

Selection of Investment Strategies in Thai Stock Market

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5 February 2014

Abstract

This paper examines the performance of the popular investment strategies such as value strategy, small-cap growth strategy, and so on for Thai Stock Market from March 2005 to May 2013. It was found that only the small-cap, value strategy can outperform Thai stock market. However, if I add a criterion about quality on top of the value and growth strategies like considering the profits of company, surprisingly, it was found that the quality criterion can improve the performance of most strategies enormously and make them outperform Thai stock market. I found that small-cap, joint value and quality strategy has highest Sharpe ratio of 0.84. Moreover, incorporating the quality reduces the drop of returns in the market downturn period.

JEL Classification: G12

Keywords: Investment strategy, value investing, profitability, asset pricing

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Chapter1 Introduction

The efficient market hypothesis (EMH) suggests that all available information at the time is correctly and fully reflected in the stock prices, so stock prices follow the random walk. The random walk hypothesis has been an important subject to financial economists for many years and has received empirical support from early research, which confirmed that stock price changes are unpredictable. However, more recent research in finance provides empirical evidence that historical stock prices do not follow random walks (Lo and MacKinlay (1990)). Deviations from the random walk hypothesis imply that price changes are predictable to certain extent. Also, stock returns were found to have a number of anomalies such as size effect, value effect, and so on. Moreover, some of these studies indicate that it is possible to earn significant profits due to market inefficiencies.

These predictability and anomalies are part of reasons why the investment strategies related to size and book-to-market investment strategies gain popular both in academia and practitioners. Value investment strategy generally involves buying securities that appear underpriced. For instance, value investors will buy stocks which have low price-to-earning multiples or have low price-to-book ratios or have high dividend yields. Value strategies were first advocated by Benjamin Graham and David Dodd in 1934. However, Graham was not just associated with buying cheap stocks, but actually he also was concerned with the quality of a firm's assets. Of the seven "quality and quantity criteria" that Graham suggested a firm should meet for inclusion in an investor's portfolio, five were directly concerned with firm quality, while only two were related to valuation. While Graham devoted as much attention to the quality dimension of value as its price dimension, he is nevertheless primarily associated with buying firms cheaply because it is his valuation metrics that have delivered exceptional returns. Value

investing is on average quite profitable, but the quality metrics Graham employed have not reliably forecast relative stock performance.

Recently, there is an increasing attention in quality investing. Quality is often viewed as an attractive alternative to traditional growth, which performed terribly during and after the dot-com bust. Its leading industry proponents include GMO's Jeremy Grantham, whose high quality indicators of "high return, stable return, and low debt" have shaped the design of MSCI's Quality Indices, and Joel Greenblatt, whose "Little Book that Beats the Market" has encouraged a generation of value investors to pay attention to capital productivity, measured by return on invested capital, in addition to valuations.

Novy-Marx (2013) found that gross profit per asset as a quality measure, has as much power predicting stock returns as traditional value metrics. Strategies based on gross profitability are highly negatively correlated with strategies based on price signals, making them particularly attractive to traditional value investors.

The quality metrics employed favor profitable companies with strong prospects, however, so tend to favor growth companies. Combining quality and value signals thus helps find stocks that are both expected to grow and reasonably priced.

Research Objectives

1. Compare the performance of the popular investment strategies in Thai Stock Market i.e., the size related strategy, the size and book-to-market related strategy.
2. Find ways to improve the performance of the popular investment strategies in Thai Stock Market such as incorporating quality measures into the investment strategies.

Expected Outcomes

1. Be able to identify which investment strategies outperform Thai Stock Market.
2. Be able to analyze how quality measures help improve the investment strategies.

This paper examines the performance of the popular investment strategies such as value strategy, small-cap growth strategy, and so on for Thai Stock Market from March 2005 to May 2013. It was found that only the small-cap value strategy can outperform Thai stock market. However, if I add a criterion about quality on top of the value and growth strategies like considering the profits of company, surprisingly, it was found that the quality criterion can improve the performance of most strategies enormously and make them outperform Thai stock market. I found that small-cap, joint value and quality strategy has highest Sharpe ratio of 0.84. Moreover, incorporating the quality reduces the drop of returns in the market downturn period.

The remainder of the paper is organized as follows. Section 2 reviews the related literatures. Section 3 explains the data for the study. Section 4 provides the methodology. Section 5 presents the empirical results. Section 6 concludes the paper.

Chapter 2 Literature Review

The successful investment strategy is pretty much related to understanding what determines the cross-sectional returns of stocks. In the asset pricing literature in finance, researchers attempt to find out the true asset pricing model that explains all asset prices and expected returns.

The important and popular asset pricing model is the capital asset pricing model (CAPM) by Sharpe (1964), Lintner (1965). The CAPM is a single-factor model where the expected returns are explained by market risk premium. This model has well theoretical ground building from Mean-variance analysis, No-arbitrage restriction, and economic equilibrium. Unfortunately, the CAPM has the empirical failure. It fails to explain a number of anomalies such as size effect, leverage effect, and value effect. Banz (1981) found that small market capitalization stocks have higher average returns than large market capitalization stocks. However, the EMH supporters argue that the size effect is not an anomaly. It could represent the risk which cannot be captured by the CAPM beta such as the liquidity risk. For leverage effect, Bhandari (1988) showed that high leveraged firm stocks produced higher average return, not only above the CAPM prediction, but even after controlling for size effect. There are a number of papers documented about the value effect. Basu (1983) documented that high earnings-to-price stocks has higher average return even after controlling for size. Rosenberg, Reid, and Lanstein (1985), Chan, Hamao, and Lakonishok (1991) found that average returns are positively related to book-to-market ratio. Again, the EMH supporters argue that the value effect is not an anomaly. It could represent the risk which cannot be captured by the CAPM beta such as the financial distress risk.

