An Event History Analysis of the Stock Return - An Empirical Study on Taiwan Stock Market

PO-SHENG KO¹, CHUANG-CHI CHIU²*, MING-HUNG SHU³
¹ National Kaohsiung University of Applied Sciences
²,³ Department of Industrial Engineering and Management
National Kaohsiung University of Applied Sciences
415, Chien Kung Road, Kaohsiung 80778
TAIWAN, R.O.C.

(* Corresponding author: y7891225@yahoo.com.tw)

Abstract: - Although CAPM has been comprehensively applied on practice for a long time, it is established under the perfect-basis assumption which does not always exist in reality because there are several factors affecting the capital return. Hence, the actual performance of the CAPM model has been questioned. There have been numerous proposals in improving the performance of the model. This study aims at finding the actual correlation of price/book ratios effect and stock return, investors may anticipate whether a certain stock will be transformed between growth stocks and value stocks, and buy/sell such stock to make profits in the future. Based on monthly data from listed companies on Taiwan stock market from 1991-2010, it is found that higher price/earnings ratio generates high possibility in transformation and expected return increase. Therefore, investors should apply influence factors of variables to models in order to explore stock-selection strategy. The investment methods from this research could be a new stock-selection strategy for investors' excess return and better investment performance.

Key-Words: - CAPM Model, capital return, growth stock, value stock, stock selection

1 Introduction
In principle, because stock value usually varies with information available and abnormal situations, which cannot be explained by efficient market hypothesis (EMH), investors can therefore earn price differences during their holding period, namely capital gain or capital return.

Capital asset pricing model (CAPM) developed by Treynor [1], Sharpe [2] and Mossin [3] was a sound theory for return change used to measure the correlation between individual asset risk and its expected return rate in the portfolios. Although CAPM has been comprehensively applied on practice for a long time, it is established under the perfect-basis assumption which does not always exist in reality. Furthermore, beside systematic risk β of CAPM, there are several other factors affecting the return including size effect [4], price/earnings ratios effect [5] and price/book ratios effect (PBR) [6]. Hence, the actual performance of the CAPM model has been questioned.

With the focus on U.S stock market, Fama and French [7] studied the difference factors of different stock return. They found market risk β value cannot explain return difference of different stocks. Later, Fama and French [8] proposed three factor model to explain variability of asset return via three complete models: market factor, size factor and price/book factor. In comparison with β value of CAPM, they regarded market and price/book factors as two main variables to better explain average return. When the size was under control, stocks with low price/book ratio had higher excess return than stocks with high price/book ratio. Bauman and Miller [9] also discovered value stocks had higher future expected return, and growth stocks had lower expected return.

Due to the existence of value premium and size effect, Fama and French [10] provided investors references for stock selection and excess return per company characteristics. Black and McMillan [11] believed the high risk of value stocks led the existence of excess premium. Therefore, investors asked for high return as compensation, or the overreaction of market on news all made long-term value stocks have higher return.

If value premium exists in Taiwan stock market, stocks classified as growth stocks in the beginning might become value stocks at the end of an observation period and vice versa. If this study
could confirm the positive or negative correlation of PBR and stock return, investors may anticipate whether a certain stock will be transformed between growth stocks and value stocks, and buy/sell such stock to make profits in the future. After applying Event History Analysis (EHA) and econometric model, this research generalized what kind of characteristics (financial data and company characteristics were used as explanatory variables) and stocks might had transformation potential in the future, and thereby acted as references for investors’ stock-market prearrangement.

2 Literature Review
Since proposed PBR had better explanatory ability in return than β coefficient of CAPM [6], numerous scholars have devoted to find better variables to explain the change of stock return. Consequently, PBR becomes an important indicator in regarding to abnormal return effect. Several affecting factors of the PBR have been proposed, such as premium value, company size, price/earnings ratio, dividend yield rate, price/sales ratio, liquidity, and momentum.

In regarding to the premium value, it is found that investors can earn excess return by buying low-PBR stocks and selling high-PBR stocks, which also make low-PBR companies have excess return [6, 7, 12]. However, Grinold and Kahn [13], and Pontiff and Shall [14] found a contrary result in which high-PBR companies have higher return and low-PBR companies have lower return. Moreover, low-PBR stocks are found relatively sensitive to the change of economic environment [15].

Whereas, company size, often referred to as the market value of listed companies, has significant correlation with listed-stock return rate. After taking “size-effect” into consideration in CAPM, Banz [4] found small stocks’ portfolios had higher risk premium than large-scale stocks. Reinganum [16] found that the annual average return rate of small-scale stocks is 20% higher than large-scale ones; meanwhile, the return rate of small companies is steadily stable at least for 2 years and thereby proved the existence of size effect. Kim and Burnie [17] pointed out that size effect significantly appears during economic expansion and disappeared during economic contraction. As for researches on advanced countries, Maroney and Protopapadakis [18] discovered significant negative correlation, namely size effect, existed between company size and stock return in U.S.A., Canada, France, Germany, Japan and Australia. Size effect seemed well explained the difference of stock return than risk. Chow and Hulburt [12] found that there is a linear relationship between the expected return rate and system risk β; and, β is the only factor explaining cross-section expected return.

