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PRICE EARNINGS RATIO (PER) MODEL CONSISTENCY: EVIDENCE FROM JAKARTA STOCK EXCHANGE

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Recently, stock valuation model using the earning multiplier approach (PER) is more popular among investors and analysts. This popularity has caused this model to seem to be the most perfect model among other valuation models. In response to the fact above, this research tries to give empirical evidence whether PER's cross-sectional model can be used in determining the fairness of stock price traded in Jakarta Stock Exchange.

Evaluation of the capability of PER's cross-sectional model in determining the common stock price was conducted by developing three regression models from different time periods, namely the years of 1995, 1996, and 1997. The regression models used in this research was the one developed by Whitbeck-Kisor (1973). The model employed growth, dividend payout ratio (DPR), and standard deviation of growth (s-growth) as independent variable.

This research was intended to test the consistency of the model in assessing stock prices. The result of this research showed that each model developed at different time periods, though with the same sample and method, gave different results. The differences were in the significance level and in the weight of influence of independent variables to the corresponding dependent variables. As a stock valuation model, a regression model should perform consistently from period to period, so normal PER of a stock could be predicted based on the model that was developed by historical data.

The results of this research conclude that PER cross-sectional model is inconsistent in determining the common stock to buy or to sell in short-term. Nevertheless, the models can be helpful in finding the variable and to set of the weight that determines the PER at a point of time. Stock valuation using earning multiplier approach is appropriate if investors have an assumption that the market taste and situation at the valuation period is the same as the period when the model is developed.

Keywords: capital market; cross-sectional model; price earning ratio

Introduction

Searching for the "correct" method to value common stock price varies from the simple mechanical method to hypotheses of factors affecting stock price. According to the efficient market theory, there is no simple mechanical method to determine the best stock in a market. On the other hand, the determinants of common stock price are quite easy to specify in general terms. The price of common stock is a function of the level of the company's earnings, dividends, risk, growth, and some other factors. While it is easy to specify these broad influences, the implementation of a system that uses these concepts to successfully value or select common stock is a difficult task. This problem has caused the introduction of valuation models.

A valuation model is a mechanism that converts a set of forecasts (or observations) on a series of economic or company variables into a forecast of market value for the company's stock. Two kinds of stock valuation models most often employed to analyze securities are:

- Discounted Cash Flow (DCF) Model or earnings capitalization method, and
- Price Earnings Ratio (PER) Model or earnings multiplication method

DCF that uses present value approach tries to forecast the present value of a stock using a certain rate of interest and the return expected by stockholders. On the other hand, PER approach estimates the stock value by multiplying the return of each stock by a certain earnings multiplier.

Although the usage of DCF model is more popular among investors, the model is only used by a few securities analysts (Bing 1971). In the United States, PER approach is used more often compared to other methods which are based on dividends. However, the method based on dividends is also increasingly being used (Jones 1996). One of the approaches which employed PER model is by determining the factors affecting stock price as mentioned above and then measuring and determining how far the factors affect PER. Therefore, the estimation of a stock PER can be determined. The employment of this cross-sectional regression analysis method was very popular in the sixties and now there is an indication that the usage of the method is increasing (Elton & Gruber 1995).

The models are very helpful in determining factors affecting stock price in a certain period. However, the models are unsuccessful in determining which stock should be sold or bought. According to Elton and Gruber (1995), there are at least three reasons why this happened, namely: the changes of market taste, the input value such as dividend and growth, and firm effects are not covered in the models.

Although the usage of PER method as a valuation model of common stock

price is more accepted, the ability of cross-sectional PER model as a tool to choose and select which stock should be bought and sold is still unreliable. Therefore, it is still needed to analyze and evaluate the process of PER model formulation to understand the advantages and disadvantages of the model.

This research is emphasized to test the *consistency* of cross-sectional PER model for different market conditions. Elton and Gruber (1995) showed that different market conditions result in different models. If the difference is significant, the PER model can only be applied in situations and conditions where the model was formulated. Based on the previous research, this research is intended to prove the significance of effects of independent variables to the model tested.

The Indonesian Capital Market in the Last Decade

Even though relatively young, the Indonesian capital market has experienced two different situations: bull and bear. The term Bull Market refers to the condition when the prices of stocks traded in the capital market increase and result in active market. On the contrary, Bear Market refers to the condition when the trading of stocks is exhausted and the prices of stock decrease. To understand when a market is bull or bear, investors usually use the market index as an indicator.

