# The Use of the P/E Ratio to Stock Valuation 

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#### Abstract

Several methods have been created to value stocks. The method using the P/E ratio is described and applied in the paper. This ratio is used in the framework of the profit model of the fundamental analysis. At the first, various methods to estimate the intrinsic value of a stock are presented in the paper. Then, the P/E ratio is detailly analyzed, including describing of options of its use. The aim of the paper is to show by means of the application of described method to stock valuation, the specific way, which could be used by many investors within their investment decision. In that the contribution of the paper resides. Within the realization of the empirical analysis, selected tests and determination index are used to statistical assessment of the relation between the P/E ratio and stock price. Author also presents other options how to use the P/E ratio in the practice. For example, creating their investment policy, investors could verify the validity of the low $\mathrm{P} / \mathrm{E}$ effect.


Key words P/E ratio, profit model, intrinsic value of a stock, fundamental analysis, stock

## 1. INTRODUCTION

Various types of securities are traded in the stock exchanges. Stock belongs among them. Finding needed data about stock, investors use different investment analyses, usually fundamental, technical or psychological analysis. Fundamental analysis is the most complex of them. Investors find intrinsic value of a stock. Focusing on the fundamental analysis, Gottwald (2011) defines this value as the ,justified price", which express the real value of a stock. Ideally stock should have this price. The estimating the intrinsic value of a stock belongs among basic aims of fundamental analysis. Investors usually buy undervalued stock, because stock price will usually rise in the future. They also usually sell overvalued stock, which price will usually fall in the future. Fundamental analysis assumes that undervaluated and overvaluated stocks exist on the capital markets. In other words, stock price can be different from its intrinsic value, in the practice. Among often used models to estimate the intrinsic value of a stock belong:

- the profit model,
- the dividend discount model,
- the combination of the profit model and the dividend discount model,
- historical model,
- the free cash flow to equity model (FCFE),
- the balance model.


## 2. OBJECTIVE AND METHODOLOGY

The objective of this paper is to present specific method to valuate stocks. Author wants to show how can investors use presented method within their investment decision. It is shown by the means of realized empirical analysis. The specific method, described in the paper, is applied on real data. Many investors can use this method to create optimal investment policy. That is the contribution of the paper. To realize empirical analysis, specific methodology using the $\mathrm{P} / \mathrm{E}$ ratio is applied. The relationship between the P/E ratio and stock market returns is estimated. Furthermore, it is analysed whether individual stock returns are correlated with the P/E ratio. Statistical tests like the Cox-Pesaran-, Davidson-MacKinnon- and MizonRichard tests are used together with determination index. Presenting numbers of observations, the P/E ratio and individual stock returns for various periods are reported. Analytical and deductive methods are used, too. The P/E ratio including the options how to use it in the practice is analysed by analytical method. Main findings and conclusion are deducted using deductive method.

## 3. RESULTS

### 3.1 The P/E Ratio Essence and its Options of Use

The P/E ratio is defined as the price-to-earning ratio. Many authors, including Watsham (1993), focuse on this ratio. He focuses also on the profit model, in which the P/E ratio is used. The ratio can be also expressed like the ratio of actual stock price and last earning per share. There are many types of P/E ratio, like normal P/E, Shiller P/E, Sharp P/E, trailing P/E, forward P/E, historical P/E, current $\mathrm{P} / \mathrm{E}$, regression $\mathrm{P} / \mathrm{E}$ and other. There are many factors which determine the P/E ratio value. Franchise factor is one of them. Focusing not only on the profit model, but also on the dividend discount model, he describes various types of the dividend discount model, especially one-stage, two-stage, three-stage and multi-stage models. One-stage model is characterized by constant dividends, two-stage model by linear growth and follow-up constant amount, three-stage model by growth, then fall and then constant amount.

The relation between the P/E ratio and the P/B ratio (price-to-book value) is analysed by Halsey (2000) to describe various type of companies, concretely:

- high performing company - high P/B, high P/E, expected positive residual income, increasing income,
- declining company - high P/B, low P/E, expected positive residual income, decreasing income,
- improving company - low P/B, high P/E, expected negative residual income, increasing income,
- poor performing company - low P/B, low P/E, expected negative residual income, decreasing income.