Moreover, Basu [5] showed that greater price/earnings ratio (PER) stocks generate smaller return rate, indicating the existence of PER effect. Fama and French [7] stated that without company size and PBR added, PER could not explain stock return rate; whereas, there are still arguments about the existence of PER effect [16, 19].

Another important factor is the dividend yield rate (DYR). Litzenberger and Ramaswamy [20, 21] believed that high-DYR stocks should have higher return rate which was supported by Fama and French [22], Campbell and Shiller [23], and Bekeria and Hodrick [24].

Also, price/sales ratio (PSR) could act as an important research tool if investors considered investment target such as growth companies. Because PER cannot be used to evaluate stock value during their deficit, PSR is a preferred indicator [25, 26].

In a decent market, the smaller bid-ask spread brings lower investors' transaction cost and better liquidity in the market. In order to supplement bid-ask spread, by measuring the defects of liquidity and explaining order-receipt capability under unchanged price, some scholars begin to utilize "volume" as an indicator for liquidity measurement. There is a significant negative relation between "volume" and "bid-ask spread"; meaning that bigger volume is followed by smaller bid-ask spread and better liquidity [27-30].

In addition to volume, turnover rate (TR) is another measurement of liquidity. This indicator is used to solve measurement deviation caused by different company size. Chui and Wei [31] utilized TR as alternative variables for liquidity. Though using “TR" to measure liquidity can avoid the influence caused by company size, it might ignore the influence of stock price as the same as volume.

The last important factor can be referred to the momentum. If securities market is efficient, all securities will react to all information rapidly and fully; whereas, the information will not react to all securities efficiently. At this moment, investors can get excess return by such phenomenon because any over-reactions will result in price inversion while under-reactions will make stock price momentum growth or decline [32, 33].
3 Empirical Study

The financial indicator of this research came from monthly database of ex-dividend adjustment in Taiwan economic journal (TEJ), including the PER of monthly individual stocks, volume, DYR, market value (MV), PSR, TR, return rate and PBR. Besides, the research first classified industries per month revenue surplus database of TEJ, then selected single month revenue per share (RPS), book value per share (BVP), number of outstanding shares (NSO) as company characteristics variables. This research sample focused on 20-year data of Taiwan stock market from 1991 to 2010. The stocks were selected based on the following criteria: (1) Exclude full-cash delivery stocks, preferred stocks, warrants and beneficiary certificates from the listed common stocks published by Taiwan Stock Exchange Corporation (TWSE); (2) Exclude financial insurance sector because of their unique preparation in financial statements and profit/loss recognitions as well as high financial leverage; (3) Eliminate the companies which were merged with others that year because their switching ratio data were old and incomplete; (4) Instead of deletion, objectively keep the companies and recover their price that month as non-trading period if their trade were temporarily prohibited by TWSE; and, (5) Delete the companies with lost PBR since missing value is unable to judge growth stocks or value stocks.

After putting financial information variables such as “PER”, “volume”, “DYR”, “return rate”, “market value”, “PSR” and “TR” into discrete-time logistic regression model with Markovian procedure. This research utilized PBR dichotomy to classify the influence effect of growth stocks and value stocks at time t-1. Therefore, the following factors are carefully considered in the model: “The early-period state is growth stock or value stock”, “The interaction between The early-period state is growth stock or value stock and PER”, “The interaction between the early-period state is growth stock or value stock and volume”, “The interaction between the early-period state is growth stock or value stock and DYR”, “The interaction between the early-period state is growth stock or value stock and return rate”, “The interaction between the early-period state is growth stock or value stock and market value”, “The interaction between the early-period state is growth stock or value stock and PSR” and “The interaction between the early-period state is growth stock or value stock and TR”.

Table 1 explains the selected 3 modes. Mode 1 is a fixed hazard rate mode which excludes covariance and Markovian effect, and is used to provide comparison standard for other modes. Both Mode 2 and 3 include Markovian effect; however, Mode 3 considers the interaction of all variables to “The beginning of the observation period is growth stock or value stock.”

