www.irmbrjournal.com
International Review of Management and Business Research
December 2014
Vol. 3 Issue.4

A Study of Value Investing: Profit, Dividend, and Free Cash Flow

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Abstract

In this study, an investment decision-making model called the profit, dividend, and free cash flow (PDF) model was established based on companies' profitability, dividend yield, and free cash flow. This study analyzed the stocks purchased and retained for a long period of time, and compared the PDF model with the Taiwan Capitalization Weighted Stock Index (TAIEX) and the F-score model modified by Lai, Doong, Yang, and Miao (2011). The empirical results indicated that the average cumulative return on TAIEX in 2004 was higher than that on the PDF and F-score portfolios. However, from 2005 to 2007, the cumulative return on the PDF portfolio increased from 14.35% to 121.36%. Although the cumulative return dropped to 1.23% in 2008 because of the financial crisis, the figure rose to 134.04% in 2009 and to 310.23% in 2013. The performance of TAIEX and the F-score portfolio was substantially lower than that of the PDF portfolio, but the performance of TAIEX was superior to that of the F-score portfolio. Although TAIEX and the F-score portfolio exhibited a similar trend, the cumulative return on the F-score portfolio was consistently negative. The F-score portfolio demonstrated the lowest performance among the 3 models. In addition, the annual cumulative or excess return on the PDF portfolio was higher than that on the F-score portfolio.

Key Words: *Value Investing, Profit, Dividend, Free Cash Flow.*

Introduction

Investment and financial management have received increased attention in recent years, and stocks have been considered to be a simple effective investment instrument. However, the number of investors who experience losses in the stock market exceeds the number of those who gained profits. Events such as the financial crisis in 2008 and the recent Eurozone crisis have negatively influenced the stock market, causing investors' assets to decline considerably, and engendering uncertainty and unease among investors in the capital market. Therefore, this study intends to explore how investors should invest in stocks to earn profits and whether a simple investment strategy for conducting safe and efficient investment is available.

Since Benjamin Graham first proposed value investing, numerous scholars have successively conducted studies on this topic. The majority of these studies have analyzed price–earnings (P–E) ratios, price-to-book (P–B) ratios, and price-to-sales (P–S) ratios. Lakonishock, Shleifre, and Vishny (1994) studied the U.S.

stock market by observing the P–E ratio, P–B ratio, price–cash-flow (P–CF) ratio, and average-sales growth rate (GS) over 5 years. O'Shaughnessy (1996) analyzed the P–E, P–B, P–S, and P–CF ratios and considered capital stocks to investigate the U.S. stock market. In addition to using similar indicators, Bauman, Conover, and Miller (1998) employed the dividend rate and the expected-earnings growth rate to distinguish growth and value stocks. Chen (2004) examined the interactions among various conditions, months, scales, and monetary environments in the stock market in Taiwan to investigate whether the Taiwanese stock market contained value investing. Yu (2011) examined the stock market in Taiwan by examining the P–E ratio, bargaining counters of a juristic person, returns on equity, dividend yields, gross profit margins, and revenue growth. Domestic and foreign studies have revealed that the return on value investing portfolios was superior to the performance of the Taiwan Capitalization Weighted Stock Index (TAIEX) in the same period. However, value investing may be overly complex for general investors who do not possess a relevant academic background, compared with investing in growth stocks or TAIEX. Therefore, the objective of this study was to determine a simple method for value investing.

The use of the P–E ratio in the aforementioned studies may be problematic. A company, the profit of which is declining, may exhibit a low P–E ratio because of the previous high profit and the decrease in stock prices. Therefore, the stocks of this company may be mistaken for value stocks. This is a frequent problem encountered when using the P–E ratio and, thus, this study did not use the P–E ratio as a variable.

The P–B ratio, which has been frequently employed in previous studies, is also an indicator that may produce distorted result. In the Taiwanese stock market, a company that acquires substantial profits typically exhibits a high P–B ratio; by contrast, the stock prices of a company with low gains is lower than the book value of the stocks. Currently, although the value of TAIEX is above 9000, the P–B ratio of more than 30 firms is lower than 1, including firms with losses or low profits such as Genius and Altek. Typically, firms that have consistently gained high profits rarely exhibit stock prices lower than the book value of the stocks. Therefore, this study did not use the P–B ratio as a variable.

Buffett's philosophy of value investing emphasizes purchasing stocks of stable companies and retaining the stocks for a long period; the quality of a company is evaluated based on whether it can earn cash. Additionally, the company should be able to gain profits under any conditions. Based on these principles, this study established the profit, dividend, and free cash flow (PDF) model, which can be used to select companies based on the following three criteria:

(a) Profitability: A company's net profit after tax over the 10 consecutive years in the research period is positive.
(b) Dividends: A company paid dividends (cash and stock dividends) for 5 consecutive years, and has an average dividend yield of more than 8% over those 5 years
(c) Free cash flow: The sum of free cash flows over the past 5 years is positive.