Defining the $\mathrm{P} / \mathrm{E}$ ratio as the market price per share divided by earnings per share, Chisholm (2009) focuses on the P/E ratio, more detailly. This ratio is used to rate which shares in a given sector are „dear" and „cheap" to each other. It is possible to compare the P/E ratios of similar companies, which are in the same line of business and their performance is affected by the same kinds of factors. There is a problem in case of companies making business in different sectors. To valuate stocks, different accounting standards are often used, too. It is also possible to estimate the P/E ratio of company which realizes not a profit, but a loss. Nevertheless, the reliability is limited. Many investors are prepared to pay a premium for high growth expectations in the form of a high $\mathrm{P} / \mathrm{E}$ ratio. $\mathrm{P} / \mathrm{E}$ ratios are affected by the general level of market interest rates. The changes in interest rates tends to have an effect on corporate earnings.

The P/E ratio is still the most widely used valuation tool in the stock markets. Analysts use it pricing new shares in an initial public offerings. The P/E ratio is also used as a measure of relative value when comparing listed companies. Company having higher P/E ratio than a rival in the same area of business usually means bad value for investor. Prospective P/E ratios build in average expectations about future growth prospects. A high P/E ratio typically indicates that the market as a whole expects significant future earnings growth. The other ratios like the price/book ratio compare the market capitalization of a company with its shareholder's equity, which means with total assets minus total liabilities. While the market capitalization is based on forecast sales and profits, the book value of the common stock is based on historic cost of the assets less depreciation and total liabilities.

### 3.2 Specific Stock Valuation Method Using the P/E Ratio

The new measure of stock valuation, having three desirable properties: symmetric, proportional and non-invariant, is developed by Azhar, Osman and Parinduri (2009). They present a new technique for the empirical analysis of some capital market ratios and stock valuation. At the first, the long-run relationship between the $\mathrm{P} / \mathrm{E}$ ratio and stock market returns is estimated. It is also analysed whether individual stock returns are correlated with the $\mathrm{P} / \mathrm{E}$ ratio. It is also examined the relationships between P/E ratio and individual stock returns after controlling for stocks' systematic risk in a modified capital asset pricing model regression. Data of the Standard \& Poor's index from 1872 to 2008 are used.

Capital market ratios, among other the P/E ratio, can be plotted in a constructed stock valuation box. The new index, the $\mathrm{PER}_{\mathrm{S}}$ (value ratio) index is described. P means the value of the firm, E means current or last period earnings. Changes in the value of $\mathrm{PER}_{\mathrm{S}}$ are associated with changes in the ratio of the current earnings of the firm to the sum of value of the firm and current earnings. It is examined, whether the share measure $\mathrm{PER}_{\mathrm{S}}$ with its proportionality and scaling properties, offers a better model specification in empirical analyses. Some specification tests are used to test whether the regression using $\mathrm{PER}_{\mathrm{S}}$ as the measure of $\mathrm{P} / \mathrm{E}$ ratio is better specified than PER, concretely the Cox-Pesaran-, Davidson-MacKinnon- and Mizon-Richard tests.

The rejecting of the null hypothesis is expected. The hypothesis suppose that the regression including PER as a measure of P/E ratio
as the true model in favor that of $\mathrm{PER}_{\mathrm{s}}$. The P/E ratio for the Standard \& Poor's index from 1872 to 2008 is analysed. The 10year changes in the index is used as the dependent variable and price to the moving average of earnings in the last 10 years to calculate PER. The analyse is repeated using 5 -year and 1 -year data.

Based on this empirical analysis, it seems that the new measure of $\mathrm{PER}_{\mathrm{S}}$ is better the the traditional one. This measure is beneficial for many financial analytics. It has three desirable properties, i.e., proportional, symmetric and non-variant. The identification of the underlying functional relationship between the denominator (earnings) and nominator (price) reveals the non-proportionality and non-symmetrical issues. These ones in turn distort the measurement of stock performance and hence the generation of an inaccurate measure of the estimated value of the performance of the firm. The $\mathrm{P} / \mathrm{E}$ ratio and the stock market returns are analysed for various periods. The results for a period of 10 years are presented in Table 1.