Later, Fama and French (1993) invented a new model called the Fama and French

three-factor model (FF3FM). Even though FF3FM does not have a strong theoretical foundation like the CAPM, however it performs very well in explaining stock returns in all countries. In other words, the FF3FM is very robust. The three-factor model of Fama and French (1993) posited that expected returns can be explained by the excess market return, a size factor (SMB), and a book-to-market factor (HML). In a later study, Fama and French (1998) extended the model to a global context and provide evidence that a two-factor model with a world market and world book-to-market equity (WHML) factor explains international stock returns better than the world capital asset pricing model (CAPM).

Fama and French (1995) found that size and book-to-market proxy for underlying risks which are associated with the behavior of earnings of small and value firms. Despite the straightforwardness of the Fama and French factors and the growing empirical support, considerable controversy exists regarding their interpretation as risk factors. Critics can be classified into two main groups.

The first group (Lakonishok, Shleifer, and Vishny (1994), Haugen (1995)) argues that the size and book-to-market effects are due to investor overreaction rather than compensation for risk bearing. They argue that investors systematically overreact to recent corporate news, unrealistically extrapolating high or low growth into the future. This, in turn, leads to underpricing of “value” (small market capitalization, high book-to-market stocks) and overpricing of “growth” (typically large, low book-to-market stocks).

A second group of critics (Ferson, Sarkissian, and Simin (1999)) cautions against using empirical regularities as “explanatory risk factors.” Berk (1995) argues that high book-to-market and small market capitalization firms will, by construction, earn higher mean returns whether they are related to mispricing or economic risk. Consistent with these arguments questioning a risk-based interpretation, Daniel and Titman (1997) find that firm characteristics (i.e., size and book-to-market) explain returns better than factor loadings from the Fama and French model. However, Davis, Fama, and French (2000) argue that Daniel and Titman’s

results are subsample specific. Ferson and Harvey (1999) show that the three-factor model fails to explain conditional expected returns.

Later, Novy-Marx (2013) shows that gross profit-to-assets as a quality metric, has roughly as much power predicting the relative performance of different stocks as book-to-market. Buying profitable firms and selling unprofitable firms, where profitability is measured by the difference between a firm's total revenues and the costs of the goods or services it sells, yields a gross profitability premium. Just as importantly, the performance of strategies based on gross profitability is strongly negatively correlated with value, so profitability strategies not only deliver high average returns, but also provide a valuable hedge to value investors.

Chapter 3 Data

This paper examines the investment strategies using all nonfinancial liquid stocks in the Stock Exchange of Thailand (SET) from March 2005 to May 2013. Liquid stocks are defined as the stocks which have average daily trading value greater than 1 million baht. Monthly stock prices (with adjustment for dividend and stock split) are from the Bloomberg database. The financial statement data of companies is from the Capital IQ database. Market index is proxied by the SET index.

Chapter 4 Methodology

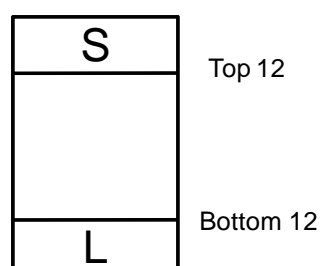
4.1 Portfolio formation for each investment strategy

For each investment strategy, I construct the value-weighted portfolio and rebalance the portfolio every the end of March of every year.

4.1.1 Size Portfolio Formation

Figure 1 shows how to form the size portfolio. I first sort all the stocks by market capitalization in ascending order. The twelve smallest market capitalization stocks are called the small-cap strategy. The twelve largest market capitalization stocks are called the large-cap strategy.