The goal of the first criterion was to fulfill Buffett's criterion that a stable company should be able to acquire profits under any conditions. Therefore, companies that acquired profits in all 10 years of the study period were selected. The second criterion involved using dividend yield for the selection of value stocks at a low price. Purchasing stocks from a company that can maintain high dividend yields for 5 consecutive years can be considered to be a wise investment even if the stock price does not increase substantially. The third criterion required the use of free cash flow to select companies with cash inflow; this was based on Buffett's recommendation of purchasing stocks from a company that has cash inflow. The aforementioned information can be obtained easily; therefore, the main contribution of this study is the establishment of a model that can be applied by people without relevant academic background. In this study, the performance of the PDF model was compared with that of TAIEX and the F-score method, which has been frequently used in recent studies on value investing (Lai, Tung, Yang, & Miao, 2011), to examine whether the proposed investment strategy is superior to investment involving TAIEX or typical value-investing approaches.

In this paper, Chapter 2 presents a literature review explaining the relationship between stock prices and indicators used in previous value-investing studies and in this study. Chapter 3 describes the research design, including the indicators used in this study and those used for comparison. Chapter 4 presents the empirical results of an analysis conducted on the returns of the portfolios established using the stock selection criteria. The research conclusion and recommendations are stated in the final chapter.

Literature Review

Value Investing

Numerous studies have investigated the difference between value- and growth-investing strategies by using factors such as P–E, P–B, and P–S ratios. In addition, value investing has been demonstrated to be superior to growth investing. .

Lakonishock et al. (1994) examined P–E, P–B, and P–CF ratios and the average GS over 5 years to divide U.S. stocks into 10 groups by using one-factor classification. The groups that exhibited low ratios were defined as value stocks, and those with high ratios were defined as growth stocks. Subsequently, Lakonishock et al. analyzed stocks within the period of April 1963 to April 1990 and investigated the returns on the value and growth stocks. The empirical results revealed that the average return on value stocks was higher than that on growth stocks. However, the earnings of individual stocks may temporarily decline because of other factors, causing the stocks to be mistaken for growth stocks. Therefore, Lakonishock et al. further paired P–E, P–B, and P–CF ratios and GS, and divided the stocks into three groups by using two-factor classification. The groups were defined as value and growth stocks based on the same rule. The result was the same as that obtained using one-factor classification. Consequently, in the long term (3–5 years), the return performance of value stocks was superior to that of growth stocks.

Bauman et al. (1998) employed P–E ratio, dividend rate, and expected-earnings growth rate to distinguish the growth and value stocks. The average returns on these two types of stocks in Australia, Europe, and East Asia were analyzed. The results indicated that the return on value stocks was higher than that on growth stocks in all three regions.

Chan and Lakonishok (2004) extended the approach developed by Fama and French (1992), using P–E and P–B ratios to divide U.S stocks into value and growth stocks. They observed that the average return on stocks with low P–E ratios was higher than that on stocks with high P–E ratios, and the difference in systemic risk between the two types of stocks was nonsignificant. Furthermore, Chan and Lakonishok (2004) employed the sample used by Fama (1998) and added the P/CF ratio and dividend–price (DP) ratio. The results demonstrated that the return on value stocks was higher than that on growth stocks in almost all countries and that the differences in the standard deviation of return and the return volatility of the two types of stock investments were nonsignificant.

Yu (2011) used the historical data of listed companies in Taiwan to investigate whether a value stock selection strategy based on the bargaining counter of a juristic person can achieve optimal portfolio return. The data were recorded between June 2006 and September 2010. P–B and P–E ratios, return on equity, dividend yield, gross profit margin, and revenue growth were examined, and the bargaining counter of a juristic person was subsequently incorporated into the model. The results revealed that the return on the value of investment portfolios was superior to the performance of TAIEX within the same period.

Yu (2013) employed multiple factors (i.e., P–B, P–E, and DP ratios) to evaluate companies listed in the TWSE (excluding the financial industry). The stocks in investment portfolios were assessed and adjusted, and the stock performance of each period was cumulated, to investigate the performance of multifactor assessment of value investing. Yu (2013) determined that the assessments conducted quarterly, half-yearly, and annually all exhibited persistence in the Taiwanese market. The cash dividend yield and stock price

performance of high-value stocks were superior to those of the market and low-value stocks. In summary, the studies reviewed in this section indicated that the return performance of value stocks is significantly superior to that of TAIEX, demonstrating the value of value investing.

Earnings and Stock Price

Ball and Brown (1968) and Beaver, Clarke, and Wright (1979) asserted that a company's earnings report can change investors' expectations toward future stock returns. Because of these findings, empirical studies on the usefulness of accounting information became the focus of capital market research, and numerous domestic and foreign studies have subsequently explored the relationship between earnings and stock prices; these studies are reviewed in this section.

Ball and Brown (1968) investigated the relationship between accounting earnings changes and stock returns by examining a sample of 260 companies listed in the New York Stock Exchange between 1949 and 1965. Three earnings expectation models were used: index of changes in annual net profit after tax, index of changes in annual earnings-per-share after tax, and the random walk model. The research verified a significant correlation between the magnitude of unexpected earning changes and the abnormal performance index.

