Momentum strategy based on the timing of 52-week high price: Empirical evidence
from the Stock Exchange of Thailand

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บทคัดย่อและแฟ้มข้อมูลฉบับเต็มของวิทยานิพนธ์ตั้งแต่ปีการศึกษา 2554 ที่ให้บริการในคลังปัญญาจุฬาฯ (CUIR)

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กลยุทธ์แบบตามตลาดโดยอยู่บนพื้นฐานของช่วงเวลาของราคาสูงสุดในรอบ 52 สัปดาห์: หลักฐานเชิงประจักษ์จากตลาดหลักทรัพย์แห่งประเทศไทย

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ปวินท์ ธชทรงธรรม : กลยุทธ์แบบตามตลาดโดยอยู่บนพื้นฐานของช่วงเวลาของราคาสูงสุดในรอบ 52 สัปดาห์: หลักฐานเชิงประจักษ์จากตลาดหลักทรัพย์แห่งประเทศไทย (Momentum strategy based on the timing of 52-week high price: Empirical evidence from the Stock Exchange of Thailand) อ.ที่ปรึกษาวิทยานิพนธ์หลัก: ผศ. ดร.อนิรุต พิเสฏฐศลาศัย, 51 หน้า.

วัตถุประสงค์ของวิทยานิพนธ์ฉบับนี้คือเพื่อศึกษาการทำกำไรโดยใช้กลยุทธ์แบบตามตลาดโดยอยู่บนพื้นฐานของช่วงเวลาของราคาสูงสุดในรอบ 52 สัปดาห์ในตลาดหลักทรัพย์แห่งประเทศไทยตั้งแต่ช่วงเดือนมกราคมปี 2005 ถึงเดือนธันวาคมปี 2015 จากการศึกษาพบว่าหุ้นที่ซื้อขายใกล้วันที่ราคาสูงสุดในรอบ 52 สัปดาห์ สามารถสร้างผลตอบแทนสูงกว่าหุ้นที่ซื้อขายไกลวันที่ราคาสูงสุดในรอบ 52 สัปดาห์อย่างมีนัยสำคัญ อคติต่อราคาสูงสุดในรอบ 52 สัปดาห์จะเพิ่มขึ้นถ้าหุ้นถูกเทรดที่ระดับราคานี้เมื่อไม่นาน นักลงทุนไม่สบายใจที่จะเสนอซื้อที่ราคาสูงขึ้น แต่ถ้าราคาหุ้นทะลุผ่านราคาสูงสุดในรอบ 52 สัปดาห์ จะมีโมเมนตัมให้ราคาหุ้นเคลื่อนไหวไปในทิศทางที่ดีต่อไป

นอกจากนั้นการนำกลยุทธ์แบบตามตลาดโดยอยู่บนพื้นฐานของช่วงเวลาของราคาสูงสุดในรอบ 52 สัปดาห์ ไปใช้ร่วมกับกลยุทธ์แบบตามตลาดโดยอยู่บนพื้นฐานของความใกล้ของราคาปัจจุบันกับราคาสูงสุดในรอบ 52 สัปดาห์ หรือกลยุทธ์การลงทุนแบบเน้นคุณค่า ทำให้การทำกำไรเพิ่มขึ้นอย่างมีนัยสำคัญ เมื่อเปรียบเทียบกับกลยุทธ์แบบตามตลาดโดยอยู่บนพื้นฐานของช่วงเวลาของราคาสูงสุดในรอบ 52 สัปดาห์

ภาควิชา	การธนาคารและการเงิน	ลายมือชื่อนิสิต	
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PAWIN THACHASONGTHAM: Momentum strategy based on the timing of 52-week high price: Empirical evidence from the Stock Exchange of Thailand. ADVISOR: ASST. PROF. ANIRUT PISEDTASALASAI, Ph.D., 51 pp.

The goal of this paper is to study the profitability of momentum strategy based on the timing of 52-week high price in the Stock Exchange of Thailand during the period of January 2005 to December 2015. The results show that stocks that recently achieved the 52-week high price can significantly provide more superior returns than stocks that achieved the 52-week high price in the distant past. The bias agianst 52-week high price will increases if stocks has been traded at this price level shortly. Investors are uncomfortable to bid higher price. But if stock price breaks out 52-week high price, there will be enough momentum to continue the price move in favorable direction.

In addition, combining momentum strategy based on the timing of 52-week high price with both momentum strategy based on the nearness of current price to the 52-week high price and value investing strategy significantly increases the profitability compared to momentum strategy based on the timing of 52-week high price.

ACKNOWLEDGEMENTS

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CHAPTER I

INTRODUCTION

1.1   Background and Problem Review

Efficient markets hypothesis (EMH) states that the current price of an asset reflect all available information. The investors cannot use all available information to beat the market. The weak form of efficient markets hypothesis states that investors cannot use historical prices to gain abnormal return in the long run. Future prices cannot be predicted by using historical prices.

However, several studies have been developed to examine whether the market is efficient or not. In the past two decades, many empirical studies have examined that the returns of stock can be predicted based on past price information. These results may imply that the markets are inefficient.

One of the most well-known trading strategy that based on historical prices and returns is a momentum strategy. Momentum effect is the anomaly in which assets that generate high returns in the past have a tendency to generate high returns in the future. Conversely, assets that generate poor returns in the past have a tendency to generate poor returns in the future. The existence of momentum anomalies over the past decades raise serious questions about the efficient market hypothesis. Starting from Jegadeesh and Titman (1993), they state that investors can earn abnormal return by using investment strategies based on their historical return. They find that buying

stocks with high cumulative 6-month returns and selling stocks with poor cumulative 6-month returns result in returns of about 1.00% per month over intermediate term after controlling size effect and value effect. This strategy is called traditional momentum strategy.

In a later period, George and Hwang (2004) demonstrate that buying stocks that trading close to 52-week high and selling stocks that trading far from 52-week high for the following 6 to 12 months (intermediate-horizons), hereafter GH momentum strategy, could lead to abnormal returns. The rational is that if price achieves 52-week high price, the information finally spread in the market and the price continue moving up. They also compare this strategy with traditional momentum strategy. They find that this strategy outperform traditional momentum strategy. The finding is that investors pay more attention on price levels than past returns.

The explanation behind this trading behaviour is that investors use this level as a decision making point in order to assess the effect of new information. When price goes up along with positive information, investors are not comfortable to buy at higher price because they think that the current price represent high-risk price. As the time pass, the positive information finally spread in the market and the price continue moving up.

Bhootra and Hur (2013) propose an alternative momentum strategy that consider 52-week high price in time dimension, hereafter RR momentum strategy. They document that the bias against 52-week high price is more powerful if stocks achieved

this level more recent, which is known as the recency bias. They show that the stocks that achieved their 52-week high in the recent past generate higher profits than the stocks that achieved their 52-week high in the distant past significantly.

According to prior studies about this psychological bias, this paper draws attention on RR momentum strategy which raises the question whether investors can use this strategy to beat the market. In addition, this paper combines RR momentum strategy with other investment strategies and examine whether it can improve the profitability of those investment strategies.

1.2   Statement of Problem

For the recency of 52-week high price, previous papers mainly study in developed market and the result might suitable to explain the developed countries investor's behaviours. Apart from the previous study in NYSE, AMEX and NASDAQ, there is no evidence to demonstrate the usefulness of timing of 52-week high in the Stock Exchange of Thailand. The more individual investors which are uninformed, the more bias against the reference level. It might not suitable to use previous studies in other countries to explain the investors' behaviour in other countries because different characteristic in each market (e.g. size of the market, investor awareness of risk etc.) may lead to different result.

1.3   Objectives

This paper aims to investigate whether the timing of 52-week high price can generate significant abnormal returns and improve the return in other strategies. There are four main objectives to be addressed in this paper.

The first objective is to examine whether the momentum strategy that considers 52-week high price in time dimension works in the Stock Exchange of Thailand. This paper examines whether the stocks that achieved their 52-week high price more recent can generate higher returns than the stocks that achieved the 52-week high price in the distant past. Moreover, this paper compares RR momentum strategy with GH momentum strategy in term of raw return. To compare between these two strategies, GH measure and RR measure are used to sort stocks into portfolios for GH momentum strategy and RR momentum strategy respectively.

The second objective is to examine whether RR momentum strategy dominate GH momentum strategy or not. Since GH momentum strategy and RR momentum strategy consider 52-week high price in different dimensions. So it leads to the question that which strategy is better, RR momentum strategy that focus on time dimension or GH momentum strategy that focus on price closeness dimension.

The third objective is to examine whether the combination of RR momentum strategy and GH momentum strategy can generate higher profits than using only RR momentum strategy.

