P/E Movements: Some New Results

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Abstract

The P/E ratio is often used as a metric to compare individual stocks and the market as a whole relative to historical valuations. We examine the factors that affect changes in the inverse of the P/E ratio (E/P) over time in the broad market (S&P 500 Index). We use a limited number of variables that can be justified on theoretical grounds, and include variables that measure investor beliefs and changes in taxes rates. We show that tax rates and investor optimism are important factors that affect the P/E ratio.

I. Introduction

The price/earnings ratio is widely used, particularly by practitioners, as a measure of relative stock valuation. It has been used both in cross-sectional and time series comparisons. The P/E ratio of a broad index of stocks over time reflects changes in various economic conditions and investor perceptions of future returns. We examine the factors that plausibly explain movements in this ratio. Comparisons of P/E ratios over time are meaningless unless changes in the underlying fundamental determinants of P/E are taken into account. A high absolute P/E ratio (compared to historical averages) is often cited as an indicator of overvaluation. However, if the theoretical determinants of P/E are substantially different than historical averages, the high P/E ratio may be justified based on changes in the fundamental factors that affect P/E. For example, if interest rates are low, and estimated future growth and the dividend payout ratio are high compared to historical averages, the P/E should be correspondingly higher.

We employ the E/P ratio rather than the more popular P/E ratio to examine the factors that change the market index E/P. The P/E ratio has the obvious defect of going to infinity as earnings go to zero. The E/P ratio also has the advantage that it is directly

comparable to yields on other securities, particularly bonds. The E/P ratio can be viewed as the current earnings yield on the market and unlike the P/E ratio is linearly related to interest rates.

There is a limit to what stock market returns alone can tell us about market valuation. The E/P ratio, with all its obvious limitations, has the merit of relating market valuation to something that investors are presumably valuing. The E/P ratio is a natural metric for comparing market valuations over time.

Our approach attempts to be parsimonious in the number of explanatory variables used. As is well known, arbitrarily introducing explanatory variables can produce spurious results. We only employ variables that can be justified on economic grounds.

An aggregate E/P ratio (e.g., S&P 500 Index) is obviously affected by changes in investors' time preferences and risk aversion. Inflationary expectations are also generally assumed to affect stock prices, as are growth prospects, the dividend payout ratio, and leverage. Our study also includes taxes, which for most investors are an important factor affecting investment decisions. We employ a novel variable to represent the effect of taxes, namely one that can be inferred from the market. Investor beliefs concerning future prospects are an important if not dominant determinant of stock market values. The role of beliefs, however, is controversial, with theorists postulating everything from strict rational expectations to noise trading and irrational exuberance. Our study does not attempt to characterize the nature of investor beliefs, but instead simply tests whether changes in beliefs are associated with changes in E/P. We employ two variables that plausibly represent investor beliefs, (the Consumer Sentiment Index and the ratio of S&P500 Index volume to population).

Our model explains virtually all of the variation in E/P. Taxes and investor beliefs as measured by the Consumer Sentiment Index appear to be important factors in the determination of E/P.

The remainder of this paper is organized as follows. Section II provides a brief review of prior literature and Section III describes the model and the data. Results are presented in Section IV and conclusions in Section V.

II. Literature Review

1. The Determinants of P/E

Many previous studies of the determinants of P/E use the Gordon constant growth valuation model (1962) as an expositional starting point. The usual Gordon model divided by earnings is:

$$\frac{P_0}{E} = \frac{(D_1 / E)}{r - g} \qquad (1)$$

where D_1 = dividends paid next year
E = earnings
r = required rate of return on similar risk investments
g = constant, perpetual growth rate in dividends.

The price/earnings ratio, therefore, is a function of the dividend payout ratio, the required return and the growth rate in dividends. While these variables have been included in virtually all of the P/E models, the models generally use a regression approach and specify a linear relationship between the variables and P/E. Because the E/P ratio is more linearly related to interest rates, risk and earnings growth than is the P/E ratio, a number of studies use E/P instead of P/E as the dependent variable in regression analysis (White, 2000, Beaver and Morse, 1978, and Jain and Rosett, 2001)[1].

Much of the research on the determinants of P/E ratios has shown that while the above relationship was derived under the simplistic assumption of constant perpetual growth, the relationship in general terms is supported empirically. Loughlin (1996), in a study of the determinants of P/E for the S&P500 from 1968 to 1993, found a positive relation between P/E and both dividend payout and expected earnings growth.[2] White (2000) reports similar findings, using a longer sample period (1926-1997). Most prior studies decompose the required return component in equation (1) into a risk-free rate estimate and a risk premium estimate. In time series studies using data for the S&P500 index, researchers generally document a positive relationship between the risk-free rate and E/P (Loughlin, 1996, and White, 2000). Models that separately incorporate an inflation variable frequently find a positive relation between inflation and E/P (Reilly, Griggs and Wong, 1983; Kane, Marcus and Noh, 1996; and White, 2000). Results for the default risk spread (a common proxy for changes in the risk premium) are less consistent, with Kane, Marcus and Noh (1996) finding a significant positive relation between the spread and P/E, while Reilly, Griggs and Wong (1983) and Jain and Rosett (2001) find no significant relation.