Beaver et al. (1979) further demonstrated the usefulness of accounting information by examining the correlation between the magnitude of changes in unexpected earnings and stock returns. The sample comprised 276 companies listed between 1965 and 1974. A market model was used to estimate the monthly stock excess returns for a company, which was totaled for 12 months to obtain the cumulative excess returns. Unexpected earnings were estimated by employing the random walk model and the market index model, and changes in unexpected earnings were estimated using standardized prediction errors and prediction error percentage. Based on the magnitude of changes in unexpected earnings, 25 investment portfolios were obtained. Spearman's rank correlation was performed to test the correlation between the mean of unexpected earnings and the cumulative average abnormal return for each portfolio. The results showed that the magnitude of unexpected earning change and the cumulative average abnormal return were significantly correlated.

Freeman (1987) examined the monthly data of companies listed in the New York Stock Exchange between 1966 and 1982 to investigate the association between company size and earnings information, as well as stock prices. The result revealed that the correlation between earnings information and stock prices was significantly influenced by company size. Specifically, the stock price reaction to earnings in large companies occurred earlier than did that in small companies; the cumulative abnormal return in small companies was higher than was that in large companies.

Easton and Harris (1991) adopted the yearly information of listed companies from 1969 to 1986 as a research sample. In addition, they employed the random walk model to estimate expected earnings and investigate the correlation between stock returns and three variables (the levels of earnings in the previous and current periods and the change in earnings in the current period). The results indicated that the three earnings variables could be ranked in descending order based on their explanatory power for stock returns as follows: level of earnings in the current period, change in earnings in the current period, and level of earnings in the previous period.

Strong and Walker (1993) focused on 146 companies listed between 1971 and 1986 and used the earnings response model to explore the relationship between abnormal returns and accounting earnings. They divided earnings into three components: net operating profit, net nonoperating profit, and extraordinary items; earnings growth rate was also considered. The three items were matched with cumulative abnormal returns or cumulative actual returns to establish 11 single-variable and multivariable analysis models. The results indicated that net operating profit, earnings growth rate, and stock returns were significantly

correlated. However, the relationship between the extraordinary items and stock returns was nonsignificant, indicating that the level of influence earnings components exert on stock returns varied based on persistence.

Huang (1995) determined whether earnings components (i.e., gross profit of sales, income tax, marketing and administrative expenses, and nonoperating profit and loss) were related to incremental information content. The research targeted 27 companied listed between 1971 and 1993 and adopted a first-order vector autoregression model for analysis. The empirical results indicated that the aforementioned earnings components exhibited strong explanatory power for returns, suggesting that all of these components were related to incremental information content.

Dividend Policy and Stock Price

The signaling hypothesis argues that the dividend announcement involves crucial information for the prediction of future company earnings and thus can influence stock price. According to Modigliani and Miller (1961), investors believed that an unexpected increase in dividends indicates an increase in a company's future earnings. By contrast, a decrease in dividends indicates a decrease in company's future earnings. Therefore, dividend announcements contain vital information. Akhigbe and Madura (1996) and Hand and Landsman (1999) agreed that dividend announcements are a channel for authorities to transmit information to investors and verified the positive correlation between dividend and stock price.

Chueh (1996) stated that the stock market in Taiwan exhibited a significant positive price reaction to dividend announcement; Taiwanese investors believed that dividends can be used to determine a company's future profit performance. In stock market practices, when a company's dividend is higher than expected, the company's stock price increases accordingly. Lin (1999) demonstrated that when a higher amount of cash dividends than that of stock dividends is issued, a company's value is positively affected. In addition, Chou (2005) proved the positive correlation between dividends and stock prices.

Regarding the relationship between dividend payout and company growth, Crutchley and Hansen (1989) and Chang and Rhee (1990) observed that a company with favorable growth opportunities required a large amount of capital for future expansion, and therefore did not possess excess cash to pay out cash dividends to investors. Tang (1994) and Lee (2001) also supported this finding.

Companies that possess favorable growth opportunities pay less cash dividends. Such companies may choose to pay stock dividends instead of cash dividends. For example, Wang (1997) and Lee (2001) both indicated that a company's growth opportunities exhibited a positive influence on stock dividends. Elgers and Murray (1985) and Lakonishok and Lev (1987) both supported the hypothesis that stock dividends can be used by companies as financial signals to convey a positive expectation for future profits.

Lee (2001) determined the positive correlation between the earnings of companies listed in the TWSE and the stock dividends paid during the same period. Therefore, domestic studies have shown that companies' profitability exhibited a positive effect on cash and stock dividends, enabling researchers to easily understand the influence of a company's profitability on the payout of cash dividends. In other words, a company with high profitability is highly capable of paying cash dividends to its shareholders. The studies reviewed in this section all supported this result.

