The Role of Return Dispersion in Momentum Profit
A Study in the Thai Stock Market

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บทบาทของการกระจายตัวของผลตอบแทนของหุ้นต่อกลยุทธ์การลงทุนโมเม้นตั้ม ในตลาดหลักทรัพย์ไทย

น.ส.ชนัญย์ชิตา วัชรวสุนธรา

สารนิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตรมหาบัณฑิต
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ชนัญย์ชิตา วัชรวสุนธรา : บทบาทของการกระจายตัวของผลตอบแทนของหุ้นต่อกลยุทธ์การลงทุนโมเม้นตั้มในตลาดหลักทรัพย์ไทย. (The Role of Return Dispersion in Momentum ProfitA Study in the Thai Stock Market) อ.ที่ปรึกษาหลัก : อ. ดร.ธนวิต แซ่ซือ

งานวิจัยนี้ได้ศึกษาผลกระทบของการกระจายตัวของผลตอบแทนตลาด ต่อความสามารถในการทำกำไรของกลยุทธ์การลงทุนแบบโมเมนตัมในตลาดหลักทรัพย์แห่งประเทศไทย (SET) โดยงานวิจัยนี้ได้ศึกษาความสัมพันธ์ของการกระจายตัวของผลตอบแทนในช่วงเวลาหนึ่งกับช่วงเวลาถัดไป พบว่ามีความสัมพันธ์ที่เป็นบวกและต่อเนื่อง กล่าวคือการกระจายตัวสูงในช่วงเวลาหนึ่งส่งผลให้การกระจายตัวสูงในช่วงเวลาถัดไป ซึ่งผู้วิจัยเชื่อว่าจะทำให้ผู้ลงทุนสามารถสร้างกำไรจากกลยุทธ์การลงทุนแบบโมเมนตัมได้ นอกจากยังยืนยันว่าการกระจายของผลตอบแทนอย่างต่อเนื่องและเป็นบวกนั้น ไม่ได้เกิดจาการสลับตำแหน่งของหุ้นในช่วงเวลาติดกัน การวิจัยยังประเมินประสิทธิภาพของกลยุทธ์โมเมนตัมที่แตกต่างกัน ได้แก่ กลยุทธ์โมเมนตัมแบบดั้งเดิม, กลยุทธ์โมเมนตัมแบบกระจายน้ำหนักของการกระจายตัวของผลตอบแทน และกลยุทธ์โมเมนตัมในเวลาที่มีการกระจายตัวของผลตอบแทนสูง ซึ่งพบว่ากลยุทธ์โมเมนตัมแบบกระจายน้ำหนักมีประสิทธิภาพที่สูงที่สุด แต่เมื่อเทียบกับการลงทุนในตลาดหลักทรัพย์แห่งประเทศไทย (SET) นั้น กลยุทธ์โมเมนตัมแบบกระจายน้ำหนักอาจจะไม่ได้ให้ผลตอบแทนที่ดีที่สุด

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This study investigates the influence of market return dispersion on the profitability of momentum investment strategies within the Stock Exchange of Thailand (SET). Employing an analytical approach, the research identifies a significant and persistent pattern of return dispersion in the Thai stock market. This pattern is characterized by a strong positive correlation between the dispersion of returns in a given period and the subsequent period, as confirmed by a significant autoregressive coefficient and the Dickey-Fuller test. Additionally, the study explores the performance consistency of top-performing stocks during periods of high and low dispersion, using transition matrices and the Chi-squared test. The results indicate a notable stability in the probability of stocks maintaining their performance rankings, regardless of market return dispersion. Furthermore, the study assesses the effectiveness of various momentum strategies – Traditional Momentum, Weighted Dispersion Momentum, and High Dispersion Momentum – considering the return dispersion factor. The Weighted Dispersion Momentum strategy emerges as the most effective, offering the highest returns with the lowest volatility. However, the analysis reveals that during the period under examination, investing solely in the SETTRI would have been the most advantageous strategy. This finding underscores the significance of evaluating momentum strategies against benchmark indices to determine their relative effectiveness. The study concludes that integrating the concept of market return dispersion into momentum strategies can significantly enhance portfolio performance in the Thai stock market, but this approach may not always surpass the returns of a well-established benchmark like the SETTRI.

Field of Study:	Finance	Student's Signature .....
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Chanunchita Watcharavasunthara

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CHAPTER 1: INTRODUCTION

The study of momentum in stock returns has a long history, with Jegadeesh and Titman (1993) being among the first to document the presence of momentum in stock returns. They found that a zero-cost portfolio long in recent winner stocks and short in recent loser stocks generated statistically significant and economically meaningful payoffs. Subsequent studies, including Jegadeesh and Titman (2001), Rouwenhorst (1998), Griffin et al. (2003) have confirmed the robustness of momentum effects in different countries and over different sample periods.

In the past few years, there has been an increase in research on momentum, specifically focusing on examining the correlation between momentum profits and return dispersion. Return dispersion refers to the statistical measure of the variability of returns among individual stocks or disaggregated stock portfolios. The utilization of this metric has been observed among finance researchers and practitioners in order to assess patterns in overall idiosyncratic volatility, the tendency of investors to follow the crowd, uncertainty in macroeconomic conditions, shifts in correlations within the global stock market, an indicator of potential alpha and a substitute for active risk, and as a leading indicator of countercyclical state variables.