Bull Market and Bear Market definitions are easy to understand. But to determine the criterion when a market is categorized as bull market or bear market is not simple. Atlas (1995) defined bull market as a period when the stocks index increase 300 percent or more thoroughly without correction of 33 percent or more. However, Atlas' definition is not simple to categorize whether a market is bullish or bearish.

For the Indonesian capital market, Composite Stock Price Index (*Index Harga Saham Gabungan*, IHSG) is an indicator to determine whether it is bullish or bearish. Generally speaking, Indonesian capital market was bullish three times and bearish four times. Bull market happened during the year 1988 until the middle of 1990, year 1993, and 1996. Bear market happened in 1979 to 1987, middle of 1990 to 1991, year 1994, and middle of 1997 until recently.

Stock Valuation Models

A valuation model can be viewed as a black box that converts the forecast of fundamental data of firms and/or economy to a forecast or valuation of market price. Below are two valuation models that are the most often used:

1. Discounted Cash Flow Models

These models are based on a concept that the value of a share of stock is equal to the present value of the cash flow that the stockholder expects to receive. Cash which will be received by investors comes from two sources: dividends and the value of the stock when he or she sells it. The latter one is also equivalent to dividend flow which will be received by stockholders. Therefore, the models are also called the dividend discount models

An investor can hold a stock for an unlimited period (*n* year) which is formulated:

$$P_0 = \sum_{t=1}^{\infty} \frac{D_t}{(1 + r)^t}$$

where,

P_0 = Stock price in the year 0

D_t = Dividend received in the *t-th* year
r = The appropriate discount rate

Conceptually the formulation above is understandable, but operationally it is very difficult. The longer the time dimension used, the higher the uncertainty of the estimation. Therefore simplification of the model is needed.

The first simplification assumes that return is constant every year and all returns are paid as dividends. Based on the above assumption, the formulation of current stock price is:

$$P_0 = E / r$$

or

$$P_0 = D / r$$

The model is named as *the zero growth model* because it is assumed there is no growth of dividends.

Since the assumption above seems unrealistic, other assumptions are used:

- Some of the returns (*b*) are retained in constant proportion
- Retained earnings are reinvested and result in *return on equity* (ROE) in the amount of *R*.
- Based on the above assumptions, EPS (*E*) and dividends (*D*) increase in the amount of *bR*, symbolized as *g*.

Henceforth, the stock price can be determined using the formula:

$$P_0 = D_1 / (r - g)$$

The model is called *constant growth model*, based on the assumption that the growth of earnings and dividends are constant. The model is adequate enough to forecast stock intrinsic value for a firm operating in maturity cycles. Otherwise, for firms that operate in the growth cycle, constant growth assumption is inappropriate. Consequently, *multiple growth model* and *three-period model* appeared.

2. Price Earning Ratio Approach

There are various approaches using PER. Huang (1987) stated that some approaches using PER basically can be categorized as follows:

■ *Method 1*

Dividing stock price by normalized earnings or average earnings to calculate P/E. The ratio is then compared to normal *P/E ratio* of the stocks.

■ *Method 2*

Dividing stock price by estimated earnings (the following one to three years) to determine *P/E ratio*. Then, the ratio is compared to normal *P/E ratio* of the stock.

■ *Method 3*

Comparing *P/E ratio* and earnings growth of each stock to P/E and average growth of the industry.

The two first approaches employ normal *P/E ratio* concept of a stock. Normal *P/E ratio* of a stock is understandable by determining factors affecting stock price, such as earnings, growth, risk, time value of money, etc. and followed by formulating the equation model of PER and the factors. The model is then used to value and justify the future PER of a firm.

Valuation model using PER approach generally seems easier, simpler, and more practical to be used by analysts and other capital market players. The simplicity of the model makes analysts often forget that estimation of an uncertain future is needed by the model. As a result, the models are very helpful in determining factors affecting stock price in a certain time but unsuccessful in determining which stock should be sold or bought. The theory which pro-

vides the basis for determining whether a stock is undervalued or overvalued is that market price will meet the theoretical price before theoretical price changes. The reasons are: the changes of market taste, the changes of data input, and the effect of firm (Elton & Gruber 1995).