Free Cash Flow Hypothesis

According to Jensen (1986), a substantial amount of free cash was accumulated by the petroleum industry between the 1960s and 1980s for use in a wide range of investments, resulting in the decline of the petroleum industry. Therefore, Jensen (1986) proposed the free cash flow hypothesis to investigate a company's agency cost. Specifically, when a company possesses a large amount of free cash flow,

company managers tend to focus on personal interests and neglect shareholders' interests; thus, managers may invest cash in company expansion to acquire numerous benefits. However, this may result in overinvestment, which generates agency costs. Particularly, inappropriate use of free cash flow and overinvestment can reduce the marginal efficiency of investment. Companies that desire to maximize company value can use earnings distribution or share repurchasing to pay funds to shareholders, rather than retaining the funds within the company. According to Devereux and Schiantarelli (1989), because the equity ownership in large companies is dispersed, large companies are substantially influenced by agency costs. Therefore, large companies' cash flow exhibited a strong influence on investment.

Gul and Tsui (1998) examined the relationship between audit fees and free cash flow. Managers of companies that were not provided growth opportunities but possessed a large amount of free cash flow tended to engage in the manipulation of accounting data and other activities (including general expenses and investments) that were not related to maximizing company value. Their result revealed that companies with high free cash flow but low growth opportunities tended to charge relatively high audit fees. Grullon and Michaely (2004) examined the free cash flow hypothesis by focusing on the various features of companies at the growth and maturity stages. They reported that a company may possess numerous favorable investment projects, high capital expenditure, low free cash flow, and high earnings growth at the growth stage, and that asset growth opportunity caused companies' systemic risk to increase, increasing capital costs. However, a company's investment opportunities and capital expenditure decreased at the maturity stage; without measures for cash expenditure, the company may experience agency problems. Therefore, Grullon and Michaely (2004) determined whether companies that repurchased shares feature the characteristics of mature companies. If companies are categorized as mature companies, the goal of share repurchasing is to consume free cash. By contrast, if the companies are categorized as growing companies, the goal of share repurchasing is to convey positive news of future gains, indicating that operational performance may improve after repurchase is announced. The empirical results revealed that companies' operational performance did not improve during the 3 years after repurchase was announced; several companies even exhibited poorer performance than did other nonrepurchasing companies. Therefore, the signaling hypothesis cannot explain motivation for share repurchasing. However, the free cash flow hypothesis was supported, because the repurchasing companies featured the characteristics of mature companies. Subsequently, Pawlina and Renneboog (2005) used British public companies as the research sample to investigate whether sensitivity to cash flow of investments was caused by agency costs or by information asymmetry. They reported that investments exhibited a strong influence on cash flow sensitivity, primarily because of the agency costs of free cash flow. They also identified the nonlinear relationship between insider ownership and the agency costs of free cash flow. Peng (2005) adopted the agency theory and pecking-order theory to verify the relationship between cash flow and investment behavior of companies listed in the TWSE, reporting that the capital investment behavior of these companies could be explained by the free cash flow hypothesis of the agency theory.

Lin (2010) focused on 183 companies listed in the TWSE between 1996 and 2006 and explored the free cash flow hypothesis of the agency theory and the strength of internal governance mechanisms. The panel threshold regression model proposed by Hansen (1999) was employed to investigate whether the threshold effect and a nonlinear relationship existed between revenue growth and company performance. The results indicated that the excessively high amount of free cash flow prompted managers to engage in company expansion or overinvestment. In addition, free cash flow was used as a threshold variable for the analysis of the relationship between revenue growth and company performance. The large amount of free cash flow enhanced the positive influence of revenue growth on company performance. However, as free cash flow increased, the degree of influence stabilized. In a study by Chen (2012), financial data (2001–2010) of companies listed in the TWSE were obtained from the database of the Taiwan Economic Journal, and cross-sectional and time-series data were incorporated in a fixed-effects model. The results showed that a company having sufficient cash tended to perform long-term investments. Additionally, short- and long-term investments were both negatively correlated with return on equity, indicating that overinvestment may negatively influence a company.

Previous studies have demonstrated that value investing is superior to investment in TAIEX, suggesting the effectiveness of value investing. However, the approaches used by previous scholars were complex and difficult to understand for investors without relevant financial background. Moreover, past studies have predominantly used indicators such as P–E or P–B ratios (e.g., stocks with low P–E or P–B ratios were defined as value stocks), but this approach is problematic in practice. For example, the earnings-per-share of HTC in 2011 was NT$73.3, and the stock price of HTC at the end of 2011 was NT$497, yielding a P–E ratio of only 6.78. Compared with TAIEX, for which the P–E ratio was 15-fold to 20-fold, HTC stocks appeared to be much cheaper and thus should be suitable for value investing. However, if a person purchased and retained HTC stock until the end of July 2014, when the closing price was NT$132, the degree of loss is 73%; the HTC stock exhibited a low P–E ratio but realized high losses. This is because the gain of HTC stock substantially changed at that time, but P–E ratio was calculated using previous gains, thus distorting the calculated P–E ratio. Similarly, the P–B ratio, an indicator used by numerous scholars, is also problematic. A company that has consistently acquired stable profits may exhibit a relatively high P–B ratio; for example, in August 2014, when TAIEX was above 9000 points, the stock prices of more than 300 companies were lower than the net value, and most of these companies, such as Genius (3406) and CMC Magnetics (2323), had consistently experienced losses or low profits. By comparison, MediaTek (2454) and Hotai Motor (2207), which featured long-term high profitability and superior performance, exhibited P–B ratios higher than 3 and 7, respectively. However, despite their excellent profitability, they were not regarded as value stocks by previous scholars. This is an oversight of previous studies.