In recent years, the research of return dispersion and momentum profit has received increased interest. Numerous studies have examined the persistence of return dispersion and momentum across numerous stock markets. Stivers and Sun (2010) discovered, for instance, that the recent cross-sectional dispersion in stock returns is negatively correlated with the subsequent momentum premium in the United States. While Bulkley and Nawosah (2009) discover that momentum effects disappear in demeaned returns, this finding suggests that the cross-sectional variation of

unconditional expected returns does not entirely explain momentum. In addition, Bhootra (2011) examines whether the absence of momentum in demeaned returns is robust to methodological adjustments that eliminate microstructure biases and recommends that future momentum studies exclude penny stocks. Docherty and Hurst (2018) demonstrate a robust relationship between return dispersion and the momentum premium, and that a conditional momentum strategy, which adjusts the unconditional strategy based on return dispersion, outperforms the unconditional strategy in all regions (Australia, Hong Kong, New Zealand, and Singapore, Austria, Belgium, Switzerland, Germany, Denmark, Spain, Finland, France, Great Britain, Greece, Ireland, and the Netherlands), These results demonstrate the significance of considering return dispersion when analyzing momentum in stock returns.

In this paper differs substantially from earlier studies. The objective of this study is to provide a mechanism for stock return dispersion leading to momentum profit in the Thai stock market by verifying relevant characteristics of return dispersion in Thai stock market. The research study is centered on the following: (1) investigating whether high dispersion in one period is followed by high dispersion in the next period; (2) examining if during consecutive periods of high market return dispersion, out-performing stocks continue to out-perform the market or become under-performers; and (3) determining whether market return dispersion correlates with momentum profit and whether incorporating market return dispersion into the momentum portfolio can improve portfolio return performance.

In conclusion, this study aims to provide further insights into the persistence of return dispersion in the Thai stock market and its potential impact on momentum investing by using an autocorrelation approach and examining the potential effects of

stock switching. The results of this study will be of interest to investors and policymakers, as they will provide valuable information on the behavior of the Thai stock market and the effectiveness of momentum investing strategies in this market.

CHAPTER 2: LITERATURE REVIEW

2.1 Momentum

Jegadeesh and Titman (1993) documented the presence of momentum in stock returns, where a zero-cost portfolio of recent winner stocks and short in recent loser stocks generates statistically significant and economically meaningful returns. This study has been followed by several subsequent studies that have found robust momentum effects over different sample periods and in several different countries.

Despite the widespread acceptance of momentum effects, there is still much debate about what drives momentum. A potential risk-based explanation of momentum is that it is attributed to the cross-sectional dispersion in unconditional expected stock returns (Conrad & Kaul, 1998). However, the empirical evidence suggests that neither the Capital Asset Pricing Model (CAPM) nor the Fama-French three-factor model of Fama and French (1996) can explain the profitability of momentum strategies.

Several behavioral models have been proposed to explain momentum. Barberis et al. (1998), Daniel et al. (1998), and Hong and Stein (1999) suggest that behavioral patterns underlie the models, with a focus on the imperfect formation and revision of expectations of investor in response to fresh information. The empirical supporting these models includes the fact that momentum profits are associated with several characteristics that are not typically associated with priced risk in conventional models of expected returns, such as the coexistence of return momentum with earnings momentum, the presence of momentum in stocks with high turnover Lee and Swaminathan (2000), and the prevalence of momentum in small firms with low analyst coverage (Hong et al., 2000).

Despite all these efforts, the precise source of momentum remains unclear. Jegadeesh and Titman (1993) show that momentum is not driven by market risk, and Fama and French (1996) demonstrate that their unconditional three-factor model cannot explain momentum either. Grundy and Martin (2001) find that conditional exposure to three-factor risk does not solve the momentum puzzle. Conrad and Kaul (1998) believe that cross-sectional dispersion in expected returns can define momentum, but this impact is not powerful enough to fully observed momentum. Jegadeesh and Titman (2001) present evidence that U.S. momentum returns quickly dissipate after the investment period, which make it hard to comply with standard principles of priced financial risk. Chordia and Shivakumar (2002) conclude that U.S. momentum profits are completely explainable using one-step-ahead forecasts projected onto lagged macroeconomic variables.

2.2 Stock Market Dispersion

The relationship between the dispersion of stock returns and various dimensions of risk has been of great interest to finance researchers. The cross-sectional dispersion of stock returns, also known as return dispersion, refers to the variability in returns across different equities and can provide significant insight into the state of the stock market and the economy.

Previous research in this area focused mainly on the US stock market and identified a correlation between the cross-sectional dispersion of stock returns and macroeconomic variables. For instance, Christie and Huang (1995) concluded that during market downturns, the dispersion of returns tends to increase due to the varying sensitivities of individual assets to market returns, according to rational asset

pricing models. Loungani et al. (1990) found that the cross-sectional dispersion of stock returns predicted high unemployment rates, supporting the sectoral shifts' hypothesis that a higher dispersion of inter-sectoral stock price growth leads to higher unemployment.

Other studies have investigated the connection between the cross-sectional dispersion of stock returns and future returns, with mixed results. While Maio (2016) found a negative correlation between the cross-sectional dispersion of stock returns and future returns for the US market, Garcia et al. (2014) found a positive correlation between the two. Similarly, return dispersion seems related to asset pricing factors, with Stivers and Sun (2010) finding a positive association between the cross-sectional dispersion of stock returns and the value premium, and a negative association with the momentum premium.

Empirical evidence also suggests that return dispersion is related to changes in economic states, uncertainty shocks, and business cycles. For example, Jiang (2010) showed that periods during major technology shocks result in extremely high return dispersion, while Bekaert and Harvey (2000) suggested that increased reliance on particular sectors in a developing economy would decrease cross-sectional return dispersion.

Researchers have also investigated the predictive power of the cross-sectional dispersion of stock returns for various outcomes, with mixed results. Angelidis et al. (2015) demonstrated that return dispersion accurately predicted the time-variation of stock market returns, volatility, and the value and momentum premia exhibited in the cross-section of stock returns. Connolly and Stivers (2003) found that a high

dispersion in a given week was related to momentum in stock index returns in the weeks that followed.

