

December 2006

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Recommended Citation

Kulshrestha, Reema and Nanda, Sonia (2006) "Determinants of Price-Earning Ratio," *Management Dynamics*: Vol. 6: No. 2, Article 2.

DOI: <https://doi.org/10.57198/2583-4932.1206>

Available at: <https://managementdynamics.researchcommons.org/journal/vol6/iss2/2>

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Determinants of Price-Earning Ratio

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Abstract

Relative P/E-ratio valuation plays an important role among investment research analysts and advisors. The P/E ratio relates to the price paid to current earnings. Due to its simple computation for various stocks and also, for making comparisons between various stocks, it is widely accepted. The research question being addressed is to find out the determinants that differentiates P/E ratio of one company from the other in a specified time period and over a period of time. A P/E-ratio valuation model can be viewed as a technically simple model, using company's earnings as its value driver, and typically being dependent on having access to stock market data for comparable companies. This analysis is concerned with the importance of differences, pertaining to valuation of relevant variables (measures of profitability and capital growth), between the companies. P/E ratio also acts as a proxy to risk and growth of a firm and is much likely to reflect market moods and perceptions.

The price/earnings ratio (P/E) is a way to show how a company's earnings relate to the stock price. The P/E ratio is calculated by dividing the current price of the stock by the annual earnings per share. The higher the P/E the more earnings growth investors are expecting and the higher premium they are willing to pay for that anticipated growth.

P/E ratio is calculated as

$$= \frac{\text{Market Value per Share}}{\text{Earnings per Share (EPS)}}$$

P/E ratio is sometimes referred to as the "multiple", because it shows how much investors are willing to pay per rupee of earnings. If a company were currently trading at a multiple (P/E) of 20, an investor would be paying Rs20 for Re1 of earnings. The P/E ratio is simple to calculate and probably the most consistent one. The starting point for the P/E ratio is the share price i.e. P/E takes

share price and divides it by earnings per share (which is the company's entire net profit, or earnings, divided by the number of outstanding shares). Together these two values relate the market's valuation of a company's shares to the wealth the company.

Any share price is built on expectations of a company's future performance. Some of these expectations will be based on fundamentals - such as the company's recent performance, its new product lines, and the prospects for its sector. The rest will reflect prevailing moods and sentiments of the investors.

By relating share prices to actual profits, the P/E ratio highlights the relationship between the price and recent company's performance. If prices and profits rise in the same proportion the ratio remains unchanged. The ratio undergoes a change only when the prices and profits change in different proportions.

The P/E ratio tells investors quite a bit about a company because it shows whether the company's stock is expensive (investors consider stock having a "high" P/E ratio to be expensive) and how much investors envisage the company will grow in the future.

The P/E ratio of a firm is a function of the expected growth rate, the higher the expected growth rate, the higher the P/E ratio for the firm. Stocks with high P/E ratios are generally considered expensive. Stocks with low P/E ratios are generally considered inexpensive. The P/E ratio tells us how much an investor is willing to pay today, for a rupee worth of the company's earnings. Investors focus on corporate earnings because when a company increases its earnings consistently over time, its stock price generally increases.

P/E ratios vary across industries and across firms because of differences in fundamentals - higher growth generally translates into a higher P/E ratio. In case of comparisons made across firms, differences in risk, growth rates and payout ratio have to be considered.

So, the P/E ratio of two companies in the same industry may differ, depending upon the internal factors faced by the company individually and the expected future growth in earnings. The high or low P/E will depend upon the future and current earnings of the company. P/E changes constantly as company stock prices fluctuate.

INVESTOR EXPECTATIONS

Suppose that XYZ Company has a stock price of Rs50 but has reported earnings of only Re1 per share. It has a P/E ratio of 50, meaning an investor would pay Rs50 to get that Re1 of earnings.