In addition to these basic determinants of P/E, researchers have identified a number of other variables that potentially impact P/E. In a study using market index data from 1954-1993, Kane, Marcus and Noh (1996) examine the relationship between P/E, market volatility and the phase of the business cycle (as measured by detrended industrial production or the default spread). Dividend yield, the real interest rate, and the inflation rate are also included in the regression model. They find that volatility, the inflation rate and industrial production are negatively related to P/E, while the default premium is

positively related to P/E. Reilly, Griggs and Wong (1983) also use a business cycle indicator, (the business failure rate) in their study using quarterly data for the S&P400 from 1962 – 1980. They include a leverage variable and the coefficient of variation in EPS calculated over the past 20 quarters as proxies for the risk premium on the market. Other variables in the regression include the one year, three year and five year growth rates on the S&P400, the inflation-adjusted yield on Aaa-rated corporate bonds, CPI actual inflation, the dividend payout ratio, the debt/equity ratio, and a default spread variable. In coincident regressions with P/E as the dependent variable, neither the failure rate nor the coefficient of variation in EPS is significant. When lagged instead of contemporaneous regressors are used in the analysis, the failure rate is significant, but has the incorrect (positive) sign.

In addition to the dividend payout ratio and past earnings growth, White (2000), includes the inverse of the 10 year T-Bond yield, dividend yield, inflation, M2 money supply, the total quarterly return on the S&P500, and the standard deviation of S&P500 monthly returns as independent variables in a time series regression study covering the period from 1926-1997. With E/P as the dependent variable, he finds negative coefficients for earnings growth, dividend payout, S&P500 total return and real GDP growth. Dividend yield, inflation, the 20-year T-Bond yield and the inverse of the 10-year T-Bond yield were positively related to E/P.

Geanakoplos, Magil and Quinzil, (2002), argue that stock market P/E ratios should be influenced by demographics, and since demography is predictable, stock returns and P/Es should also be at least partially predictable. They use a stochastic OLG model with a cyclical structure to generate cyclical PE ratios.

Jain and Rosett (2001) include an index of consumer sentiment in their model, along with expected inflation, the real interest rate, expected growth in real GDP, the slope of the treasury yield curve, and the default risk spread. Of the variables used in the multiple regression analysis, only expected inflation and expected growth in real GDP are significant for the sample period from 1952 to 2000. Jain and Rosett conclude that variation in E/P across time is not easily explainable by a consistent set of macroeconomic variables, and find that consumer sentiment does not appear to be a significant factor in determining E/P.

Previous time series studies generally provide empirical support for the fundamental determinants of E/P suggested by the Gordon model. However, earlier studies ignore the effect of changes in taxes on E/P, and with the exception of Jain and Rosett, ignore the impact of changes in beliefs on E/P.

III. METHODOLOGY

We begin with the identity that this period's E/P equals last period's E/P plus the changes to last period's E/P. E/P from the Gordon formula can be written as:

$$\frac{E}{P} = \frac{r - g}{(D/E)} \tag{2}$$

Taking the natural log of both sides we obtain:

$$\ln\frac{E}{P} = \ln(r - g) - \ln(D/E) \tag{3}$$

After taking the total differential we obtain the approximation that:

$$\%\Delta(E/P) \cong \%\Delta(r - g) - \%\Delta(D/E) \tag{4}$$

There is no directly observable measure of the appropriate discount rate for the market or the growth rate, therefore the empirical model takes the following form:

$$E/P_t = \alpha + \beta_1(E/P_{t-1}) + \beta_2(\Delta\text{Dividend Payout}_t) + \beta_3(\text{Departure from Livingston Growth Trend}_t \text{ or Departure from Past Profit Growth Trend}_t) + \beta_4(\Delta\text{T-Note Yield}_t) + \beta_5(\Delta\text{Term Structure Slope}_t) + \beta_6(\Delta\text{Baa} - \text{Aaa Yield Spread}_t) + \beta_7(\Delta(\text{Debt/Assets})_t) + \beta_8(\Delta\text{Implied Marginal Tax}_t) + \beta_9(\Delta(\text{Capital Gains Tax}_t / \text{Marginal Tax}_t)) + \beta_{10}(\Delta\text{Consumer Sentiment}_t) + \beta_{11}(\Delta(\text{Volume}_t/\text{Population}_t)) + \varepsilon_t \quad (2)$$

The variables are defined in Exhibit 1. The coefficients in this model are the response of E/P to a change in a particular independent variable, holding all other variables constant. Including the lag of E/P as a regressor is consistent with the approach taken by Kane, Marcus and Noh (1996), and is equivalent to allowing the regression to explain the first difference of the E/P multiple.

The remaining variables represent factors that plausibly explain changes in E/P. According to the Gordon (1962) model, changes in the dividend payout ratio, the growth rate and the required return will affect E/P. There should be a negative relation between changes in the dividend payout ratio and changes in the E/P ratio, because increases in this ratio increase cash flow to investors and are viewed as a signal of future prospects.

An increase in the growth rate of the firm implies a decrease in the E/P for the stock**.** In the Gordon model, the growth rate is assumed to be constant and perpetual. Ibbotson and Chen (2002), note that there has been a secular decline in the dividend payout ratio over the period from 1925–2000. Firms also tend to manage dividends, making dividend growth alone an unreliable measure of future growth. Most empirical studies, therefore, use earnings growth instead of dividend growth. Park (2000) found that in time-series regressions covering the period from 1954 to 1998, forecasted growth variables better explain actual P/E's for the S&P500 than historical growth measures.[3]

While most researchers use past or expected growth in earnings[4], it seems likely that the anticipated or expected growth is already reflected in the current E/P level. Changes in E/P, therefore, should only occur when the growth rate departs from its expected trend. Some of the change in growth is transient noise and not an indicator of a permanent shift in growth expectations. Quarterly growth changes, therefore, may not be a good indicator of changes in expected long term growth. We estimate changes in growth based on both expert opinion and historical data. First, we calculate the estimated growth in the S&P500 Index using the Livingston Survey of economists. The Livingston Survey participants are asked to predict the level of the S&P500 Index for a twelve-month forecast horizon. These forecasts can be used to construct an expected return (excluding dividends) on the index. The growth variable is then calculated as the residual from a regression of the current quarter's return estimate on lagged estimates for the previous eight quarters (i.e. the departure from an estimated linear return trend line)[5].