Moreover, several studies, including those by Johnson (2002) and Sagi and Seasholes (2007), have suggested that momentum profits are likely to be procyclical. Additionally, Cooper et al. (2004) have found that momentum profits are dependent on the state of the market in a procyclical manner. Stivers and Sun (2010) have linked the variation in momentum profits to the market's cross-sectional return dispersion, which they view as a leading counter-cyclical state variable in accordance with Gomes et al. (2003) and Jiang et al. (2005). These findings are consistent with earlier research by Chordia and Shivakumar (2002), Cooper et al. (2004), and Stivers and Sun (2010), which have all demonstrated procyclical variations in momentum profits. The expected momentum profits vary over time, and recent cross-sectional return dispersion has been found to be negatively correlated with subsequent momentum profits, indicating that momentum profits are procyclical. In recessionary periods, loser stocks are affected the most, while winner stocks are affected the least. Conversely, in expansionary periods, winner stocks are affected the most, and loser stocks are affected the least. This asymmetry in returns on momentum portfolios suggests that the reaction of momentum profits to economic conditions is asymmetric in recessionary and expansionary states, leading to strong procyclical time-variations in expected momentum profits. The study's findings are robust to the use of alternative instrumental variables and state-transition probability estimation methods, as well as the assumption of a fat-tailed distribution of stock returns. Finally, the study examines the economic significance of out-of-sample predictability and finds that it is particularly significant for loser stocks during recessionary periods.

Overall, these findings suggest that the cross-sectional dispersion of stock returns can provide valuable information about the state of the stock market and the economy, as well as its potential for predicting future outcomes and asset pricing factors. Further research in this area is needed to better understand the underlying mechanisms and potential applications of return dispersion in finance.

CHAPTER 3: RESEARCH OBJECTIVE

The objective of this study is to provide a mechanism for stock return dispersion leading to momentum profit in the by verifying relevant characteristics of return dispersion in Thai stock market.

The research study is centered on the following:

1. Is high dispersion in one period followed by high dispersion in the next period?
2. During periods of high market return dispersion, do out-performing stocks continue to out-perform the market, or do they switch to be under-performers? In other words, do winners persistently win during high market return dispersion?

The main rationale behind this study is that if returns tend to move in the same direction over time, the dispersion of returns would likely do the same. This study intends to expand our understanding of this area by testing this hypothesis through an empirical research investigation.

The ultimate goal of this study is to use the information regarding the market return dispersion to improve the profit in momentum investment strategy. Thus, the third and final research question is:

3. Does the market return dispersion correlate with momentum profit, and whether incorporating market return dispersion into the momentum portfolio helps improve the portfolio's return performance?

CHAPTER 4: HYPOTHESIS DEVELOPMENT

The stock market is a crucial aspect of any economy, and a better understanding of its behavior can provide valuable insights for investors and policymakers. One of the key characteristics of stock market behavior is the dispersion of returns, which refers to the degree of variation in returns among stocks in a particular market. This study aims to investigate the persistence of return dispersion in the Thai stock market through an autocorrelation approach.

Autocorrelation plays a crucial role in univariate time-series models as these models operate under the assumption that past values of a series can be used to predict future values. Based on a comprehensive examination of prior scholarly investigations pertaining to autocorrelation in stock returns, a diverse array of findings has emerged, encompassing positive, negative, and null autocorrelation.

Poterba and Summers (1988) found that there is a positive correlation between stock returns over short periods and a negative correlation over longer periods, based on data from the NYSE and other countries. They also suggest that the random-walk hypothesis is not valid and that transitory price components play a significant role in the variance of returns. Fama and French (1988) also found a negative serial correlation in long-horizon portfolio returns. Other studies have found different results. Hong and Stein (1999) proposed a model that explains the momentum effect in asset prices, and in this model, they predict that momentum traders will drive stock returns to be positively autocorrelated.

Jain and Xue (2017) calculated return autocorrelation for 43 stock markets, including developed and emerging markets which also includes Thailand, between 1980 and 2013. The results demonstrate that return autocorrelation is significantly

greater in developing markets compared to developed markets. This is due to the fact that the majority of emerging markets enforce a price limit, for example Thailand, enforces price cap and floor prohibiting the trading of price exceeding 30% (and not be less than 0.01 Baht) of the closing price of the securities on the prior trading day. In contrast, the US market has no price limit. Moreover, according to Harvey (1995), autocorrelation is adversely correlated with the market size. Stock/sector concentration is positively correlated with autocorrelation. If the index is dominated by a small number of stocks or is specialized in a certain sector, this will, on average, increase the serial correlation of the returns.

Considering this, the research hypothesis proposed in this study is that there is a positive relationship between the cross-sectional dispersion of returns on the Thai stock market from one period to the next. While previous research, such as Stivers and Sun (2010), has found that cross-sectional dispersion of stock returns is negatively correlated with the subsequent momentum premium, this study takes a different approach by examining whether there is the repetition of cross-sectional dispersion in stock returns over time and whether this repetition may lead to future momentum. The main rationale behind this study is that if returns tend to move in the same direction over time, the dispersion of returns would likely do the same. This study aims to provide further insights into this topic by testing this assumption through empirical research investigation. In order to test if there is a positive autocorrelation in the cross-sectional dispersion of returns on the Thai stock market, the null hypothesis is formulated as:

H_{0a}: There is no positive autocorrelation in the cross-sectional dispersion of returns on the Thai stock market.

According to Conrad and Kaul (1998), purchasing stocks that have performed well in the past using the proceeds from selling stocks that have underperformed is similar to acquiring high-mean securities using the proceeds from selling low-mean securities. They argue that a momentum investment strategy has the potential to be profitable as long as there is dispersion in the mean returns of different securities. However, the study also acknowledges that even if there is high dispersion in the mean returns, a momentum strategy may not be advantageous if past outperforming stocks do not continue to outperform or vice versa. Therefore, if there is no significant pattern of underperforming stocks becoming overperforming or vice versa, this could suggest that the momentum strategy may still be effective.