Finally, this paper tries to examine whether the combination of RR momentum strategy and Value investing strategy can generate higher profits than using only RR momentum strategy. As the stocks that trading near 52-week high may under-react to the available information, these stock may be traded undervalued. So this paper combines RR momentum strategy with Value investing strategy and examine whether it can generate higher profits than using only RR momentum strategy.

1.4   Contribution

This paper makes three contributions to the literature as follow. Firstly, this paper shows whether a simple strategy that sorted on the timing of 52-week high price (RR momentum strategy) can generate significant raw return and significant abnormal returns in the Stock Exchange of Thailand. Bhootra and Hur (2013) state that because of investors' bias, investors are not comfortable to buy at higher price in order to react to the information that prevails in the market when the stock has been traded at 52-week high price recently. The more individual investors which are uninformed, the more bias against the reference level. Because of large proportion of individual investors relative to institutional investor, it suggests that investors' trading behaviour in Thailand mainly depends on behavioural biases. Since the lack of empirical evidence in Thailand, therefore this paper expands the scope of the previous studies by examining the profitability of this strategy using the stock data from Stock Exchange of Thailand.

Secondly, this paper demonstrates whether RR momentum strategy dominates GH momentum strategy. This paper tries to compare between momentum strategy that considers 52-week high price in time dimension with momentum strategy that considers 52-week high price in price dimension.

Thirdly, this paper shows whether returns to the combination of RR momentum strategy and GH momentum strategy are higher than returns to RR momentum strategy. In addition to using RR momentum strategy alone, combining GH momentum strategy with RR momentum strategy may significantly improve the profitability.

Finally, this paper shows whether returns to the combination of RR momentum strategy and value investing strategy are higher than returns to RR momentum strategy. In addition to using RR momentum strategy alone, combining Value investing strategy with RR momentum strategy may significantly improve the profitability.

1.5   Research Hypothesis

Hypothesis 1: The stocks that achieved their 52-week high price in the recent past can significantly generate higher returns than the stocks that achieved the 52-week high price in the distant past.

The rationale for this research hypothesis is that investors pay attention on the time dimension and consider how long the stocks hit its 52-week high.

Hypothesis 2: RR momentum strategy outperforms GH momentum strategy.

Since GH momentum strategy and RR momentum strategy consider 52-week high price in different dimensions, investors may pay more attention in one dimension.

Hypothesis 3: The stock returns of combination of GH momentum strategy and RR momentum strategy generates are higher than the stock returns of stand-alone strategy (RR momentum strategy).

Considering in one dimension may generate some profits, but combining strategies that consider in different dimension may generate higher returns.

Hypothesis 4: The stock returns of combination of Value investing strategy and RR momentum strategy generates are higher than the stock returns of stand-alone strategy (RR momentum strategy).

Stocks that traded near 52-week high level can be implied that these stocks are traded undervalued because of investors' under-reaction behavior.

CHAPTER II

LITERATURE REVIEW

In this section, this paper presents summarized result from relevant papers. There are four sections classified as follows; (1) Momentum Strategy (2) GH Momentum Strategy (3) RR Momentum Strategy (4) Value Investing

2.1   Momentum Strategy

Momentum effect is the anomaly in which stocks that have superior performance in the past have a tendency to have superior performance in the future. In the opposite way, stocks that generate poor performance in the past have a tendency to generate poor performance in the future. Momentum strategy research started by Jegadeesh and Titman (1993). Their idea is that whether stock prices overreact or underreact to new information, the current price is not correct. Investors can use historical performance to predict future returns. They form portfolio using past performance ranking over the past J months. They sort stocks into decile regarding to their 6-month cumulative returns and measure their following K months. This strategy is called J-month/K-month strategy, investors use past J month to form portfolios and hold portfolios over K months. They examine the strategy by buying stocks that provides superior returns in the past and selling stocks that have bad performance in the past. Using NYSE data, they find that forming portfolio using twelve months period and holding portfolio over three month can generate 1.31 percent per month which is

the highest return among other patterns. Generating significant positive return by using past information, it imply that price momentum is existed in the US market.

2.2   GH momentum strategy

GH momentum strategy was initially introduced by George and Hwang (2004), They use the closeness of the current trading price to the 52-week high price, GH measure, as measurement to form portfolio. They take long (short) position in stocks whose current price is close to (far from) the 52-week high price.

They find that the closeness of current price to 52-week high price can predict the future returns better than 6-month cumulative returns of stocks. Since 52-week high price is the information that everyone can reach, so this study is another interesting evidence that challenges Efficient Market Hypothesis (EMH).

They also find that investors use 52-week high price as as a decision making point in order to assess the effect of new information. When new information lead the price near or to 52-week high price, investors are not comfortable to buy at higher price in order to react to the information that prevails in the market when the stock has been traded at 52-week high price recently. The information finally spreads in the market and the price continue moving up.

Du (2008) examine 52-week high price strategy with the MSCI country indexes. They form the country portfolios with firm-specific risk removed. They demonstrate that momentum strategies and 52-week high price strategy can generate abnormal returns after risk and transaction cost adjustments.

In contrast, Liu, Liu et al. (2011) conduct the tests using GH momentum strategy in 20 markets. They find that this strategy can generate profits in 18 markets out of 20 markets. Moreover, Griffin, Ji et al. (2003) and Chui, Wei et al. (2000) report that using momentum strategy in Taiwan stock market cannot generate significant profits.

2.3   RR momentum strategy

From George and Hwang (2004), investors are not comfortable to buy at higher price in order to react to new information because of the anchoring-and-adjustment bias, although there is positive news eventually prevail. This under-reaction can generate return predictability.

Due to the psychological bias, if investors concern more on information that recently spread in the market, then investors strongly tend to underreact when the stocks achieved their 52-week high price recently. Oppositely, if the stocks achieved their 52-week high price early on during the year.

Bhootra and Hur (2013) propose an alternative momentum strategy based on the timing of 52-week high price. They conduct the test by using U.S. common stocks data to show that stocks which recently achieved 52-week high price generate higher returns than stocks which achieved 52-week high price in the distant past. They called this anomaly as "recency bias", which is the anomaly that investors are not comfortable to buy at higher price in order to react to the information that prevails in the market when the stock has been traded at 52-week high price recently.

Recent studies focus on the profitability of timing of 52-week high price outside the U.S. market. For example, Hao, Chu et al. (2015) demonstrate that this strategy can generate significant abnormal returns in Taiwan stock market.

2.4   Value Investing

Value investing concept initiated by Ben Graham and David Dodd in 1928. The concept is that the stocks are classified as being cheap or expensive based on financial ratios. Basu (1977) discovers that stocks with low P/E ratio (PE) have a propensity for generating higher returns than stocks with higher P/E ratio. Sareewiwatthana (2011) studies the data from Stock Exchange of Thailand and finds that portfolios with low P/E ratio provide higher returns than the market average and outperform portfolios that classified by other financial ratios.
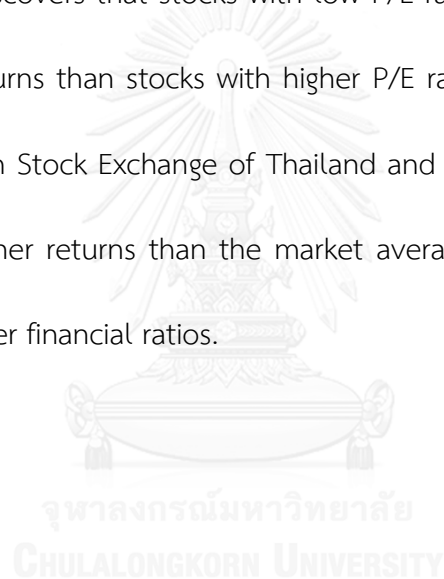
CHAPTER III

DATA

3.1 Sample Selection

The tests in this paper were conducted by using the data of stocks listed on the Stock Exchange of Thailand (SET). The data used in this paper is the data during the period of January 2005 to December 2015. The data is collected from Bloomberg in monthly basis adjusted for stock splits and dividends.

To avoid illiquid and thinly-traded securities, I exclude stocks which have low trading turnover. Trading turnover of each stock is calculated by dividing average daily trading volume by total shares outstanding. Stocks with low trading turnover is defined as stocks that have trading turnover lower than 0.01.

3.2 Data Descriptive

The statistical summary of data including minimum, maximum, average, median, and standard deviation of all monthly data samples used in this paper is represented in Table 1. The return of market is volatile due to the sideway market before Hamburger Crisis and the downward trend in crisis period.

