIVY3[T]	0.002						-0.053			0.197	0.046	0.197	0.501	1.879	0.780
			(0.0)						(-3.7)			(1.1)	(0.4)	(1.1)			

$EPBOOK_T$	$\frac{EPS_{T+1}}{CPI_{T+1}} / \frac{SPX_T}{CPI_T}$ where EPS is book EPS and SPX is the index (S&P 500)
EPBOOK3	$\frac{1}{3} \frac{\left[\frac{EPS_{T+3}}{CPI_{T+3}} + \frac{EPS_{T+2}}{CPI_{T+2}} + \frac{EPS_{T+1}}{CPI_{T+1}}\right]}{\frac{SPX_T}{CPI_T}}$
EPADJC EPADJC3	as above, but EPS is scaled to reflect economic profits inclusive of all adjustments, using Cagan-Lipsey data.
EPADJFH EPADJFH3	as above, but EPS is scaled to reflect economic profits inclusive of all adjustments, using Friend-Hasbrouck data.
DIVY1	$\frac{DPS_{T+1}}{CPI_{T+1}} / \frac{SPX_T}{CPI_T}$ where DPS and SPX represent dividends and price per share of the S&P 500.
DIVY3	$\frac{1}{3} \frac{\left[\frac{DPS_{T+3}}{CPI_{T+3}} + \frac{DPS_{T+2}}{CPI_{T+2}} + \frac{DPS_{T+1}}{CPI_{T+1}}\right]}{\frac{SPX_T}{CPI_T}}$
DP_T	$CPI_T / CPI_{T-1} - 1$
$DP1Y_T$	DP_{T+1}
$EDP1Y_T$	$E_T\left[DP_{T+1}\right]$ where the expectation is generated by an autoregressive forecasting model.
RAA_T	coupons on newly issued AA utility bonds.
$TIME_T$	.01 in 1946; incremented by .01 each year thereafter.

Table 15

Inflation and Stock Prices

Annual Data

EQU	PERIOD	DEP VAR	CONST	DP[T]	DP[T-1]	DP[T-2]	DP[T-3]	DP[T-4]	DP[T-5]	TIME[T]	SUM	R2C	DW	RHO1
1.	1946-1978	RSPXEND[T]	57.3 (0.6)	-108.3 (-1.6)						33.4 (0.2)	-108.3 (-1.6)	0.748	1.891	0.888
2.	1946-1978	RSPXEND[T]	36.5 (0.5)	-126.4 (-1.8)	-59.8 (-1.3)					74.5 (0.4)	-186.3 (-2.1)	0.730	1.943	0.873
3.	1946-1978	RSPXEND[T]	4.9 (0.1)	-195.1 (-2.2)	-77.9 (-1.6)	-65.5 (-1.2)				160.4 (1.3)	-338.6 (-2.3)	0.708	1.912	0.812
4.	1946-1978	RSPXEND[T]	-35.9 (-1.4)	-468.0 (-5.2)	-186.6 (-4.1)	-187.1 (-3.7)	-214.4 (-4.2)			326.5 (4.6)	-1056.2 (-5.5)	0.731	1.986	0.708
5.	1946-1978	RSPXEND[T]	-37.9 (-1.3)	-454.9 (-4.8)	-202.0 (-4.0)	-196.6 (-3.7)	-220.7 (-4.1)	-30.6 (-0.6)		334.9 (4.4)	-1104.8 (-5.2)	0.703	2.019	0.722
6.	1946-1978	RSPXEND[T]	-37.8 (-1.3)	-454.5 (-4.6)	-201.6 (-3.8)	-197.1 (-3.4)	-221.0 (-3.9)	-30.9 (-0.6)	-1.3 (0.0)	334.9 (4.3)	-1106.5 (-4.9)	0.674	2.022	0.721