The continuation of outperformance in the Thai stock market could be explained by retail-driven orders and the presence of substantial asymmetric information. Retail investors, driven by behavioral biases and the fear of missing out (FOMO), may contribute to the persistence of outperformance by following trends and purchasing stocks that have previously performed well. Their collective buying pressure can sustain the upward momentum of these stocks, leading to their continued outperformance.

Moreover, the market's asymmetries in information may also contribute to the continuation of outperformance. Certain investors or organizations may have access to privileged information or insights that are unavailable to the public. This privileged information, which may consist of insider recommendations, expert analysis, or confidential research, enables these investors to make informed investment decisions, which may contribute to the positive performance of certain stocks.

Testing the null hypothesis to determine if there is a substantial pattern of such stock switching is necessary to confirm the viability of the momentum strategy.

H0b: There is statistically significant difference between the diagonal elements and the average of the off-diagonal elements in the transition matrices of the two market dispersion episodes which are high market dispersion and low market dispersion.

In other words, the null hypothesis assumes that the persistence of winners and the likelihood of switching between quintiles are similar in both high and low market dispersion episodes. Rejecting the null hypothesis would indicate that there is a significant difference in the transition patterns between the two episodes, suggesting that winners persistently win during high market dispersion.

In this part, a momentum technique is utilized to investigate the relationship between return dispersion and momentum, as it aligns with the central theme of this article. Previous studies have established a statistical correlation between the dispersion of returns and the momentum premium. (Stivers and Sun (2010); Angelidis et al. (2015)). Consequently, we differentiate between two types of momentum strategies: the traditional momentum strategy and the dispersion-adjusted momentum strategy.

We recognize the potential of market return dispersion to enhance the performance of a momentum strategy. To explore this further, we compare the returns of two distinct portfolios:

Traditional Momentum Strategy: his strategy follows a conventional approach to momentum investing and does not incorporate market return dispersion as a factor in the decision-making process.

Dispersion-Adjusted Momentum Strategy: This strategy incorporates market return dispersion by implementing the momentum strategy only when the market return dispersion is above the median. This approach considers the level of market return dispersion as a signal for determining when to execute the momentum strategy.

We believe that if investors are using return dispersion to make investment decisions, then the returns on the dispersion-adjusted momentum strategy should be higher than those of the traditional momentum strategy.

H0c: There is no significant difference between the returns of the traditional momentum strategy and dispersion-adjusted momentum strategy.

CHAPTER 5: METHODOLOGY

5.1 Cross-sectional return dispersion

I adopt the measure of the cross-sectional return dispersion constructed from individual stocks following Chichernea et al. (2015).

$$RD_{i,t} = \sqrt{\sum_{i=1}^{n} \left(R_{i,t} - \bar{R}_t\right)^2 / (n-1)}$$

Where n denoted is the number of available return observations for listed stock i in Thai Stock Market which cover the period of 2015-2022, $R_{i,t}$ is the return of the individual stock i in week t and $\bar{R}_t$ is the average weekly market return.

It is comparable to the measures proposed by Jiang (2010) and Stivers and Sun (2010), with a few minor differences. By utilizing size and book-to-market portfolios or investigating only the top 90% of NYSE and AMEX-listed stocks, the measures presented by Jiang (2010) and Stivers and Sun (2010) effectively limit return dispersion variation and eliminate potentially helpful information. By using the entire universe of individual stocks, as this measure does, the variation in return dispersion is not minimized and potentially relevant information is not lost. This is for a more thorough and informative analysis of the cross-section of returns on the Thai Stock Exchange. To avoid distorting dispersion measures, all missing and suspended data must be eliminated.

The decision to use weekly data instead of daily data aims to capture more meaningful and stable trends in stock performance. By avoiding the potential noise and reversals in daily stock prices, we can obtain a clearer understanding of persistent patterns and trends. Weekly data reduces the influence of short-term market volatility,

providing a more reliable assessment of cross-sectional return dispersion. This choice ensures that the analysis captures meaningful and stable insights into the persistence of winners and the likelihood of switching between quintiles during high market dispersion in the Thai Stock Market.

The study acknowledges the possibility of adjusting to improve the results. If the analysis using weekly data does not yield satisfactory outcomes or if further insights are needed, alternative time intervals which are bi-weekly or/and monthly data can be considered.

5.2 Autocorrelation

To examine the structure of autocorrelation in the cross-sectional dispersion of Thai stock returns. A regression analysis can be used, where the dispersion in one period is regressed on the dispersion in the previous period. This regression model can be formulated as follows:

$$RD_{i,t} = \beta_{i,0} + \beta_{i,1} RD_{i,t-1} + \varepsilon_{i,t}$$

Where $RD_{i,t}$ and $\varepsilon_{i,t}$ represent the individual return dispersion and regression residuals respectively for week t. The primary interest is on the autoregressive coefficient $\beta_{i,1}$. The average estimate of autocorrelation coefficients can be calculated based on the regression for individual return dispersion. A positive and statistically significant coefficient estimate would support the hypothesis that high dispersion in one period is followed by high dispersion in the next period.

After estimating the regression model as described, it is important to test for the statistical significance of the autoregressive coefficient $\beta_{i,1}$to determine whether the relationship between the dispersion in one period and the previous period is

indeed significant. One statistical test that can be used for this purpose is the t-test, which can be conducted on the coefficient estimate to test the null hypothesis that the coefficient is equal to zero. If the coefficient estimate is found to be statistically significant at a desired level of significance (e.g. 5% or 1%), then we can conclude that there is evidence of a significant relationship between dispersion in one period and the previous period.