Table 1: The P/E ratio and the stock market returns for a period of 10 years

| Variable | 10 year (1) | 10 year (2) | 10 year (3) |
| :---: | :---: | :---: | :---: |
| PER | -0.047 | - | -0.008 |
| PER $_{S}$ | - | 5.510 | 4.717 |
| Constant | 1.100 | -0.380 | -0.144 |
| Mizon- <br> Richard test <br> PER | - | - | 0.240 |
| Cox-Pesaran <br> test | -2.428 | -0.730 | - |
| Davidson- <br> MacKinnon <br> test | 1.876 | 0.356 | - |
| $\mathrm{R}^{2}$ | 0.138 | 0.162 | 0.163 |
| Number of <br> observations | 118 | 118 | 118 |

Source: Azhar, Osman and Parinduri (2009)
PER means the price earnings ratio, $\mathrm{PER}_{\mathrm{S}}$ means share value index and $R^{2}$ means determination index. It is possible to choose another period. The results for a period of 5 years are presented in Table 2.

Table 2: The P/E ratio and the stock market returns for a period of 5 years

| Variable | 5 year (1) | 5 year (2) | 5 year (3) |
| :---: | :---: | :---: | :---: |
| PER | -0.021 | - | -0.006 |
| PER $_{\text {S }}$ | - | 2.395 | 1.867 |
| Constant | 0.505 | -0.144 | 0.015 |
| Mizon- <br> Richard test <br> PER | - | - | 0.250 |
| Cox-Pesaran <br> test | -1.392 | -0.433 | - |
| Davidson- <br> MacKinnon <br> test | 1.214 | 0.393 | - |
| $\mathrm{R}^{2}$ | 0.066 | 0.076 | 0.077 |
| Number of <br> observations | 128 | 128 | 128 |

Source: Azhar, Osman and Parinduri (2009)
It is clear, that the shorter period, the more number of observations is reported. Finally, the results for a period of 1 year are presented in Table 3.

Table 3: The P/E ratio and the stock market returns for a period of 1

| Variable | 1 year (1) | 1 year (2) | 1 year (3) |
| :---: | :---: | :---: | :---: |
| PER | -0.003 | - | -0.004 |
| PER $_{\text {S }}$ | - | 0.237 | -0.155 |
| Constant | 0.075 | 0.001 | 0.115 |
| Mizon- <br> Richard test <br> PER | - | - | 0.600 |
| Cox-Pesaran <br> test | 0.215 | -0.804 | - |
| Davidson- <br> MacKinnon <br> test | -0.227 | 0.648 | - |
| R |  | 0.004 | 0.007 |
| Number of <br> observations | 136 | 136 | 136 |

Source: Azhar, Osman and Parinduri (2009)
The results of the Cox-Pesaran- and Davidson-MacKinnon tests show that the null hypothesis - that model with PER is the true model - must be rejected. The model using the yearly P/E and prices of stocks in the Standard \& Poor's from 1990-2008 is estimated. Individual stock returns, not stock market returns like up to now, are reported in following tables. The results of the modified CAPM regressions for a period of 10 years are presented in the Table 4.

Table 4: The P/E ratio and individual stock returns for a period of a 10 years

| Variable | 10 year (1) | 10 year (2) | 10 year (3) |
| :--- | :---: | :---: | :---: |
| PER | 0.002 | - | 0.003 |
| PER $_{\text {}}$ | - | 9.323 | 10.043 |
| Mizon- <br> Richard test <br> PER | - | - | 9.500 |
| Cox-Pesaran <br> test | -12.348 | -0.273 | - |
| Davidson- <br> MacKinnon <br> test | 1.204 | 0.540 | - |
| R$^{2}$ | 0.606 | 0.607 | 0.607 |
| Number of <br> observations | 657 | 657 | 657 |

Source: Azhar, Osman and Parinduri (2009)
Similarly, the results of the modified CAPM regressions for a period of 5 years are presented in the Table 5.