Some investors believe it is correct to invest in stocks with high P/E ratios. Most of the time, it's because the investor expects the company to report much higher earnings in the next few years, resulting in a higher stock price. If XYZ Company eventually reports earnings of Rs10 per share-up from Re1 per share-while still keeping a 50 P/E ratio, the company's stock price would have jumped to Rs500.

Some companies have very low P/E ratios. This suggests that investors don't think those companies are going to increase their earnings very much and don't expect the price of the company's stock to rise.

To identify the undervalued and overvalued stocks, the P/E ratios are compared to the market expected growth rate in earnings. Firms with P/E ratio less than their expected growth rate are said to be undervalued and firms with P/E ratio more than their expected growth rate are said to be overvalued. So, the P/E ratio to growth is used as a measure of relative valuation of a firm. When stock prices rise very rapidly without corresponding earnings increase, the market is overvalued and ready for correction. Also when interest rates or the market risk premiums are low, P/E ratio tends to be high and subsequent returns should be lower.

PROBLEMS WITH THE P/E RATIO

P/E analysis is only valid in certain circumstances and it has its pitfalls. Some factors that can undermine the usefulness of the P/E ratio include:

- 1. Difference in Time Horizon** Investors sometimes use different 12-month periods to calculate P/E ratios. Some look at a company's reported earnings from the previous year-this gives the "trailing" P/E ratio. Other analysts use the estimated earnings for the next 12 months in a company's future to calculate the "forward" P/E ratio. Last year's reported earnings are "on the books," so trailing P/E ratios are accurate and not subject to change. A forward P/E ratio is only an estimate and is subject to change because actual company earnings are often different from analyst estimates.

But investors are usually forward-looking in the sense that they want to know how a company will do in the future, and that's why some investors use forward P/E ratio.

2. **Accounting Earnings** are an accounting figure that includes non-cash items. The guidelines for determining earnings are governed by accounting rules (as per GAAP) that change over time and are different in each country.
3. **Inflation** In times of high inflation, inventory and depreciation costs tend to be understated because the replacement costs of goods and equipment rises with the general level of prices. Thus, P/E ratios tend to be lower during times of high inflation because the market sees earnings as artificially distorted upwards. As with all ratios, it's more valuable to look at the P/E over time in order to determine the trend. Inflation makes this difficult, as past information is less useful today.
4. **Many Interpretations** A low P/E ratio does not necessarily mean that a company is undervalued. Rather, it could mean that the market believes the company is headed for trouble in the near future. Stocks that go down usually do so for a reason. It may be that a company has warned that earnings will come in lower than expected. This wouldn't be reflected in the P/E ratio until earnings are actually released, during which time the company might look undervalued.

THEORETICAL FRAMEWORK

As mentioned earlier, the objective of this paper is to find out the determinants which differentiate P/E ratio of one company from the other in a given period of time and also over a specified time period. The price earning ratio for a stable firm can be extracted from a stable growth dividend discount model:

$$P_0 = \frac{DPS_1}{r - g_n}$$

Where,

P_0 = Value of equity

DPS_1 = Expected dividends per share next year

r = Required rate of return on equity

g_n = Growth rate in dividends (forever)

For computing P/E Ratio we shall first compute its determinants. So starting with K_e which is the desired rate of return by the investors

$$E(r_i) = K_e = r_f + \beta_i [E(r_m) - r_f]$$

Here,

$E(r_i)$ = The expected return on securities

r_f = Risk free rate (which is considered 5.5%)

β_i = The sensitivity of the security to the market returns

$E(r_m)$ = The expected market return which has been considered at 20% and it has been calculated by taking the average returns of past 15 years i.e. 1990-2005

$$\beta = \frac{\text{Cov}(r_i, r_m)}{\sigma^2 m}$$

Here, $\sigma^2 m$ is the variance of the market return.