5.3 Transition matrix analysis

To answer the question of whether winners persistently win during high market return dispersion, the study first classifies the market dispersion into two groups: "high market dispersion" and "low market dispersion." This classification is based on a specified criterion, such as comparing the dispersion measure to a median value. Stocks with dispersion values above the median are categorized as "high market dispersion," while stocks with dispersion values equal to or below the median are classified as "low market dispersion.

When categorizing market dispersion into “high” and “low”, it is crucial to note that these designations refer to the originating period from which the dispersion is measured. “High market dispersion” signifies that the stocks originated from a period where the dispersion values were above the median of our historical dataset. Conversely, “low market dispersion” indicates that the stocks originated from a period with dispersion values at or below the median.

After classifying the market dispersion, the next step is to calculate the transition matrices for each group. The transition matrix, also known as the quintile transition matrix or probability matrix, shows the probability of a stock moving from one quintile to another over time. The quintile transition matrix is a 5x5 matrix

(Quintile groups), where each row and column represent a quintile (or group) of stocks based on their performance, with the top quintile representing the best performers and the bottom quintile representing the worst performers. The values in the matrix represent the probability of a stock moving from one quintile to another over time. For example, if the value in the row for the top quintile and the column for the second quintile is 0.39, this means that 39% of stocks that were in the top quintile in one period moved to the second quintile in the next period.

Table 1 Example of a transition matrix with stock performance classified by quantile groups.

	Destination				
Origin	1	2	3	4	5
1	0.39	0.24	0.16	0.11	0.09
2	0.22	0.24	0.25	0.20	0.09
3	0.14	0.21	0.26	0.22	0.16
4	0.17	0.21	0.17	0.23	0.21
5	0.09	0.09	0.15	0.24	0.44

Using the historical stock performance data, the transition matrices are constructed separately for the "high market dispersion" group and the "low market dispersion" group. Each matrix captures the probabilities of stock movements between quintiles within the respective market dispersion group.

Following the calculation of the transition matrices, a statistical test can be performed to evaluate the significance of the differences between them. One approach is to compare the diagonal elements (representing the probability of stocks remaining

in the same quintile) to the average of the off-diagonal elements (representing the average probability of stocks moving to a different quintile) in each matrix. Calculate the difference between the diagonal elements and the average of the off-diagonal elements for each transition matrix. This difference represents the difference between the persistence of winners and the likelihood of switching between quintiles in the two market dispersion groups.

Perform a statistical test to evaluate the significance of the differences between the transition matrices. One suitable test is the chi-squared test of independence. This test examines the association between the market dispersion episodes and the probabilities of stock movements between quintiles.

Specify the significance level (e.g., $\alpha = 0.05$) for the test. This represents the threshold for rejecting the null hypothesis. If the p-value resulting from the test is below the significance level, it suggests a statistically significant difference between the transition patterns of the high and low market dispersion groups.

Interpret the test results. If the p-value is below the significance level, reject the null hypothesis, indicating a significant distinction in the transition patterns. This supports the notion that winners persistently win during high market dispersion. Conversely, if the p-value is above the significance level, fail to reject the null hypothesis, suggesting no significant difference in the transition patterns between the two market dispersion groups.

Analyzing the transition matrix can help determine the persistence of winners (stocks in the top quintile) and losers (stocks in the bottom quintile) over time. If there is a high probability of a stock in a high return quintile remaining in that quintile over

time, this would suggest persistence of winners, while a low probability would suggest the opposite.

5.4 Stock Market Dispersion and Momentum Return

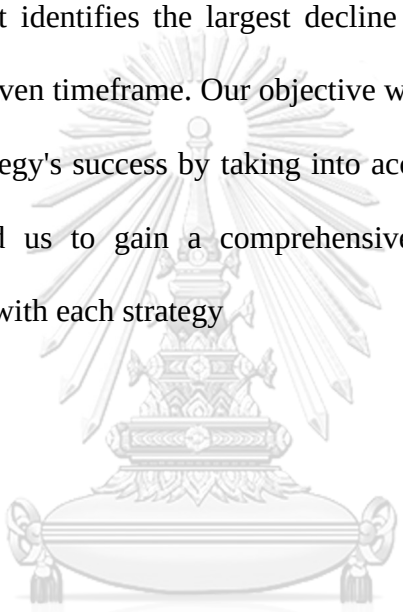
The aim of this study is to compare the performance of two distinct momentum strategies: the dispersion-adjusted momentum strategy and the traditional momentum strategy. We seek to investigate whether incorporating market dispersion as a filtering criterion enhances the effectiveness of the momentum strategy.

The Traditional Momentum Strategy operates by implementing momentum every week. Stocks are ranked at t-1, and the momentum returns at time t are calculated based on the winners and losers pinpointed at time t-1, which includes the top 10% and bottom 10% ranks. This method results in weekly rebalancing of the portfolio.

The Weighted Dispersion Momentum Strategy also performs momentum on a weekly basis but adjusts the returns using a normalized [0,1] return dispersion. By weighting returns with this normalized dispersion, the strategy emphasizes more on the magnitude of return dispersion, providing a nuanced approach to momentum investing.

On the other hand, the High Dispersion Momentum Strategy is employed solely when the return dispersion at t-1 is categorized as high (above the median). During weeks when the dispersion isn't considered high, the strategy doesn't engage in momentum, and the return is set to zero since mommentum strategy is considered as zero cost. This strategy leverages high return dispersion as a clear signal for momentum in the subsequent period.