Figure 1: Size Portfolio Formation

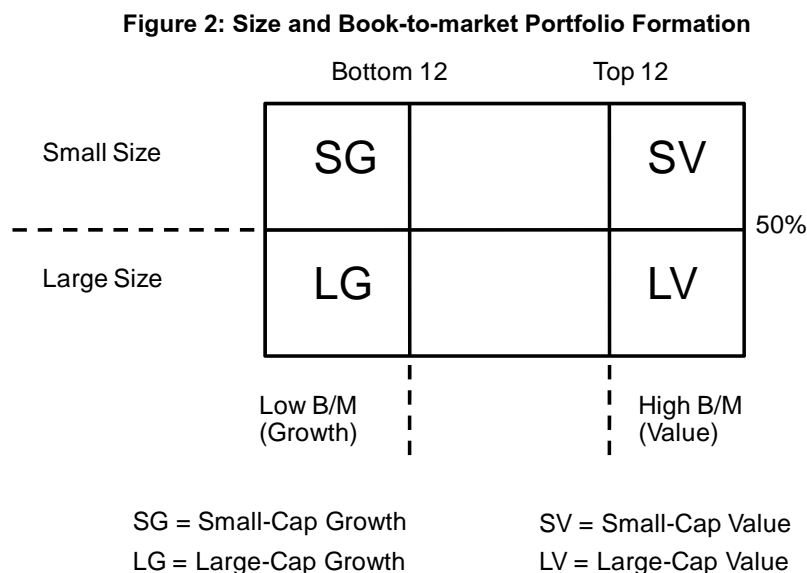


S = Small-Cap L = Large-Cap

4.1.2 Size and Book-to-market Portfolio Formation

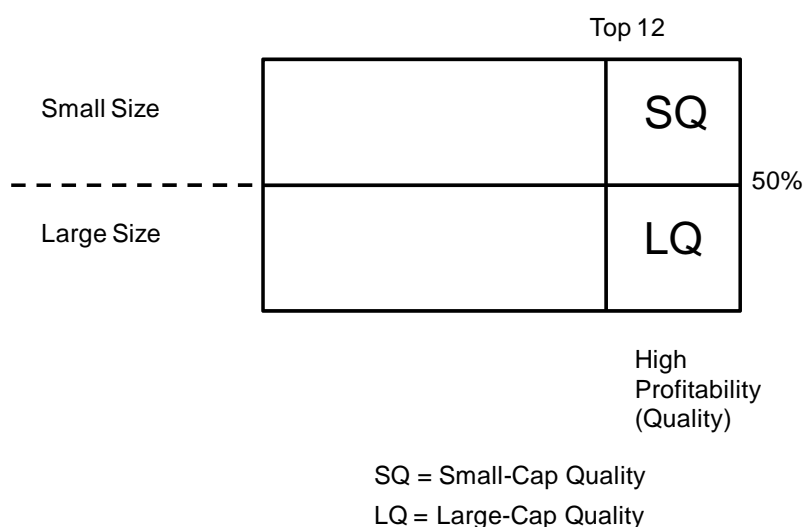
Figure 2 shows how to form the size and book-to-market portfolio. I first sort all the stocks by market capitalization in ascending order. Then, I divide the stocks into two groups, namely small and large. In each group, I then sort the stocks by book-to-market ratio in ascending order. The twelve smallest book-to-market stocks are called the growth strategy. The twelve largest book-to-market stocks are called the value strategy. As a result, I totally have 4

strategies i.e., the small-cap, growth strategy, the small-cap, value strategy, the large-cap, growth strategy, and the large-cap, value strategy.



4.1.3 Size and Quality Portfolio Formation

I use the following profitability ratios as a proxy of quality: Gross Profit/Asset, EBITDA/Asset, EBIT/Asset, and Net Income/Asset. Figure 3 shows how to form the size and quality portfolio. I first sort all the stocks by market capitalization in ascending order. Then, I divide the stocks into two groups, namely small and large. In each group, I then sort the stocks by profitability ratio in ascending order. The twelve largest profitability ratio stocks are called the quality strategy. As a result, I totally have 2 strategies i.e., the small-cap, quality strategy and the large-cap, quality strategy.

Figure 3: Size and Quality Portfolio Formation

4.1.4 Size and joint Value and Quality Portfolio Formation

The main principle of value investing is to buy the cheap stock, considering some measures like price-to-earning ratio (P/E) and price-to-book ratio (P/B). The value investor will buy low P/E and P/B stocks. However, in the pool of cheap stocks that we use P/E and P/B to determine, the quality measures will additionally enable us to distinguish the stock that is cheap for good reason (by its performance, this is the correct price) from the stock that is undervalued (this stock is very good, but for some reason at this moment of time it is underpriced by investors). So, if we use the joint value and quality strategy, we are expected to get higher returns than the value strategy alone.

Before going to size and joint value and quality portfolio formation, I would like to illustrate how to conduct joint rank through the following simple example in figure 4. Suppose I have 5 stocks and I would like to find the top joint ranks between book-to-market and gross profit per asset. I first find the rank of stocks according to book-to-market and gross profit per asset, respectively. Then, I calculate the average between the book-to-market rank and gross profit per asset rank. After that, I sort the stocks by the average joint ranks in ascending order. The first stock is the top joint ranks.

Figure 4: Example on How to Conduct Joint Rank

Stock	B/M	GP/A	Rank of B/M	Rank of GP/A	Average Joint Rank
A	0.3	0.5	4	2	3
B	0.6	0.3	2	3	2.5
C	0.8	0.8	1	1	1
D	0.1	0.2	5	5	5
E	0.5	0.25	3	4	3.5



