Event History Analysis of the Stock Return: Taiwan Stock Market

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***Abstract*—** Although CAPM has been comprehensively applied in 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. And, our study aims at finding the actual correlation between price/book ratios effect and stock return so that 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 as well as increase in the expected return. Therefore, investors should take these determinants as the key variables in their investing models in order to implement their proper stock-selection strategy. The investment methods from this research could be a new stock-selection strategy for investors' excess return and better investment performance.

***Keywords*—** CAPM Model, Capital Return, Growth Stock, Value Stock, Stock Selection

I. 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 [1]-[3], is a sound theory for return change and is used to measure the correlation between individual asset risk and its expected return rate in the portfolios. Because portfolio is efficient under CAPM and non-systematic risk is totally dispersed by diversified portfolio, only systematic risk is usually considered in the model. The expected return of securities shows positive linear relationship with its market risk, meaning that higher return usually generates higher market risk β value which has been considered as the only factor to explain expected return. Although CAPM has been comprehensively applied in practice for a long time, it is established under the perfect-basis assumption which does not always exist in reality. Also, beside systematic risk β of CAPM, there are several other factors affecting the return including size effect [4], price/earnings ratios effect (PER) [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 the difference of the return of different stocks. Later, Fama and French [8] proposed three-factors 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 considered market and price/book factors as two main variables which can 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 premium value 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 usually ask for high return as compensation or the overreaction of market on news all makes long-term value stocks have higher return.

If premium value 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 between 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 generalize what kind of characteristics (financial data and company characteristics are used as explanatory variables) and stocks might have transformation potential in the future, and thereby, act as references for investors' stock-market prearrangement.

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II. 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.

A. The Effect of 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]. After portfolios were formed per PBR, Rosenberg et al. [6] examined the significance of the buying/selling behavior towards excess return and found that investors can earn excess return by buying low-PBR stocks and selling high-PBR stocks, which also signified low-PBR companies to have excess return. Similarly, Fama and French [7] also found PBR and company size best explained average return of stocks. However, Grinold and Kahn [13] used Britain stock market as sample, and concluded that high-PBR companies had higher return while low-PBR companies have lower return, which was contrary to the findings of [6]. After reviewing the return of value stocks and growth stocks, Bauman and Miller [9] pointed that value stocks had higher return, proving the existence of premium value. However, excess return gap between low-PBR stocks and high-PBR stocks was not huge; particularly, PBR has better predictive ability for the period before 1960, but it has no significant correlation in the period after 1960 [13], [14]. Chow and Hulburt [12] studied large-scale and low-PBR portfolios in Japan stock market, then discovered their returns were significantly higher than those of small-scale and high-PBR ones. Besides, the investment performances of low-PBR portfolios were significantly better than the return of any random portfolios. Nevertheless, if only size effect is considered, results could not reveal any significant improvement on portfolio efficiency. In order to improve portfolio efficiency, PBR should be the key factor to be first taken into consideration. As for future profitability, low-PBR stocks were found relatively sensitive to the change of economic environment, thus their reaction on stock price impact was more rapid than that of high-PBR ones [5]. When the size was under control, low-PBR stocks can keep ahead of high-PBR ones in term of the return because PBR and company size was negative related.

Based on PBR index, the stocks on Taiwan stock market are classified into high, middle and low portfolios. Several researchers found that the return rates of low-PBR portfolios were higher than those of the high-PBR ones, proving that the PBR effect indeed existed in Taiwan stock market. The effect of company size was also found existing in Taiwan stock market despite the insignificance of the risk coefficient β. From integrated viewpoints of cross section and vertical section, PBR effect shows the biggest influence on annual return rate. There has been a huge attempt to find the relationship between the risk compensation, investors' behavioral bias and the premium value. It was found that if value firms had better fundamental analyses, investors could have higher excess return in the following one or two years. Therefore, investors' behavioral bias can better explain the phenomenon of premium value.

Numerous empirical researches have proven that significant effect of premium value actually exists in stock market. However, it has been also found that different research period and different samples may have different premium value effects. Most scholars claim that low-PBR stocks have higher return, namely value stocks have higher return than growth stocks. Assuming that premium value exists in Taiwan stock market as the aforementioned, this paper aims to study the transformation factor between growth stocks and value stocks.

B. The Effect of Company Size

Company size is often referred as the market value of listed companies, specifically their number of outstanding shares (NSO). Company size effect refers to certain correlation between listed-stock return rate and its company size. For instance, operational risk of small companies is higher than large-scale ones. Therefore, investors expect to obtain higher expected return. Such phenomenon implies that the return rate of small stocks is higher than large-scale ones after their risk adjustment. When size-effect was added as a variable into CAPM, Banz [16] found that small stock portfolios had higher risk premium than large-scale ones. The reason was that small-stock companies were often equipped with high growth rate, significant rise on stock value and unstable size effect during research. Hence, except for company size effect, other anomalies were possibly undiscovered.