One of the reasons why market price does not meet the theoretical price is that the parameter used to determine the theoretical price had changed. The change is caused by change of market taste. Market taste always changes through time, often rapidly and drastically. Research done by Cohen, Zinbarg and Zeikel (1973) showed that the effect of return growth of PER is greater in the bull market compared to the bear market. Gruber (1971) proved that the effect of dividends, growth, and three variables of risk (earnings instability, financial leverage, and size) to price always changes from year to year.

Data input or value to determine theoretical price is obtained from historical extrapolation or analyst expectation. The value of the input such as return and growth or expectation may change drastically any time. The change of one of the variables can change the stock theoretical price.

The actual price of a stock may always be above (or below) the theoretical price. This can happen because there are other factors uncovered in valuation models.

Determination of PER

Some of the factors affecting the PER of a stock can be derived from the dividend discount below:

$$\frac{P_0}{EPS_0} = \frac{d(1 + g)}{r - g}$$

The equation above shows that PER is affected by rate of return growth (*g*), rate of expected return (*r*), and dividend payout ratio (*d*).

An empirical study supporting the theory above was developed by Whitbeck-Kisor (1963). Using multiple regression analysis, they employ three variables affecting PER: rate of earnings growth (g), dividend payout ratio (DPR), and standard deviation of growth (s *growth*). The model was replicated by Chandra (1994)—the last variable was replaced by standard deviation of stock return (s *stock return)*—using the stocks listed in Jakarta Stock Exchange.

Empirical Models, Variables, and Measurement Scale

Multiple regression based on the model developed by Whitbeck-Kisor is employed in this research. The model is:

$$PER = b_0 + b_1\, g + b_2\, d + b_3\, s$$

g = rate of earnings growth
d = dividend payout ratio (DPR)
s = standard deviation of earnings growth

1. Price Earnings Ratio (PER)

$$PER_t = \frac{P_t}{EPS_t}$$

PER_t : Price Earnings Ratio in the *t-th* year
P_t : Closing Price at the end of *t-th* year
EPSt : Earnings per share in the *t-th* year

2. Rate of Earnings Growth

$$g_t = \frac{\sum_{n=1}^{4} \frac{EPS_{t-n+1} - EPS_{1-n}}{EPS_{t-n}}}{4}$$

g_t : earnings growth in the *t-th* year

EPS_{t-n+1} : Earnings per share in the *t-th* year

EPS_{t-n} : earnings per share in the *t-th* year

3. Dividend Payout Ratio (DPR)

$$DPR_t = \frac{DPS_t}{EPS_t}$$

DPR_t : Dividend Payout Ratio in the *t-th* year

DPS_t : Dividend per share in the *t-th* year

EPS_t : Earning per share in the *t-th* year

4. Standard Deviation of Rate of Earnings Growth (s)

$$s_t = \sqrt{\frac{\sum_{n=0}^{3} (g_{t-n} - \bar{g})^2}{4 - 1}}$$

s_t : Standard deviation of earnings growth in the year of *t*

g_{t-n} : Actual growth in the year of *t-n*

$\bar{g}$: Average earnings growth in the *t-0* to *t-3*

Data and Sample

The population of this research consists of stocks listed in Jakarta Stock Exchange (JSX). Data was obtained from Jakarta Stock Exchange Statistic and Indonesian Capital Market Directory (ICMD). Data and samples were obtained from three different periods: 1995, 1996, 1997.

The criteria for the samples are as follow:

1. The stocks must have been listed in JSX for the three periods (1995, 1996, 1997).
2. EPS data of the stocks are available from 1991 and forward. One of the variables in this research is rate of return growth. The proxy of it is average of return growth for the last four years.