Therefore, unlike previous studies, this study did not use the conventional indicators. Instead, a self-developed PDF model that simultaneously considered profits, dividends, and free cash flow was used to understand whether this PDF method could outperform TAIEX and the F-score method frequently used by recent scholars for value investing analysis.

Research Design

Development of Investment Portfolios

Profit, Dividend, and Free Cash Flow Portfolio

The PDF portfolio was developed using three indicators: profitability, dividends, and free cash flow. The stock selection strategy involved selecting companies that met the following three criteria and analyzing their profit performance.

Profitability: A company's annual net profit after tax over the 10-year research period is positive. In this study, the research period was between 2004 and 2013. Therefore, companies that possessed positive net profit after tax during these 10 years fulfilled the criterion of profitability.

Dividends: A company paid dividends for 5 consecutive years, and the average dividend yield over those 5 years was higher than 8%. The dividends involved cash and stock dividends. In this study, companies that paid dividends each year from 2009 to 2013 fulfilled this criterion. The dividend yield = (cash dividends for common stocks + stock dividends for common stocks) / end-of-year market value × 100%.

Free cash flow: The sum of free cash flows over the previous 5 years is positive. Free cash flow = net profit after tax + depreciation + amortization – fixed assets (acquisition) – [(current assets – current liabilities) at the end of a period – (current assets – current liabilities) at the beginning of a year].

F-Score Portfolio

The F-score portfolio in this study was developed based on the F-score investment criteria proposed by Piotroski (2000) and Lai et al. (2010). Stock selection comprised two stages.

Stage 1: Identifying Excellent Companies

Company stocks were assessed and scored using the F-score method modified by Lai et al. (2010). A total of nine financial variables were considered; the stocks that met the criterion obtained 1 point. The F-score ranged from 0 to 9 points; stocks that obtained 8–9 points were in the high-score group. The criteria were as follows:

Return on assets (ROA): If the ROA in the current year is positive, the stock scores 1 point; if not, the stock scores 0 points. ROA = net profit after tax / average total assets. Average total assets = (beginning-of-year total assets + end-of-year total assets) / 2.

Change in total return on assets (ΔROA): This was calculated by subtracting the previous-year ROA from the current ROA. When ΔROA is 0 or higher, the stock scores 1 point; if not, the stock scores 0 points.

Ratio of operating cash flow to average total assets (CFO): When CFO is positive, the stock scores 1 point; if not, the stock scores 0 points. CFO = operating cash flow / average total assets.

Accrual: Accrual was calculated by subtracting CFO from ROA. When accrual is negative, the stock scores 1 point; if not, the stock scores 0 points.

Change in debt ratio (ΔLEVER): When the debt ratio in the current period is lower than that in previous period (i.e., when ΔLEVER is negative), the stock scores 1 point; if not, the stock scores 0 points. Debt ratio = total liabilities / total assets.

Change in current ratio (ΔLIQUID):ΔLIQUID was calculated by subtracting the previous current ratio from the current ratio in the current period. When ΔLIQUID is positive, the stock scores 1 point; if not, the stock scores 0 points. Current ratio = current asset / current liabilities.

Cash capital increase: One point was assigned for a cash capital increase in the current year; no points were assigned if cash capital did not increase.

Change in gross profit margin (ΔMARGIN): This variable was calculated by subtracting the gross profit margin in the previous period from that in the current period. When ΔMARGIN is positive, the stock scores 1 point; if not, the stock scores 0 points. Gross profit margin = (net revenue – operating costs) / net revenue.

Change in total asset turnover (ΔTURN): If total asset turnover in the current period is higher than that in the previous period (i.e., a positive value), the stock scores 1 point; if not, the stock scores 0 points. Total asset turnover = net revenue / average total assets.

Stage 2: Identifying Favorable Prices

The scores of the nine criteria were totaled for each stock; stocks that obtained 8 or 9 points were categorized into the high-score group. At the second stage, stocks in the high-score group were ranked based on BM ratio (book value per share / stock market value), and the stocks ranked in the top were placed in the high-BM (HBM) group. Thus, the HBM group comprised individual stocks selected using the F-score investment criteria.

Measurement of Stock Selection Performance

The stock selection performance of the PDF model was compared with that of the F-score method. Value investing emphasizes long-term investment performance. Therefore, this study compared the PDF method with F-score method by conducting t tests on the cumulative and excess returns over 10 years. The

purchase price (the closing price of the first month in the first year) and the selling price (the closing price at the end of each year) were used to calculate the cumulative return for each year. The excess return was calculated by subtracting the cumulative return on TAIEX from the cumulative return on individual stocks.

Data Period and Data Source

In this study, the data of stock prices and financial ratios were collected from the database of the Taiwan Economic Journal. The ex-right and ex-dividend prices were used as the stock prices. The data period was between January 2004 and December 2013, over a span of 10 years. The research sample consisted of listed and over-the-counter companies in Taiwan in 2013, which were selected based on the PDF and F-score portfolios. The finance and insurance industries were excluded from the analysis because of the unique characteristics of these industries.