The second method used for estimating changes in growth uses actual past growth in total corporate profit. Changes in the trend of earnings growth are calculated as the residual from a regression of the current quarter's profit growth on lagged profit growth for the previous eight quarters. The two estimates serve as a check on the validity of our growth variable.

We hypothesize a negative relation between our growth variable and E/P; if growth for a particular quarter is above the trend line, stock prices for a given level of earnings should increase as investors revise growth expectations.

The E/P for the S&P500 index is also affected by changes in factors that influence an investor's required return. To capture these influences, we include the constant

maturity one-year Treasury note as an indicator of short-term interest rates. This rate captures the effect of changes in real interest rates and incorporates short-term inflation expectations. If the yield on the T-note increases, stock prices are expected to decrease, resulting in a direct relationship between changes in E/P and changes in T-note yield.

To capture expected changes in long-term expected inflation, we use the spread between the 20-year constant maturity Treasury note yield and the one-year constant maturity Treasury note yield. This measure should be reasonably accurate if changes in inflation expectations are the primary cause of yield differences between risk-free assets with different maturities. Jain and Rossert (2001) argue that in the Gordon model (1962), there is no role for inflation, because if the required return and growth are represented in nominal terms, inflation effects cancel out. However, the inflation effects only cancel out if the impact of inflation on earnings exactly matches the general inflation in prices. This is unlikely, because of bracket creep and because depreciation is not indexed to inflation.[6] Empirical work has frequently documented a significant positive relation between E/P and inflation.[7]

Changes in the default risk premium (the difference between the Moody's Baa-rated and Aaa-rated corporate bond yields) are used to reflect changes in the market risk premium. This is consistent with the approach taken by Reilly, Griggs and Wong (1983). Kane, Marcus and Noh (1996) argue that the yield spread will be wider during recessions, and at the same time earnings will be below trend values, so the E/P ratio should be inversely related to the spread variable, and the spread variable should be useful in picking up variations in E/P associated with changes in the business cycle. If, however, as a result of perceived increases in default risk, stock prices decline by more than the

decline in earnings, P/E could decrease (and E/P increase), indicating a positive relationship between E/P and the spread variable.

As an additional risk measure, we use changes in the median debt/total assets ratio (calculated using the universe of Compustat firms) to capture the impact of changes in leverage on the E/P ratio. Increases in leverage have been viewed as a signal of greater optimism by managers, who presumably would not shoulder additional fixed payments unless they were confident that the new debt payments could be met through permanent increases in cash flow. More traditionally, leverage has been used as a measure of risk. If firms on average are increasing leverage because they are signaling their optimism, the relationship between leverage and E/P will be negative. If greater leverage results in greater risk, then the opposite holds.[8]

We include changes in the implied marginal tax rate to control for the influence of taxes on the relative attractiveness of stocks versus alternative investments. At first glance, it appears that increases in the marginal tax rate would unambiguously increase E/P ratios by reducing after-tax cash flows to investors. This conclusion, however, assumes that changes in tax rates do not cause shifts in demand across asset classes. Instead, an increase in the marginal tax rate may cause investors to shift assets away from bonds, (where interest income is taxed at ordinary income rates) and into stocks, particularly stocks generating the majority of their returns from capital gains instead of dividend income.[9] Stocks offer a tax deferral on capital gains at the historically more favorable capital gains tax rates. As investors try to shelter income from the higher marginal tax rates, demand for stocks may increase, thus increasing stock prices.

The effect of taxes cannot be fully captured by examining changes in top marginal individual tax rates. Investors, for example, may be able to avoid paying the top rate through the use of tax shelters or tax-avoidance/tax-deferral strategies. We therefore use the change in the implied marginal tax rate, calculated by solving for the tax rate that equates the yields on the 10-year AAA-rated municipal and 10-year Treasury note. To insure that our measure picks up information not captured by more traditional tax rate variables, we also include the change in the ratio of the top long-term capital gains rate to the top marginal tax rate for individuals as a regression variable.

All of the variables discussed above reflect theoretical determinants of the E/P ratio. Stock prices, however, are also be influenced by changes in investor beliefs. If experts are the dominant investors, and/or rational expectations guide investment decisions, then the impact of changes in beliefs should be captured by the theoretical determinants of E/P discussed above and changes in investor beliefs should not be significantly related to changes in E/P. If, however, changes in beliefs are caused by less rational factors, such as overreaction to positive or negative news regarding stocks, these changes may explain movements in the market E/P. Changes in expert opinions regarding future growth prospects are captured by our growth variable, so for consumer sentiment to add additional explanatory power, changes in consumer sentiment must be different from or more volatile than changes in expert opinion. To examine the issue of relative volatility, we calculate the coefficient of variation of 1) changes in the Livingston Survey estimates of the S&P500 return, 2) changes in economic variables that impact consumers (disposable income, personal income and consumer spending), and 3) changes in the Consumer Sentiment Index. Changes in consumer sentiment are more volatile than

changes in expert opinion or actual changes in relevant economic variables.[10] This is possibly consistent with overreaction by consumers, and provides a theoretical justification for separately including consumer sentiment as a regression variable.