In order to assess the efficiency of each method, a comprehensive set of performance indicators was employed. Our primary focus was on analyzing cumulative returns, which denote the combined profits achieved during a particular timeframe. Furthermore, our focus moved towards standard deviation, a metric that includes the level of uncertainty or potential loss linked to the performance of any strategy. Finally, we explored our understanding of maximum drawdown, which is an important indicator that identifies the largest decline from the highest point to the lowest point within a given timeframe. Our objective was to conduct a comprehensive evaluation of each strategy's success by taking into account three key characteristics. This approach allowed us to gain a comprehensive grasp of the strengths and weaknesses associated with each strategy



CHAPTER 6: RESULT AND DISCUSSION

6.1 Data Analysis

6.1.1 Cross-sectional return dispersion data

To evaluate stock return dispersion in Thailand's financial market, we examined a comprehensive dataset of stocks listed on the Stock Exchange of Thailand (SET) obtained from DataStream. The dataset comprises, on average, samples from 570 constituents spanning 416 weeks, specifically from 16 January 2015 to 30 December 2022. In order to document the weekly fluctuations and patterns in the market, stock prices were recorded on a weekly basis, namely on Fridays.

The cautious evaluation and accuracy of the data is an important part of our research. It was essential to address any shortcomings in the dataset since, like other stock exchanges, the SET is dynamic and subject to changes over time as a result of the addition of new stocks and the withdrawal of others. At the beginning of our data range, there were instances where certain stocks were not yet part of the SET market. We have included the pricing in certain circumstances to allow for accurate return computations and to guarantee consistency. By using this method, we were able to provide a thorough analysis of the market dynamics, taking into account stocks that were not formally part of the SET. To ensure the reliability and accuracy of our analysis, any data inconsistencies, such as missing values or records related to suspended stocks, were diligently filtered out. This approach mitigates any potential distortions in the dispersion measurements.

Table 2 provides a brief summary of the stock market return dispersion, presenting essential statistical indicators. The measurements of mean and standard deviation provide a comprehensive understanding of the dispersion of stock return variations within the selected time frame.

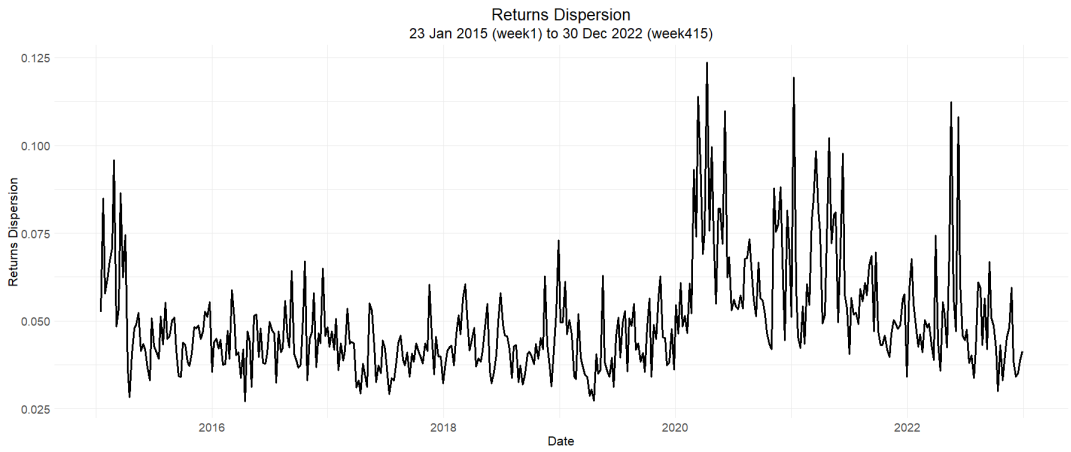
Table 2 Summary statistics for return dispersion

Measure	Mean	Median	Standard Deviation	Max	Min	No.of weeks
Return dispersion	4.99%	4.59%	1.57%	12.37%	2.72%	416

The depicted statistics in Table 2 offer a comprehensive overview of the stock return dispersion during the observed period.

The time series plot, as represented in Figure 1, visualizes the evolution of the equally weighted weekly return dispersion throughout the study duration. Notably, periods of pronounced high dispersions are evident in the years 2015, 2020, 2021, and 2022. These spikes in dispersion emphasize the dynamic nature of stock return variability in the SET over the years and might hint at underlying economic or market-specific events influencing stock performances.

Figure 1: Time series plot of return dispersion



6.2 Empirical Results

The results of this study are organized into three main parts. The first part looks at whether high market return dispersion in one period continues into the next period. The second part examines if top-performing stocks keep doing well during times of high market return dispersion or if they start to do worse. Lastly, the third part investigates if market return dispersion affects momentum profits and if including it in the momentum portfolio strategy improves the overall returns.

6.2.1 Persistence of High Market Return Dispersion

Before diving deep into the regression analysis, it's pivotal to address a foundational assumption: the stationarity of our time series data. Stationarity implies that the statistical properties of a time series (or rather its generative process) remain constant over time. This means the mean, variance, and autocorrelation structure do not change over time. A non-stationary series can produce misleading statistics and thus lead to spurious regressions. To ensure that our series on the cross-sectional dispersion of Thai stock returns is stationary, we employed the Augmented Dickey-Fuller (ADF) test. The results of the ADF test revealed a Dickey-Fuller statistic of -4.074 with a p-value of 0.01. This p-value is below the standard significance threshold of 0.05, which implies that we can reject the null hypothesis of the test. Thus, we can confidently state that the series is stationary, eliminating concerns of potential spuriousness in our subsequent regression analysis.

Upon analyzing the structure of autocorrelation in the cross-sectional dispersion of Thai stock returns, several insights were derived. The regression model

detailed previously was employed to examine the persistence in return dispersion over sequential periods.

Table 3: Regression Analysis on Persistence of High Market Return Dispersion

Measure	**Estimate**
β_0	0.022563*** (0.002155)
β_1	0.547163*** (0.041206)
Degrees of Freedom (DF)	413
R^2	0.2992
Adjusted R^2	0.2975

* p < 0.10, ** p < 0.05, *** p < 0.01.

Note that the numbers in parentheses represent the standard errors of the corresponding estimates.