Sort joint ranks

Stock	Average Joint Rank
C	1
B	2.5
A	3
E	3.5
D	5

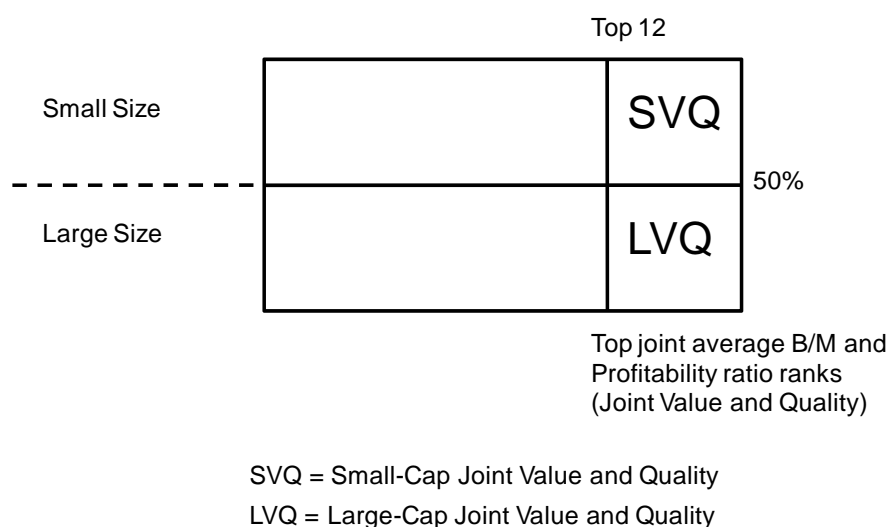


Top joint ranks



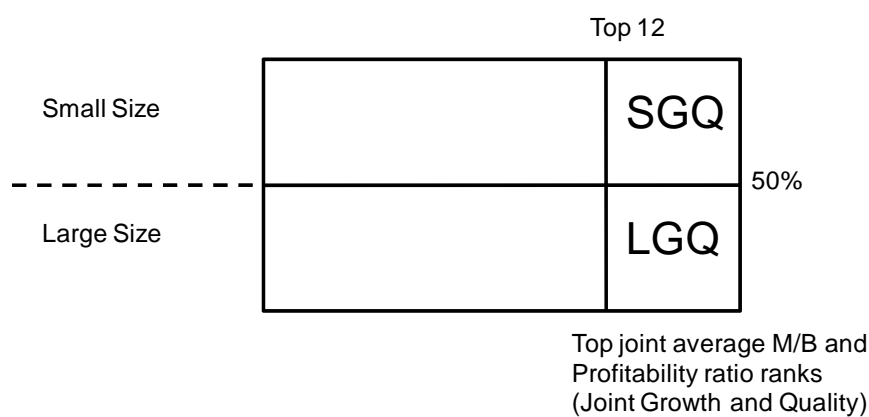
Bottom joint ranks

Figure 5 shows how to form the size and joint value and quality portfolio. Again, I use the following profitability ratios as a proxy of quality: Gross Profit/Asset, EBITDA/Asset, EBIT/Asset, and Net Income/Asset. I first sort all the stocks by market capitalization in ascending order. Then, I divide the stocks into two groups, namely small and large. In each group, I then sort the stocks by average joint ranks between book-to-market and profitability ratio in ascending order. The top twelve joint rank stocks are called the joint value and quality strategy. As a result, I totally have 2 strategies i.e., the small-cap, joint value and quality strategy as well as the large-cap, joint value and quality strategy.

Figure 5: Size and Joint Value and Quality Portfolio Formation

4.1.5 Size and joint Growth and Quality Portfolio Formation

Figure 6 shows how to form the size and joint growth and quality portfolio. Again, I use the following profitability ratios as a proxy of quality: Gross Profit/Asset, EBITDA/Asset, EBIT/Asset, and Net Income/Asset. I first sort all the stocks by market capitalization in ascending order. Then, I divide the stocks into two groups, namely small and large. In each group, I then sort the stocks by average joint ranks between market-to-book and profitability ratio in ascending order. The top twelve joint rank stocks are called the joint growth and quality strategy. As a result, I totally have 2 strategies i.e., the small, joint growth and quality strategy as well as the large, joint growth and quality strategy.

Figure 6: Size and Joint Growth and Quality Portfolio Formation

SGQ = Small-Cap Joint Growth and Quality

LGQ = Large-Cap Joint Growth and Quality

4.2 Performance Measure of Investment Strategies

To measure the performance of investment strategies, I consider the following measures:

4.2.1 Monthly Returns of Stock *i* in Portfolio

$$R_{i,t} = \ln\left(\frac{P_{i,t}}{P_{i,t-1}}\right)$$

where

$R_{i,t}$ denotes the return of stock *i* in month *t*.

$P_{i,t}$ denotes the price of stock *i* in month *t*.

$P_{i,t-1}$ denotes the price of stock *i* in month *t-1*.

4.2.2 Monthly Returns of Portfolio

$$R_{p,t} = \sum_{i=1}^{12} w_{i,t} R_{i,t}$$

where

$R_{p,t}$ denotes the return of portfolio in month t .

$w_{i,t}$ denotes the weight on stock i in month t .

$R_{i,t}$ denotes the returns of stock i in month t .

4.2.3 Average Annual Returns

$$\text{Average Annual Returns} = 12 \times \text{Average Monthly Returns}$$

4.2.4 Sharpe Ratio

$$\text{Sharpe ratio} = \frac{(\text{Average Annual Returns} - \text{Riskfree rate})}{\text{Annualized Standard Deviation}}$$

where

Risk free rate is assumed to be constant equal to 2% per year.

Annualized Standard Deviation = $\sqrt{12}$ × Monthly Standard Deviation

4.2.5 Performance of 1 Baht

Suppose I start my investment of 1 Baht at the beginning of the investment horizon. One way to evaluate whether my investment strategy is good is to calculate how much I would receive at the end of the investment horizon.

$$\text{Value of Portfolio at time } T = \exp\left(\sum_{t=1}^T R_t\right)$$

where

R_t denotes the return of portfolio in month t .

4.2.6 Maximum drawdown

The drawdown is the measure of the decline from a historical peak in value of portfolio $V(t)$. The drawdown at time T , $D(T)$

$$D(T) = \max_{t \in (0, T)} \frac{V(t) - V(T)}{V(t)}$$

The maximum drawdown at time T , $MD(T)$

$$MD(T) = \max_{\tau \in (0, T)} \left\{ \max_{t \in (0, \tau)} \frac{V(t) - V(\tau)}{V(\tau)} \right\}$$

4.2.7 Jensen's Alpha

Jensen's Alpha is used to determine the abnormal return of a portfolio over the theoretical expected return. Generally, the theoretical return is predicted by the Capital Asset Pricing Model (CAPM). Thus, I run the following regression.

$$R_{investment\ strategy,t} - R_{f,t} = \alpha + \beta(R_{market,t} - R_{f,t})$$

$$\alpha = (R_{investment\ strategy,t} - R_{f,t}) - \beta(R_{market,t} - R_{f,t})$$

where

α denotes Jensen's Alpha.

$R_{investment\ strategy,t}$ denotes the monthly returns of the investment strategy.

$R_{market,t}$ denotes the monthly market returns (SET index).

$R_{f,t}$ denotes the risk free rate which is assumed to be constant equal to 2% per year.