Reinganum [17] ranked 10 portfolios per stock value at the end of every year, and compared their daily excess return. When PER and company size are separately tested, they are found to have significant relationship with the stock return: the annual average return rate of small-scale stocks was 20% higher than that of the large-scale ones; meanwhile, the return rate of small companies was steadily stable at least 2 years and thereby proved the existence of size effect. Taking seasonal factors into consideration, Fant and Peterson [18] found negative correlation existing between company size and return, namely size effect. However, they found that company size and return only show strong negative correlation in January after analyses were divided into 2 parts (i.e. January vs. February to December). This could be explained that size effect only existed in January, none in other months. According to Kim and Burnie [19], size effect significantly appeared during economic expansion and disappeared during economic recession. Compared to large-scale companies, small ones had lower return on assets (ROA) and higher leverage ratio (LR); therefore, their performances were easily affected by negative economic change. Meanwhile, their size effect mainly occurred in January regardless of the economy situation. As for researches on advanced countries, Maroney and Protopapadakis

[20] discovered significant negative size effect existing between company size and stock return in U.S.A., Canada, France, Germany, Japan and Australia.

In Taiwan stock market, the correlation between stock price behavior, size effect and the stock return rate was studied in several researches which already proved the existence of negative size effect because the stock return rate of large-scale companies was usually higher than that of small ones. Similarly, size effect also existed in stock return even though risk variable was substituted by company size, thus size effect seemed better explained the difference of stock return than risk. It was also found that both weekly and monthly data had a significant positive correlation. In term of the determinants of cross-sectional returns, there was a linear relationship existing between the expected return rate and system risk β value. Furthermore, β value was the only factor could explain cross-section expected return, meaning that there was no size effect in Taiwan stock market.

Therefore, it is often believed that there is a negative correlation between company size and stock return because most small companies have high growth rate and risk, as well as the possibility of stock price rise.

C. The Effect of Price/Earnings Ratio (PER)

Stock price is the cost investors pay for stocks; and earning per share (EPS) is the profit companies earn for their stockholders, therefore, PER is the market price of that stock divided by the annual EPS. The PER effect indicates that low-PER stocks have higher return on investment (ROI) because their stock values might be underrated.

Basu [5] classified 5 portfolios by PER, then measured their monthly return rates (1956-1969) by Sharpe, Jensen and Treynor indexes. It was found that greater PER stocks generated smaller return rate, confirming the existence of PER effect. Nevertheless, Reinganum [17] examined the influence of PER and market value on return rate, then conducted study per quarterly and yearly data (1963-1977). Based on the quarterly data of PER, high-PER portfolio return was found statistically better than that of the low-PER ones. Reinganum believed that Basu's findings in [5] might be caused by size effect, instead of PER. To response Reinganum's research [17], Basu re-studied NYSE listed stocks (1963-1983), and found that the return rate of low-PER stocks was still higher than that of high-PER stocks. Even after the size difference was adjusted, PER effect was still significant. However, the research results of Johnson et al. [21] were also contrary to [5]. Based on the Basu's research methods in [5], Johnson et al. [21] selected NYSE listed companies (1979-1984) as their samples, and their findings showed that PER effect indeed existed in early US stock market. Fama and French [7] proved that PER was equipped with explanatory ability basically. Besides, they further described the instability of PER effect: PER could not explain stock return rate before company size and PBR were added.

In Taiwan stock market, it was found that after PER portfolios were under control, every January from 1980 to 1986 had a significant impact on the return. This implies that research period profoundly affects research results when market structure changes. PER of Taiwan stock market was found negatively related to the excess return. Moreover, PER effect only existed when PER was positive, and stocks with negative PER had significant excess return.

Though being mentioned in numerous researches, the existence of PER effect has been still a controversial issue [17], [18].

D. The Effect of Dividend Yield Rate

As a stock selection indicator among value investing strategies, dividend yield rate (DYR) is dividend per share (DPS) divided by market value per share (MVPS). Because most US listed companies prefer divided payment, investors accordingly use DYR as their selection index. Litzenberger and Ramaswamy [22], [23] assumed that high-DYR stocks should have higher return rate because investors' higher income tax can thus be compensated. Nevertheless, Miller and Scholes [24] pointed that the relation between DYR and return rate was not significant based on empirical analyses designed by Litzenberger and Ramaswamy [22], [23].