Table 1

Basic descriptive statistics of data

	Count	Min	Max	Average	Median	SD
Market return	120	-0.3007	0.1557	0.0102	0.0190	6.00%
SMB	120	-0.1053	0.0875	-0.0146	-0.0140	3.93%
HML	120	-0.2066	0.0590	-0.0334	-0.0288	6.00%
Risk-free rate	120	0.0021	0.0054	0.0033	0.0032	0.07%

3.3   Measurement

3.2.1   52-Week high price

52-week high price is the highest price that a stock has been traded

during the period of 52-week.

3.2.2   RR measure

RR measure (Recency Ratio) is calculated based on the idea of

Bhootra and Hur (2013). RR measure is considered as a measure that is related

to the investors' timing bias to 52-week high price. RR measure for each stock

can be computed at the end of each month as follows:

$$RR = 1 - \frac{number\ of\ days\ since\ 52\ weeks\ high\ price}{364} \qquad (1)$$

The relationship between RR measure and the number of days since

the 52-week high price is shown in Figure 1.
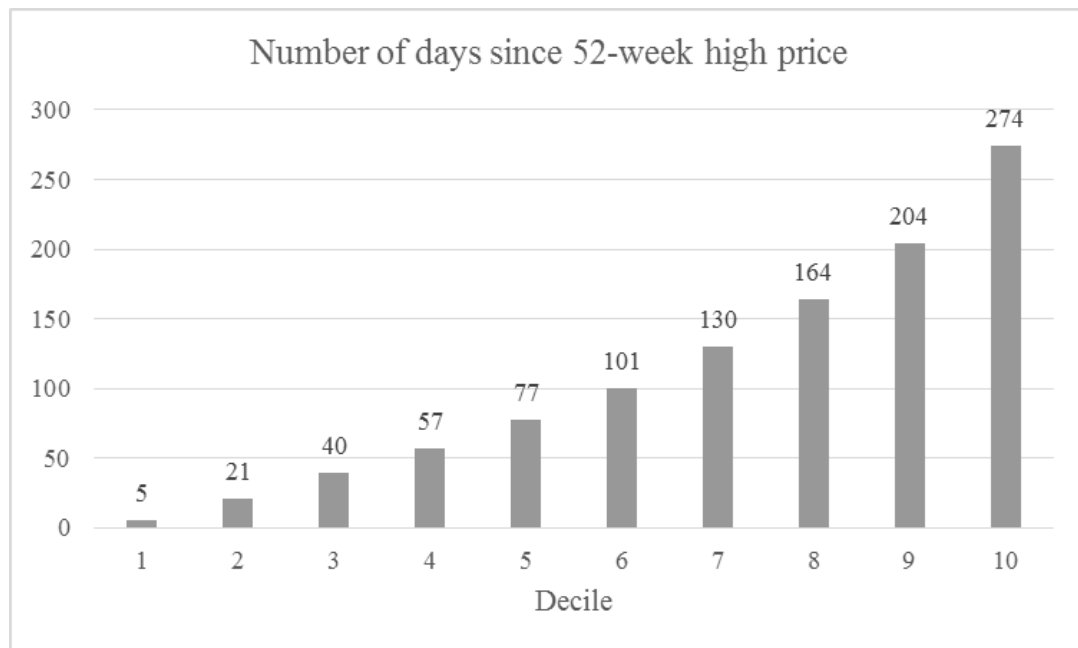
Figure 1 shows the relationship between the recency ratio and the number of days since the 52-week high price.

3.2.3 GH measure

GH measure is a proxy based on the closeness of current price to 52-week high price and is computed by:

$$GH = \frac{current\ price}{52\ week\ high\ price} \qquad (2)$$

3.2.4 Price-to-Earnings ratio (P/E ratio)

Price-to-Earnings ratio or P/E ratio is a measurement used for identifying the valuation of a company which can be calculated by dividing current stock price per share by earning per share. The higher value of P/E ratio indicates that a stock is more expensive than others.

P/E ratio is computed by:

$$Price - to - Earnings\ ratio = \frac{current\ price}{EPS} \qquad (3)$$

3.2.5   Risk-free rate

Risk-free rate is the rate of return an investor expected from a completely risk-free investment over a specified time. This paper uses Thailand six month government bill rate as a risk free rate.

CHAPTER IV

METHODOLOGY

4.1   Portfolio Analysis

RR momentum strategy

This paper forms portfolio using this strategy at the beginning of each month and called it as portfolio formation date. On portfolio formation date, all stocks are sorted on RR measure and separated into 10 deciles. All stocks in the market that pass the criteria mentioned in data section are broadly classified into three groups as you can see from Figure 2.
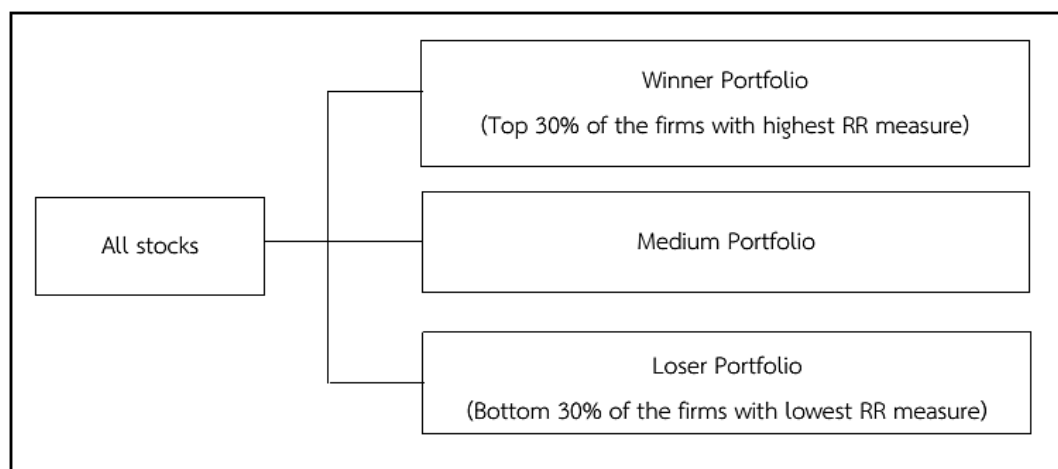

Figure 2 Forming momentum strategy based on RR measure

The momentum portfolios comes from taking a long position in High RR measure portfolio and a short position in the Low RR measure portfolio. The holding period is 6 month. The strategy is to hold this position over month

t + 2 to t + 8. A month skipped between portfolio formation date and holding period is used to decrease bid-ask bounce effect.

Bid price is the price which ones is willing to pay. Ask price is the price which ones is willing to receive in exchange the money with the asset. There is always gap between buy price and ask price. When investors decide to buy stock, investors must pay at ask price which crosses the buy-ask spread and lift up the price. In the same way, if investors decide to sell stock, investors must sell at buy price which also crosses the buy-ask spread and pull down the price. This is what we called the bid-ask bounce effect which will inflate the value of data statistics.

To decrease seasonality effect, the strategy the tests are conducted using average returns of overlapping portfolios. This approach follows Jegadeesh and Titman (1993).

For example, assume that the current period is t, first portfolio is sorted at the beginning of month t – 5, while holding period is between t - 4 to t + 2. Second portfolio is sorted at the beginning of month t - 4, while holding period is between t - 3 to t + 3. Third portfolio is sorted at the beginning of month t – 3, while holding period is between t – 2 to t + 4. Fourth portfolio is sorted at the beginning of month t – 2, while holding period is between t – 1 to t + 5. Fifth portfolio is sorted at the beginning of month t – 1, while holding period is between t to t + 6. Sixth portfolio is sorted at the

beginning of month t, while holding period is between t + 1 to t + 7. Stocks are sorted based on RR measure.

The returns in each particular month are derived from averaging returns from six overlapping portfolios that has been formed during each of the previous five months which are the returns of month t + 1 of each separate portfolio. After the first month of constructing the portfolios, all stocks will be sorted again using the same measure and following the same procedure. Same approach is used to form portfolios at the end of other months.

GH momentum strategy

GH momentum strategy is the strategy that use 52-week high price as a decision making point in order to assess the effect of new positive information initiated by George and Hwang (2004). When positive information lead price of a stock near or to a 52-week high price, investors are not comfortable to buy at higher price in order to react to the information that prevails in the market. The information slowly spreads and the price continue moving up. They document that buying stocks with the highest GH measure and selling stocks with the lowest GH measure for the following 6 to 12 months (intermediate-horizons) could lead to abnormal returns.