Empirical Results

Descriptive Statistics

Table 1 displays the sample companies that were selected using the PDF and F-score criteria in 2013. Regarding the PDF criteria, 506 companies acquired positive net profits for 10 consecutive years; 42 companies paid dividends in all the past 5 years and possessed dividend yield higher than 8%; 815 companies possessed a positive sum of free cash flows over the past 5 years. A total of 26 companies fulfilled all the three criteria.

At the first stage of F-score assessment, the number of companies that acquired 0–2 points, 3–5 points, 6–7 points, and 8–9 points (high-score group) was 189, 701, 421, and 87 companies, respectively. At the second stage, the top 20 companies of the high-score group ranked in a descending order based on the BM ratio, were classified as the HBM group, which comprised 17 companies.

Number of companies and scores

The data involved the number of companies with various F-scores (1–9 points) and number of companies selected using the PDF criteria developed in this study.

Table 1. Number of Sample Companies Selected in 2013

PDF	Criteria	Acquiring positive net profit after tax annually over 10 years		Paying dividends in all the past 5 years with a dividend yield higher than 8%				Positive sum of free cash flows over the past 5 years			Fulfilling all the three criteria	
	Number of companies	506		42				815			26	
F-score	Score	0	1	2	3	4	5	6	7	8	9	HBM
	Number of companies	19	62	108	192	241	268	253	168	74	13	17

Note: Companies with 8 or 9 points were placed in the high-score group and were ranked based on the BM ratio. The top 20 companies were placed in the HBM group.

Descriptive statistics for F-score and PDF portfolios

Table 2 shows the descriptive statistics for the HBM group generated using the F-score method. The standard deviation of total assets was 10,074,531.729, signifying that the total assets of the sample companies differed considerably. The mean values for the analyzed data were as follows: BM ratio (1.152), ROA (4.494%), CFO (15.9), accrual (-15.853), ΔLEVER (-0.061), ΔLIQUID (0.479), ΔMARGIN (0.036), and ΔTURN (0.036). In addition, ΔTURN was 0.102. Because companies in the HBM group were selected based on the ranking of F-scores and BM ratios, they exhibited satisfactory performance in each indicator. Particularly, indicators of changes in debt ratio, current ratio, gross profit margin, and total asset turnover all increased between 2012 and 2013.

Table 2. Descriptive Statistics for F-score HBM Group

	Number of companies	Minimum	Maximum	Mean	Standard deviation
Total assets (NT$1000)	17	546,575.000	42,660,530.000	7,700,493.882	10,074,531.729
BM ratio	17	0.836	1.672	1.152	0.287
ROA	17	0.260	21.220	4.694	4.936
CFO	17	0.899	146.328	15.900	36.937
Accrual	17	-146.293	-0.823	-15.853	36.945
ΔLEVER	17	-0.200	-0.006	-0.061	0.056
ΔLIQUID	17	0.005	1.491	0.479	0.462
ΔMARGIN	17	-0.005	0.141	0.036	0.040
ΔTURN	17	0.010	0.660	0.102	0.155

The individual stocks selected using the PDF method were companies that acquired net profits annually over 10 years. Therefore, company's net profit after tax was also examined over a 10-year period. The minimal net profit after tax was 20,560, and the maximal value was 7,157,524, which were both positive. The mean value was 856,482.6, and the standard deviation was 1,383,811.285, indicating a substantial difference in net profit after tax among the various individual stocks. Companies that paid dividends for 5 consecutive years were selected; therefore, the dividend yield was observed on a 5-year basis. The mean dividend yield was 8.73% with a maximum and minimum of 20.75% and 4.35%, respectively. This study also observed the sum of free cash flow over the past 5 years, the mean value of which was 541,363.73.

Table 3. Descriptive Statistics for PDF Portfolio

	Number of companies	Min	Max	Mean	Standard deviation
Net profit after tax (NT$1000)	231	20560	7157524	856482.60	1383811.285
Dividend yield (%)	123	4.35	20.75	8.73	2.69951
Free cash flow (NT$1000)	123	-1090251	5509358	541363.73	901437.741

Table 4 and Fig. 1 display the comparison of average cumulative returns of PDF portfolio, F-score portfolio, and TAIEX. Here, the F-score portfolio refers to the company stocks in the HBM group obtained previously. In 2004, the cumulative return on the PDF portfolio, TAIEX, and F-score portfolio was -11.7%, -2.19%, and -20.88%, respectively. The cumulative return on TAIEX was superior to that on the PDF and F-score portfolios in the first year; however, from 2005 to 2007, the cumulative return on the PDF portfolio increased from 14.35% to 121.36%. Although the cumulative return on the PDF portfolio dropped to 1.23%

in 2008 because of the financial crisis, it rose to 134.04% in 2009 and again to 301.23% in 2013. The performance of TAIEX and the F-score portfolio was inferior to that of the PDF portfolio, but the performance of TAIEX was superior to that of the F-score portfolio. Although TAIEX and the F-score portfolio exhibited a similar trend, the cumulative returns on the F-score portfolio were all negative and the F-score portfolio exhibited the lowest performance among the three.