Note that E/P will be affected even if investors correctly forecast a key E/P determinant such as short term growth, but assume that transitorily high short-term growth rates can be sustained for indefinitely.[11]

To capture the impact of changes in investor beliefs on E/P values, we use two measures. The first measure, *ΔConsumer Sentiment Index*, is the change in the University of Michigan Consumer Sentiment Index.[12] The second measure of changes in investor beliefs is changes in the quarterly volume of shares of S&P500 companies. To control for increases in volume caused by changes in demographics through time, the quarterly volume numbers are divided by the total population ages 35-65 for that quarter. This population interval most closely corresponds to the "accumulator" phase of an investor's life cycle and should capture the individuals with the majority of the wealth invested in the market. Given the herd mentality and fads theories of investor psychology[13], one would expect volume to increase during periods of investor overreaction. If investors are characterized by excessive optimism, we would predict an inverse relationship between per capita volume and E/P. A direct relationship between our volume variable and E/P would be supportive of excessive pessimism.

We run two regressions using the variables described above. In the first regression, the departure from the Livingston Survey growth trend is used as the growth variable, while in the second regression the growth variable is the departure from the past profit growth trend.

IV. RESULTS

Descriptive statistics for the variables included in the regression model are shown in Table 1. Regression results for the period from the first quarter of 1964 to the last quarter of 1999 are shown in Table 2. Panel A of this table shows the results of the regression incorporating departures from the trend in Livingston Survey estimates of S&P500 return as the growth variable, while Panel B results use departures from the trend in past corporate profit growth. In both regressions, lagged E/P is significant, with a coefficient close to one. This result indicates a slight negative drift in E/P over time.

In Panel A, changes in dividend payout, leverage, the one-year Treasury yield and the term structure have the greatest impact on E/P; the coefficients are significant and have the predicted signs. Consistent with the results of Kane, Marcus and Noh (1996), changes in default risk, as measured by the *ΔSpread* variable, are negatively related to E/P. While the *ΔSpread* coefficient is large, the relationship between *ΔSpread* and E/P is not significant. The coefficient on departures from the trend in growth, as measured by the estimated S&P500 return, is significant and of the predicted negative sign. The leverage (*ΔDebt/Assets*) variable has the predicted positive sign and is marginally significant (*p*-value of .103). The measures of investor optimism (*ΔConsumer Sentiment Index and ΔVolume/Population*) have the predicted negative signs, but only the Consumer Sentiment variable is significant. Jain and Rosett (2001) include the Consumer Sentiment Index in their model of the determinants of E/P but do not find a significant effect. Jain and Rosett model, however, also included macroeconomic economic variables such as the expected growth in real GDP and expected inflation as

explanatory variables. If consumer sentiment is influenced by reports of changes in key economic variables, it is not surprising that interactions between these variables could cause the coefficient on the sentiment index to be insignificant.

The change in the implied marginal tax rate is significantly negatively related to E/P. Thus, increases in the implied marginal tax rate decrease E/P (or increase P/E). The result is consistent with the hypothesis that as individual tax rates increase, investors attempt to minimize taxes by shifting into assets classes such as stocks that allow deferral of taxes and generally preferential tax treatment of capital gains. The implied marginal tax rate variable appears to better capture the relationship between taxes and E/P than the ratio of the top capital gains rate to the top marginal tax rate. The coefficient on the ratio is not significant when both the ratio and the implied marginal tax variable are included in the regression.[14]

Results of the regression utilizing departures from the past growth trend as the growth variable (Panel B) are similar to the Panel A results. With the exception of two variables, all signs and significance levels are the same as the Panel A results. Differences are present in the leverage variable, and the *ΔVolume/Population* variable. In Panel A, the leverage variable (*ΔDebt/Assets*) is marginally significant, while the *ΔVolume/Population* variable is insignificant. In Panel B, the leverage variable is insignificant, but the *ΔVolume/Population* variable is significant. The negative sign on this variable is possibly consistent with investor optimism-driven trading.

The estimated values of E/P from the regressions in Panel A and Panel B are compared to actual E/P values in Figures 1 and 2, respectively. With the exception of the late 1990's, the model fits the actual data very well, and closely tracks changes in the

actual E/P. In the late 1990's many of the regression variables simultaneously had values that were extremely high or low by historical standards (e.g. interest rates were very low, while earnings growth estimates were very high). Applying coefficients derived from the historical relationship between these variables to the extreme changes in the values of the regression variables during this period resulted in more volatile estimates for E/P in 1998 and 1999. Using departures from the trend of past profit growth as the growth estimate, our model indicates that for the period from the first quarter of 1998 to the end of 1999, E/P was generally too low (or P/E was too high) to be justified by changes in the factors included in our model. Results using departures from the Livingston Survey growth estimates are less consistent. For four of the eight quarters in 1998 and 1999, we show that actual P/E was too high to be justified by changes in the variables included in our model, while the remaining four quarters indicate that the actual P/E was low compared to the predicted P/E. Further, indication of under- or overvaluation of the market does not persist when estimated growth is used; the estimated P/E frequently indicates overvaluation in one quarter, followed by undervaluation in the next quarter.

Using data as of the end of 1999, our model produces estimated E/P's of .035 and .034 using estimated and past growth variables, respectively. This is equivalent to a P/E of 28.5 (using the estimated growth variable) and 29.7 (using the past growth variable). At the end of 1999, the actual P/E for the S&P500 Index was 30.5.