Table 1. **Descriptive Statistic of Each Variable**

	Mean	Standard Deviation	Max	Min	Outliers	
					Top	Bottom
PER 95	16.66	30.04	260.00	(86.84)	46.70	(13.38)
Growth 95	0.04	2.51	19.96	(16.63)	2.55	(2.47)
DPR 95	0.55	0.66	6.00	(0.37)	1.21	(0.12)
s Growth 95	1.62	4.46	39.50	0.06	6.07	(2.84)
PER 96	24.24	80.48	1.000.00	(53.70)	104.72	(56.25)
Growth 96	(0.17)	2.20	7.33	(18.83)	2.03	(2.37)
DPR 96	0.77	2.35	30.00	(1.48)	3.12	(1.58)
s Growth 96	1.44	3.94	36.72	0.05	5.38	(2.50)
PER 97	11.10	46.45	400.00	(87.50)	57.54	(35.35)
Growth 97	(1.21)	4.60	9.20	(43.31)	3.40	(5.81)
DPR 97	0.32	4.36	29.85	(43.42)	4.67	(4.04)
s Growth 97	3.82	8.82	86.35	0.05	12.64	(4.99)

Therefore, EPS data is needed from at least four years before 1995.

3. Outliers from all variables of each period are excluded from the sample. Outliers are defined as values that are outside of the two deviation standards around the average of each variable. (more than mean + 2 deviation standard or less than mean –2 deviation standard).

From 283 stocks listed in JSX in 1997, only 237 have been listed from 1995 to 1997. From the amount above, only 177 have EPS from 1991. Mean and standard deviation of each variable are shown in Table 1.

The outliers in the Table 1 are excluded. As a result, the number of sample analyzed are 119 stocks.

Analysis and Results

Three regression models are employed using the same amount of samples (119) for the year of 1995, 1996 and 1997. The comparisons of the results for each year are shown in Table 2.

Table 2 shows that the F-statistic value for the three models are pretty high, higher than F-table value for a = 0.005 (0.5%), namely 4.5. This means that three regression models can explain the changes of PER based on the information of earnings growth, DPR, and deviation standard of growth.

Statistic value of *t*, printed italic in the Table 2 shows that the value is significant in a = 0.5 percent (*t-table* is 2.576), except for s earnings growth in 1996 that is significant in an a of 5 percent (*t-table* is 1.645). This means that in 1995, the independent variable that significantly affected PER are growth and DPR, in 1996 DPR and s growth, and in 1997 DPR only.

Because of the significant difference of variable effects from one period to the next, a model formulated in one period cannot be used in the next. For example, the model formulated in 1995 cannot be used to predict PER value for 1996 although the independent variable value is known (in this case growth, DPR, s-growth). The reason is that in 1995, growth

Table 2. **Comparison of Multiple Regression Results**

$$PER = b_0 + b_1 g + b_2 d + b_3 s$$

	Model I (1995)	Model II (1996)	Model III (1997)
Intercept	6.422393	9.016363	3.080499
t-stat.	*3.459*	*4.229*	*3.121*
Growth	-6.322367	-2.439599	0.56824
t-stat.	*-2.767*	*-0.784*	*0.639*
DPR	8.945484	13.218403	7.657885
t-stat.	*-2.767*	*-0.784*	*0.639*
s Growth	1.506548	-4.814653	-0.457122
t-stat.	*0.99*	*-2.27*	*-0.871*
F-statistic	*5.42971*	*19.0072*	*37.15711*
SSE	7933.57827	14608.03331	6151.47742
R^2	0.12407	0.33148	0.49221
Adj-R^2	0.10122	0.31404	0.47896

Table 3. **Comparisons of Simple Regression Results**
$PER = b_0 + b_1 d$

	Model I (1995)	Model II (1996)	Model III (1997)
Intercept	7,112385	5,534378	1,917121
t-stat.	*4,490*	*3,645*	*2,616*
DPR	8,820307	14,045195	8,100322
t-stat.	*2,779*	*7,090*	*10,227*
F-stat.	7,72458	50,27052	104,58385
SSE	8496,37842	15284,22249	6396,50258
R^2	0,06193	0,30053	0,47198
Adj-R^2	0,05392	0,29456	0,46747

affected PER significantly and in 1996 growth did not affect it anymore. On the contrary, s-growth that did not affect significantly in 1995, affected significantly in 1996. In 1997, the variable that affected PER significantly is DPR only.

Therefore, although each model above can explain the effect of each independent variable to its dependent variable (PER) for each year, the three models cannot be used to predict future PER. Assume, the prediction of earnings, DPR, and *s-growth* of a stock in 1998 are known, normal PER for 1998 is also determinable. But it is difficult to determine which model will be used. The reason is that each model is very different.