EQU	PERIOD	DEP VAR	CONST	DP[T]	DP[T-1]	DP[T-2]	DP[T-3]	DP[T-4]	DP[T-5]	TIME[T]	SUM	R2C	DW	RHO1
7.	1946-1978	LOG RSPXEND[T]	5.321 (2.1)	-1.198 (-1.1)						-2.007 (-0.4)	-1.198 (-1.1)	0.789	1.910	0.926
8.	1946-1978	LOG RSPXEND[T]	4.810 (2.2)	-1.490 (-1.4)	-1.058 (-1.4)					-0.962 (-0.2)	-2.548 (-1.8)	0.769	2.017	0.919
9.	1946-1978	LOG RSPXEND[T]	3.573 (2.4)	-2.546 (-1.9)	-1.369 (-1.8)	-1.181 (-1.3)				1.628 (0.5)	-5.096 (-2.2)	0.746	2.006	0.884
10.	1946-1978	LOG RSPXEND[T]	2.321 (7.2)	-7.978 (-6.1)	-3.371 (-5.1)	-3.583 (-4.9)	-3.851 (-5.2)			5.863 (6.6)	-18.783 (-7.1)	0.761	1.789	0.653
11.	1946-1978	LOG RSPXEND[T]	2.323 (6.8)	-7.729 (-5.4)	-3.541 (-4.9)	-3.667 (-4.8)	-3.887 (-5.2)	-0.402 (-0.5)		5.897 (6.4)	-19.727 (-6.8)	0.731	1.831	0.663
12.	1946-1978	LOG RSPXEND[T]	2.342 (6.8)	-7.652 (-5.2)	-3.465 (-4.6)	-3.714 (-4.6)	-3.911 (-5.0)	-0.432 (-0.6)	-0.205 (-0.3)	5.870 (6.3)	-19.379 (-6.6)	0.701	1.869	0.658

EQU	PERIOD	DEP VAR	CONST	DDP[T]	DDP[T-1]	DDP[T-2]	DDP[T-3]	DDP[T-4]	DDP[T-5]	TIME[T]	SUM	R2C	DW
13.	1946-1978	PDIFF RSPXEND[T]	0.155 (1.2)	-1.565 (-2.2)						-0.316 (-1.0)	-1.565 (-2.2)	0.155	2.002
14.	1946-1978	PDIFF RSPXEND[T]	0.153 (1.2)	-1.689 (-2.4)	-0.967 (-1.4)					-0.308 (-1.0)	-2.656 (-2.5)	0.196	2.039
15.	1946-1978	PDIFF RSPXEND[T]	0.151 (1.2)	-2.118 (-2.7)	-1.162 (-1.6)	-1.029 (-1.3)				-0.297 (-1.0)	-4.309 (-2.6)	0.230	2.241
16.	1946-1978	PDIFF RSPXEND[T]	0.094 (0.8)	-3.711 (-4.0)	-2.442 (-3.0)	-2.114 (-2.6)	-2.384 (-2.7)			-0.143 (-0.5)	-10.650 (-3.8)	0.350	2.144
17.	1946-1978	PDIFF RSPXEND[T]	0.089 (0.7)	-3.735 (-3.9)	-2.528 (-2.3)	-2.187 (-2.1)	-2.451 (-2.3)	-0.117 (-0.1)		-0.129 (-0.4)	-11.019 (-2.6)	0.338	2.139
18.	1946-1978	PDIFF RSPXEND[T]	0.114 (0.9)	-3.833 (-3.9)	-2.387 (-2.1)	-1.678 (-1.4)	-2.002 (-1.6)	0.327 (0.3)	0.724 (0.8)	-0.196 (-0.6)	-3.850 (-1.7)	0.335	2.055

$RSPXEND_T$ S&P composite index deflated by CPI (end of year values). (average value over 1946-78 is 59.6)

DP_T $(CPI_T/CPI_{T-1}) - 1.$

$TIME_T$ .01 in 19; incremented by .01 each year thereafter.

DDP_T $DP_T - DP_{T-1}$

$$(PDIFF\ RSPXEND)_T = \frac{RSPXEND_T}{RSPXEND_{T-1}} - 1.$$

Table 18 Real and Nominal Market Returns, Monthly.

SQU	PERIOD	DEP VAR	CONST	DX6[T+12]	DX6[T+18]	DX6[T+6]	TIME[T]	R2C	DW	MSE
1.	1947.01-1976.12	RRM[T]	-0.002 (-0.9)	0.061 (1.4)	0.101 (2.2)	0.257 (5.7)		0.094	2.099	0.00145
2.	1947.01-1976.12	RRM[T]	0.012 (1.3)	0.059 (1.4)	0.098 (2.1)	0.254 (5.6)	-0.003 (-1.6)	0.100	2.114	0.00144
3.	1947.01-1976.12	RM[T]	0.002 (0.6)	0.048 (1.1)	0.076 (1.7)	0.236 (5.2)		0.079	2.114	0.00144
4.	1947.01-1976.12	RM[T]	0.012 (1.3)	0.047 (1.1)	0.074 (1.6)	0.234 (5.2)	-0.002 (-1.1)	0.082	2.122	0.00143

Table 18a. Heteroscedasticity Tests on Equ. 1 in Table 18.