This paper forms portfolio using this strategy at the beginning of each month and called it as portfolio formation date. On portfolio formation date, all stocks sorted on GH measure and separated into 10 deciles. All stocks in the market that pass the criteria mentioned in data section are broadly classified into three groups as you can see from Figure 2.
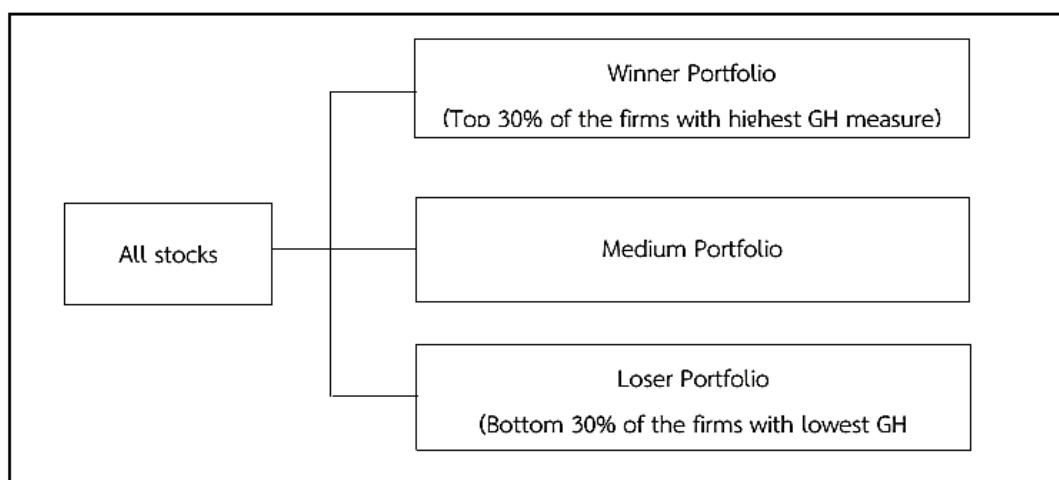
Figure 3 Forming momentum strategy based on GH measure

The return of GH momentum strategy is derived from the same approach as RR momentum strategy.
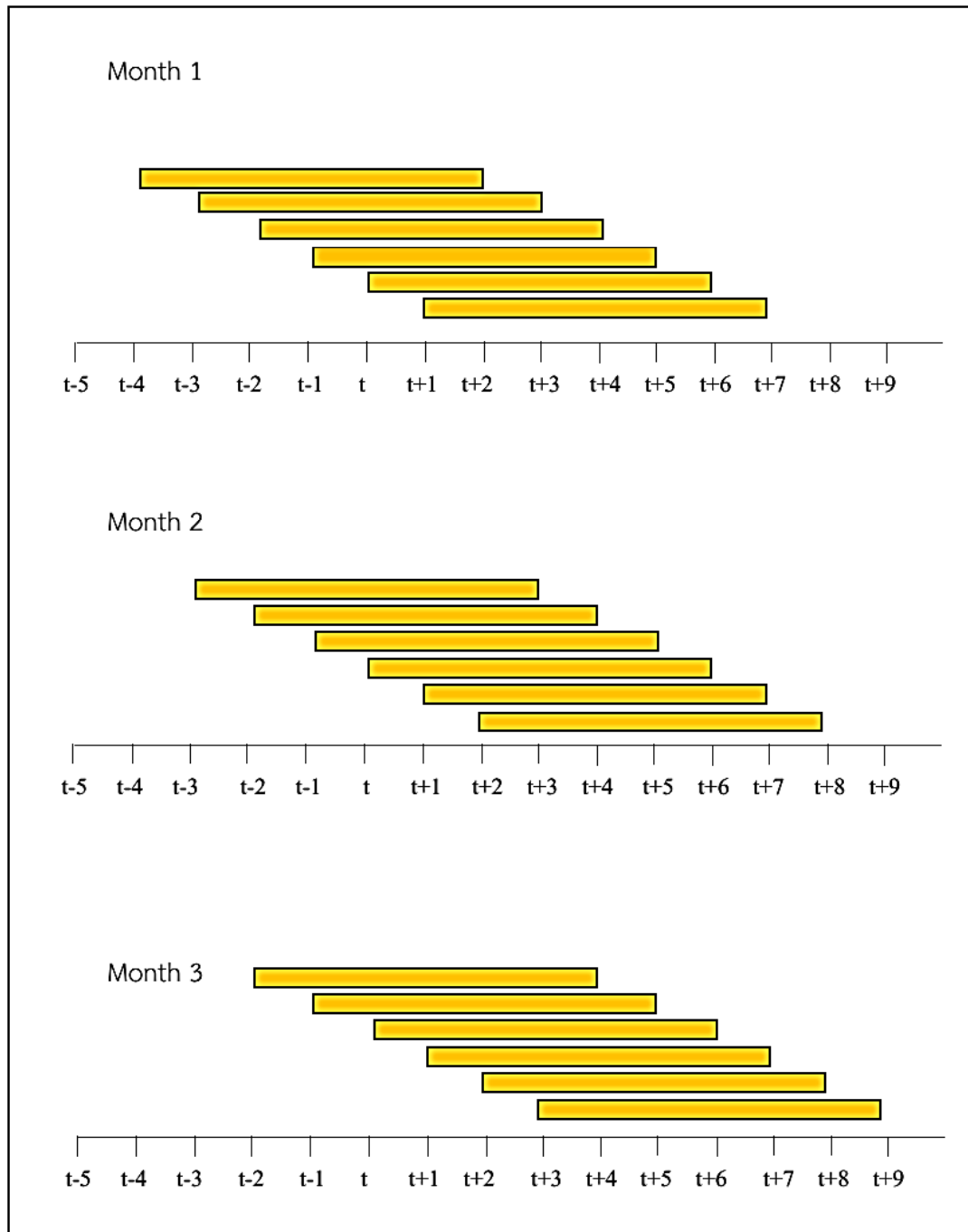
Figure 4 The procedure of forming momentum strategy based on RR measure and GH measure

Combination of RR momentum strategy and GH momentum strategy

Next, this paper try to examine the profitability when combining RR momentum strategy with GH momentum strategy which are the strategies that consider in different dimensions.

This paper forms portfolio using this strategy at the beginning of each month and called it as portfolio formation date. On portfolio formation date, all stocks are classified by RR measure into three groups. To draw reliable inferences, we need to use 30% cutoff to make sure that there are adequate number of stocks in portfolios. The 30% of the stocks with highest RR measure are called high RR portfolio and the 30% of stocks with lowest RR measure are called low RR portfolio. The remaining 40% are medium portfolio. After classifying stocks into three group, the next step is sorting stocks in each group based on GH measure into three portfolios for each group. The return of this combined strategy is derived from the same approach as stand-alone strategy.

Figure 5 The procedure of forming portfolio using combination of RR momentum strategy and GH momentum strategy

<u>Combination of RR momentum strategy and Value investing strategy</u>

On portfolio formation date, all stocks are classified by RR measure into three groups. To draw reliable inferences, we need to use 30% cutoff to make sure that there are adequate number of stocks in portfolios. The 30% of the stocks with highest RR measure are called high RR portfolio and the 30% of stocks with lowest RR measure are called low RR portfolio. The remaining 40% are medium portfolio. After classifying stocks into three group, the next step is sorting the stocks in each group based on P/E ratio into three portfolios for each group. The return of this combined strategy is derived from the same approach as stand-alone strategy.
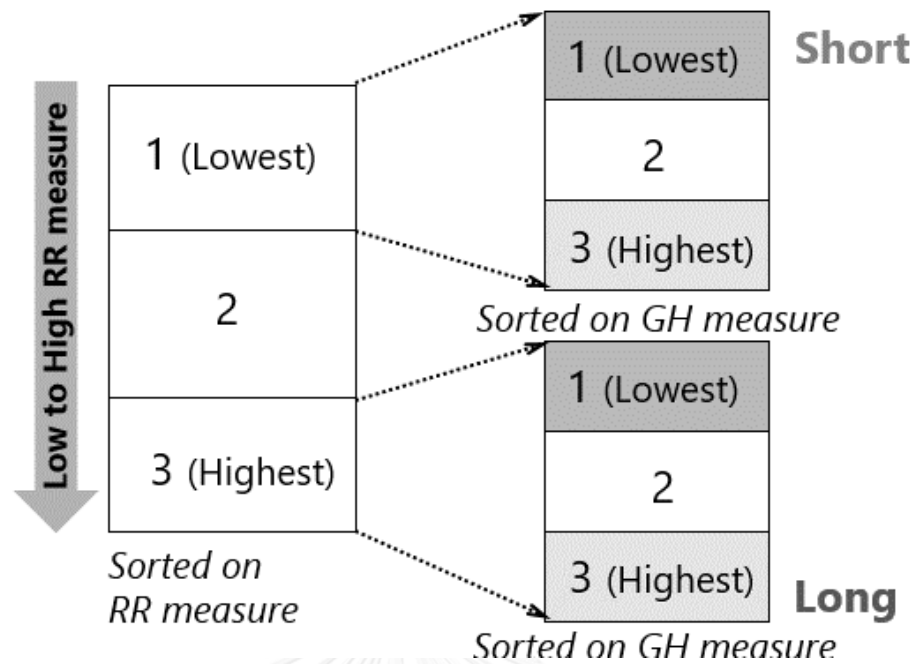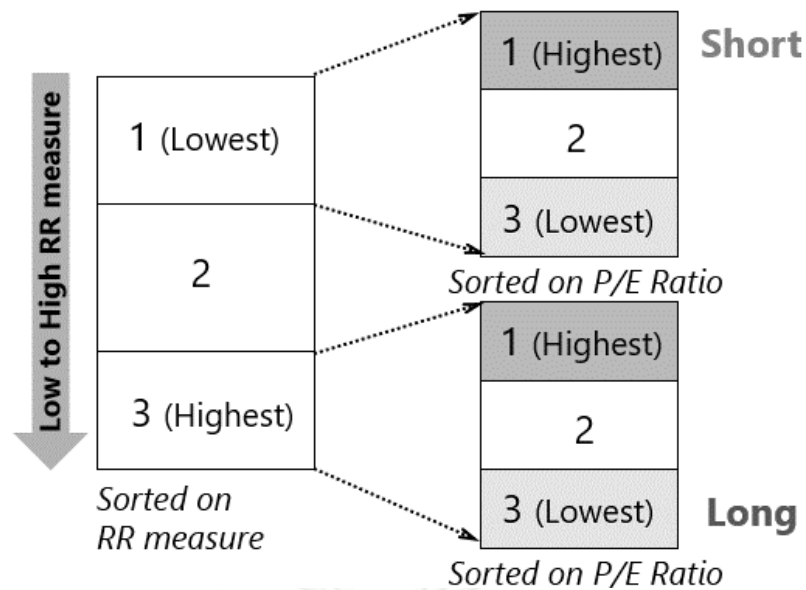
Figure 6 The procedure of forming portfolio using combination of RR momentum strategy and Value investing strategy