One of the interesting things from the table above is that DPR statistic value of t always increased from 1995 to 1997. This means that the effect of DPR to PER from 1995 to 1997 got more significant. Moreover the increase of statistic value of t is followed by the increase of R^2 value. This means that the increase of DPR significance can better explain the change in PER. Although DPR always affects significantly for all the models in this research, the analysis of whether DPR can be used as the only variable for the three models above is needed. Table 3 provides the summary of comparisons of three regression models which use DPR as the only independent variable.

Table 3 shows that all statistic value of F or t is always significant in $a = 1$ percent. This means that DPR as an independent variable for the three regression models can explain PER change for each of the models. Although the table shows that independent variable in the three models always affect significantly, it cannot be concluded that the three models can predict the normal PER of a stock. The table shows that each k-th coefficient (b_k) in each model is different from each other. This means that DPR's effect to PER in 1995 may be different to that of 1996 or 1997. If the difference is significant, normal PER resulted from the calculation of the models will also be significantly different.

To understand whether each coefficient differs significantly or not, the next step is determining the statistic value of t to compare two coefficients. *T-test* developed by Hartono and Ratnaningsih (1997) is employed to compare two coefficients of two different regression models. The test is similar to the previous *t-test*. The difference is that *t-statistic* is formulated as follows:

$$t = \frac{\hat{b}_k^{(1)} - \hat{b}_k^{(2)}}{\sqrt{\frac{SSE^{(1)} + SSE^{(2)}}{df^{(1)}} \bullet \left[\frac{(\hat{b}_k^{(1)})^2 \bullet (df^{(1)})}{(t^{(1)})^2 \bullet (SSE^{(1)})} + \frac{(\hat{b}_k^{(2)})^2 \bullet (df^{(2)})}{(t^{(2)})^2 \bullet (SSE^{(2)})} \right]}}$$

Where,

$b_k^{(i)}$ = *k-th* coefficient of *i-th* equation

$t^{(i)}$ = *t-statistic* of *i-th* equation

$df^{(i)}$ = degree of freedom of *i-th* equation

$SSE^{(i)}$ = sum square error of *i-th* equation

When *t-statistic* value is higher than *t-table* or lower than negative value of *t-table*, it means that the two coefficients differ significantly. The result of statistic value of t to compare the two coefficients is presented in the Table 4.

Statistic value of *t* printed bold in table 4 is the significant value level of *t* for $\alpha = 5$ percent (*t-table* value is 1.645). This means that the coefficients of the model formulated in 1995 are relatively similar to that formulated based on 1996 data. Coefficients of the model formulated in 1996 differ significantly from that formulated based on 1997 data. Coefficients of 1997 model compared to those of 1995 model are only different in its intercept coefficients, but its DPR coefficient is relatively similar.

The results of statistical analysis show that the level of effect of factors always changes from one period to another. Even for the factor that always affects significantly, the level of its effect is different from one period to the other. Actually, insignificant difference is no matter. Unfortunately, the results of statistic analysis above show that the difference of effect is sometime very significant.

The results are consistent to that of Gruber (1971) which showed that effect of dividend, growth, and other three variables (instability of earnings, financial leverage, and size) to price always changes from year to year. It is also consistent to that of Cohen, Zinbarg, and Zeikel (1973) which showed that the model formulated when the market was bullish was different to that when it was bearish.

The difference of model can be related to bullish and bearish condition of

Table 4. **Coefficient Comparisons of Simple Regression Result**

Variable being compared	t-statistic
Intercept 95 vs Intercept 96	0,6851
Intercept 96 vs Intercept 97	2,2673
Intercept 97 vs Intercept 95	(3,0913)
DPR 95 vs DPR 96	(1,2616)
DPR 96 vs DPR 97	3,0312
DPR 97 vs DPR 95	(0,2329)

the Indonesian Capital Market. In 1995 the market tended to be stable and IHSG was closed at 513.847 or increased 9.2 percent compared to the former year. In 1996 IHSG was very volatile. The bull market was until February 1997. From February 1997 to June 1997 the market was relatively stable. But from the middle of 1997 to the end of 1997 the index dropped drastically, making the market bearish. The fact is that three market conditions used in this research was different from each other. In other words, it can be concluded that models formulated based on different market conditions –although the same sample and method were employed- result in different models.