Fama and French [25] held portfolios for one month to four years in order to explore the predictive ability of DYR on stock return rate. The findings indicated longer holding period generated more predictive ability. In the long term, most high DYR in particular had high return rate, which was the same as findings of Campbell and Shiller [26] as well as Bekaert and Hodrick [27], namely DYR could act as one of factors to predict stock return.

According to above mentioned literatures about DYR, high-DYR portfolios are mostly associated with higher return rate. It can be inferred that investors have heavier income tax, so they request higher nominal return rate. However, it does not guarantee the equally high real return rate. Besides, companies with more cash dividends signify high DYR, good company operation, stable earnings, and further leading high return rate. While US companies which usually paid dividends quarterly, Taiwan companies paid dividends yearly. For this reason, the DYR of Taiwan companies did not change much in the short term. Among the small changes identified, the change in stock price was prominent. As a result, DYR was usually used to provide references for long-term manipulation and seldom used to explain stock return rate.

E. The Effect of Price/Sales Ratio

Price/sales ratio (PSR) is the ratio of market value per share (MVPS) and revenue per share (RPS). PSR effect means low-PSR stock return is higher than high-PSR stocks. In the late 1950, Philip [28] mentioned PSR could act as an important research tool if investors considered investment target such as growth companies. Twenty years later, PSR was also selected as one of the stock-selection variables in [29].

O'Shaughnessy [30] found the ROI of 50 low-PSR stocks in US stock from 1954 to 1994 was higher than others; meanwhile, the ROI of the highest PSR was only 4.15%. The logic of utilizing price/sales ratio (PSR) was to consider a company with

higher revenue level usually generated bigger growth potential on future earnings and better stock price. PER could not be used to evaluate stock value when the company had deficit, hence PSR was another evaluation indicator. In brief, low-PSR stocks often had higher expected return rate.

F. The Effect of Liquidity

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, measure the defects of liquidity and explain order-receivable capability under unchanged price, some scholars begin to utilize "volume" as an indicator for liquidity measurement. Demsetz [31] studied NYSE stocks and found that there was a significant negative relation between "volume" and "bid-ask spread". Moreover, bigger volume was followed by smaller bid-ask spread and better liquidity. Besides, Branch and Freed [32] as well as Benston and Hagerman [33] all studied NYSE, AMEX and OTC stocks, then found that there was a negative relation existing between the "volume" and "bid-ask spread". By considering daily trade as samples for data analysis, Amihud and Mendelson [34] proposed transaction cost theory to reflect asset pricing, then utilize bid-ask spread to evaluate stock liquidity and tested the correlation between stock return and liquidity. The findings all showed stock return existed liquidity premium. Charles et al. [35] mentioned high volume represented investors expect better profitability from companies in the future. In the long term, stock price naturally performed well, leading to the increase in return. However, Vinay et al. [36] believed that investors should have higher premium on stock price with low volume, which contradicted the statement "companies with low volume should have better performance in the future."

In addition to "volume", "turnover rate (TR)" was also considered as one of indicators for liquidity measurement. This indicator is used to solve measurement deviation caused by different company size. Normal stock TR is the volume divided by its NSO. Under the same NSO, the greater volume generates both frequent TR and better liquidity. NSO can help companies to estimate potential transaction number. Therefore, TR, a proportional indicator of potential transaction number is directly related to market depth. Under the same order scale, low-TR stocks signify the lack of market liquidity, and thus are asked for higher return rate for compensation.

Chui and Wei [37] utilized TR as an alternative variable for liquidity. By employing the liquidity of CAPM proposed by Amihud and Mendelson [34], they concluded that there was a significant negative correlation between stock TR and expected return rate. Similarly, Datar et al. [38] replaced liquidity with stock TR; then, they also discovered the negative relation between return rate and TR. This also confirmed the findings of Amihud and Mendelson [34] that the negative relation between stock liquidity and market return indicated that stock with high stock TR or volume had less return; and thereby, proved the existence liquidity effect.

Although the problem of "volume" is resolved when people use volume as measurement indicator for liquidity, the ignorance of "price" factor might be unable to explain the influence of different volume on stock price. Scholars mainly believe that negative relation exists between volume and market return, meaning that the return of low-volume stocks is higher than that of the high-volume ones. Using TR to measure liquidity can avoid the influence caused by company size, but it might ignore the influence of stock price as the same as volume. Several researches come into a same conclusion that there is a negative correlation between stock liquidity and market return, i.e. stocks with lower TR have higher return.