EQU	PERIOD	DEP VAR	CONST	DPACT[T]	DPAVY[T]	EDPAR[T-1]	EDPTB[T-1]	R2C	DW	B-P
1.	1947.01-1976.12	ARES[T]	0.028 (18.1)	0.048 (2.0)				0.011	1.895	
2.	1947.01-1976.12	ARES[T]	0.025 (14.1)		0.122 (3.7)			0.036	1.922	
3.	1947.02-1976.12	ARES[T]	0.025 (15.2)			0.118 (4.0)		0.042	1.949	
4.	1947.01-1976.12	ARES[T]	0.025 (14.1)				0.118 (3.8)	0.038	1.926	
5.	1947.01-1976.12	G2[T]	0.879 (7.8)	3.137 (1.7)				0.008	1.779	4.809
6.	1947.01-1976.12	G2[T]	0.657 (5.0)		8.960 (3.6)			0.035	1.805	20.105
7.	1947.02-1976.12	G2[T]	0.661 (5.4)			9.134 (4.1)		0.046	1.834	26.237
8.	1947.01-1976.12	G2[T]	0.663 (5.1)				8.274 (3.6)	0.034	1.801	19.494

Table 18b. Heteroscedasticity Tests on Equ. 2 in Table 18.

EQU	PERIOD	DEP VAR	CONST	DPACT[T]	DPAVY[T]	EDPAR[T-1]	EDPTB[T-1]	R2C	DW	B-P
1.	1947.01-1976.12	ARES[T]	0.028 (18.3)	0.041 (1.7)				0.008	1.923	
2.	1947.01-1976.12	ARES[T]	0.025 (14.1)		0.121 (3.6)			0.036	1.957	
3.	1947.02-1976.12	ARES[T]	0.025 (15.3)			0.116 (3.9)		0.041	1.986	
4.	1947.01-1976.12	ARES[T]	0.025 (14.1)				0.117 (3.7)	0.038	1.960	
5.	1947.01-1976.12	G2[T]	0.884 (7.6)	2.912 (1.6)				0.007	1.819	4.145
6.	1947.01-1976.12	G2[T]	0.648 (4.9)		9.130 (3.6)			0.035	1.849	20.875
7.	1947.02-1976.12	G2[T]	0.656 (5.3)			9.203 (4.1)		0.044	1.876	26.635
8.	1947.01-1976.12	G2[T]	0.654 (4.9)				8.436 (3.5)	0.034	1.845	20.266