Table 4. Descriptive Statistics for Cumulative Returns

Year	PDF	TAIEX	F-score
2004	-11.70%	-2.19%	-20.88%
2005	14.35%	4.90%	-99.25%
2006	89.48%	28.45%	-49.44%
2007	121.36%	45.98%	-61.56%
2008	1.23%	-24.90%	-194.69%
2009	134.04%	28.93%	-42.19%
2010	216.04%	42.72%	-44.47%
2011	150.36%	20.74%	-91.24%
2012	230.60%	28.36%	-73.88%
2013	310.23%	42.70%	-48.76%

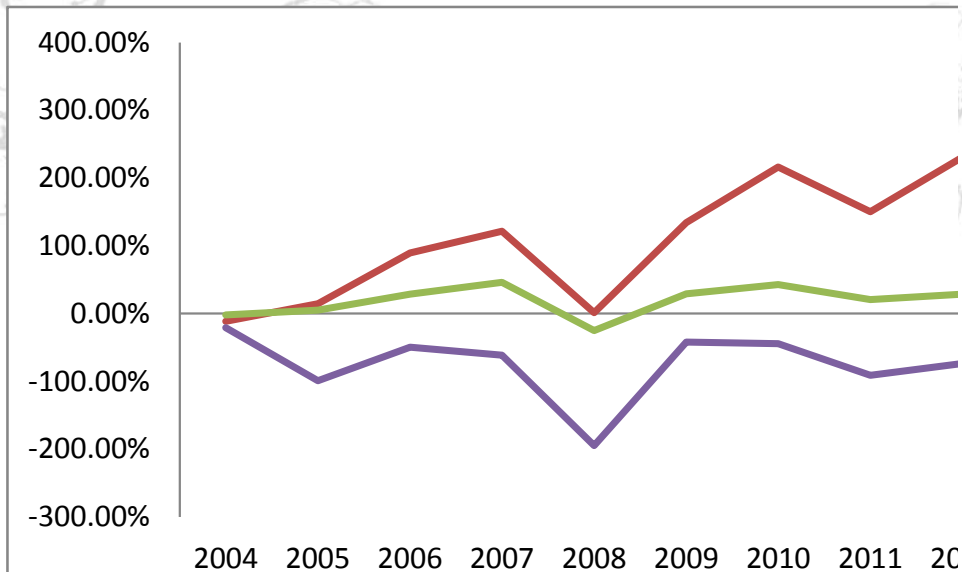

Figure 1. Comparison of cumulative returns

Subsequently, this study conducted t tests to compare cumulative returns and excess returns between the PDF and F-score portfolios. Table 5 shows the results, revealing that the cumulative returns on the PDF portfolio were higher than that on the F-score portfolio in all 10 years. The difference between the two portfolios was nonsignificant in the first year but was significant at a 5% or 1% significance level in the other 9 years. The comparison result of excess returns in Table 6 was similar to that of cumulative returns. The excess returns on the PDF portfolio in all the 10 years were superior to those on the F-score portfolio (at a 5% or 1% significance level). Overall, the results indicated that the PDF portfolio was superior to the F-score portfolio.

Table 5. Comparison of Cumulative Returns of PDF and F-Score Portfolios

	Portfolios	Mean	Standard deviation	T test
First year	PDF	-11.70%	0.387	0.552
	F-score	-20.88%	0.605	
Second year	PDF	14.35%	0.588	2.930***
	F-score	-99.25%	1.610	
Third year	PDF	89.48%	1.385	2.906***
	F-score	-49.44%	1.512	
Fourth year	PDF	121.36%	2.396	2.492**
	F-score	-61.56%	1.986	
Fifth year	PDF	1.23%	0.698	2.770***
	F-score	-194.69%	3.231	
Sixth year	PDF	134.04%	1.633	3.333***
	F-score	-42.19%	1.611	
Seventh year	PDF	216.04%	2.572	3.593***
	F-score	-44.47%	1.800	
Eighth year	PDF	150.36%	2.039	4.010***
	F-score	-91.24%	1.717	
Ninth year	PDF	230.60%	3.136	3.671***
	F-score	-73.88%	1.627	
Tenth year	PDF	310.23%	4.070	3.501***
	F-score	-48.76%	1.348	

*** p < .01; ** p < .05; * p < .1

Table 6. Comparison of Excess Returns of PDF and F-Score Portfolios

	Portfolios	Mean	Standard deviation	T test
First year	PDF	-9.51%	0.387	0.552***
	F-score	-18.69%	0.605	
Second year	PDF	9.45%	0.588	2.930***
	F-score	-104.15%	1.610	
Third year	PDF	61.03%	1.385	2.906***
	F-score	-77.89%	1.512	
Fourth year	PDF	75.38%	2.396	2.492**
	F-score	-107.54%	1.986	
Fifth year	PDF	26.13%	0.698	2.770***
	F-score	-169.79%	3.231	
Sixth year	PDF	105.11%	1.633	3.333***
	F-score	-71.12%	1.611	
Seventh year	PDF	173.32%	2.572	3.593***
	F-score	-87.19%	1.800	
Eighth year	PDF	129.62%	2.039	4.010***
	F-score	-111.98%	1.717	
Ninth year	PDF	202.24%	3.136	3.671***
	F-score	-102.24%	1.627	
Tenth year	PDF	267.53%	4.070	3.501***
	F-score	-91.46%	1.348	