V. CONCLUSIONS

This study extends the substantial body of prior research on the determinants of the E/P ratio for the aggregate stock market. We use a limited number of variables that can be justified on theoretical grounds to develop our model, and include variables to capture the impact of changes in investor beliefs and taxes. The results are consistent with the notion that taxes and investor sentiment variables are significant determinants of E/P. Dividend payout, debt/assets, the slope of the yield curve, short-term interest rates, and growth estimates are also significant explanatory variables. We find similar results using two alternative measures of growth: past growth trends and estimated growth trends based on Livingston Survey forecasts.

Our study explains virtually all of the changes in E/P (R^2 = .95) over the period studied (1964 to 1999). We use a novel measure of taxes, namely the marginal tax rate implied by the yield spread between AAA municipal bonds and the 10-year Treasury bond. We also find that changes in consumer sentiment (as measured by the University of Michigan Consumer Sentiment Index) are negatively related to changes in E/P. Changes in consumer sentiment are more volatile than changes in expert opinion or actual changes in the relevant economic variables. This evidence might be an indication of investor overreaction.if one assumes that expert opinion fully incorporates all relevant information. It does not appear such overreactions are exploitable by investors.

Exhibit 1 – Variable Definitions

Dependent Variable

E/P	Quarterly E/P of the S&P 500. E/P is calculated by dividing the price at the end of the quarter by the earnings per share for the most recent four quarters. Earnings is defined as primary earnings from continuing operations less preferred dividends and including savings due to common stock equivalents.

Independent Variables

E/P_{t-1}	E/P lagged one quarter
ΔDividend Payout	Change in the quarterly dividend payout ratio. For each quarter, the dividend payout ratio is calculated by dividing the dividends per share reported on the S&P500 index (Compustat index I0003) paid over the prior twelve months by the earnings per share paid over the prior twelve months. The change in the dividend payout ratio is calculated by subtracting the previous quarter's dividend payout ratio from the current quarter's ratio.
Departure from Livingston Growth Trend	Departure from the growth trend, where the growth estimate is defined as the Livingston Survey estimated one-year growth in the S&P400 (1952-1990) or the S&P500 (1990-1999) Index, obtained from the Philadelphia Federal Reserve website (www.phil.frb.org). The departure from the growth trend is calculated as the residual from a regression of the current quarter's Livingston estimated growth on lagged estimates for the previous eight quarters (i.e. the departure from the linear trend of estimated growth). Livingston Survey estimates are provided semiannually in June and December; March and September estimates were calculated by interpolation.
Departure from Profit Growth Trend	Alternate measure of departures from the growth trend, where the growth estimate is defined as the growth in corporate profit calculated using the quarterly CPATAX data item available from the *Federal Reserve Economic Database (FRED)*. The departure from the growth trend is the residual from a regression of the current quarter's profit growth on lagged profit growth for the previous eight quarters (i.e. the departure from the linear trend of profit growth).
ΔT-Note Yield	Change in the annual yield on the constant maturity 1-year Treasury note, calculated by subtracting the yield on the last day of the previous quarter from the yield on the last day of the current quarter. Yields were obtained from the *Federal Reserve Economic Database (FRED)*.

ΔTerm Structure Slope	Change in the slope of the yield curve, where the slope is calculated by subtracting the yield on a 1-year Treasury note from the yield on a 20-year Treasury bond. The change in the slope is calculated by subtracting the slope of the last day of the previous quarter from the slope on the last day of the current quarter. All data was obtained from *FRED*.
ΔBaa – Aaa Yield Spread	Change in the spread between Moody's Baa-rated and Aaa-rated corporate bonds, calculated by subtracting the spread on the last day of the previous quarter from the spread on the last day of the current quarter. Data for this variable was obtained from *FRED*.
ΔDebt/Assets	Change in the quarterly debt to total assets ratio. The total debt ratio is calculated as the median debt to total assets ratio for all firms listed on *Compustat* in a given year. Debt is defined as (Current Assets + Long-term Debt)/Total Assets. The change in the total debt ratio is calculated by subtracting the previous quarter's total debt ratio from the current quarter's ratio. Linear interpolation is used to convert from annual to quarterly data.
ΔImplied Marginal Tax	Change in the implied marginal tax rate, where the implied marginal tax rate is calculated by solving for the tax rate (T) that equates the yields on the 10-year AAA-rated municipal and 10-year Treasury note. Specifically, T = 1 – (Municipal yield/Treasury yield). The change in the implied marginal tax rate is calculated by subtracting the implied marginal tax rate on the last day of the previous quarter from the implied marginal tax rate on the last day of the current quarter. Treasury note data was obtained from *FRED,* and municipal yield data was obtained from *Global Financial Database (www.globalfindata.com)*.
Δ(Capital Gains/ Marginal Tax Rate)	Change in the ratio of the top capital gains rate for individuals to the top marginal income tax rate for individuals, both from *World Tax Database (wtdb.org).* After 1996, the top capital gains rates on long-term capital gains were obtained from Burman (1999).
ΔConsumer Sentiment	Change in the University of Michigan Consumer Sentiment Survey, calculated by subtracting the survey result for the previous quarter from the survey result for the current quarter.
ΔVolume/ Population	Change in the total volume/population ratio, where total volume is the total quarterly volume on S&P500 stocks (obtained from the *Center for Research in Security Prices (CRSP)*) and population is the total U.S. population for ages 35 to 65 from the *Census Bureau*. Linear interpolation is used to convert annual population numbers to quarterly numbers.