G. The Effect of 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 cause price inversion and under-reactions cause stock price momentum growth or decline. Jegadeesh and Titman [39] found the return rate of winner portfolios during formative period (for example, the top 10% stocks per return rate) is significantly greater than loser portfolios during holding period (for example, the bottom 10% stocks per return rate), regardless of investment period. As a result, investors can earn excess return by buying winner stocks and selling loser stocks simultaneously.

It has been a frequent issue to find a good forecasting model for the return of stocks on a market. The discovery of middle-term (3-12 months) price momentum strategy receives the most attention. Fama and French [40] utilized three-factor model to explain the reverse phenomenon of long-term stock return. The results showed that size factor and PBR could catch the inverse phenomenon of long-term stock return and three-factor model could fully explain other asset return behaviors, but they were totally unable to explain the anomalies of middle-term price momentum. Moreover, Jegadeesh and Titman [39] tested many data from different sample periods; their findings also indicated that middle-term price momentum was not the result of data manipulation. Incorporating with the value investing strategy, price-momentum scholars thought that the investment strategy of momentum effect was to buy the better portfolios which were superior to market, meanwhile sell poor ones.

The existence of the middle-term price momentum was clearly identified in Europe and US stock markets; however, it does not exist in Asia stock markets. Hammeed and Yuanto [41] studied the momentum effect in 6 Asia stock markets (Taiwan, Hong Kong, Korea, Malaysia, Singapore and Thailand) and concluded that there was insignificant difference in its effect to the short-term contrarian and to middle-term momentum phenomenon like US stock market. Chui et al. [42] discovered that except Hong Kong stock market which had a significant momentum profit, other Asian stock markets did not have the price momentum. Hong et al. [43] also found that Hong Kong was the only Asia stock market having price and earnings momentum. Based on the literatures above, Taiwan stock

market doesn't have middle-term momentum phenomenon like Europe and US stock markets, but it has momentum effect in the long term. Therefore, the investment strategy of momentum effect can be considered to earn excess return.

III. 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.

The descriptive analysis of the variables of financial information and company characteristics is shown in Table 1.

Table 1. Descriptive analysis

Variable	Min	Max	Average	Standard deviation
Financial information				
PER	0.280	7775.000	46.373	194.137
Volume	0	48	0.86	1.728
DYR	0	63	2.66	3.227
Return rate	-77	182	1.19	13.931
Market value	161	1873427	23288.02	86784.319
PSR	0	2192	2.93	21.354
TR	0	4	0.22	0.264
Company characteristics				
RPS	-4.570	51.190	1.948	2.325
BVP	0.070	282.310	15.591	7.531
NSO	6826	26427660	554752.45	1404560.233

By considering the financial information variables such as "PER", "Volume-VOL", "DYR", "Return rate- RR", "Market value- MV", "PSR" and "TR" into discrete-time logistic regression model with Markovian procedure, we utilized PBR dichotomy to classify the influence effect of growth stocks and value stocks at a certain time. Therefore, besides the above mentioned variables, the following factors are also taken into consideration in the model:

- The early-period state is growth stock or value stock (denoted by @@);
- The interaction between @@ and PER;
- The interaction between @@ and VOL;
- The interaction between @@ and DYR;
- The interaction between @@ and RR;
- The interaction between @@ and MV;
- The interaction between @@ and PSR;
- The interaction between @@ and TR;

Table 2 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 2. The data mode analysis of financial information

Variable	Mode 1	Mode 2	Mode 3
@@	-	4.866**	4.925**
PER	1.030**	0.268**	0.318**
@@×PER	-	-	-0.088
VOL	0.282**	0.133**	0.136**
@@×VOL	-	-	-0.011
DYR	0.012**	-0.006	-0.005
@@×DYR	-	-	-0.002
RR	-0.002*	0.005**	0.004*
@@×RR	-	-	0.003
MV	-1.313**	-0.917**	-0.921**
@@×MV	-	0.206*	0.223*
PSR	-1.891**	-1.270**	-1.284**
@@×PSR	-	0.293*	0.312*
TR	-2.325**	-1.079**	-1.074**
@@×TR	-	-1.664**	-1.657**
Constant	4.209**	0.906**	0.857**
Omnibus χ^2	21053.261*	73315.413*	73317.725*
Cox & Snell R^2	0.246	0.626	0.626
Nagelkerke R^2	0.328	0.834	0.834
H&L χ^2	113.950*	13.019*	20.233**

Remarks: H&L: Hosmer & Lemeshow; *p <0.001; **p < 0.01

Based on the Omnibus chi-square test in Table 2, Mode 2 and 3 are considered significant. Though Cox & Snell R^2 and Nagelkerke R^2 of the two modes are almost the same, the lower value of Hosmer & Lemeshow chi-square 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 as shown in Table 3.