*** p < .01; ** p < .05; * p < .1

Financial Dimensions

This study used financial indicators to analyze the profitability, operational capacity, financial structure, and solvency of the companies selected by using the PDF and F-score methods. T tests were then conducted to examine the differences between the PDF and F-score portfolios. Because the returns were observed over a period of 10 years, the financial indicators were analyzed over 10 years. Table 7 presents the comparison of financial dimensions between the PDF and F-score portfolios. Profitability was determined using ROA. In this study, the average ROA of companies in the PDF portfolio was significantly higher than that of companies in the F-score portfolio at a 1% significance level. The operational capacity was determined based on the receivables turnover ratio, inventory turnover, and fixed assets turnover, all of which were higher for the PDF portfolio compared with those of the F-score portfolio. In addition, only the difference in receivables turnover ratios was nonsignificant. Regarding he financial structure, the debt ratio for the PDF portfolio was significantly lower than that for the F-score portfolio at a 5% significance level. Solvency was measured using the current ratio and interest protection multiples (Table 7), which were significantly higher for the PDF portfolio than those for the F-score portfolio at a 1% and 10% significance level, respectively. Consequently, the comparison described in this section indicated that the profitability, operational capacity, financial structure, and solvency of the PDF-selected companies all surpassed those of the HBM group companies selected using the F-score method.

Table 7. The comparison of financial dimensions

	Portfolios	Number of companies	Mean	Standard deviation	T test
ROA (%)	PDF	260	13.789	7.080	10.088***
	F_score	170	6.754	7.053	
Receivables turnover ratio	PDF	260	100.897	836.000	0.245
	F_score	170	79.940	913.659	
Inventory turnover	PDF	260	5.732	10.313	2.269**
	F_score	170	3.843	4.165	
Fixed assets turnover	PDF	260	61.177	127.842	2.108**
	F_score	170	28.535	193.292	
Current ratio (%)	PDF	260	272.386	290.613	3.935***
	F_score	170	179.912	119.593	
Interest protection multiples	PDF	260	7228.372	51895.921	1.812*
	F_score	170	13.616	67.413	
	F_score	260	4838.916	29598.612	
Debt ratio (%)	PDF	170	45.340	18.744	-2.259**
	F_score	260	49.211	15.022	
	F_score	170	2.549	3.263	

*** p < .01; ** p < .05; * p < .1

ROA = [net income from continuing operations + interest expense × (1%–17%)] / average total assets × 100
Receivables turnover ratio = year revenue / average receivables
Inventory turnover = year revenue / average inventory
Fixed assets turnover = year revenue / average fixed assets
Current ratio = current assets / current liabilities × 100
Interest protection multiples = (net profit before tax + interest expense) / interest expense
Debt ratio = total debts / total liabilities × 100

Conclusion

In previous studies, stocks were selected using a combination of indicators, and returns were examined over a period of 1 or 2 years (Lai et al. 2010). This study selected stocks based on profit, dividend, and free cash flow and observed the long-term returns on the selected stocks. The results revealed that the 10-year cumulative returns on the stocks selected using the PDF method were significantly higher than those for the stocks selected using the F-score method. Moreover, the financial ratios (including ROA, receivables turnover ratio, inventory turnover, fixed assets turnover, current ratio, interest protection multiples, and debt ratio) of the PDF portfolio and the F-score portfolio were compared. The comparison results showed that companies selected using the PDF method possessed superior profitability, operational capacity, financial structure, and solvency, compared with companies selected using the F-score method.

Research Contributions and Implications

The PDF model developed in this study contained only three indicators: positive net profit after tax for 10 consecutive years, dividends paid over the past 5 years with a dividend yield higher than 8%, and a positive sum of free cash flows over the past 5 years. The returns on the PDF portfolio were superior to those on the F-score portfolio. Moreover, the PDF stock-selection method is simple and convenient. Therefore, investors can employ the PDF method proposed in this study to select and invest stocks that can generate long-term stable returns.

In the academic field, value stocks should be used for long-term investment to avoid an increase in transaction costs and a reduction in profits. However, previous studies have focused on the 1- or 2-year return on investment, overlooking the long-term return on value investing. In this study, the returns on value investing over a period of 10 years were analyzed. Future studies can compare various investment strategies based on the findings of this study to propose an optimal investment strategy.

Future Research and Limitations

This study examined only companies' previous profit performance without considering the future development of various industries. Hence, future studies can analyze the development of individual industries to propose appropriate investment strategies. Moreover, this study only focused on the stock market in Taiwan, which is an emerging market in East Asia; therefore, the findings of this study may be inapplicable to other countries. The indicators adopted in this study should be adjusted based on the specific characteristics of individual countries.

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