Table 1
Descriptive Statistics for Regression Variables
Quarterly Data from 1964 to 1999

Regression Variables	Mean	Median	Maximum	Minimum	Std. Deviation
Earnings/Price Ratio	0.07308	0.0632	0.1498	0.0298	0.0285
ΔDividend Payout$_t$	-0.00148	-0.0024	0.0747	-0.0545	0.0214
Departure from Livingston Growth Trend$_t$	0.00171	-0.0012	0.1629	-0.1201	0.0414
Departure from Past Profit Growth Trend$_t$	0.00126	0.0014	0.1677	-0.1715	0.0634
ΔT-Note Yield$_t$	0.00014	0.0013	0.0384	-0.0766	0.0119
ΔTerm Structure Slope$_t$	0.00004	-0.0005	0.0530	-0.0337	0.0084
ΔBaa - Aaa Yield Spread$_t$	0.00001	-0.0001	0.0091	-0.0056	0.0022
Δ(Debt/Assets)$_t$	0.00044	0.0010	0.0066	-0.0052	0.0031
ΔImplied Marginal Tax Rate$_t$	-0.00093	-0.0001	0.0940	-0.0666	0.0284
Δ(Cap. Gains Tax$_t$/Marg. Tax$_t$)	0.88889	1.0000	1.0000	0.0000	0.3154
ΔConsumer Sentiment Index$_t$	0.00089	-0.0010	0.1870	-0.1520	0.0576
Δ(Volume/Population)$_t$	3.69383	0.6264	90.7800	-31.0134	14.0833

All variables are defined in Table 2.

Table 2
REGRESSION RESULTS
Quarterly data from 1964 to 1999

Panel A: $E/P_t = \alpha + \beta_1 (E/P_{t-1}) + \beta_2 (\Delta \text{Dividend Payout}_t) + \beta_3 (\text{Departure from Livingston Growth Trend}_t) + \beta_4 (\Delta \text{T-Note Yield}_t) + \beta_5 (\Delta \text{Term Structure Slope}_t) + \beta_6 (\Delta \text{Baa} - \text{Aaa Yield Spread}_t) + \beta_7 (\Delta (\text{Debt/Assets})_t) + \beta_8 (\Delta \text{Implied Marginal Tax}_t) + \beta_9 (\Delta (\text{Capital Gains Tax}_t / \text{Marginal Tax}_t)) + \beta_{10} (\Delta \text{Consumer Sentiment}_t) + \beta_{11} (\Delta (\text{Volume}_t / \text{Population}_t)) + \varepsilon_t$

Variable	Coefficient	Std. Error	T-Statistic	P-Value
Intercept	0.00188	0.00202	0.93045	0.35380
E/P_{t-1}	0.98795	0.01766	55.94946	0.00000
ΔDividend Payout$_t$	-0.12730	0.02347	-5.42433	0.00000
Departure from Livingston Growth Trend$_t$	-0.06759	0.01254	-5.39132	0.00000
ΔT-Note Yield$_t$	0.39745	0.08597	4.62322	0.00000
ΔTerm Structure Slope$_t$	0.29070	0.11505	2.52675	0.01270
ΔBaa - Aaa Yield Spread$_t$	-0.20170	0.25977	-0.77647	0.43890
Δ(Debt/Assets)$_t$	0.27092	0.16167	1.67574	0.09620
ΔImplied Marginal Tax Rate$_t$	-0.03009	0.01756	-1.71319	0.08900
Δ(Cap. Gains Tax$_t$/Marg. Tax$_t$)	-0.00144	0.00157	-0.91510	0.36180
ΔConsumer Sentiment Index$_t$	-0.02319	0.00977	-2.37386	0.01900
Δ(Volume/Population)$_t$	-0.00003	0.00003	-1.00763	0.31550

Adjusted R^2 = 0.96099, F Statisitic = 321.2714, Durbin-Watson = 2.2216

Panel B: $E/P_t = \alpha + \beta_1 (E/P_{t-1}) + \beta_2 (\Delta \text{Dividend Payout}_t) + \beta_3 (\text{Departure from Past Profit Growth Trend}_t) + \beta_4 (\Delta \text{T-Note Yield}_t) + \beta_5 (\Delta \text{Term Structure Slope}_t) + \beta_6 (\Delta \text{Baa} - \text{Aaa Yield Spread}_t) + \beta_7 (\Delta (\text{Debt/Assets})_t) + \beta_8 (\Delta \text{Implied Marginal Tax}_t) + \beta_9 (\Delta (\text{Capital Gains Tax}_t / \text{Marginal Tax}_t)) + \beta_{10} (\Delta \text{Consumer Sentiment}_t) + \beta_{11} (\Delta (\text{Volume}_t / \text{Population}_t)) + \varepsilon_t$

Variable	Coefficient	Std. Error	T-Statistic	P-Value
Intercept	0.00141	0.00217	0.64974	0.51700
E/P_{t-1}	0.98864	0.01900	52.04679	0.00000
ΔDividend Payout$_t$	-0.14530	0.02511	-5.78761	0.00000
Departure from Past Profit Growth Trend$_t$	-0.02326	0.00864	-2.69139	0.00800
ΔT-Note Yield$_t$	0.51177	0.09033	5.66524	0.00000
ΔTerm Structure Slope$_t$	0.38170	0.12243	3.11781	0.00220
ΔBaa - Aaa Yield Spread$_t$	-0.14870	0.27910	-0.53276	0.59510
Δ(Debt/Assets)$_t$	0.26183	0.17713	1.47821	0.14170
ΔImplied Marginal Tax Rate$_t$	-0.03369	0.01888	-1.78393	0.07670
Δ(Cap. Gains Tax$_t$/Marg. Tax$_t$)	-0.00098	0.00169	-0.58124	0.56210
ΔConsumer Sentiment Index$_t$	-0.02991	0.01039	-2.87881	0.00470
Δ(Volume/Population)$_t$	-0.00007	0.00004	-1.79031	0.07570