4.2 Examining abnormal return of each strategy

To investigate the abnormal returns, time-series regression is applied in this section. The returns used in this equation are in monthly basis.

$$R_{i,t} - R_{ft} = \beta_{1t}(R_{mt} - R_{ft}) + \beta_{2t} \cdot SMB_t + \beta_{3t} \cdot HML_t + \propto_i \qquad (5)$$

Here, $R_{i,t}$ is return of the portfolio that has been formed using the strategies in term of monthly basis, R_{ft} represent risk-free rates at time t, SMB_t is firm size factors at time t, HML_t is value effect factors at time t, and $\propto_i$ is abnormal returns.

This paper examine whether the abnormal return is significantly greater than zero or not. Positive alpha can be imply that momentum profits arise from using the strategy can generate significant abnormal return when controlled for firm size effect and value effect.

4.3   Cross-sectional regression

To consider the explanatory power of each strategy in firm-level, cross-sectional regressions are adapted in this section.

For cross-sectional regression, we consider the regression in the following form (varying j = 2 to j = 7)

$$R_{i,t} = b_{0jt} + b_{1jt}R_{i,t-1} + b_{2jt}Size_{t-1} + b_{3jt}BTM_{t-1} + b_{4jt}GHH_{i,t-j} +$$
$$b_{5jt}GHL_{i,t-j} + b_{6jt}RRH_{i,t-j} + b_{7jt}RRL_{i,t-j} + e_{it} \qquad (6)$$

Here, $R_{i,t}$ is the return on stock i in month t, $R_{i,t-1}$ is the variable use to adjust short-term reversals, $Size_{t-1}$ is used to adjust size effect, BTM_{t-1} is used to adjust book-to-market effect, $RRH_{i,t-j}$ is a dummy variable that equals to 1 if the stock is in portfolio that contains stocks with 30% highest RR measure at the end of month t-j. $RRL_{i,t-j}$ is a dummy variable that equals to 1 if the stock is in portfolio that contains stocks with 30% lowest RR measure at the end of month t-j, $GHH_{i,t-j}$ is a dummy variable that equals to 1 if the stock is in portfolio that contains stocks with 30% highest GH measure at the end of month t-j, and $GHL_{i,t-j}$ is a dummy variable that equals to 1 if the stock is in portfolio that contains stocks with 30% lowest GH measure at the end of month t-j.

In each month t, the average value of the coefficient estimates from six cross-sectional regressions (for j = 2 to j = 7) represent the excess return in month t of strategies, after adjusting the effects of controlling variables.

CHAPTER V

EMPIRICAL RESULTS

5.1   Portfolio Analysis

Beginning from the first objective of this paper, this paper tries to examine whether a simple strategy that sorts on RR measure (RR momentum strategy) can generate statistically significant raw returns and abnormal returns.

The empirical study begins from examining the raw returns of each strategy. The raw returns of two strategies that consider in time dimension and price dimension are shown in Table 1. The portfolios are sorted on GH and RR measures. Group of stocks that contains high GH and RR measures is classified as stocks that tend to generate higher returns. The results suggest the portfolio that contains stocks with highest RR measure generates an average return of 1.41% per month. In the opposite way, the portfolio that contains stocks with lowest RR measure generates an average return of 0.81% per month. The average return from the portfolio that contains stocks with highest RR measure is significantly greater than the average return from the portfolio that contains stocks with lowest RR measure by 0.59% at 99% significant level.

However, as you can see from Figure 7, there is no significant trend by using this strategy through decile 1 portfolio to decile 5 portfolio.

For GH momentum strategy, the results suggest the portfolio that contains stocks with highest GH measure generates an average return of 1.78% per month. In the opposite way, the portfolio that contains stocks with lowest RR measure generates an average return of 0.57% per month.
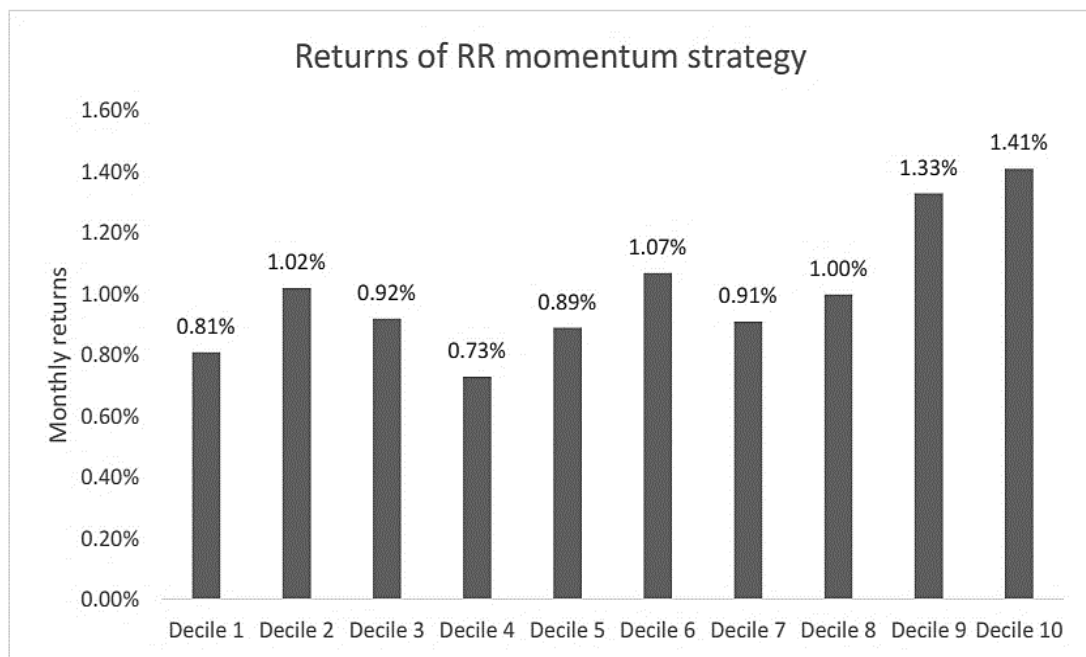
Figure 7 shows an average returns of strategy based on RR measure in monthly basis
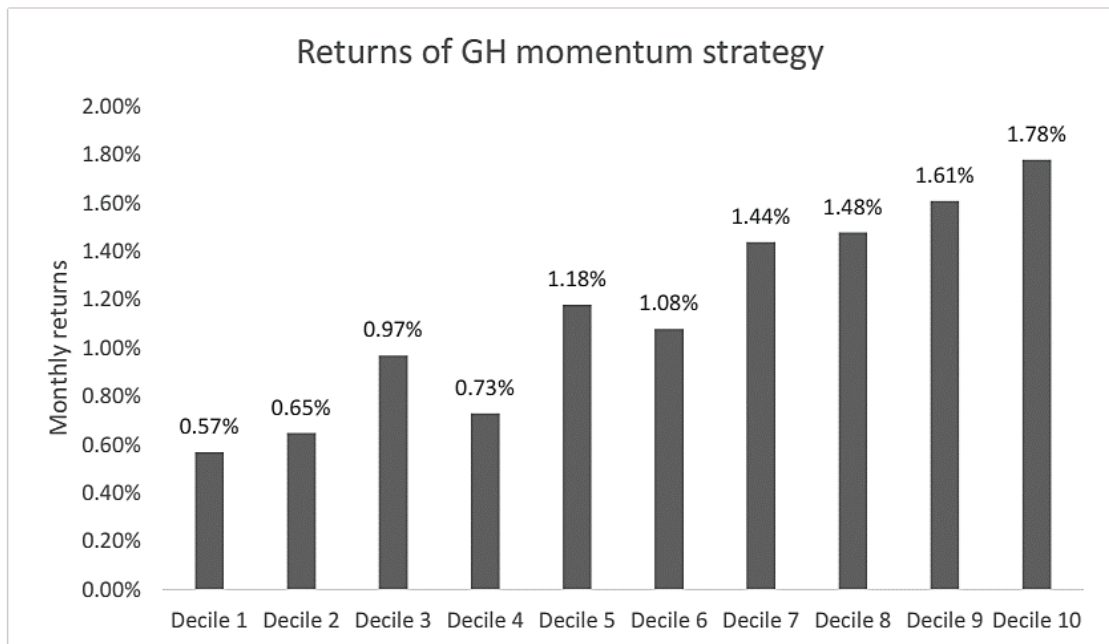
Figure 8 shows an average returns of strategy based on GH measure in monthly basis