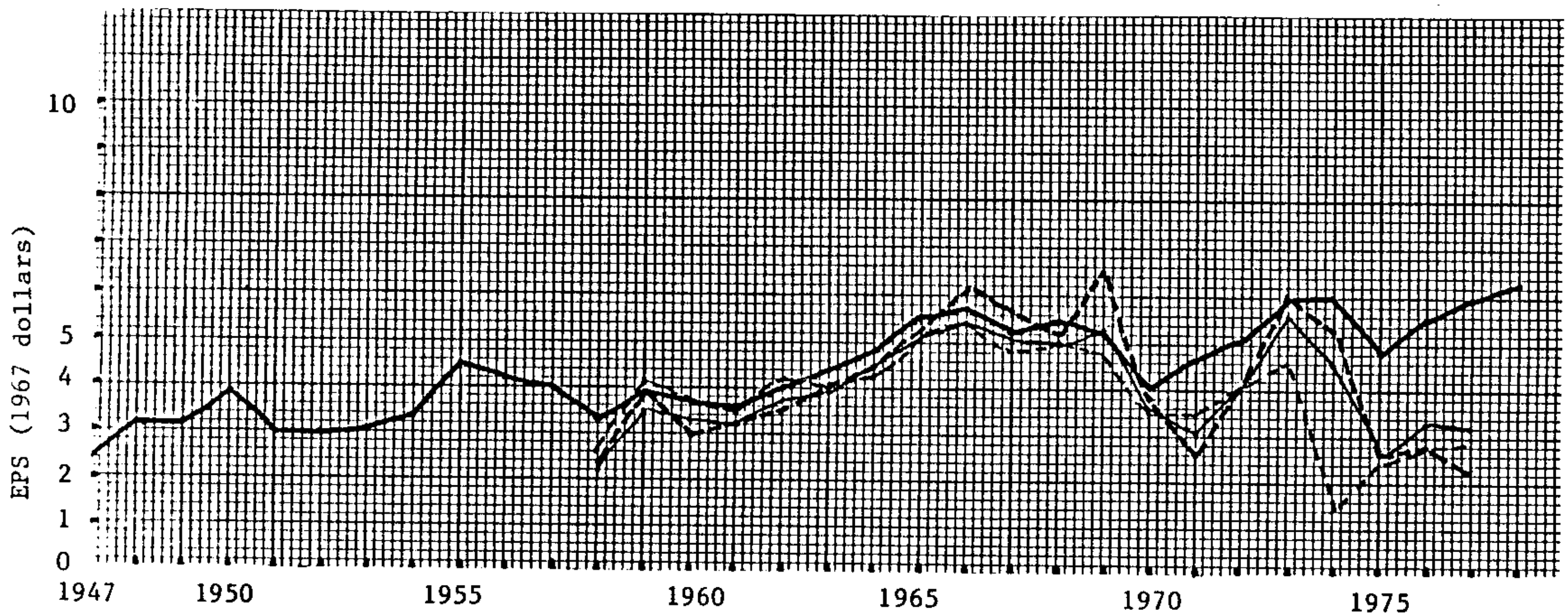
Table 18c. Heteroscedasticity Tests on Equ. 3 in Table 18.

EQU	PERIOD	DEP VAR	CONST	DPACT[T]	DPAVY[T]	EDPAR[T-1]	EDPTB[T-1]	R2C	DW	B-P
1.	1947.01-1976.12	ARES[T]	0.028 (18.5)	0.031 (1.3)				0.005	1.871	
2.	1947.01-1976.12	ARES[T]	0.025 (14.2)		0.115 (3.4)			0.032	1.904	
3.	1947.02-1976.12	ARES[T]	0.025 (15.3)			0.111 (3.7)		0.037	1.934	
4.	1947.01-1976.12	ARES[T]	0.025 (14.2)				0.108 (3.5)	0.032	1.903	
5.	1947.01-1976.12	G2[T]	0.897 (7.7)	2.614 (1.4)				0.005	1.793	3.340
6.	1947.01-1976.12	G2[T]	0.661 (4.9)		8.852 (3.5)			0.032	1.820	19.625
7.	1947.02-1976.12	G2[T]	0.669 (5.3)			8.928 (3.9)		0.041	1.849	25.070
8.	1947.01-1976.12	G2[T]	0.675 (5.0)				7.987 (3.3)	0.030	1.814	18.166

Table 18d. Heteroscedasticity Tests on Equ. 4 in Table 18.

EQU	PERIOD	DEP VAR	CONST	DPACT[T]	DPAVY[T]	EDPAR[T-1]	EDPTB[T-1]	R2C	DW	B-P
1.	1947.01-1976.12	ARES[T]	0.028 (18.6)	0.026 (1.1)				0.003	1.893	
2.	1947.01-1976.12	ARES[T]	0.025 (14.2)		0.115 (3.4)			0.032	1.932	
3.	1947.02-1976.12	ARES[T]	0.025 (15.3)			0.110 (3.7)		0.037	1.962	
4.	1947.01-1976.12	ARES[T]	0.025 (14.2)				0.108 (3.5)	0.032	1.930	
5.	1947.01-1976.12	G2[T]	0.905 (7.6)	2.313 (1.2)				0.004	1.822	2.616
6.	1947.01-1976.12	G2[T]	0.656 (4.8)		8.922 (3.4)			0.032	1.854	19.938
7.	1947.02-1976.12	G2[T]	0.666 (5.2)			8.955 (3.9)		0.040	1.882	25.218
8.	1947.01-1976.12	G2[T]	0.669 (4.9)				8.062 (3.3)	0.029	1.847	18.511

Figure 1. Deflated Earnings Per Share (Book and Economic Based on Friend-Hasbrouck Data).