The significance of the Omnibus chi-square 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 chi-square test, the overall fitness of the regression model is considered good. During financial information analysis, the alleged events in the research refer to the occurrence of transformation from growth stocks to value stocks. After deducting interactional independent variables, 6 explainable variables are found, including "PER", "VOL", "RR", "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 transform growth stocks to value stocks.

Table 3. Model coefficients

	B	S.E.	Wald	Sig.	Exp(B)
@@	4.866	0.251	377.074	0.000	129.844
PER	0.268	0.048	31.584	0.000	1.308
VOL	0.133	0.011	159.093	0.000	1.143
DYR	-0.006	0.006	1.032	0.310	0.994
RR	0.005	0.001	17.963	0.000	1.005
MV	-0.917	0.048	364.432	0.000	0.400
@@×MV	0.206	0.066	9.781	0.002	1.229
PSR	-1.270	0.065	384.962	0.000	0.281
@@×PSR	0.293	0.088	11.139	0.001	1.341
TR	-1.079	0.102	112.885	0.000	0.340
@@×TR	-1.664	0.120	190.920	0.000	0.189
Constant	0.906	0.190	22.835	0.000	2.475

Omnibus χ^2 in model coefficient = 73315.413 ($p<0.001$)

Hosmer & Lemeshow χ^2 = 13.019

Cox & Snell R^2 = 0.626

Nagelkerke R^2 = 0.834

Percentage of correct = 94.2%

Based on Table 3, regression coefficient of PER in the regression model is 0.268, a positive number with significance under 0.1% significance level. Therefore, any positive change in PER will positively affect the transformation of growth stocks to value ones; particularly, the probability of transformation increases by 1.308 times for every 1% increase in the PER. This indicated that higher current PER generates high possibility in stock transformation (growth stocks transform to value stocks) and the increase in expected return. On the contrary, current higher PER generates low possibility in stock transformation (value stocks transform to growth stocks) and the decrease in expected return. The results matched Basu's opinion "PER effect was contrary" [5].

Similarly, the regression coefficient of VOL in the regression model is 0.133, a positive number with significance under 0.1% significance level. Therefore, any positive change in VOL will positively affect the transformation of growth stocks to value ones; particularly, the probability of transformation increases by 1.143 times for every increase of one hundred million shares in the volume. This indicates higher current volume generates high possibility in stock transformation (growth stocks transform to value stocks) and the increase in expected return. On the contrary, current higher volume generates low possibility in stock transformation (value stocks transform to growth stocks) and the decrease in expected return. The results are contrary to the conclusions "Greater volume generated higher return rate, and liquidity effect did not exist" proposed by Demsetz [31] as well as Branch and Freed [32].

Furthermore, with the significance of 0.31 for the regression coefficient of DYR in Table 3, DYR is not statistically significant. This indicates that DYR does not actually affect the transformation between growth stocks and value stocks.

The return rate in the model has as regression coefficient of 0.005, a positive number with significance under 0.1% significance level. Therefore, any positive change in RR will positively affect the transformation of growth stocks to value ones; particularly, the probability of transformation increases by 1.005 times for every 1% increase in the RR. This indicates the higher current RR generates the higher possibility in stock transformation (growth stocks transform to value stocks) and increase in the expected return. On the contrary, current higher RR generates low possibility in stock transformation (value stocks transform to growth stocks). The results match the conclusion "the ROI of low-PBR stocks is higher than the RR of high-PBR stocks" proposed by Fama and French [7]. Meanwhile, the results are also correlated to momentum effect as mentioned in [39], i.e. the return is equipped with momentum. Therefore, investors could use momentum strategy to consult the predictability of previous return, and then get higher excess return.

Also, from Table 3, the regression coefficient of market value (MV) with and without interaction with early-period state significantly changes from (-0.917) to 0.206 which is equal to the absolute difference of 1.123. Hence, the probability of the transformation increases by 3.0725 (=1.229/0.4) times for every 1% increase in the MV. This indicates that early-period growth stocks with higher current MV generate low possibility in stock transformation (growth stocks transform to value stocks) and expected return increase. On the contrary, early-period value stocks with higher current MV generate high possibility in stock transformation (value stocks transform to growth stocks) and the decrease in the expected return. MV and company size are usually used to present the comprehensive evaluation of corporate operation. Banz [16] confirms that there is significant negative correlation between size and return. Consequently, stock return of small companies is higher than the large-scale ones. However, Banz's finding is contrary to the result "inverse size effect indeed exists in Taiwan stock market".