4.3 Investment Strategies with Quality in the Market Downturn Period

To investigate how incorporating quality helps the investment strategies in the market downturn period, I run the following regression.

$$R_{with\ Quality,t} - R_{without\ Quality,t} = \beta_0 + \beta_1 D_t + \varepsilon_t$$

where

$R_{with\ Quality,t}$ denotes the monthly returns of the investment strategy with quality measure.

$R_{without\ Quality,t}$ denotes the monthly returns of the corresponding investment strategy but without quality measure.

D_t denotes the dummy variable for negative market return.

Thus, $D_t = 1$ if the market return < 0 , and $D_t = 0$, otherwise.

I expect the β_1 to be significantly positive which implies that incorporating the quality measure into investment strategies helps improve the returns of the investment strategies in the market downturn period.

Chapter 5 Empirical Results

5.1 Performance of each Investment Strategy

5.1.1 Investment Strategies Related to Size and Book-to-market

I first investigate the performance of size strategies as well as size and book-to-market strategies. Table 1 shows performance comparison among investment strategies related to size and book-to-market. Clearly, the small-cap, value strategy is the only one strategy which outperforms market. In particular, it has higher average annual returns and higher Sharpe ratio than market. It is worth 3.4X in May 2013 while the market is worth 2.29X. However, in terms of maximum drawdown, the small-cap, value strategy is quite the same as market. This result is consistent with the size effect and value effect of stock returns in the asset pricing literature.

**Table 1: Performance Comparison among
Investment Strategies Related to Size and Book-to-market**

Investment Strategies	Annual Returns	Annual SD	Sharpe Ratio	Performance of 1 Baht	Max Drawdown
Smallest 12 stocks	9.8%	26.2%	0.30	2.23	56.0%
Largest 12 stocks	5.7%	25.8%	0.15	1.60	57.3%
Small + Value	15.0%	30.1%	0.43	3.40	55.2%
Small + Growth	-6.8%	29.7%	-0.30	0.57	76.1%
Large + Value	1.4%	31.9%	-0.02	1.12	72.4%
Large + Growth	11.4%	24.6%	0.38	2.55	50.5%
SET Index	10.2%	23.2%	0.35	2.29	55.7%

Notes: 1. Green shade means “perform better than market”, Yellow shade means “perform as well as market”

2. Performance of 1 Baht is the value of portfolio as of May 31, 2013 if investing 1 Baht at March 31, 2005.

Figure 7: Average Annual Returns of Investment Strategies Related to Size and Book-to-market

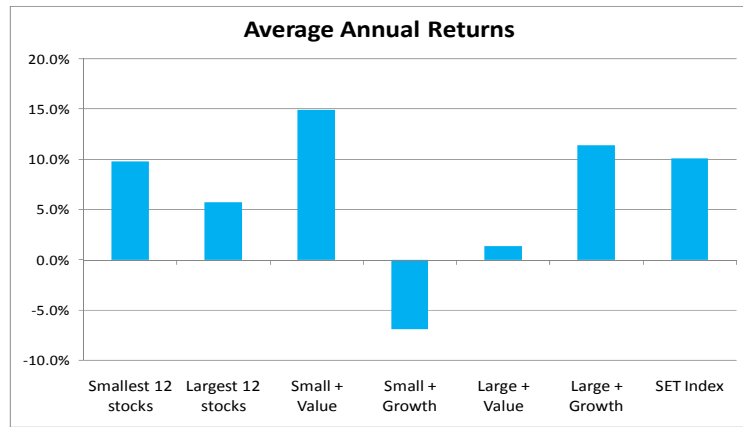


Figure 8: Sharpe Ratio of Investment Strategies Related to Size and Book-to-market

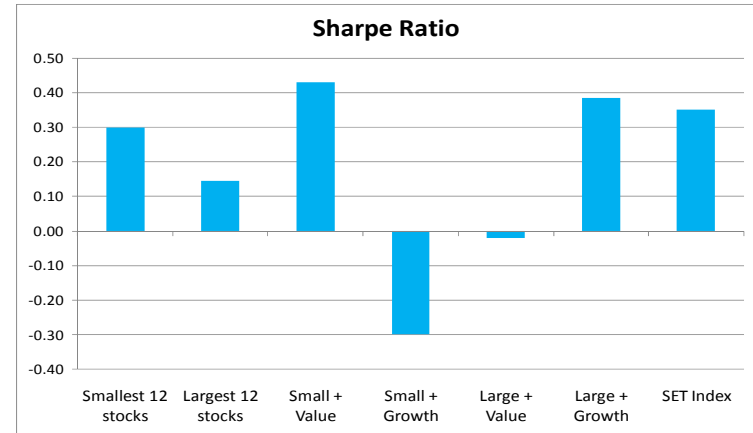


Figure 9: Performance of 1 Baht of Investment Strategies Related to Size and Book-to-market