The intercept coefficient (β_0), which represents the mean value of return dispersion when the lagged dispersion is zero, is estimated at 0.022563. With a t-value of 10.47, the p-value is significantly less than 0.001, indicating this intercept is statistically significant at even the 0.1% level. The primary focus of this analysis was the autoregressive coefficient (β_1) for the lagged return dispersion, which assesses the persistence of return dispersion. The coefficient for the lagged return dispersion was found to be positive at 0.547163. This suggests a significant positive relationship between the current period's dispersion and that of the previous period. The t-value of 13.28 further reinforces the statistical significance of this relationship, with a p-value less than 0.001. The model's adjusted R-squared value stands at 0.2975, indicating that approximately 29.75% of the variation in the return dispersion can be explained by its previous period's value. The residual standard error was observed to be

0.01315, derived from 413 degrees of freedom. This value indicates the typical deviation of observed values from the values predicted by the model. The F-statistic, which tests the overall significance of the regression model, is 176.3, and its associated p-value is significantly less than 0.001. This provides strong evidence against the null hypothesis, suggesting that the regression model fits the data better than a model without any predictors.

In conclusion, the empirical results indicate a significant persistence in the cross-sectional return dispersion in the Thai stock market. High dispersion in one period appears to be a strong indicator of high dispersion in the subsequent period. The prior confirmation of the data's stationarity through the Dickey-Fuller test further strengthens the reliability of our regression findings.

6.2.2 Stock Performance Analysis Across Different Market Dispersion Periods

1. Transition Matrices Analysis

To determine whether winners persistently outperform during high market return dispersion or if there is significant stock switching, we analyzed transition matrices based on quantile groups, classified according to the origin of their market return dispersion. Specifically, we distinguished between periods of “high market return dispersion” - those originating from times when market dispersion values were above the median - and “low market return dispersion” - those with origin periods exhibiting dispersion values at or below the median. This origin-based classification allows us to analyze patterns of winning stocks not during isolated events of market

dispersion but as a consistent behavior resulting from their initial classification period."

High Market Return Dispersion:

Table 4 sheds light on stock movements during high market dispersion phases. Stocks that previously ranked in the top performance quintile ([1,1]) had a 28.75% likelihood of retaining their position in the subsequent period. This demonstrates that top-performing stocks display a commendable consistency in such volatile times. However, a shift downwards to the second quintile ([1,2]) was noted at 15.88%.

On the opposite spectrum, stocks that were in the bottom quintile ([5,5]) presented a 29.92% chance of remaining stagnant and a 15.35% possibility of ascending to the fourth quintile ([5,4]). The difference between the diagonal and the off-diagonal elements is approximately 16.85%. This suggests that during high market dispersion, there is a 16.85% higher probability for stocks to remain in their respective quintiles compared to moving to a different quintile.

Table 4: Transition matrice with stock performance classified by quantile groups during high market return dispersion

Time t-1	**Time t**				
	[,1]	[,2]	[,3]	[,4]	[,5]
[1,]	28.75%	15.88%	13.19%	18.13%	24.04%
[2,]	16.31%	32.93%	16.05%	19.18%	15.53%
[3,]	13.28%	15.73%	44.31%	14.64%	12.04%
[4,]	16.67%	19.67%	14.71%	31.51%	17.43%
[5,]	26.11%	16.41%	12.20%	15.35%	29.92%

Low Market Return Dispersion:

When we pivot to periods of low market dispersion, as illustrated in Table 5, the pattern slightly deviates. The premier performing stocks ([1,1]) exhibited a 30.02% probability of sustaining their rank. Meanwhile, the stocks at the lowest rung ([5,5]) had a slightly enhanced likelihood of 30.23% to persist in their current quintile.

Table 5: Transition matrix with stock performance classified by quantile groups during low market return dispersion

Time t-1	**Time t**				
	[,1]	[,2]	[,3]	[,4]	[,5]
[1,]	30.02%	14.01%	13.61%	17.64%	24.73%
[2,]	14.47%	38.43%	15.92%	16.64%	14.54%
[3,]	13.38%	15.22%	44.23%	14.02%	13.15%
[4,]	16.30%	17.28%	14.19%	35.88%	16.34%
[5,]	26.78%	15.64%	12.66%	14.68%	30.23%

2. Test Statistics

To validate these observations, a Chi-squared test was employed. The outcome yielded a test statistic of X-squared = 1.7334, having a degree of freedom of 36, resulting in a p-value of 1. Such a p-value indicates an absence of concrete evidence to contest the baseline assumption. Consequently, there is no statistically significant variation in the transition patterns between quintiles for both high and low market dispersion categories.

In conclusion, the transition matrices for high and low dispersion groups do not show statistically significant differences in the diagonal elements (i.e., the probability of a stock remaining in its current quintile). This means that, at a 5% significance level, stocks in both high and low dispersion environments have roughly similar chances of maintaining their performance ranking from one period to the next.

The overall transition patterns between high and low dispersion groups are not statistically different either. This means that the entire pattern of stock transitions, not just staying in the same quintile but moving between all quintiles, is roughly similar between the two groups. However, there is a caution for momentum strategies: If investors are considering using momentum strategies, this analysis implies that the transition behaviors of stocks are not significantly different in high vs. low dispersion periods. Hence, a strategy that works (or doesn't work) in one environment may have similar outcomes in the other.