Adjusted R^2 = 0.95488, F Statisitic = 276.1168, Durbin-Watson = 1.9049

where:

E/P is the quarterly Earnings/Price ratio for the S&P500

Δ Dividend Payout is the quarterly change in the dividend payout ratio for the S&P500

Departure from Livingston Growth Trend is the departure from the linear trend of S&P500 return estimates provided by the Livingston Survey

Departure from Livingston Growth Trend is the departure from the linear trend of actual aggregate corporate profit provided by the Federal Reserve Economic Database (FRED)

Δ T-Note Yield is the quarterly change in the 1-year Treasury Note yield..

Δ Term Structure Slope is the quarterly change in the spread between the 20-year Treasury Note and the 1-year Treasury Note

Δ Baa-Aaa Yield Spread is the quarterly change in the spread between the Baa-rated Moody's corporate bond yield and the Aaa-rated Moody's corporate bond yield.

Δ Debt/Assets is the change in the median Debt/Total Assets ratio for all firms listed on Compustat in a particular quarter

Δ Implied Tax Rate is the change in the implied marginal tax rate, calculated by solving for the tax rate (T) that equates the yields on the 10-year AAA-rated municipal bond index and the 10-year Treasury note

Δ(Capital Gains Tax/Marginal Tax)is the quarterly change in the ratio of the top capital gains rate for individuals to the top marginal tax rate for individuals

Δ Consumer Sentiment Index is the quarterly change in the University of Michigan Consumer Sentiment Survey

Δ Volume/Population is the quarterly change in the ratio of total S&P500 volume to total population age 35-65

Figure 1: Actual Vs. Estimated E/P Using Residuals Livingston Survey Growth 1964-1999, Quarterly

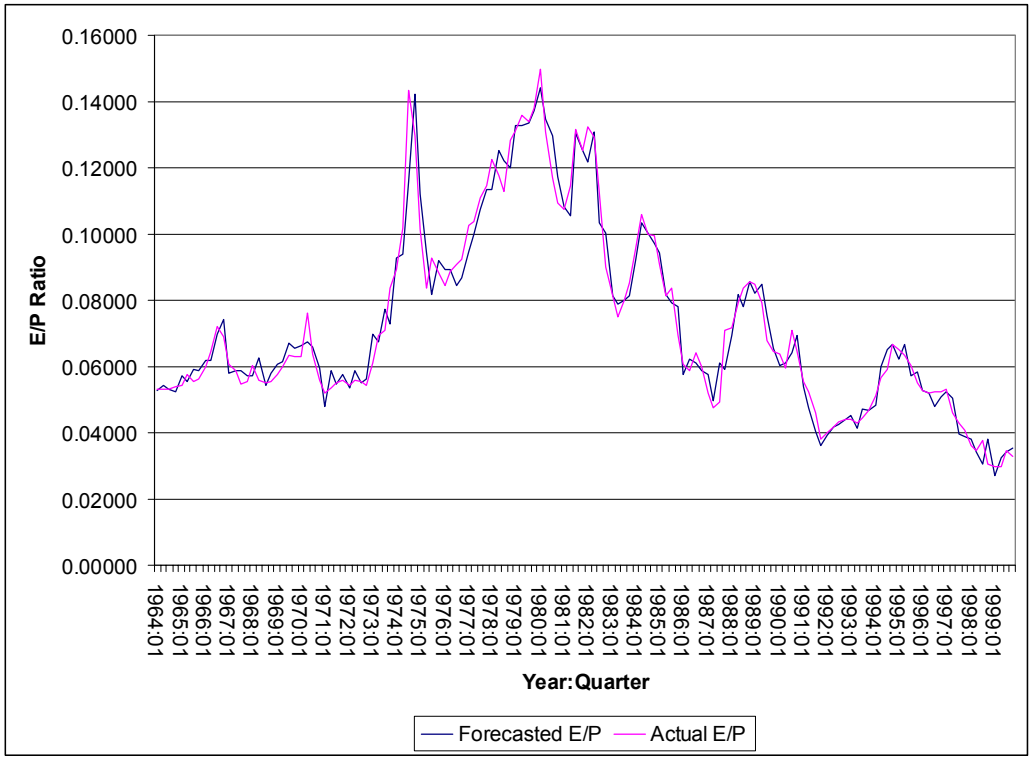
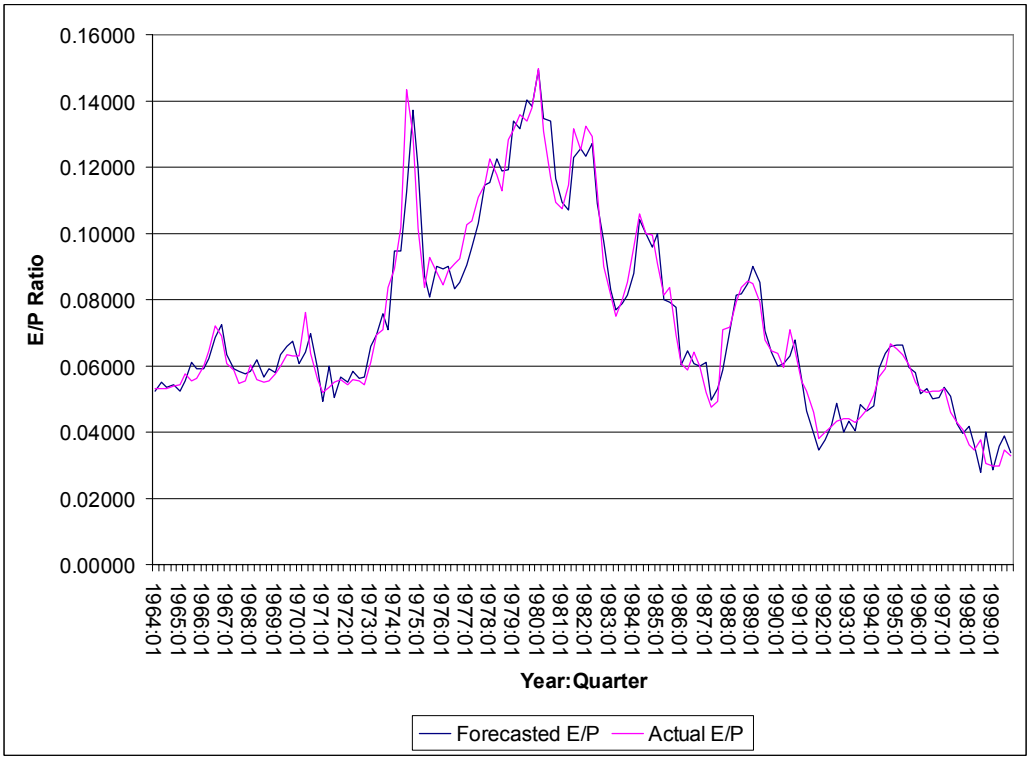