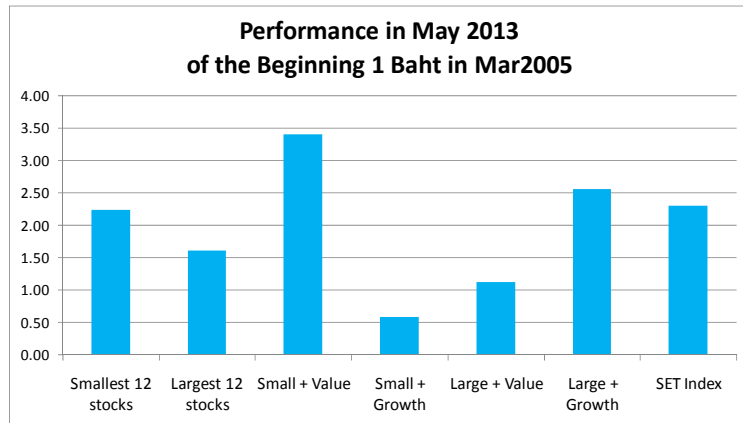
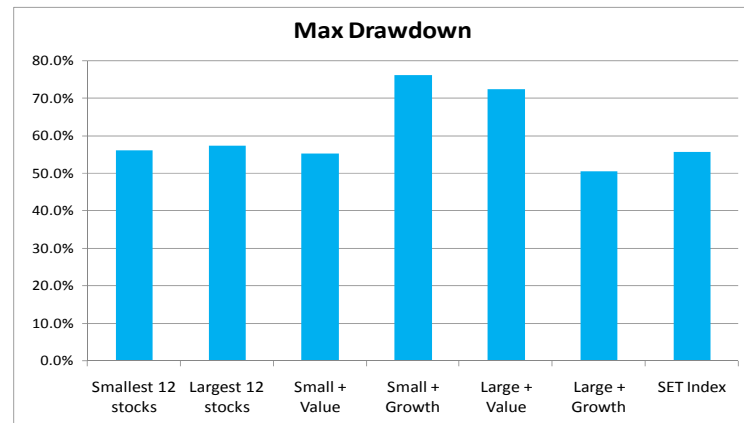


Figure 10: Maximum Drawdown of Investment Strategies Related to Size and Book-to-market



5.1.2 Investment Strategies Related to Size and Quality

I now examine the performance of size and quality strategies. In Table 2, it was found that incorporating high gross profit per asset as a quality measure helps improve both small-cap and large-cap strategies. Intuitively, the gross profit per asset is subject to less manipulative accounting adjustment than other profitability ratio. The gross profit per asset more reflects the operation and cash of firms which will affect how much the firm would grow in the futures. This implies that the gross profit per asset is the best quality measure among the profitability ratios which I will later use to incorporate into other investment strategies.

**Table 2: Performance Comparison among
Investment Strategies Related to Size and Quality**

Investment Strategies	Annual Returns	Annual SD	Sharpe Ratio	Performance of 1 Baht	Max Drawdown
Smallest 12 stocks	9.8%	26.2%	0.30	2.23	56.0%
Largest 12 stocks	5.7%	25.8%	0.15	1.60	57.3%
Small + HighGP/A	14.3%	26.0%	0.47	3.22	55.7%
Large + HighGP/A	20.2%	25.2%	0.72	5.19	51.6%
Small + HighEBIT/A	8.5%	22.9%	0.28	2.00	54.7%
Large + HighEBIT/A	6.0%	23.1%	0.17	1.63	46.2%
Small + HighNI/A	7.0%	26.2%	0.19	1.77	58.4%
Large + HighNI/A	11.5%	25.9%	0.37	2.56	59.0%
Small+HighEBITDA/A	15.0%	21.0%	0.62	3.41	48.9%
Large+HighEBITDA/A	7.4%	22.1%	0.24	1.82	47.3%
SET Index	10.2%	23.2%	0.35	2.29	55.7%

Notes: 1. Green shade means “perform better than market”, Yellow shade means “perform as well as market”

2. Performance of 1 Baht is the value of portfolio as of May 31, 2013 if investing 1 Baht at March 31, 2005.

5.1.3 Investment Strategies Related to Size, Book-to-market, and Quality

From section 5.1.2, the gross profit per asset helps improve the performance of size strategies considerably. It is interesting to try incorporating the gross profit per asset as a quality measure into the investment strategies related to size and book-to-market. Table 3 shows that incorporating gross profit per asset into investment strategies improves the performance of all the investment strategies. The most striking results are that the small-cap, joint value and quality strategy, the large-cap, quality strategy, and the large-cap, joint value and quality strategy. They all outperform market with Sharpe ratio of 0.84, 0.72, and 0.67 respectively. Their 1 Baht performances are 6.3X, 5.19X, and 4.71X respectively. However, the maximum drawdowns of them are not much outstanding as compared to market.

**Table 3: Performance Comparison among
Investment Strategies Related to Size, Book-to-market, and Quality**

Investment Strategies	Annual Returns	Annual SD	Sharpe Ratio	Performance of 1 Baht	Max Drawdown
Smallest 12 stocks	9.8%	26.2%	0.30	2.23	56.0%
Largest 12 stocks	5.7%	25.8%	0.15	1.60	57.3%
Small + Value	15.0%	30.1%	0.43	3.40	55.2%
Small + Growth	-6.8%	29.7%	-0.30	0.57	76.1%
Large + Value	1.4%	31.9%	-0.02	1.12	72.4%
Large + Growth	11.4%	24.6%	0.38	2.55	50.5%
Small + HighGP/A	14.3%	26.0%	0.47	3.22	55.7%
Large + HighGP/A	20.2%	25.2%	0.72	5.19	51.6%
Small + Joint V&Q	22.5%	24.4%	0.84	6.30	48.1%
Small + Joint G&Q	5.2%	21.4%	0.15	1.53	58.0%
Large + Joint V&Q	19.0%	25.2%	0.67	4.71	56.8%
Large + Joint G&Q	11.1%	21.9%	0.42	2.48	45.2%
SET Index	10.2%	23.2%	0.35	2.29	55.7%

Notes: 1.Green shade means “perform better than market”, Yellow shade means “perform as well as market”

2. Performance of 1 Baht is the value of portfolio as of May 31, 2013 if investing 1 Baht at March 31, 2005.

3. Joint V&Q refers to “Joint Value and Quality”, Joint G&Q refers to “Joint Growth and Quality”

Figure 11: Average Annual Returns Comparison between Investment Strategies with and without Quality