However, it does not mean that the model formulated based on the same market conditions will result in the same models. The difference of regression models for a certain time differ to that for other periods is caused more by the change of market taste, not by market condition. Market taste always changes through time. It is possible that market taste is different from one period to another period although the market condition is not different. Besides, it is impossible for market conditions to be identical. Bull market in 1988 was different to that in 1993 or 1996. Bear market in 1991 was different to that in 1997.

The results show that cross-sectional regression analysis cannot be used to determine which stocks should be sold or bought because the regression model cannot be used to predict normal PER value that is needed to determine which stock is overvalued or undervalued. However, the cross-sectional regression analysis using PER model can explain factors affecting PER in a certain time or period.

Implication

The weaknesses and limitations of present value approach caused PER model to become a popular approach to value a stock. Using PER model approach, investors can determine intrinsic value of a stock by multiplying EPS of a previous stock by earnings multiplier, normal PER. Earnings multiplier or normal PER can be determined by using cross-sectional regression analysis. The popularity of valuation models using the PER model approach with its affecting factors has caused it to seem as if it is the most suitable approach to value stock.

The result of this research show that normal PER determined by using cross-sectional regression analysis can be applied in the period when the model was formulated. Intrinsic value of stock obtained by multiplying EPS of a previous year by normal PER is actually inappropriate because normal PER here is historical, which may differ from current normal PER. Moreover, the results above show that in different periods, PER model resulted can be different although formulated using the same sample and method. Miscalculation of intrinsic value can cause mistakes in decision making.

Therefore, PER model approach should only be used when investors assume that market situations and market taste are similar both when evaluation process is conducted and PER model is formulated. Stock valuation using PER model is appropriate when the assumptions are met. Therefore, similar to present value approach, PER model is not free from error because the existence of assumption or prediction in this approach. Prediction, or whatever concerning the future is an uncertain thing.

This research is only intended to remind readers that every valuation using fundamental analysis or other approach is not free from error. "No matter who does the analysis, or how it is done, mistakes will be made" (Jones 1996). Investors must remember that stock valuation is more an art than a science.

Conclusions and Suggestions

Cross-sectional regression analysis of stocks listed in JSX using PER model developed by Whitbeck-Kisor shows that from year to year factors affecting significantly are various. Among the three variables used by Whitbeck-Kisor, only DPR variable *consistently* affects significantly for three periods of analysis. Further analysis shows that although DPR variable always affects significantly, the effect level of DPR variable to PER is different.

Stock valuation using PER model approach assumes that regression model formulated based on historical data is a mirror of regression model when valuation is conducted. Earnings multiplier used to determine intrinsic value of stock based on the EPS data of a previous year can be obtained from the regression model. This research which uses samples of 1995, 1996, and 1997 show that regression model resulted from three periods is not always similar. Therefore the assumption is not appropriate.

Although the assumption is appropriate, PER model resulted from the cross-sectional regression analysis cannot automatically be used to value the common stock price. There are two other factors that make the model unable to determine whether stock is overvalued or undervalued, namely (1) input variable which always change and (2) firm effect uncovered in the model.

The evaluation of cross-sectional PER model as a valuation model to assess the fair price of stocks traded in JSX in this research show that PER model cannot be used to determine the intrinsic value of a stock. The model is unsuccessful in determining which stock should be sold or bought. However the model is successful in explaining factors affecting the PER of a stock at a certain time.

The changes of market taste causing different regression models in this research are affected by conditions and situations of capital market. Since three periods of sample used in this research has different market conditions and situations, the regression model resulted is also different. Market in 1995, 1996, and 1997 is normal, bullish, and bearish respectively.

Based on the result above, below are suggestions for future research. *First*, this research uses cross-sectional data in formulating the regression model. The results show that from year to year the model resulted are different because of different market conditions. To solve this problem, future research is suggested using poll data (combination of cross-sectional and time-series data).

Second, the results show that different regression models are resulted from different market conditions and situations. But this research has not investigated yet whether the same market conditions and situations will result in the same regression models. Research conducted by comparing the same market conditions and situations will prove whether the difference of regression models is resulted by different market conditions and situations or by market taste which always changes from year to year.

Finally, investors and analysts should remember that there is no perfect valuation model. Stock valuation is more an art

than a science. Cross-sectional PER model approach should only be used if investors assume that market situations and taste when the valuation is conducted is similar to that when the PER model is formulated.

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