Considering the effect of price-sales ratio (PSR) to the transformation of growth stocks to value stocks, it was found that its regression coefficient significantly changes from (-1.270) to (-0.293), which is equal to the absolute difference of

1.563 with significance. Thus, the probability of transformation increases by 4.772 (=1.341/0.281) times for every 1% increase in the PSR. This indicates that early-period growth stocks with higher current PSR generate low possibility in stock transformation (growth stocks transform to value stocks) and expected return increase. On the contrary, early-period value stocks with higher current PSR generate high possibility in stock transformation (value stocks transform to growth stocks) and expected return decrease. This indicates that ROI would accordingly decrease when low-PSR stocks transform to high-PSR stocks [30].

Similarly, with the regression coefficient of TR change from (-1.079) to (-1.664) which is equal to the absolute difference of 0.585 with significance, the probability of transformation decreases 0.556 (=0.189/0.34) time for every 1% increase in TR. This indicates that early-period growth stocks with higher current TR generate high possibility in stock transformation (growth stocks transform to value stocks) and the increase in expected return. On the contrary, early-period value stocks with higher current TR generate low possibility in stock transformation (value stocks transform to growth stocks) and the decrease in expected return. This argument corresponds to Datar et al. [38] who thereby proposed liquidity effect to deduce the existence of significant negative correlation between stocks' expected return and TR. In brief, high-TR and high-liquidity stocks have lower expected return.

After test upon financial information model, the positive constant of 0.906 indicates that the probability of transformation from growth stocks to value stocks would be quickly transformed from value stocks to growth stocks.

With the same token, we also consider the financial information variables such as "RPS", "BVP", and "NSO" as well as their interactions with the Markovian effect in the econometric model. Particularly, the following interactions are taken into consideration in this research.

- The early-period state is growth stock or value stock (denoted by @@);
- The interaction between @@ and RPS;
- The interaction between @@ and BVP;
- The interaction between @@ and NSO;

In this paper, 18 different industries are taken into consideration. Their stock structures are shown in Table 4.

Three modes are considered. Mode 1 excludes Markovian effect. Both mode 2 and 3 include Markovian effect, however, mode 3 refers to the mode where all variables interact with "The early-period state is growth stock or value stock". After mode 2 deducts all variables with non-significant interactive effect from mode 3, the remaining 2 variables "The interaction between the early-period state is growth stock or value stock and BVP" and "The interaction between the early-period state is growth stock or value stock and NSO" are added into model.

Table 5 shows the Omnibus chi-square test of the three modes; among which Mode 2 and Mode 3 both reach significance. Furthermore, the verifications of Cox & Snell R^2 and Nagelkerke R^2 are almost 0.626 and 0.834 respectively, but the variable number of mode 2 is less than mode 3. As a result, mode 2 is more suitable and concise than mode 3. Besides, the goodness of fit in mode 2 regarding Hosmer & Lemeshow chi-square test is better than mode 3 (14.044 vs. 35.222), thus mode 2 is selected as the econometric model of company characteristics.

During company characteristics analysis, the alleged events in the research refer to the occurrence of growth stocks transformed to value stocks (i.e. 0 transforms to 1). After deducting interactional independent variables, Table 6 presents 4 explainable variables: "RPS", "BVP", "NSO" and "Industry". The Wald value of these 4 variables all reaches significance level, this signifies they could predict and explain the important predictive variables that growth stocks transform to value stocks.

Table 4. Stock structures of investigated industries

Industry Sectors	Growth stock	Value stock
1. Cement industry	23.24%	76.76%
2. Food industry	34.05%	65.95%
3. Plastic industry	38.50%	61.50%
4. Textile Fiber	27.52%	72.48%
5. Electric Machinery	53.77%	46.23%
6. Electric & Cable	14.05%	85.95%
7. Chemistry & Biotech	50.35%	49.65%
8. Glass Ceramics	34.93%	65.07%
9. Paper industry	21.55%	78.45%
10. Iron & Steel industry	29.41%	70.59%
11. Rubber industry	61.33%	38.67%
12. Automobile industry	45.55%	54.45%
13. Electronics Industry	68.15%	31.85%
14. Construction, Material	35.15%	64.85%
15. Transportation	42.35%	57.65%
16. Tourism	61.10%	38.90%
17. Trade & Department	57.79%	42.21%
18. Oil, Power & Fuel	49.18%	50.82%
19. Others	69.81%	30.19%
All sectors	50.95%	49.05%

Remark: Growth stocks and value stocks are classified by dichotomy in PBR. If values near median are equal, they are all classified into growth stocks.