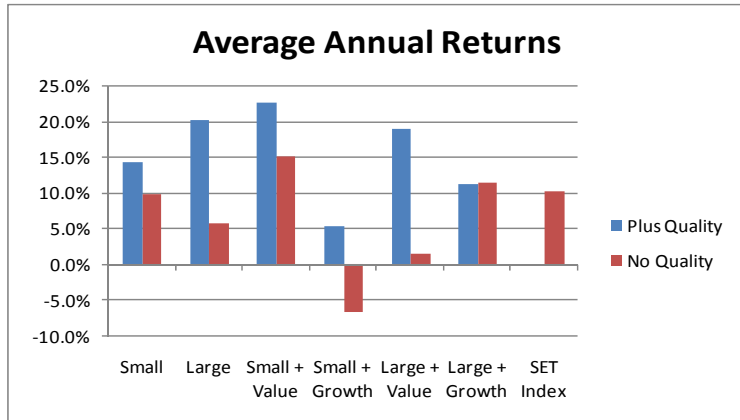


Figure 12: Sharpe Ratio Comparison between Investment Strategies with and without Quality

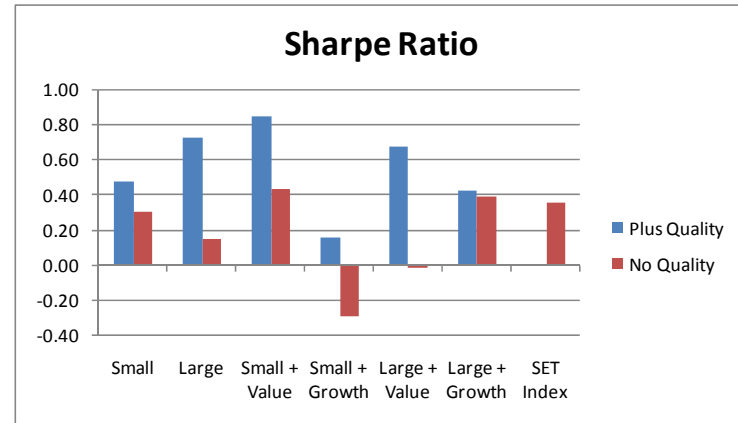


Figure 13: Performance of 1 Baht Comparison between Investment Strategies with and without Quality

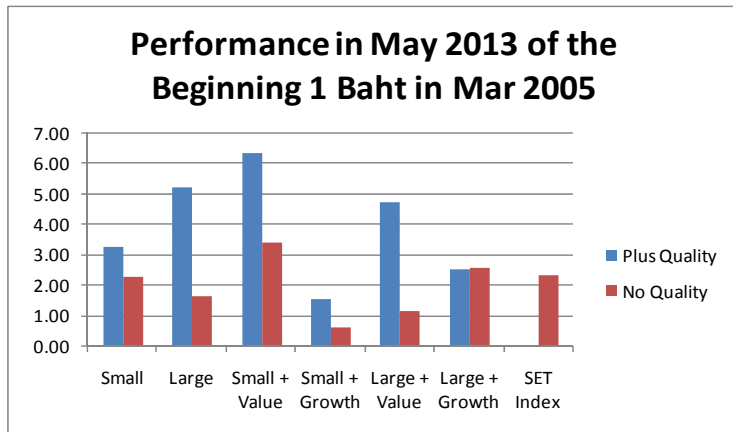
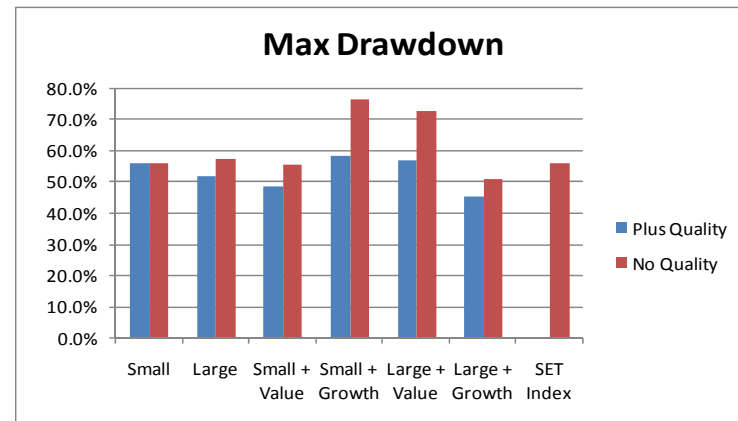
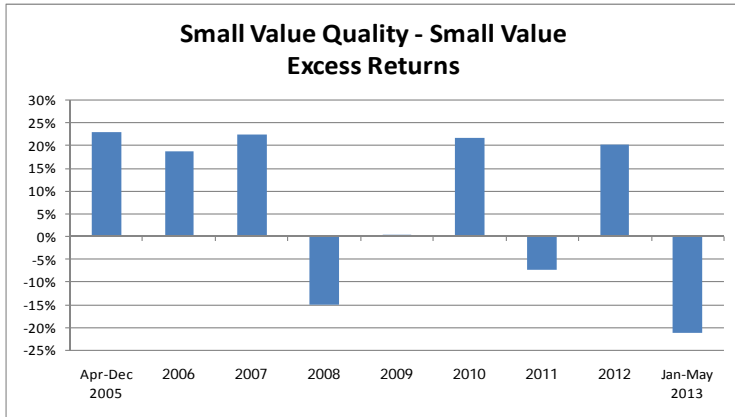