Figure 2: Actual Vs. Estimated E/P Using Residuals Profit Growth 1964-1999, Quarterly



NOTES

[1] We also use the E/P ratio in our analysis.
[2] In our review of the literature, we focus on time series studies. Several cross-sectional studies have also examined the determinants of E/P (e.g. Cho, 1994, and Zarowin, 1990).
[3] During this period, he found that historical earnings growth estimates are negatively related to actual P/E in univariate regressions, while earnings forecasts are positively related to actual P/E.
[4] See, for example, White (2000), Reilly, Griggs and Wong (1983), and Loughlin (1996).
[5] While an estimate of corporate profits is included on the Livingston Survey, and would be a more direct measure of earnings growth, data on this item is only available from 1971 to the present. Because it is based on index returns, our measure is broader than simply changes in earnings trends. If, however, economists' estimates of the index level are based primarily on anticipated earnings, our measure should provide a reasonable proxy.
[6] Over most of the period, individual tax brackets were not inflation-indexed, hence there is a bigger tax on any corporate payout as inflation increases.
[7] Modigliani and Cohn (1979) find a positive relationship, as does Sharpe (2001). Modigliani and Cohn suggest that inflation may be proxying for some other relevant variable, while Sharp concludes that the positive relationship is partially due to analysts's earnings forecasts being negatively related to expected inflation and partially because of the market's expectations of higher return. Jain and Rosett (2001) examine the period from 1952-2000 and find that although the association between expected inflation and the S&P500 E/P ratio is significantly positive over the entire period, the association is not consistent across subperiods of the data, and may therefore be spurious in nature.
[8] The increase in leverage in our empirical model cannot be due to an exogeneous decrease in stock prices because we use the book value of debt divided by the book value of total assets as our leverage measure.
[9] This argument is obviously inapplicable to tax-exempt bonds and institutions that can avoid taxation.
[10] We find that the coefficient of variation for changes in the Consumer Sentiment Index is substantially higher than the coefficients of variation for changes in either the Livingston Survey estimates or the economic variables. For example, the coefficient of variation for changes in the Consumer Sentiment Index is 64.41, while the coefficient of variation for changes in the Livingston Survey estimates of the return on the S&P500 is 2.12. For comparison, the coefficient of variation for changes in unemployment is 25.4940, while the coefficient of variation for changes in real disposable personal income is .71. Because the Livingston Survey is conducted semi-annually, we use semi-annual data to calculate coefficients of variation for all relevant variables, however the use of quarterly data does not significantly change the results..
[11] For example, if an investor correctly forecasts an annual short term growth rate of 15% per year, but assumes that this growth can be sustained for 5 years instead of 3 years, the trailing E/P will increase by almost 15%, (assuming an initial dividend of $2, initial earnings of $3, a 12% required return, and a constant long-term growth rate of 6% per year following the short-term growth period).
[12] The University of Michigan Consumer Research Center conducts the Consumer Sentiment survey via detailed telephone interviews of 500 consumers. Respondents are asked questions that touch on the performance of the economy—for instance, what are their durable goods buying plans over the next 12 months. The Consumer Sentiment surveys are conducted throughout the month and are reported twice during the same month. The results are compared to the base year for this survey of 1966.
[13] A detailed discussion of herd mentality is provided by Brunnermeier (2001). The fads literature is substantial, including articles by Bikhchandani and Hirshleifer (1992 and 1998), West (1988) and Chowdhury (1993).
[14] We also calculated results using separate variables for the top marginal capital gains rate and the top marginal ordinary income rate instead of the ratio of the two marginal rates. The results were very similar; neither marginal tax variable was significant in regressions including the implied marginal tax variable.

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