Table 5: The P/E ratio and individual stock returns for a period of 5 years

| Variable | 5 year (1) | 5 year (2) | 5 year (3) |
| :--- | :---: | :---: | :---: |
| PER | 0.001 | - | 0.001 |
| PER $_{\text {S }}$ | - | 1.634 | 1.796 |
| Mizon- <br> Richard test <br> PER | - | - | 4.000 |
| Cox-Pesaran <br> test | -15.888 | -0.469 | - |
| Davidson- <br> MacKinnon <br> test | 2.033 | 1.007 | - |
| R $^{2}$ | 0.682 | 0.683 | 0.683 |
| Number of <br> observations | 1100 | 1100 | 1100 |

Source: Azhar, Osman and Parinduri (2009)

The determination index is generally bigger by individual stock returns than by stock market returns presented in first three tables. Finally, the results results of the modified CAPM regressions for a period of 1 year are presented in the Table 6.

Table 6: The P/E ratio and individual stock returns for a period of a 1 year

| Variable | 1 year (1) | 1 year (2) | 1 year (3) |
| :--- | :---: | :---: | :---: |
| PER | 0.001 | - | 0.001 |
| PER $_{\text {S }}$ | - | 0.093 | 0.198 |
| Mizon- <br> Richard test <br> PER | - | - | 4.390 |
| Cox-Pesaran <br> test | 0.021 | -35.940 | - |
| Davidson- <br> MacKinnon <br> test | 0.869 | 2.437 | - |
| R |  | 0.194 | 0.191 |
| Number of <br> observations | 1488 | 1488 | 0.194 |

Source: Azhar, Osman and Parinduri (2009)
The coefficients of PER in insignificant statistically in most cases and they also have the wrong sign. The coefficients of $\mathrm{PER}_{\mathrm{S}}$ are both significant statistically and with the correct signs. The CoxPesaran and Davidson-MacKinnon tests show that the null hypothesis - that model with PER is the true model - must be rejected. However, the results of the Mizon-Richard test are inconclusive. Results indicate that empirical work using PER, the traditional $\mathrm{P} / \mathrm{E}$ ratio, as the dependent variable may suffer from misspecification problem. This problem can be addresed using the new share approach of $\mathrm{P} / \mathrm{E}$ ratio, the $\mathrm{PER}_{\mathrm{S}}$. Stock valuation box can be used as a tool of analysis to provide a crucial first stage for analyzing changes in stock valuation components, particularly those assumed to be correlated with potential increase and decrease in stock value. The versatility of used methodology is emphasized by its applicability for any number of years and for any single and sectoral study of stock performance.

## 4. DISCUSSION

To value stocks, many methods are used in the practice. Researchers try to apply various models of the fundamental analysis in practice to estimate the intrinsic value of a stock. The essence of the $\mathrm{P} / \mathrm{E}$ ratio is analysed in the paper. Many other empirical researches focuse directly on the $\mathrm{P} / \mathrm{E}$ ratio or on relation between the one and returns. Various types of the $\mathrm{P} / \mathrm{E}$ ratio are used in different cases. Presented new technique, which is used to stock valuation, belongs to group of many stock valuation techniques. The values of MizonRichard test, Cox-Pesaran test and Davidson-MacKinnon test depends on selected period in years. Number of observations is obviously sufficient. Some researches also focuse on the low P/E effect. This market anomaly can be caused by investors and analysts looking too much into the past when carrying out their analyses, as a result of which they overvalue the future growth of revenue potential of companies, which used to achieve favourable results in the past. If the low $\mathrm{P} / \mathrm{E}$ of a stock with average or lower level of risk and non-liquidity is connected with high expected profit growth rate, which exceeds P/E, the stock is usually undervalued. The low P/E effect is also obviously related to the company size effect and neglected firm effect. Investments into stocks of small companies are connected with higher risk and non-liquidity levels than investments into stocks of large companies. Due to this reasons small companies are often neglected by investors. The low $\mathrm{P} / \mathrm{E}$ ratio
effect is used in efficient market theory. Presented CAPM model belongs among important models in this theory.

## 5. CONCLUSION

Based on presented results, method described in this paper can be considered as suitable for many investors creating their investment policy and also financial analysts. Using the P/E ratio, this method enables specific stock valuation. This technique enables longer-list of covenient models. Several statistical tests used in application of the method on real data reliably prove the ability of the method to valuate stocks. The P/E ratio including its special types belong among important indicators used not only within the fundamental analysis to estimate the intrinsic value of a stock. This important indicator is used by many investors. It is possible to continue in the research by modification of various models of the fundamental analysis including the profit model or the dividend discount model, which lead to another methods how to value stocks.

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