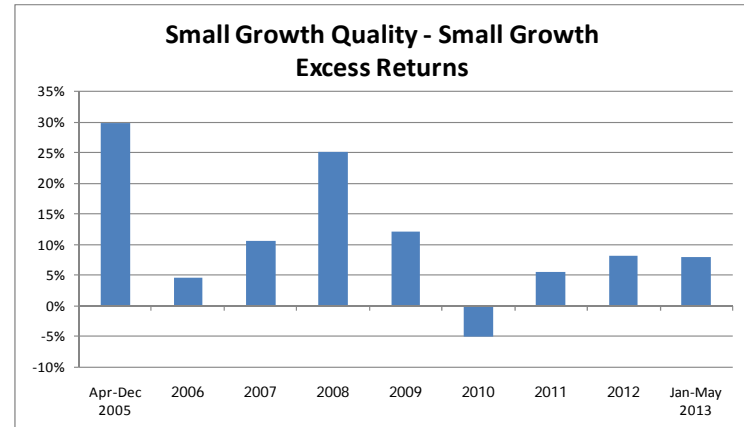
Figure 14: Maximum Drawdown Comparison between Investment Strategies with and without Quality



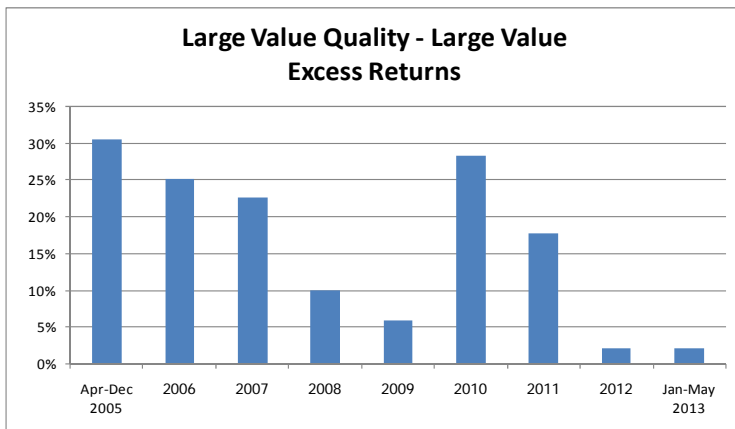
**Figure 15: Excess Returns from Incorporating Quality
Small Value Strategy**



**Figure 16: Excess Returns from Incorporating Quality
Small Growth Strategy**



**Figure 17: Excess Returns from Incorporating Quality
Large Value Strategy**



**Figure 18: Excess Returns from Incorporating Quality
Large Growth Strategy**



5.1.4 Jensen's Alpha

Table 4 present the Jensen's Alpha which represents the abnormal returns of each investment strategy. Consistent with section 5.1.3, the small-cap, joint value and quality strategy, the large-cap, quality strategy, and the large-cap, joint value and quality strategy have the significantly positive alpha of 1.2%, 0.9%, 0.8% per month respectively.

Table 4: Jensen's Alpha

$$R_{investment\ strategy,t} - R_{f,t} = \alpha + \beta(R_{market,t} - R_{f,t})$$

$$\alpha = (R_{investment\ strategy,t} - R_{f,t}) - \beta(R_{market,t} - R_{f,t})$$

Coefficients	Small+HighGP/A	Large+HighGP/A	Small Joint V&Q	Small Joint G&Q	Large Joint V&Q	Large Joint G&Q
Intercept	0.4%	0.9%	1.2%	-0.2%	0.8%	0.2%
p-value	0.3610	0.0170	0.0119	0.5499	0.0397	0.5197
Mkt Risk Premium	0.91	0.95	0.82	0.73	0.94	0.82
p-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
R-squared	66.4%	76.8%	60.8%	63.0%	74.9%	76.8%

Note: Joint V&Q refers to "Joint Value and Quality", Joint G&Q refers to "Joint Growth and Quality"

5.2 Investment Strategies with Quality in the Market Downturn Period

So far, it is clear about how quality improves the overall performance of investment strategies. However, it is also interesting to examine how the quality measure plays a role in the market downturn period. Table 5 presents the results of the regression of the return differences between the with-quality investment strategy and the without-quality investment strategy on the dummy variable for negative market returns. It was found that the coefficients of dummy for negative market returns are significantly positive for the small-cap, joint value and quality strategy, the small-cap, joint growth and quality strategy, and the large-cap, joint value and quality strategy. This implies that quality helps increase their returns by 2.1%, 2.1%, and 2.5% per month respectively in the market downturn period.

Table 5: Investment Strategies with Quality in the Market Downturn

$$R_{with\ Quality,t} - R_{without\ Quality,t} = \beta_0 + \beta_1 D_t + \varepsilon_t$$

Coefficients	Small	Large	Small + Value	Small + Growth	Large + Value	Large + Growth
Intercept	0.1%	0.6%	-0.1%	0.2%	0.6%	-0.2%
p-value	0.8177	0.2340	0.8163	0.6713	0.2560	0.5564
Dummy for Negative Mkt Returns	0.7%	1.6%	2.1%	2.1%	2.5%	0.5%
p-value	0.4964	0.0661	0.0255	0.0241	0.0049	0.3885

Chapter 6 Conclusion

This paper points out the importance of incorporating quality measure into investment strategies. This can lead to extra returns on top of the popular investment strategies such as value strategy, small-cap growth strategy, and so on. For instance, quality can improve the performance of value strategy because quality measures will additionally enable us to distinguish the stock that is cheap for good reason (by its performance, this is the correct price) from the stock that is undervalued (this stock is very good, but for some reason at this moment of time it is underpriced by investors). So, if we use the joint value and quality strategy, we are expected to get higher returns than the value strategy alone. Also, this paper shows that gross profit per asset is the best quality measure among the profitability ratios since it is subject to less manipulative accounting adjustment than other profitability ratios. Moreover, incorporating quality into investment strategies would help reduce the drop of returns in the market downturn period as well.

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