To draw reliable inferences, we need to use 30% cutoff to make sure that there are adequate number of stocks in portfolios. The results based on this classification are represented in Table 2, Panel B. High RR measures (GH measures) portfolio consists of 30% of stocks with highest RR measures (GH measures). Low RR measures (GH measures) portfolio consists of 30% of stocks with lowest RR measures (GH measures). Middle RR measures (GH measures) portfolio consists of the rest of sample data.

For RR momentum strategy, the portfolio that contains stock with highest RR measure gains an average returns of 1.24% per month, while the portfolio that contains stock with lowest RR measure gains an average return of 0.92% per month. The result shows that the stocks which relatively achieved 52-week high price recently generate higher raw returns the stocks which achieved the 52-week high price early on during

the past 52-week period significantly. Momentum return comes mainly from portfolio with high RR measure because of high return from the other side. The difference in returns of extreme portfolios is 0.33 which is significant at 99% significant level.

For GH momentum strategy, the portfolio that contains stock with highest GH measure gains an average returns of 1.62% per month, while the portfolio that contains stock with lowest GH measure gains an average return of 0.73% per month. The returns from the portfolio that contains stock with highest GH measure are significantly greater than the returns of the portfolio that contains stock with lowest GH measure by 0.89% at 99% significant level. The results suggest that there is significant evidence that using GH momentum strategy can generate significant raw returns in Stock Exchange of Thailand.
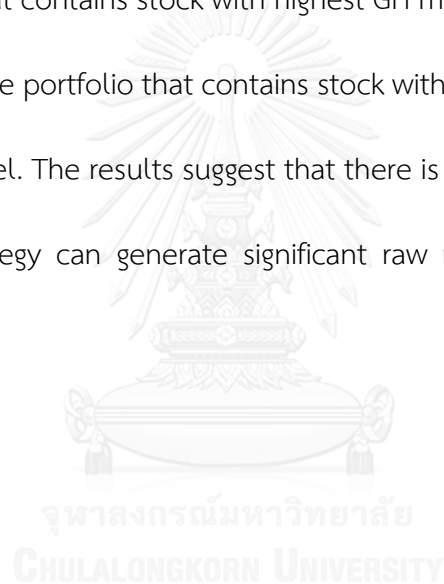
Table 2

Monthly returns of GH and RR portfolios

	GH	RR
Panel A: 10 Portfolios		
Low (L)	0.57	0.81
2	0.65	1.02
3	0.97	0.92
4	0.73	0.73
5	1.18	0.89
6	1.08	1.07
7	1.44	0.91
8	1.48	1.00
9	1.61	1.33
High (h)	1.78	1.41
H - L	1.21***	0.59%***
	(3.94)	(2.85)
Panel B: 3 Portfolios		
L	0.73%	0.92%
2	1.11%	0.90%
H	1.62%	1.24%
H - L	0.89%***	0.33%***
	(4.38)	(2.85)

In each month t from January 2005 to December 2015, stocks are sorted into 10 portfolios for Panel A results and 3 portfolios for Panel B results based on the ratio of current price to 52-week high price (GH) and the recency ratio (RR). The table reports the 6-month average monthly returns from month $t + 2$ month $t + 7$, and the return differences of extreme portfolios. The returns are represented in percent. The numbers in parentheses are t-statistics. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Examining abnormal returns by using GH momentum strategy

Table 3 reports the OLS regression estimates of three-factor model for portfolios using GH momentum strategy. The results show that there are statistically significant abnormal returns by using this stand-alone strategy. The abnormal return when controlled the firm size effect and value effect is 0.01%.

The coefficient of market risk premium suggests that the portfolio that contains stock with highest GH measure tends to pick stocks with higher market risk than loser portfolios. The negative factor loading on SMB identifies in Table 3, Column 3 to Column 5, indicates that all three portfolios tend to pick up large stocks. Moreover, the portfolio that contains stock with highest GH measure tend to consist of stocks with low price-to-book ratio. Importantly, the regression estimation demonstrates that there are excess returns for portfolio that contains stocks with high GH measure. For portfolio that contains stocks with low GH measure, the coefficient of market risk premium suggests that this portfolio tends to pick stocks with less market risk than other portfolios.

Table 3

Examining abnormal return: GH momentum strategy

	VARIABLES	(1) High GH	(2) Middle GH	(3) Low GH	(4) GH H-L
(1)	MKT_PREMIUM	0.04	0.01	-0.02	0.06
		(0.71)	(0.12)	(-0.29)	(1.60)
(2)	SMB	-0.03	-0.04	-0.11	0.07
		(-0.43)	(-0.48)	(-1.06)	(1.37)
(3)	HML	0.05	-0.00	0.03	0.02
		(0.63)	(-0.04)	(0.25)	(0.42)
(4)	Constant	0.02***	0.01*	0.00	0.01***
		(3.84)	(1.83)	(0.84)	(2.66)

The observations use in this regression is the data from the period between January 2005 and December 2015. The dependent variable is the difference between portfolio returns using the strategy and risk-free rate. The portfolio is held for six months. The controlling variables are Market risk-premium factor (controlled market risk), SMB factor (controlled size effect), and HML factor (controlled value effect). The results are represented in 4 parts; High GH portfolio (Top 30%), Middle GH portfolio (the 40% rest), Low GH portfolio (Bottom 30%), and the zero-cost portfolio of buying High GH and selling Low GH. The numbers in parentheses are t-statistics. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Examining abnormal returns by using RR momentum strategy

Table 4 reports the OLS regression estimates of three-factor model for portfolios using RR momentum strategy. The results indicate that there is no momentum return by taking long position in the portfolio that contains stock with highest RR measure and short position in the portfolio that contains stock with lowest RR measure. The abnormal return after adjusting firm size effect and book-to-market effect is only -0.01% with t-statistic of -0.87. However, the results suggest that the portfolios using this strategy have a tendency to consist of stocks with low market risk because of the statistically negative coefficient of market risk premium.

For the portfolio that contains stock with highest RR measure, the coefficient of market risk premium shows that the portfolio that contains stock with highest RR measure have a tendency to pick stocks with less market risk. The negative factor loading on SMB identifies that the portfolio that contains stock with highest RR measure tend to pick up large stocks. Moreover, the portfolio that contains stock with highest RR measure tend to consist of stocks with low price-to-book ratio. Importantly, the regression estimation demonstrates that there are excess returns for the portfolio that contains stock with highest RR measure.

For the portfolios that contains stock with lowest RR measure, the coefficient of market risk premium shows that the portfolios that contains stock with lowest RR measure have a tendency to pick stocks with more market risk than the portfolios that contains stock with highest RR measure.

In conclusion, the empirical results in this section demonstrate that there is evidence of momentum effect using either strategy that considers in price dimension or strategy that considers in time dimension in the Stock Exchange of Thailand (in term of raw returns). The explanation behind this effect is that investors may under-react to stock-specific news which is either due to an anchoring bias or due to slow information diffusion. However, RR momentum strategy cannot generate abnormal returns after adjusting market risk premium, size premium, and value premium. On the other hand, GH momentum strategy can generate abnormal returns.