Table 6 illustrates the regression coefficients of the selected variables. The regression coefficient of RPS is (-0.060), a negative number with significance under 0.1% significance level. Therefore, any positive change in the RPS will negatively affect the transformation of the growth stocks and value stocks; particularly, the probability of transformation increases by 0.939 times for every 1 dollar increase in the RPS. This indicates that current higher RPS generates low possibility in stock transformation (growth stocks transform to value stocks) and the increase in the expected return. On the contrary, current higher RPS generates high possibility in stock transformation (value stocks transform to growth stocks) and the decrease in the expected return. The results match the finding of Beaver et al. [44] "When RPS is positive and return rate is negative, the

result of revenue and return rate present inverse ratio and correlation.

Also, with the BVP, its regression coefficient is significantly changed from 0.043 (without interaction) to (-0.037) (with interaction) with significance, which is equal to the absolute difference of 0.08. Therefore, the probability of transformation decreases by 0.9 (=0.939/1.043) times for every 1 dollar increase of BVP. This indicates that early-period growth stocks with current higher BVP generates low possibility in stock transformation (growth stocks transform to value stocks) and the decrease in the expected return. On the contrary, early-period value stocks with current higher BVP generates high possibility in stock transformation (value stocks transform to growth stocks) and the increase in the expected return.

Table 5. The data mode analysis of company characteristics

Variable	Mode 1	Mode 2	Mode 3
@@	-	4.040***	3.998***
RPS	-0.126***	-0.063***	-0.075***
@@×RPS	-	-	0.019
BVP	-0.052***	-0.037***	-0.036***
@@×BVP	-	0.043***	0.040***
NSO	0.353***	0.127***	0.124***
@@× NSO	-	0.150**	0.158***
Industry classification			
1. Cement industry	1.747***	0.897***	0.894***
2. Food industry	1.390***	0.674***	0.677***
3. Plastic industry	1.159***	0.567***	0.567***
4. Textile fiber	1.570***	0.817***	0.816***
5. Electric machinery	0.722***	0.343*	0.344*
6. Electric & Cable	2.509***	1.312***	1.311***
7. Chemistry & Biotech	0.828***	0.360**	0.360**
8. Glass ceramics	1.250***	0.619***	0.616***
9. Paper industry	1.800***	0.939***	0.935***
10. Iron & Steel industry	1.640***	0.842***	0.845***
11. Rubber industry	0.217**	0.041	0.040
12. Automobile industry	1.647***	0.725***	0.737***
13. Electronics industry	0.197**	0.072	0.072
14. Construction, Material	1.189***	0.581***	0.578***
15. Transportation	0.942***	0.418**	0.414**
16. Tourism sector	0.397***	0.077	0.074
17. Trade, Department	0.412***	0.109	0.110
18. Oil, Power & Fuel	0.821***	0.428**	0.428**
Constant	-1.698***	-3.095***	-3.076***
Omnibus χ^2	16884.63***	97471.59***	73306.89***
Cox & Snell R^2	0.155	0.621	0.621
Nagelkerke R^2	0.206	0.828	0.828
H&L χ^2	463.146***	14.044*	35.222***

Remark:H&L- Hosmer & Lemeshow, *p < 0.10; **p < 0.05; ***p < 0.01;

Furthermore, it is also found that the NSO positively affects the transformation between the growth stocks and the value ones. Particularly, its regression coefficient is significantly changed from 0.127 (without interaction) to 0.150 (with interaction), which is equal to the absolute difference of 0.023. Therefore, the probability of transformation increases by 1.023 (=1.162/1.136) times for every 1% increase of the NSO. This indicates that early-period growth stocks with current higher NSO generate low possibility in stock transformation (growth stocks transform to value stocks) and the increase in the expected return. On the contrary, early-period value stocks with current higher NSO generate high possibility in stock transformation (value stocks transform to growth stocks) and the decrease in the expected return. The results indicate, if NSO decreases, companies might conduct capital reduction and repurchase treasury stocks. Eventually, the decrease of NSO leads to the increase in DPS, MVPS and expected return.