Substituting in for $\text{DPS}_0 = \text{EPS}(1 + g_n)(\text{PayoutRatio})$, the value of the equity can be written as:

$$P_0 = \frac{\text{EPS}_0 * \text{Payout Ratio} * (1 + g_n)}{r - g_n}$$

Here payout ratio changes as there is a change in the growth rate. In the initial years when the company is experiencing extra-ordinary growth rate then it needs more cash flows to support its high growth and thus, pays less to the shareholders as a result of which the payout ratio is low. But in due course of time as the company reaches its stabilization stage the growth rate declines and hence the payout ratio increases as the company now focuses on fulfilling the expectations of their shareholders. Hence, they distribute most of their cash flows in the form of dividends. Thus we conclude that payout ratio is a decreasing function of growth.

Rewriting in terms of the Price/ Earning ratio

$$\frac{P_0}{\text{Earnings}} = \frac{\text{PayoutRatio} * (1 + g_n)}{r - g_n}$$

If P/E ratio is stated in terms of expected earnings in the next time period, this can be simplified to:

$$\frac{P_0}{\text{EPS}} = P/E = \frac{\text{PayoutRatio}}{r - g_n}$$

The P/E ratio is an increasing function of the profit margin, the payout ratio and the growth rate, and a decreasing function of the riskness of the firm.

$$g = b * \text{ROE}$$

$$\text{ROE} = (1 - T)[r + (r - i)D/E]$$

$$r = \text{PBIT}/\text{CE}$$

$$\text{PBIT}/\text{CE} = \frac{\text{PBIT}}{\text{Sales}} * \frac{\text{Sales}}{\text{CE}}$$

Where,

- g = Growth rate
- b = Retention ratio (1 - payout ratio)
- CE = Capital employed
- r = Return on capital employed
- PBIT/Sales = Operating profit margin
- Sales/CE = Turnover ratio
- D/E = Debt equity ratio

A high P/E ratio suggests that investors are expecting higher earnings growth in the future compared to companies with a lower P/E ratio. The P/E ratios of one company compared to other companies in the same industry, or to the market in general, or against the company's own historical P/E ratio may differ because they have to meet the dynamic challenges in the external environment. This may

be because companies facing the same environment may have different growth and survival needs as a result of which there may be variation in different factors one of them being the debt equity ratio.

The variables which formulate the P/E ratio i.e. the various factors on which the P/E ratio depends are operating profit margin, turnover ratio, debt equity ratio, capital employed, beta, payout ratio, return on equity and growth. The objective of this study is to find out the determinants which differentiate P/E ratio of one company from the other in a given period of time and also, over a specified time period.

MODEL

Valuation ratios seem pretty simple. But actually, there can sometimes be some interesting subtleties. More intriguing may be how we decide what constitutes a reasonable threshold for each metric.

The Price-to-Earnings (P/E) ratio is the single most widely used measure of a stock's value. That's because the key to stock ownership is the shareholder's stake in a portion of the company's profit stream. The purpose of this paper was to analyze the factors that determine the price - earnings ratio of stocks over a period of time.

We did a cross sectional analysis of various factors which determine the P/E ratio.

The variables which have been considered as the determinants of this study are:

- payout ratio
- beta
- size of the company(Total Asset)
- growth
- productivity ratio(Sales/Networth)
- net profit margin(NP/Sales)

Beta measures stock price volatility relative to the overall stock market. We used the BSE 100 as a proxy for the market and we automatically define its Beta as being 1.00.

The payout ratio measures what a company pays out to investors in the form of dividends. Growing companies will typically retain more profits to fund growth and pay lower or no dividends. Companies that pay higher dividends may be in mature industries where there is little room for growth and paying higher dividends is the best use of profits. It tells what percentage of earnings management is doling out to shareholders in the form of dividends. A high payout ratio often means the company's earnings are faltering or that it is trying to entice investors who find little else to get excited about.