Table 4

Examining abnormal return: RR momentum strategy

	VARIABLES	(1) High RR	(2) Middle RR	(3) Low RR	(4) RR H-L
(1)	MKT_PREMIUM	0.04	-0.02	-0.02	-0.02*
		(0.71)	(-0.31)	(-0.29)	(0.65)
(2)	SMB	-0.03	-0.11	-0.11	0.02
		(-0.43)	(-1.26)	(-1.06)	(0.51)
(3)	HML	0.05	0.00	0.03	-0.05
		(0.63)	(0.03)	(0.25)	(1.21)
(4)	Constant	0.02**	0.01	0.00	-0.01
		(3.84)	(1.12)	(0.84)	(-0.87)

The observations use in this regression is the data from the period between January 2005 and December 2015. The dependent variable is the difference between portfolio returns using the strategy and risk-free rate. The portfolio is held for six months. The controlling variables are Market risk-premium factor (controlled market risk), SMB factor (controlled size effect), and HML factor (controlled value effect). The results are represented in 4 parts; High GH portfolio (Top 30%), Middle GH portfolio (the 40% rest), Low GH portfolio (Bottom 30%), and the zero-cost portfolio of buying High GH and selling Low GH. The numbers in parentheses are t-statistic. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

5.2   Combination of GH momentum strategy and RR momentum strategy

The results in previous section provides the evidence that using either strategy that considers in price dimension or strategy that considers in time dimension are profitable in the Stock Exchange of Thailand. Considering 52-week high price bias in both time dimension and price closeness dimension may generate higher profits than considering only in time dimension.

The next objective of this paper is to examine the profitability of combination strategies of GH momentum strategy and RR momentum strategy. The analysis in this section is to test whether the stock returns of combined strategy are higher than stand-alone strategy (RR momentum strategy).

The empirical study in this section starts from sorting the stocks into three portfolio based on RR measures, then sorting the stocks based on GH measures and examining the profitability of this combined strategy. Table 5 indicates the returns to each of the three RR portfolios (low, middle, high) and difference in returns between these extreme portfolios. High RR measures portfolio consists of 30% of stocks with highest RR measures. Low RR measures portfolio consists of 30% of stocks with lowest RR measures. Middle RR measures portfolio consists of the rest of sample data.

The average monthly returns of GH momentum strategy for the 30% of stocks with the lowest RR measures is 0.86%. The average monthly returns decrease to 0.79% for middle portfolio. Lastly, the average monthly returns decrease to 0.70% for highest RR measures portfolio.

The difference of raw returns between portfolio that consists of stocks with high RR measure and high GH measure and portfolio that consists of stocks with low RR measure and low GH measure is 1.13% which is statistically significant at 99% confidence interval. The result suggests that combining RR momentum strategy with GH momentum strategy can generate significant profits.

Moreover, the difference of raw returns between portfolio that using combined strategy and stand-alone strategy is 0.80% which is statistically significant at 99% confidence level. The result suggest that using combined strategy can improve the return significantly.

In addition, the raw returns to the combination of RR momentum strategy and GH momentum strategy may come from the effect of market risk premium, size premium, and book-to-market premium. So this paper further examine the abnormal returns of this combined strategy.

Table 5

Monthly returns of combined strategy of RR momentum strategy and GH momentum strategy

RR measure	GH measure	Average monthly return
High	High	1.75%
	Low	1.04%
	High – Low	0.70%***
		(2.74)
Middle	High	1.33%
	Low	0.54%
	High – Low	0.79%***
		(3.29)
Low	High	1.48%
	Low	0.62%
	High – Low	0.86%***
		(3.61)
High GH Portfolio (High RR measure) – Low GH Portfolio (Low RR measure)		
	Raw Return	1.13%
		(2.96)
The difference of raw returns between using combination of RR momentum strategy with GH momentum strategy and stand-alone strategy (RR momentum strategy)		
	Raw Return	0.80%
		(3.60)

In each month t from January 2005 to December 2015, stocks listed on Stock Exchange of Thailand are independently sorted into three portfolios (Low, Middle, and High with Low and High obtained using 30% cutoffs) based on GH measure and RR measure. GH measure is the ratio of current price to 52-week high price, and RR measure is the recency ratio that equals [1 - (current date - date of 52-week high)/364]. For each of the three RR portfolios, the table reports the average monthly returns of High RR portfolio and Low RR portfolios from month t + 2 month t + 7. The numbers in parentheses are t-statistics. *** p<0.01, ** p<0.05, * p<0.1

Table 6

Examining abnormal return: Combination of RR momentum strategy and GH momentum strategy

	VARIABLES	(1) High RR	(2) Middle RR	(3) Low RR	(4) High GH and High RR – Low GH and Low RR
(1)	MKT_PREMIUM	0.04	0.07	0.03	0.03
		(1.01)	(1.71)	(0.90)	(0.71)
(2)	SMB	0.01	0.12*	-0.01	-0.01
		(0.31)	(1.92)	(-0.01)	(-0.21)
(3)	HML	0.05	0.03	-0.02	0.01
		(0.74)	(0.44)	(-0.29)	(0.10)
(4)	Constant	0.01*	0.01**	0.00	0.01***
		(1.87)	(2.10)	(1.05)	(2.71)

The observations use in this regression is the data from the period between January 2005 and December 2015. The dependent variable is the difference between portfolio returns using the strategy and risk-free rate. The portfolio is held for six months. The controlling variables are Market risk-premium factor (controlled market risk), SMB factor (controlled size effect), and HML factor (controlled value effect). The results are represented in 4 parts; High RR portfolio (Top 30%), Middle RR portfolio (the 40% rest), Low RR portfolio (Bottom 30%), and the portfolio of buying High GH and High RR and selling Low GH and Low RR. The numbers in parentheses are t-statistics. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 6 presents the OLS regression estimates of three-factor model for High RR, Low RR, and momentum portfolios using combined strategy of RR momentum strategy and GH momentum strategy. The results indicate that there are significant momentum returns by taking long position in portfolio that consists of stocks with high RR measure and high GH measure and short position in portfolio that consists of stocks with low RR measure and low GH measure.

Overall, it can conclude that using the combination of RR momentum and GH momentum strategy can generate significant profits which are higher than using only RR momentum strategy.

5.3   Combination of Value investing strategy and RR momentum strategy

The concept of momentum investing and Value investing are well-established empirical anomaly in the academic finance literature. Value investing strategy is the strategy used to search for the stocks which are undervalued. Previous studies demonstrate the evidence that the value and momentum investment strategies can generate superior returns. To combine these strategies together is to search for the stocks that are undervalued and have solid momentum effect. Again, investors may get more benefits if the combination of two strategies can generate better returns than the stand-alone strategy.

In this section, we try to examine the profitability of combination strategies of Value investing strategy and RR momentum strategy. The analysis in this section is to test whether the stock returns of combined strategy are higher than stand-alone strategy (RR momentum strategy).

The empirical study in this section starts from sorting the stocks into three portfolio based on RR measures, then sorting the stocks based on Price-to-Earnings ratio and examining the profitability of this combined strategy. Table 7 indicates the returns to each of the three RR portfolios (low, middle, high) and difference in returns

between these extreme portfolios. High RR measures portfolio consists of 30% of stocks with highest RR measures. Low RR measures portfolio consists of 30% of stocks with lowest RR measures. Middle RR measures portfolio consists of the rest of sample data.

The average monthly returns of Value investing strategy for the 30% of firms with the lowest RR measures is 1.04%. The average monthly returns decrease to 1.04% with t-statistic of 6.24 for middle portfolio. Lastly, the average monthly returns decrease to 1.06% with t-statistic of 5.91 for highest RR measures portfolio.

The difference of raw returns between portfolio that consists of stocks with high RR measure and low P/E Ratio and portfolio that consists of stocks with low RR measure and high P/E Ratio is 1.40% which is statistically significant at 99% confidence interval. The result suggests that combining RR momentum strategy with Value investing strategy can generate significant profits.

Moreover, the difference of raw returns between portfolio that using combined strategy and stand-alone strategy is 1.00% which is statistically significant at 99% confidence level. The result suggest that using combined strategy can improve the return significantly.

In addition, the raw returns to the combination of RR momentum strategy and GH momentum strategy may come from the effect of market risk premium, size

premium, and book-to-market premium. So this paper further examine the abnormal returns of this combined strategy.