Table 1. The data mode analysis of financial information

<table>
<thead>
<tr>
<th>Test</th>
<th>Mode 1</th>
<th>Mode 2</th>
<th>Mode 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Omnibus ( \chi^2 )</td>
<td>21053.261*</td>
<td>73315.413*</td>
<td>73317.725*</td>
</tr>
<tr>
<td>Cox &amp; Snell R²</td>
<td>0.246</td>
<td>0.626</td>
<td>0.626</td>
</tr>
<tr>
<td>Nagelkerke R²</td>
<td>0.328</td>
<td>0.834</td>
<td>0.834</td>
</tr>
<tr>
<td>H&amp;L ( \chi^2 )</td>
<td>113.950*</td>
<td>13.019</td>
<td>20.233**</td>
</tr>
</tbody>
</table>

Remarks: H&L: Hosmer & Lemeshow; *p < .01; **p < .001

Based on the Omnibus \( \chi^2 \) test in Table 1, Mode 2 and 3 are considered significant. Though Cox & Snell R² and Nagelkerke R² of the two modes are almost the same, the lower value of Hosmer & Lemeshow \( \chi^2 \) test indicates that the goodness of fit in Mode 2 is better than that in Mode 3. As a result, Mode 2 is selected as the econometric model of financial information.

Table 2. Model coefficients

<table>
<thead>
<tr>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>@@</td>
<td>4.866*</td>
<td>0.251</td>
<td>377.074</td>
<td>1</td>
</tr>
<tr>
<td>PER</td>
<td>0.268*</td>
<td>0.048</td>
<td>31.584</td>
<td>1</td>
</tr>
<tr>
<td>Volume</td>
<td>0.133*</td>
<td>0.011</td>
<td>159.093</td>
<td>1</td>
</tr>
<tr>
<td>DYR</td>
<td>-0.006</td>
<td>0.006</td>
<td>1.032</td>
<td>1</td>
</tr>
<tr>
<td>Return rate</td>
<td>0.005*</td>
<td>0.001</td>
<td>17.963</td>
<td>1</td>
</tr>
<tr>
<td>MV</td>
<td>-9.17*</td>
<td>0.048</td>
<td>364.432</td>
<td>1</td>
</tr>
<tr>
<td>@@×MV</td>
<td>0.206**</td>
<td>0.066</td>
<td>9.781</td>
<td>1</td>
</tr>
<tr>
<td>@@×PSR</td>
<td>-1.27*</td>
<td>0.065</td>
<td>384.962</td>
<td>1</td>
</tr>
<tr>
<td>@@×TR</td>
<td>0.293**</td>
<td>0.088</td>
<td>11.139</td>
<td>1</td>
</tr>
<tr>
<td>@×TR</td>
<td>-1.664*</td>
<td>0.120</td>
<td>190.920</td>
<td>1</td>
</tr>
<tr>
<td>Constant</td>
<td>0.906*</td>
<td>0.190</td>
<td>22.835</td>
<td>1</td>
</tr>
</tbody>
</table>

Omnibus \( \chi^2 \) in model coefficient = 73315.413*

Hosmer & Lemeshow \( \chi^2 \) = 13.019

Cox & Snell R² = 0.626

Nagelkerke R² = 0.834

Percentage of correct = 94.2%

Remarks: *p < 0.001; **p < 0.01

@@: The early-period state is growth stock or value stock

The significance of the Omnibus test less than 0.1% indicates that at least one independent variable can effectively explain and predict the samples’ probability in transformation between growth stocks.
or value stocks. Furthermore, with the value of 13.019 in the Hosmer & Lemeshow test, the overall fitness of the regression mode is considered good. During financial information analysis, the alleged events in the research refer to the occurrence of growth stocks transforms to value stocks (i.e. 0 transforms to 1). After deducting interactional independent variables, 6 explainable variables are found, including “PER”, “volume”, “return rate”, “MV”, “PSR” and “TR”. Because the Wald values of these 6 variables all reach significance level, they can be used to predict and explain the important predictive variables that growth stocks are transformed to value stocks.

4 Conclusion
Based on monthly data from listed companies on Taiwan stock market from 1991-2010, this research found that only DYR doesn’t financially affect transformation between growth stocks and value stocks; whereas, other factors are all correlated. In this study, it is found that higher PER generates high possibility in transformation and expected return increase. The findings indicate PER effect doesn’t exist in Taiwan stock market, which is contrary to Basu [5].

Based on technical analyses, stock investors' optimism upon market leads increases in stock demand, volume and stock price. On the contrary, stock price will decrease. The research also found higher volume generates high possibility in transformation and expected return increase, which signifies positive correlation exists between volume and return rate. The findings indicate liquidity effect doesn't exist, which is contrary to Demsetz [27].

Return rate affects transformation. According to empirical results, higher return rate generates high possibility in transformation. The findings prove return rate has momentum, which matches not only value premium [7] but also momentum effect [32].

There are several factors affecting the investment performance which might be varied because of research model, sampling period and sample difference. During the measurement of stock return, investors should apply influence factors of variables to models in order to explore stock-selection strategy. The investment methods from this research could be a new stock-selection strategy for investors' excess return and better investment performance.

References:


