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Construct Value Investment Portfolio Based on Financial Indicators

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Abstract

This study constructs investment portfolio based on firm's financial and value performances and goes further to see if it performs better than the market return. We use profitability, financial risks, and growth as financial performance indicators and apply P/E ratio as price performance indicator. Using Taiwanese data, we create portfolio by the sorted top 50 samples year by year and test their long-term buy-and-hold performance in the period of 2006 to 2015. Empirical evidence shows such value investment portfolio perform better in the two- and three-year holding period.

Keywords: *Financial Index, Portfolio, PE Ratio*

1. Introduction

Both fundamental analysis and technical analysis are widely used by investors in their investment decision making process. Fundamental analysis evaluates firm's value mainly by focusing on firm's financial robustness and observing the characteristics of the industry it belongs to predict the future development. Consequently, buy in stocks that are undervalued and get profit eventually at the time the market finds its value. Alternatively, technical analysis uses historical information such as the stock price and trading volume to predict the price trends in order to formulate appropriate investment strategies. This study argues that fundamental analysis is a more stable analytic tool than the technical analysis under the fact of diverse uncertainties in stock market. The fundamental analysis provides solid financial information from real operations that helps making good prediction, leading to better profit.

Since the core idea of the value-based investment method sheds light on the financial fundamentals rather than on the short-term price movement trend, this research argues the potential stocks can be sorted out by firm's operational performance. Also, the value-based investment method focuses on the undervalued assets and believes the market value will move toward to their fair value. This research first analyzes company's fundamentals based on their accounting data, considering company's profitability, financial risks, and growth potential. On the other hand, we try to evaluate company's values at the same time to find out those who are more likely to be undervalued using P/E ratio as indicator. That is, we convert the information from financial statements into signals and select investment targets that are undervalued to form a value investment portfolio. In short, there are two steps in portfolio constructing process. One is to identify the financial performance of the company, and the other is to evaluate value of the company. In the financial performance identification step, every firm is evaluated and scored by its profitability, growth, and financial risk performance in the year. Those scores will be added up for each firm and firms in the market will be ranked by the aggregated score. In the second step, firms in the market will be ranked based on their price-earnings ratio. Aforementioned two rankings will be added up and the top 50 excellent targets will be chosen to construct investment portfolio. The two steps are equally important in the construction process.

Our empirical evidence shows that so constructed investment portfolio performs good in either the two- or three-year holding period. The contribution of this research is twofold. First, the scoring standards set by this research in selecting targets helps sorting out firms with better profitability, safety, and potential. Second, this research combines the uses of financial reporting fundamentals and value evaluation, sets buying criteria and creating an investment portfolio containing good firms with good price.

2. Literature Review

The relationship between investor's trading behavior and stock returns has received much attention in financial world. Due to the uncertainties on future returns, predicting stock price premiums has been one of the important concerns for financial scholars. Most of prior studies argue the stock price premium is predictable.

Capual, Rowley, and Sharpe (1993) studied the listed companies in the United States, the United Kingdom, Germany, Japan, France and Switzerland from 1981 to 1992 and find the value portfolio performs better than the growth portfolio. Similar, Fama and French (1998) studied listed companies in 13 countries including the United States, Japan, the United Kingdom, and France from 1975 to 1995 using the price-to-net ratio, price-to-earnings ratio, price-to-cash flow ratio, and dividend yield to distinguish value and growth stocks. Their empirical results also show the value portfolio performs better than the growth portfolio. In addition, Piotroski (2000) studied U.S. listed companies from 1976 to 1996 using nine fundamental indicators as selection criteria to select target assets. He long the good targets and short those poor ones, finding a 23% buy-and-hold annual return. Therefore, value investment strategy works.

More than just comparing with the growth stocks, Li (2013) discusses Warren Buffett's value-based stock selection method with the market weighted index. Her Buffett's value-based stock selection strategy includes target company whose ROE is higher than 15% and the earnings reinvestment rate is less than 40%. The selected target should be on the list for at least two years with an annual surplus of more than NT\$300 million. Also, their P/E ratio should be lower than 12 and the shareholding of directors should be more than 10%, 15% or 20% for large, median, and small size company respectively. Her results show the value stock performing better than the market. Zhou (2007) uses Taiwan sample to examine whether the portfolio constructed using Mohanram's (2005) G-score investment strategy earns positive return under the control of relevant risk factors. Mohanram's (2005) G-score consists of eight indicators, including profitability, earnings quality, overvalued or undervalued. His results show the investment portfolio constructed by the G-score investment strategy obtains 11.09% of the market excess return in one-year holding period. More than that, it also obtains 13.17% of excess return when comparing to growth stocks. In sum, the value-based investment strategy dominates both the market and growth stocks.

Way to sort out value stock from the market is critical. Huang (2014) improves the F_Score stock selection strategy proposed by Piotroski (2000) by using fifteen financial indicators to identify company's financial status. Associating with market-to-book ratio, he constructs H_Score stock selection strategy. Portfolio which is constructed by H_Score performs better than either the F Score portfolio or the market. Tsai (2017) uses the F_Score of Piotroski (2000) with a consideration of company's dividend-to-price ratio to construct a portfolio. Using the F_Score, or dividend-to-price ratio, or both to rank samples, she defines the top 30% as value stocks

and the last 30% as growth stocks. She finds the value portfolio stochastically dominates the growth portfolio. Even there are many ways to construct value portfolio, the results are similar.

3. Methodology

The value investing portfolio is constructed through the following two steps. In the beginning, we rank firm in the market based on its operational robustness using financial data. We observe firm's profitability, financial risks, and growth. Through this, every firm in the market receives rankings based on the aforementioned three categories of indicators and be scored at the point of time in the market. Alternatively, firm's price-earnings ratio is used as the other indicator to rank firm's price performance. Consequently, we add up the financial and price performance rankings obtained in the first and second steps and rank firms based on that sum scores. This study takes the top 50 targets to construct portfolio by year and to see its buy-and-hold performance.

3.1 Operational robustness analysis

3.1.1 Profitability Indicator

The main purpose of any enterprise is to make profit. More than identifying how much profit a firm obtained, it is necessary to evaluate the profitability earned from operation and the competitiveness of the enterprise in the industry for the purposes of long-term survival and sustainable growth. That explains why value investing strategy weights mainly on firm's profitability. In line with it, we use the return-on-equity (ROE), operating profit rate, and total asset turnover rate to measure firm's profitability. ore profit the company can make for shareholders. The ROE is computed as follow.

1. ROE

The ROE represents the profitability of an enterprise for the funds invested by shareholders. The higher the return on shareholders' equity is, the more profit the company can make for shareholders. The ROE is computed as follow.

$$ROE_{i,t} = NI_{i,t} / E_{i,t} \quad (1)$$

where $ROE_{i,t}$ is the return on equity of company i at time t . $NI_{i,t}$ is the net profit after tax for company i at time t . $E_{i,t}$ is the total shareholder equity for company i at time t . We assign the ROE score based on Table 1.

Table 1
ROE Score classification

ROE	<10%	10%~15%	15%~20%	20%~25%	25%>
Score	-1	0	1	2	3

2. Operating profit rate

The operating profit rate is the most important item among the profitability indicators. It can analyze the profitability of the company in the industry. If the operating profit rate is higher, it means that the company is more competitive in the industry compared with its peers. We compute the operating profit rate as follow.

$$EI_{i,t} = OI_{i,t} / NNOR_{i,t} \times 100\% \quad (2)$$

$EI_{i,t}$ is the operating profit rate for company i at time t . $OI_{i,t}$ is the net operating profit for company i at time t . $NNOR_{i,t}$ is the net revenue of company i at time t . We assign the EI score based on Table 2 for each sample.

Table 2
EI Score classification

EI	<10%	10%~15%	15%~20%	20%~25%	25%~30%	30%>
Score	-1	0	1	2	3	4

3. Total asset turnover

The total asset turnover rate is the efficiency indicator of the company's use of all assets to create profits. The higher the total asset turnover rate, the higher the efficiency of the company's use of assets to create profits, reflecting the stronger sales ability. The total asset turnover rate is computed as follow.

$$TA_{i,t} = NNOR_{i,t} / A_{i,t} \quad (3)$$

$TA_{i,t}$ is the total asset turnover rate for company i at time t . $NNOR_{i,t}$ is the net revenue for company i at time t . $A_{i,t}$ is the total assets for company i at time t . We assign the TA score for each sample based on the rules reported in Table 3.

Table 3
TA Score classification

TA	<0.5	0.5~1	1~1.5	1.5~2	2>
Score	-1	0	1	2	3

3.1.2 Financial risk

Safety is also an important concern in value investing strategy. If a company makes a profit but does not have cash inflow, or it continues to invest and burn out money or to borrow too much, it will cause a corporate crisis. We use invest payable debt ratio, earnings quality ratio, and free cash flow to proxy company's financial risk.

1. Interest payable debt ratio

Interest payable liabilities allow companies to use less of their own funds to create the same high profits. But it makes a higher probability of bankruptcy because they have to pay more interest to the liabilities. We compute the interest payable debt ratio using equation (4). Company with higher interest payable debt ratio has higher financial risk.

$$ID_{i,t} = (ST_{i,t} + CPI_{i,t} + CURLT_{i,t} + LT_{i,t}) / A_{i,t} \quad (4)$$

$ID_{i,t}$ is the operating profit rate for company i at time t . $ST_{i,t}$ is the short-term debt for company i at time t . $CPI_{i,t}$ is the short-term bills payable for company i at time t . $CURLT_{i,t}$ is the long-term debt payable within one year for company i at time t . $LT_{i,t}$ is the long-term debt for company i at time t . $A_{i,t}$ is the total asset for company i at time t . We assign ID score to each sample using the rules reported in Table 4.

Table 4
ID Score classification

ID	<50%	50%~40%	40%~30%	30%>
Score	-1	0	1	2

2. Earnings quality ratio

The earnings quality ratio is to measure how much cash inflow is brought back by net profit after tax for one dollar. If the operating cash flow to net profit ratio is greater than 100%, it means that after-tax net profit brings back at least the same amount of cash inflow. If the company's earnings quality ratio is lower than 100% for a long time or is unstable, it means the ability to bring back cash is not good in the industry. The earnings quality ratio is computed by equation (5).

$$QU_{i,t} = CASHO_{i,t} / NI_{i,t} \quad (5)$$

Among them, $QU_{i,t}$ is the earnings quality rate of company i at time t . $CASHO_{i,t}$ is the operating cash flow of company i at time t . $NI_{i,t}$ is the net profit after tax of company i at time t . After obtaining the QU for each sample, we assign the QU score to each of them following Table 5.

Table 5
QU Score classification

QU	<70%	70%~80%	80%>
Score	-1	0	1

3. Free Cash Flow

Free cash flow represents the cash inflow brought by the business operation, and the remaining funds after deducting the funds required for investment. If the free cash flow of a company is less than 0 for a long time, it means that the funds earned from operations are not enough to meet the investment needs. At the time, it will be supplemented by financing cash flow, and the financial pressure may become higher and the company will face more risks. The free cash flow is measured as equation (6).

$$FCF_{i,t} = (CASHO_{i,t} - CASHI_{i,t}) / OS_{i,t} \quad (6)$$

The $FCF_{i,t}$ is the free cash flow of company i at time t . $CASHO_{i,t}$ is the operating cash flow of company i at time t . $CASHI_{i,t}$ is the investment cash flow of company i at time t . $OS_{i,t}$ is the number of outstanding shares of company i at time t . We assign FCF score to each sample when FCF is obtained following Table 6.

Table 6
FCF Score classification

FCF	<\$1	\$1~\$2	\$2~\$3	\$3~\$4	\$4~\$5	\$5>
Score	-1	0	1	2	3	4

3.1.3 Growth indicators

For having stable and safe profitability in business operations, company's future growth opportunity is also an important concern. If the company does not have growth potential in the future, it has less chance to get higher stock return. Therefore, we use annual revenue growth rate to measure growth opportunity.

1. Annual revenue growth rate

The annual revenue growth rate can be regarded as a signal of the company's growth momentum. If it increases year by year, it means that the company's sales capacity will increase and the company will grow steadily. We use the equation (7) to measure annual revenue growth rate.

$$EARN_{i,t} = (NNOR_{i,t} / NNOR_{i,t-1} - 1) \times 100\% \quad (7)$$

where $EARN_{i,t}$ is the annual revenue growth rate of company i at time t . $NNOR_{i,t}$ is the current year's revenue of

company i at time t . $NNOR_{i,t-1}$ is the last year's revenue of company i at time $t-1$. The EARN score will give to each sample following Table 7.

Table 7
EARN Score classification

EARN	<0%	0%~10%	10%~20%	20%~30%	30%>
Score	-1	0	1	2	3

3.2 Value Evaluation

We use the price-to-earnings ratio as the value evaluation indicator which is widely used by investors in practice. The price-to-earnings presents how long it will take for investors to cover their investment by company's created profits under the assumption that company's profit remains unchanged in the future. It can be used as an indicator to see whether the market over-valued, under-valued, or fair-valued the firm. The PE ratio is computed as equation (8):

$$PE_{i,t} = Price_{i,t} / EPS_{i,t} \quad (8)$$

$PE_{i,t}$ is the P/E ratio of company i at time t . $Price_{i,t}$ is the book value of company i 's stock at time t . $EPS_{i,t}$ is the earnings per share of company i at time t .

3.3 Performance measurement

For examining whether the so constructed portfolio perform better, we use the buy-and-hold method to measure its performance. We first measure the price performance for each sample. Equation (9) therefore is applied.

$$BHR_{i,t_1,t_2} = \prod_{t=t_1 \sim t_2}^T (1 + R_{i,t}) - 1 \quad (9)$$

BHR_{i,t_1,t_2} is the buy-and-hold return for the company i from time t_1 to t_2 . The $R_{i,t}$ is the annual return for the company i at time t .

3.4 Portfolio Construction Process

We use ROE, operating profit ratio, total asset turnover ratio, interest payable ratio, earnings quality ratio, free cash flow, and annual revenue growth rate as indicator to rank samples and assign scores to them respectively. Those seven scores are summed as one for each firm and we rank all the samples from high to low. The lower ranking a company has, the more robust the company's is in operation. In fact, the value investing strategy attaches importance on the buying in price and looks for under-valued stocks. This study uses the

price-to-earnings ratio to rank all listed stocks from low to high. The lower ranking to a company represents a higher potential of undervaluation by the market.

Finally, we add up the two ranking numbers obtained from the financial and price performances to sort out target samples of value investment. A smaller ranking value indicates the company has financial performance and price potential. We choose the top 50 companies to construct investment portfolio.

This research takes the listed companies in the Taiwan stock market from January 1, 2006 to December 31, 2016 as samples. All of the financial data such as net profit after tax, shareholder equity, net revenue, and total assets, return to shareholders' equity, operating interest rate, total asset turnover, interest payable ratio, earnings quality rate, free cash flow, and annual revenue growth rate are obtained from Taiwan Economic Journal.

4. Results

4.1 Portfolio performance measurement

Table 8 shows the annual return of the value investment portfolio and the market return. In 2006, the portfolio return is 29.05% and the market return is about 8.72%. However, the portfolio return turns down to -48.20% as well as the market return (-46.03%) primarily due to the financial crisis. As can be seen, the value investment portfolio performs better than the market most of time. Speaking precisely, the portfolio beats the market at a good time (positive market return period) and won't perform worse than the market at the hard time (negative market return period). Our tests on difference provide support to the outperformance. A clear comparison is presented in Figure 1. The polylines show the portfolio return is higher than the market return in our investigation period.

Table 8
Overall sample holding performance for one year

Year	Portfolio	Market	Difference test
2006	29.05%	8.72%	0.0019***
2007	-48.20%	-46.03%	0.3682
2008	158.13%	78.34%	0.0000***
2009	7.93%	9.58%	0.7866
2010	-22.20%	-21.18%	0.7627
2011	23.07%	8.87%	0.0620**
2012	36.24%	11.85%	0.0014***
2013	15.25%	8.08%	0.1479*
2014	0.43%	-10.41%	0.2758
2015	9.73%	10.98%	0.6818

Note: ***, **, and * denote as the 1%, 5%, and 10% significance level.

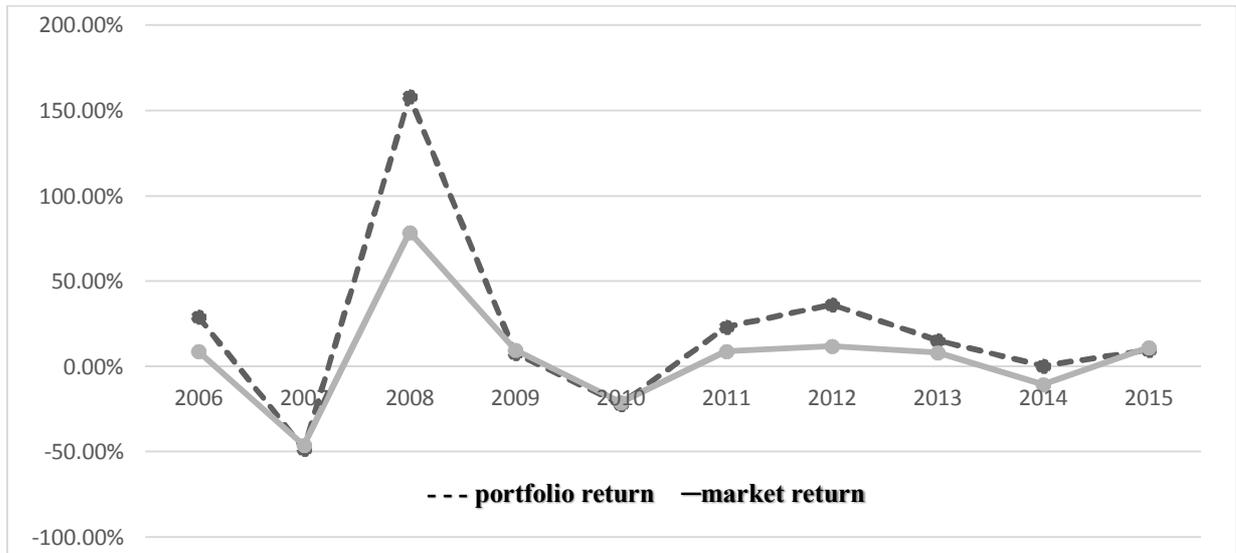


Figure 1

Returns of value investment portfolio and market returns from 2006 to 2015

We compute the return of holding the top 50 targets from the time they are chosen for two years using equation (9). Table 9 shows the two-year buy-and-hold return for value investment portfolio and market return. The two-year buy-and-hold return for portfolio is -16.97% which is higher than the two-year market return (-23.39%). Similar to the result from Table 8, the value investment portfolio performs better than the market. Figure 2 presents the polylines.

Table 9

Overall sample holding performance for two year

Year	Portfolio return	Market return	Difference test
2006	-16.97%	-23.39%	0.0249**
2007	5.01%	-1.89%	0.0006***
2008	66.23%	39.80%	0.0004***
2009	-6.05%	-7.06%	0.7790
2010	-8.00%	-7.37%	0.7918
2011	23.11%	10.35%	0.0215**
2012	18.35%	9.95%	0.0134**
2013	5.30%	-1.60%	0.1852
2014	1.82%	-0.29%	0.5708

Note: *** and ** denote as the 1% and 5% significance level.