A higher beta indicates that a stock is relatively volatile while a lower beta indicates more stability. A stock with a Beta of 0.90 would, on average, be expected to rise or fall only 90% as much as the market. So if the market dropped 1.0%, such a stock might rise or fall 0.9%. On the other hand, a stock with a Beta of 1.10 would, on average, rise or fall 10% more than the market. So a 1.0% market move, up or down, should spur a 1.1% move for the stock. As far as the present study is concerned, the risk-free rate has been assumed as 5.5% with continuous compounding.

Total assets were also considered as one of the determinants of P/E ratio, it is the fair market value of securities owned, plus collateral held for securities loaned, uninvested cash, foreign currency, receivables, forward foreign currency contract appreciation, variation margin, and other miscellaneous assets, as on the date indicated. This is the amount of everything that the company owns, prior to subtracting debt.

The final models which have been considered for the present study are

For inter firm analysis two models have been used :

$$P/E = a + b\beta + c\pi + dg + e(TA) + u$$

Where,

- a = intercept value
- b = coefficient value of beta
- c = coefficient value of payout ratio
- d = coefficient value of growth
- e = coefficient value of total asset(TA)
- u = random disturbance

$$P/E = a + b\beta + c\pi + d(TR) + e(PM) + f(TA) + u$$

Where,

- a = intercept value
- b = coefficient value of beta
- c = coefficient value of payout ratio
- d = coefficient value of turnover ratio (TR)
- e = coefficient value of Profit margin (PM)
- f = coefficient value of total asset (TA)
- u = random disturbance

For comparison over time:

$$P/E = a + b\beta + c\pi + dg + e(TR) + f(PM) + g(TA) + h(ROE) + u$$

Where,

- a = intercept value
- b = coefficient value of beta
- c = coefficient value of payout ratio
- d = coefficient value of growth
- e = coefficient value of turnover ratio
- f = coefficient value of profit margin
- g = coefficient value of total asset
- h = coefficient value of return on equity (ROE)
- u = random disturbance

If the value of the coefficient is positive, it implies that the coefficient has a positive and a direct relationship with the variable and if the value is negative then it has an inverse relationship with the variable.

Multiple regression model has been used to study the relationship between the independent and the dependent variable which is the P/E ratio. The data of the BSE 100 companies has been taken from the Prowess database.

Step - by - step regression has also been conducted to check the efficiency of the model by including the variables one by one. The R2 value is analyzed whether it is increasing or decreasing with the inclusion or exclusion of the variable one by one. If the value of R2 increases by including the variable then the factor is important for the model and if the value decreases then the factor is excluded from the study.

EMPIRICAL RESULTS

P/E ratio varies across industries and across firms because of differences in fundamentals - higher growth generally translates into higher P/E ratios. When comparisons are made across firms, differences in risk, growth rates, and payout ratio have to be controlled for explicitly.

Inter firm analysis (cross section) In contrast to the comparable-firm approach, the regression approach uses the information for the entire cross section of firms to predict P/E ratios. The simplest way of summarizing this information is with a multiple regression, with the P/E ratio as the dependent variable and proxies for risk, growth, and payout forming the independent variables.

The results of different estimated regression models show significance of the various determinants considered during the analysis.

Table 1

$$P/E = a + b\beta + c\pi + dg + e(TA) + u$$

	Coefficient (t-value)	P-Value
Intercept (α)	1.217339 (4.402208)	2.81E-05
Beta (β)	-1.71819 (-7.33251)	7.47E-11
Payout Ratio(π)	7.636849 (20.53618)	1.04E-36
Growth (g)	-0.52168 (-0.97664)	0.33123
Total Asset (TA)	4.68E-08 (0.027434)	0.978171

$$R^2 = 0.87478$$

Considering the various factors viz. Beta, Payout Ratio, Growth and Total Asset, the study shows that the Beta and payout ratio are highly significant which implies that they are reflected in the market P/E Ratio the most.

One of the important observation we deduced from this is that payout ratio is one of the most significant factors that affect the P/E ratio. This is to say that investors consider payout ratio as an important parameter for judging whether the company has strong future plans or not. This is in sharp contrast to the general notion among investors, that a company which has a higher retention ratio, that is a low payout ratio, has brighter future prospects because it retains maximum of its profits for the expansionary and growth purpose and very less is left to be paid to the shareholders.