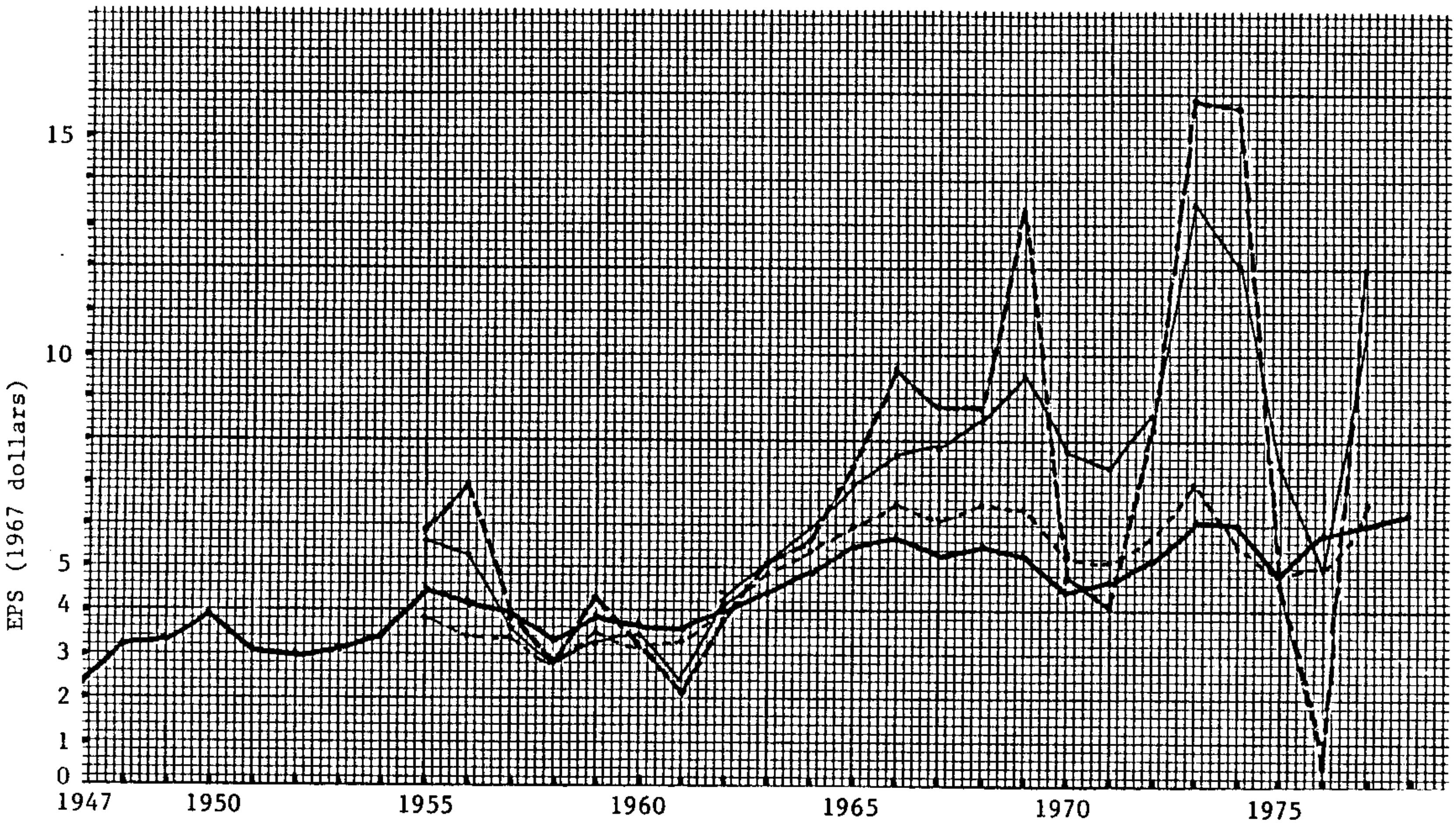
REPS EPS for S&P 500 deflated by CPI.

Deflated EPS reflecting inventory, depreciation and purchasing power of debt adjustments.

Deflated EPS reflecting all adjustments except changes in market value of debt.

Deflated EPS reflecting all adjustments.

Figure 2. Deflated Earnings Per Share (Book and Economic Based on Cagan-Lipsey Data).



REPS — EPS for S&P 500, deflated by CPI.