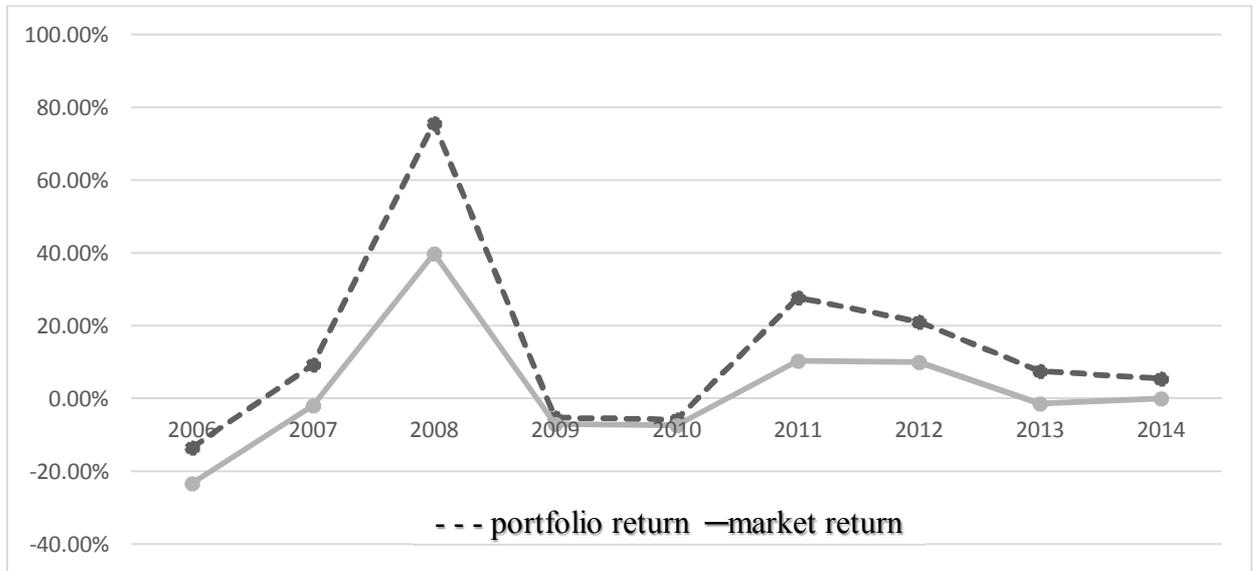


Figure 2

The two-year buy-and-hold portfolio and market returns

We go further to compute the return of holding the top 50 targets from the time they are chosen for three years using equation (9). Table 10 shows the three-year buy-and-hold return for value investment portfolio and market return. The three-year buy-and-hold return for portfolio which is constructed in 2006 is 12.34%. Our results again show the value investment portfolio beat the market.

Table 10

Three-year buy-and-hold return

Year	Portfolio return	Market return	Difference test
2006	12.34%	1.53%	0.0000***
2007	5.13%	1.79%	0.1723
2008	19.88%	15.49%	0.1483
2009	-0.75%	-2.03%	0.6495
2010	0.94%	-1.36%	0.3678
2011	16.92%	9.59%	0.0331**
2012	9.72%	2.69%	0.0245**
2013	7.18%	2.43%	0.1641

Note: *** and ** denote as the 1% and 5% significance level.



Figure 3
The three-year buy-and-hold portfolio and market returns

5. Conclusion

The value investment strategy stands upon the logic of investing on healthy but undervalued targets since the market will find their true values in the long run. This research uses the information about company’s financial performance to set seven scoring criteria and selects companies with better operational robustness. We shed lights on firm’s profitability, financial risks, and growth to proxy company’s operation using the indicators of ROE, operating profit rate, total asset turnover, interest payable debt ratio, earnings quality rate, free cash flow, and annual revenue growth rate. Considering simultaneously with company’s stock undervaluation, we construct an effective investment portfolio and evaluate its buy-and-hold performance for years. Results show the return for the effective portfolio is better than the market return in the one-, two-, and three-year observation period.

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