This has been validated in the case of Microsoft wherein the company was earning good profits and had future expansion plans but as per management's decision they declared high dividends which had a negative impact on the mindset of investors. For now they thought that the company was not planning to venture in any projects and is thus, giving out excess cash flows as dividends to the shareholders. This negative perception was immediately reflected in the market sentiments and resulted in fall in the value of the Microsoft stock. **But this is in sheer contrast with our results wherein payout ratio is one of the most critical factors reflected in the market P/E ratio of the company (Table 1)**

Table 2

$$P/E = a + b\beta + c\pi + d(TR) + e(PM) + fTA + u$$

	Coefficient (t-value)	P-Value
Intercept(α)	1.181306652 (4.635664)	1.15E-05
Beta(β)	-1.6919505 (-7.65387)	1.69E-11
Payout Ratio(π)	7.728733763 (21.71224)	2.13E-38
Turnover Ratio(Sales/Networth)(TR)	-9.4277E-05 (-0.45469)	0.650383
Net Profit Margin NP/Sales)(PM)	-0.453433929 (-1.11535)	0.267542
Total assets(TA)	-1.73477E-07 (-0.10828)	0.914007

$$R^2 = 0.889454$$

Now, considering the other set of factors viz. Beta, Payout Ratio, Productivity Ratio(Sales/Networth), Net Profit Margin(NP/Sales) and Total Asset, our analysis shows that the Beta and payout ratio are highly significant which implies that it is reflected in the market P/E Ratio the most. Thus, these two factors help in differentiating the P/E ratio between companies. On the other hand Total Asset, productivity ratio and net profit margin do not show significance in the determination of the P/E Ratio (Table 2)

Comparison over time: Another comparison that is often made is between P/E Ratios across time. As the fundamentals change over time, the P/E Ratio will also change. A more appropriate comparison, therefore, is between P/E Ratio across time based upon fundamentals existing at that time.

Table 3

$$P/E = a + b\beta + c\pi + dg + e(TR) + f(PM) + g(TA) + h(ROE) + u$$

	Coefficient (t-value)	P-Value
Intercept(α)	1.405835 (14.5468)	3.93E-40
Beta(β)	-1.69126 (-18.6144)	6.15E-59
Payout Ratio(π)	7.35076 (39.72715)	1.2E-155
Growth(g)	-0.00611 (-1.67113)	0.095333
Turnover Ratio(Sales/Networth)(TR)	6.53E-07 (0.633707)	0.526567
Net Profit Margin NP/Sales)(PM)	0.00913 (2.74211)	0.006327
Total Assets(TA)	-0.00017 (-1.43292)	0.152515
Return On Equity(ROE)	0.003198 (1.272868)	0.203666

$$R^2 = 0.829243$$

Analyzing the various factors viz. beta, payout ratio, return on equity, productivity ratio, net profit margin, total asset and growth over the period of last 5 years we deduced that beta is the most significant determinant reflected in the market P/E ratio followed by the payout ratio.

Further, running the step by step regression among the variables, we deduced that payout ratio and beta remained the most significant determinants. R-square value of beta and payout comes out to be the most significant which is 0.887646.

This implies that, before investing, investors must not only consider the growth of the company as a deciding factor but also, consider the payout ratio, which plays a significant role. Growth per se does not produce a high P/E ratio.

CONCLUSION

The P/E multiple is determined by the same fundamentals that determine discounted cash flow values; like expected growth, risk and payout ratios. To the extent that there are differences in fundamentals across time, and across companies, the multiples are different.

The important observation of our research is that the payout ratio is one of the most significant factors that affect the P/E ratio followed by beta i.e. these two factors act as important parameters for judging the future prospects of a company and are the most significant determinants reflected in the market price - earning ratio.