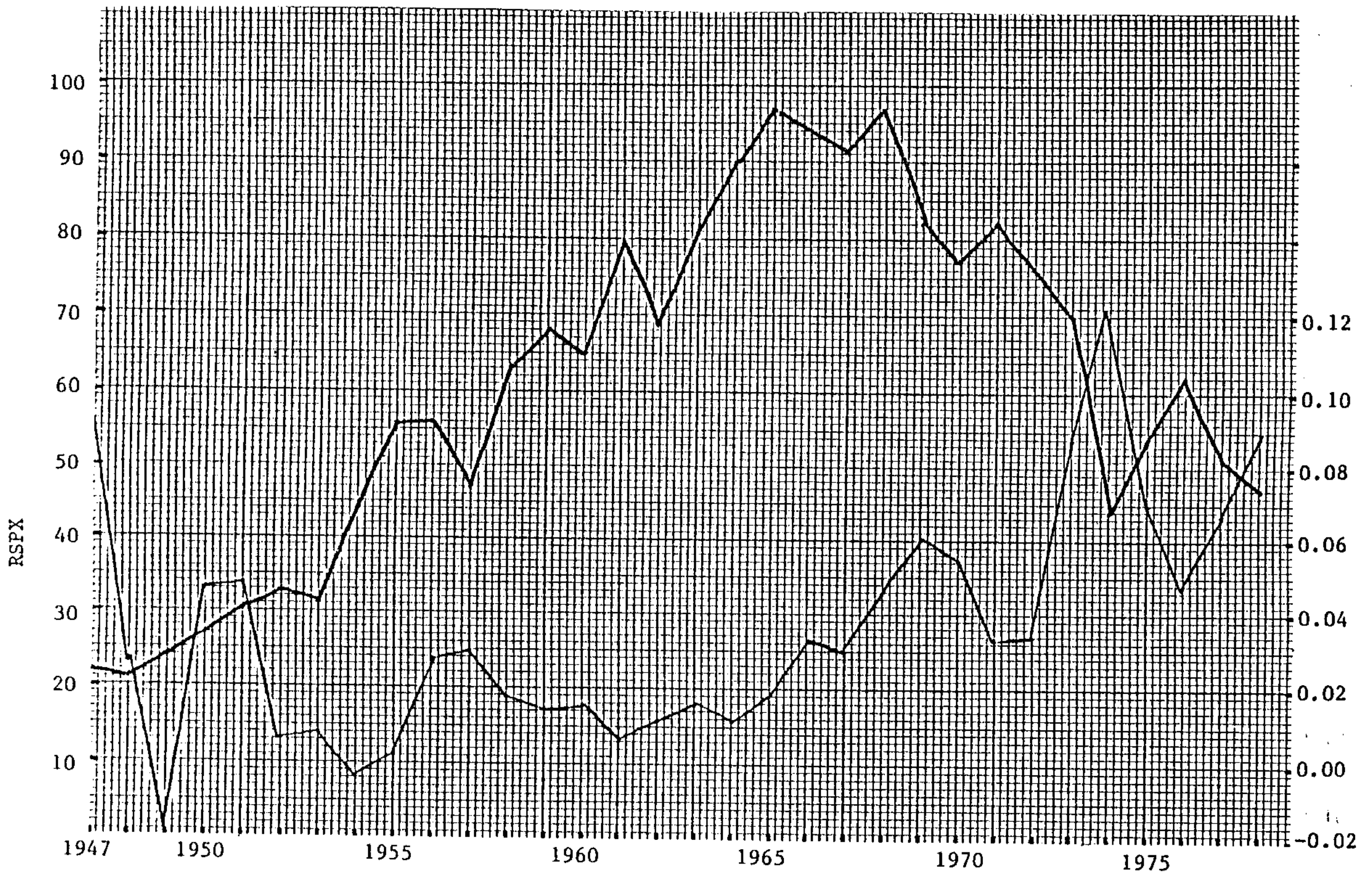
REPSCLA — Deflated EPS reflecting inventory, depreciation and Purhasing power of debt adjustments.

REESCLB — Deflated EPS reflecting all adjustments except changes in market value of debt.

REPSCLC — Deflated EPS reflecting all adjustments.

(See notes to Tables 8 and 10 for method of computation.)

Figure 3. Deflated Stock Prices and Inflation.



RSPXEND End of year S&P composite index, deflated by CPI.

DP = $(CPI_T/CPI_{T-1})-1$. Annual inflation in CPI.