Table 8 presents the OLS regression estimates of three-factor model for portfolio that contains stocks with low RR measure, portfolio that contains stocks with high RR measure, and momentum portfolios using combined strategy of RR momentum strategy and Value investing strategy. The results indicate that there are significant momentum returns by taking long position in portfolio that consists of stocks with high RR measure and low P/E ratio and short position in portfolio that consists of stocks with low RR measure and high P/E ratio.

Overall, it can conclude that using the combination of RR momentum and Value investing strategy can generate significant profits which are higher than using only RR momentum strategy.

Table 7

Monthly returns of combined strategy of RR momentum strategy and Value investing strategy

RR measure	PE Ratio	Average monthly return
High	Low	1.95%
	High	0.89%
	Low – High	1.06%***
		(5.91)
Middle	Low	1.61%
	High	0.57%
	Low – High	1.04%***
		(6.24)
Low	Low	1.52%
	High	0.55%
	Low – High	1.04%***
		(4.60)
Low PE Ratio (High RR) – High PE Ratio (Low RR)		
	Raw Return	1.40%
		(3.78)
The difference of raw returns between using combination of RR momentum strategy with Value investing strategy and stand-alone strategy (RR momentum strategy)		
	Raw Return	1.00%
		(1.56)

In each month t from January 2005 to December 2015, stocks listed on Stock Exchange of Thailand are independently sorted into three portfolios (Low, Middle, and High with Low and High obtained using 30% cutoffs) based on P/E ratio and RR. P/E ratio is the ratio of current price to earnings per share, and RR is the recency ratio that equals [1 - (current date - date of 52-week high)/364]. For each of the three RR portfolios, the table reports the average monthly returns of portfolio that contains stocks with low P/E ratio and portfolio that contains stocks with high P/E ratio portfolios from month t + 2 month t + 7, and the return differences of extreme portfolios. The returns are represented in percent. The t-statistics are reported in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 8

Examining abnormal return: Combination of RR momentum strategy and Value investing strategy

	VARIABLES	(1) High RR	(2) Middle RR	(3) Low RR	(4) High RR and Low P/E – Low RR and High P/E
(1)	MKT_PREMIUM	0.02	-0.06**	0.02	-0.00
		(0.64)	(-2.18)	(0.52)	(-0.12)
(2)	SMB	-0.01	-0.09**	-0.01	-0.04
		(-0.05)	(-2.15)	(-0.07)	(-0.63)
(3)	HML	0.02	0.01	0.11*	0.06
		(0.45)	(0.11)	(1.74)	(0.98)
(4)	Constant	0.01***	0.01**	0.01***	0.02***
		(3.12)	(2.40)	(3.23)	(5.56)

The observations use in this regression is the data from the period between January 2005 and December 2015. The dependent variable is the difference between portfolio returns using the strategy and risk-free rate. The portfolio is held for six months. The controlling variables are Market risk-premium factor (controlled market risk), SMB factor (controlled size effect), and HML factor (controlled value effect). The results are represented in 4 parts; High RR portfolio (Top 30%), Middle RR portfolio (the 40% rest), Low RR portfolio (Bottom 30%), and the portfolio of buying High RR and Low P/E and selling Low RR and High P/E. The numbers in parentheses are t-statistic. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

5.4   **Cross-sectional regressions**

To consider the profitability of the momentum strategies in firm-level, cross-sectional regressions are adapted in this section.

Table 9 shows the results from estimation of the regression specification. The results indicate the absent of short-term return reversals: the coefficient on past month returns are significantly positive. There is significant evidence of negative relationship between firm size and return. There is significant evidence of momentum for winners based on GH measures but the winners based on RR measure have weak positive returns. For loser portfolios, the returns are also insignificant for both portfolios based on GH measures and RR measures. The return to the winner minus loser hedge portfolio using momentum strategy based on the timing of 52-week high price is -0.0005% per month which is not statistically significant at 95% confidence level.

In summary, the results show that after hedging for all controlling variables, the factor loading that represents GH momentum strategy and the factor loading that represents RR momentum strategy do not explain the return of stocks. The controlling variables explained most of the stock returns.

Table 9

Cross-sectional regression: Explanatory power of each strategy

		Raw return
(1)	Intercept	0.06***
		(4.73)
(2)	$R_{i,t-1}$	0.03*
		(1.76)
(3)	$Size_{t-1}$	-0.01***
		(-2.77)
(4)	BTM_{t-1}	-0.02***
		(-5.90)
(5)	GHH	0.01
		(1.82)
(6)	GHL	0.00
		(0.42)
(7)	RRH	0.00
		(0.83)
(8)	RRL	0.00
		(1.10)
(9)	GHH - GHL	0.01
		(0.87)
(10)	RRH - RRL	0.00
		(0.75)

In each month t from January 2005 to December 2015, six (j = 2 to j = 7) cross-sectional regressions of the following form are estimated for stocks listed on Stock Exchange of Thailand: $R_{i,t} = b_{0jt} + b_{1jt}R_{i,t-1} + b_{2jt}Size_{t-1} + b_{3jt}BTM_{-1t} + b_{4jt}GHH_{i,t-j} + b_{5jt}GHL_{i,t-j} + b_{6jt}RRH_{i,t-j} + b_{7jt}RRL_{i,t-j} + e_{it}$, $R_{i,t}$ is the return on stock i in month t, $R_{i,t-1}$ is the variable use to adjust short-term reversals, $Size_{t-1}$ is used to adjust size effect, BTM_{t-1} is used to adjust book-to-market effect, $RRH_{i,t-j}$ is a dummy variable that equals to 1 if the stock is in portfolio that contains stocks with 30% highest RR measure at the end of month t-j. $RRL_{i,t-j}$ is a dummy variable that equals to 1 if the stock is in portfolio that contains stocks with 30% lowest RR measure at the end of month t-j, $GHH_{i,t-j}$ is a dummy variable that equals to 1 if the stock is in portfolio that contains stocks with 30% highest GH measure at the end of month t-j, and $GHL_{i,t-j}$ is a dummy variable that equals to 1 if the stock is in portfolio that contains stocks with 30% lowest GH measure at the end of month t-j. In each month t, the average value of the coefficient estimates from six cross-sectional regressions (for j = 2 to j = 7) represent the excess return in month t of strategies, after adjusting the effects of controlling variables. The t-statistics are reported in parentheses.

CHAPTER VI

CONCLUSIONS

The goal of this paper is to examine whether the momentum strategy based on the timing of 52-week high price can generate significant profits in the Stock Exchange of Thailand and to examine whether using the combination of RR momentum strategy and GH momentum strategy and the combination of RR momentum strategy and Value investing strategy can generate higher return than using only RR momentum strategy.

The tests in this paper were conducted by using the data of stocks listed on the Stock Exchange of Thailand (SET) during January 2005 to December 2015. To analyze the profitability of the both stand-alone strategy and combined strategy, the tests were conducted by taking a long position in stocks with recent 52-week high price and a short position in stocks with distant 52-week high price. This paper also investigates the momentum profits by controlled the firm size and book-to-market ratio using Fama-French three-factor model.

First, the results show that stocks that achieved the 52-week high price in recent past significantly generate higher returns than stocks that achieved the 52-week high price in distant past. The winner portfolios which consist of top 30% of the stocks with the most recent 52-week high price significantly outperform the loser portfolios

which consist of bottom 30% of the stocks with most distant 52-week high price by 0.33% per month. However, the momentum strategy based on the timing of 52-week high price does not dominate the momentum strategy based on the closeness of 52-week high price. In addition, there is no momentum profits by using this strategy.

Second, this paper also conduct the test by combining momentum strategy based on the timing of 52-week high price with momentum strategy based on the closeness of 52-week high price. The result exhibits that the profitability of using the combination of momentum strategy based on the closeness of current price to the 52-week high price and momentum strategy based on the timing of 52-week high price can generate significant raw returns which are also significantly higher than using stand-alone strategy.

Thirdly, there is additional improvement when combining the momentum strategy based on the timing of 52-week high price with Value investing strategy. The result exhibits that the profitability of using the combination of Value investing strategy and momentum strategy based on the timing of 52-week high price can generate significant raw returns which is also significantly higher than using stand-alone strategy.

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APPENDIX

VITA

Pawin Thachasongtham holds Bachelor of Engineer (Industrial Engineer) from Chulalongkorn University in Bangkok. Influenced by Warren Buffet's philosophy, Pawin displayed an interest in investing during his study in bachelor degree. He is also a co-founder of Intania Finance and Investment Club. By the time he finished bachelor degree, he enrolled the Master of Science in Finance (MSF) Program at Chulalongkorn University in 2015. He has passed Level 1 of CFA Examination in 2014. He is also being Level 2 candidate in CFA Program (June 2016). He would like to pursue his career path in asset management field after graduate from the master degree.