Table 6. Model Coefficients

Variables	B	S.E	Wald	Sig.	Exp(B)
@@	4.040	0.324	155.55	0.000	56.850
RPS	-0.060	0.007	80.421	0.000	0.939
BVP	0.043	0.004	94.194	0.000	1.043
@@×BVP	-0.037	0.004	107.34	0.000	0.964
NSO	0.127	0.039	10.642	0.001	1.136
@@×NSO	0.150	0.061	6.172	0.013	1.162
Industry classification sector			523.13	0.000	0.000
1. Cement industry	0.897	0.205	19.140	0.000	2.451
2. Food industry	0.674	0.178	14.291	0.000	1.962
3. Plastic industry	0.567	0.178	10.104	0.001	1.763
4. Textile fiber	0.817	0.172	22.500	0.000	2.264
5. Electric machinery	0.343	0.176	3.799	0.051	1.409
6. Electric & Cable	1.312	0.197	44.254	0.000	3.715
7. Chemistry & Biotech	0.360	0.175	4.243	0.039	1.434
8. Glass ceramics	0.619	0.212	8.525	0.004	1.856
9. Paper industry	0.939	0.202	21.582	0.000	2.558
10. Iron & Steel industry	0.842	0.177	22.540	0.000	2.322
11. Rubber industry	0.041	0.191	0.046	0.830	1.042
12. Automobile industry	0.725	0.235	9.499	0.002	2.065
13. Electronics industry	0.072	0.167	0.185	0.667	1.075
14. Construction, Material	0.581	0.175	11.076	0.001	1.788
15. Transportation	0.418	0.182	5.241	0.022	1.518
16. Tourism sector	0.077	0.203	0.145	0.704	1.080
17. Trade, Department	0.109	0.189	0.334	0.563	1.116
18. Oil, Power & Fuel	0.428	0.202	4.492	0.034	1.534
Constant	-3.095	0.262	139.21	0.000	0.045
Omnibus χ^2 = 97471.589			H&L χ^2 = 14.044		
Cox & Snell R^2 = 0.621			Nagelkerke R^2 = 0.828		
Percentage of correct = 94.5%					

As shown in Table 6, the coefficients of the 18 investigated industries are all positive. As such, if compared to a reference group of industries named “Other industries”, they all have high probability of transformation between the growth stocks and the value ones. Among the 18 industries investigated, the electric and cable sector has the highest probability of transforming from growth stocks to value stocks. Similarly, the paper industry, cement, iron & steel, textile fiber, and automobile

industries are orderly ranked after the electric and cable sector.

The constant in the regression model is a negative number, indicating that the probability of transformation from growth stocks to value stocks is lower than transformation from value stocks to growth stocks; hence, the growth stocks do not easily transform to value stocks.

IV. 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 as well as the increase in the expected return. The findings indicate PER effect does not exist in Taiwan stock market, which is contrary to Basu [5].

With the above technical analyses, the optimism upon market of stock investors leads to increases in stock demand, volume, and stock price. On the contrary, stock price will decrease. The research also found that higher volume generates high possibility in transformation and the increase in expected return; meaning that there is a positive correlation existing between volume and return rate. These findings refute the existence of liquidity effect, which is contrary to Demsetz [27]. Return rate affects transformation. According to the empirical results, higher return rate generates high possibility in transformation and return rate has momentum effect, which fully agrees with the premium value [7] and momentum effect [32] as well.

Under the company characteristics, higher RPS generates lower possibility in transformation and the increase in the expected return. This matches the finding of Beaver et al. [44].

BVP shows influence on transformation. Early-period growth stocks with higher BVP generate higher possibility in transformation and the increase in the expected return. This signifies that the lower net value generates higher PBR and lower expected return under the circumstance of premium value.

In general, NSO might raise stock price and expected return because of companies' capital-reduction policy. The early-period growth stocks with higher NSO generate lower possibility in transformation and the increase in the expected return. This result also presents negative relation between NSO and return.

The results of MV analyses indicate that early-period growth stocks with higher MV generate low possibility in transformation and the increase in the expected return. This shows that the return rates of small companies are usually higher than those of large-scale ones, which is found the same as the size effect proposed by Banz [16]. Our results also show that early-period growth stocks with higher PSR generate low possibility in stock transformation (growth stocks transformed to value stocks) and the increase in the expected return. This indicates that a negative correlation actually exists between PSR and return rate, which matches the conclusion in [30].

Based on the analyses of industrial stocks, the probability of transformation from growth stocks to value stocks is lower than transformation from value stocks to growth stocks. This signifies that transformation of growth stocks to value stocks is difficult. Specifically, technical analysis shows that Plastic industry sector, Electronic industry sector, Tourism sector and Trade & Department store sector are the sectors with longer growth stocks state; therefore, their transformation might be disadvantageous.

Though DYR does not significantly affect transformation between growth stocks value stocks and growth stocks, changes of other variables all affect the transformation between these two stocks. For these reasons, the influence factor on transformation might be varied because of research model, sampling period and sample difference. During the measurement of stock return, investors should apply several determinants to regression 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.

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