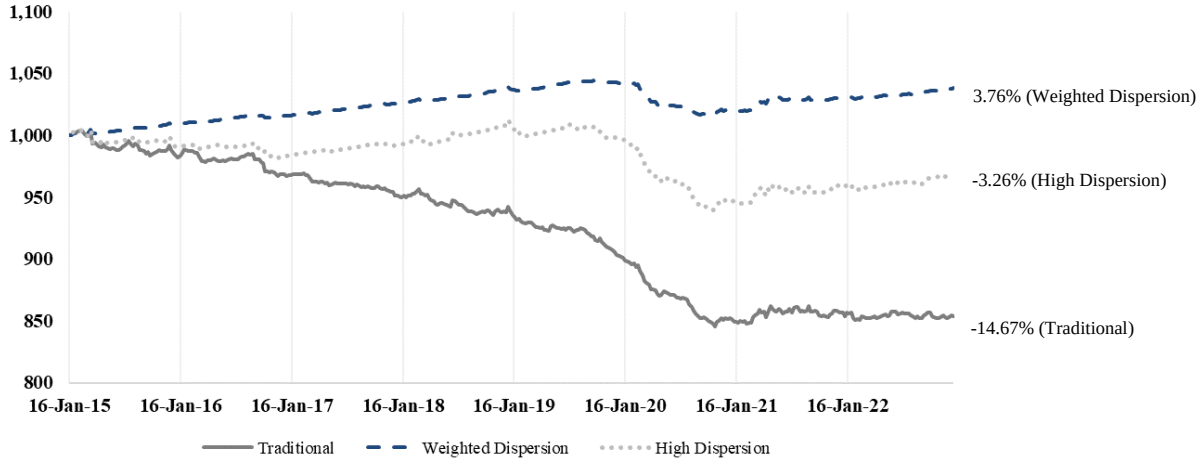
6.2.3 Market Return Dispersion's Influence on Momentum Profits

The objective of this study is to examine the potential impact of incorporating market dispersion as a filtering parameter on the effectiveness of the momentum approach. This study establishes three portfolios and evaluates their performances based on three key metrics: cumulative returns, standard deviation, and maximum drawdown.

1) **Traditional Momentum:** This Strategy ranks stocks weekly at t-1, calculating momentum returns at time t based on the top and bottom 10% ranks from t-1, leading to weekly portfolio rebalancing.
2) **Weighted Dispersion Momentum**: This Strategy also weekly, adjusts returns using a [0,1] normalized return dispersion, emphasizing return magnitude for a refined momentum investment approach.
3) **High Dispersion Momentum**: This strategy operates only when t-1 return dispersion is above median. If not, momentum isn't applied, and returns are

zeroed out, capitalizing on high return dispersion as a momentum indicator for the next period.

Figure 2: Cumulative return performance of portfolios (2015-2022)



In evaluating the effectiveness of momentum strategies under varying market dispersion conditions, an initial investment of 1,000 units was allocated to each of the three portfolios. This investment operates under the assumption that the momentum approach is cost-free, with the notional amount earning returns equivalent to the risk-free rate throughout the investment period. The risk-free rate here serves as a baseline for return calculations, typically reflected by the yield of a 1-year government bond.

Over the examined period from 2015 to 2022, the Traditional Momentum portfolio experienced a downturn, ending with a cumulative return of -14.67%. This indicates that the standard momentum strategy without the consideration of market dispersion factors underperformed, reducing the value of the initial investment.

The Weighted Dispersion Momentum portfolio, which adjusts returns using a normalized return dispersion weighting, shows persistence and a positive performance, closing with a cumulative return of 3.76%. This suggests that

incorporating dispersion as a weighting factor can enhance the performance of a momentum strategy, offering an improved alternative to the traditional method.

Ultimately, the High Dispersion Momentum strategy, which is exclusively implemented during times characterized by above-average return dispersion, yielded a cumulative return of -3.26%. Although the observed strategy did not yield favorable returns, it demonstrated superior performance compared to the Traditional Momentum portfolio. This implies that emphasizing high-dispersion periods may help reduce losses in comparison with the traditional approach.

Table 6: Standard Deviation and Maximum Drawdown result of portfolios (2015-2022)

Portfolios	Annualized return	Standard Deviation	Maximum Drawdown
Traditional Momentum	-2.24%	0.19%	15.82%
Weighted Dispersion Momentum	0.53%	0.07%	2.73%
High Dispersion Momentum	-0.47%	0.17%	7.18%

The utilization of Standard Deviation and Maximum Drawdown measurements has yielded valuable insights when assessing the risk characteristics of various momentum strategies spanning the period from 2015 to 2022. The Weighted Dispersion Momentum portfolio not only exhibited a comparatively low standard deviation of 0.07%, indicating a reduced level of risk when compared to other momentum strategies, but it also achieved a positive annualized return of 0.53%. This underscores the strategy's effectiveness in balancing volatility management with the potential for profit, as evidenced by its minimal maximum drawdown of 2.73% - the lowest among the momentum techniques analyzed.

In contrast, the Traditional Momentum portfolio exhibits a relatively higher degree of risk, as seen by a standard deviation of 0.19% and a maximum drawdown of 15.82%. In combination with a negative annualized return of -2.24%, the approach implies an increased probability of large short-term declines and raises worries about the long-term sustainability of the observed patterns during the investigated timeframe.

The High Dispersion Momentum strategy, while showing a moderate risk profile with a standard deviation of 0.17% and a maximum drawdown of 7.18%, still carries a notable risk of loss, especially considering its negative annualized return of -0.47%. While the Traditional strategy offers a little improved ability to manage volatility, its lack of positive returns raises concerns about its appeal when compared to the Weighted Dispersion Momentum strategy.

In summary, the Weighted Dispersion Momentum portfolio exhibits a more favorable risk-return profile in comparison to the other assessed momentum strategies. The findings highlight the significance of including return dispersion as a crucial factor in enhancing the effectiveness of momentum methods. Although the traditional strategy of solely focusing on momentum may have limited effectiveness, incorporating return dispersion components, either through weighting or targeting high dispersion situations, has the potential to improve performance. The use of regular weekly rebalancing, along with a greater understanding of return dispersion, enables the implementation of adaptable strategies that successfully overcome the complex conditions of the market.

Figure 3: Cumulative return performance of portfolios & SETTRI (2015-2022)

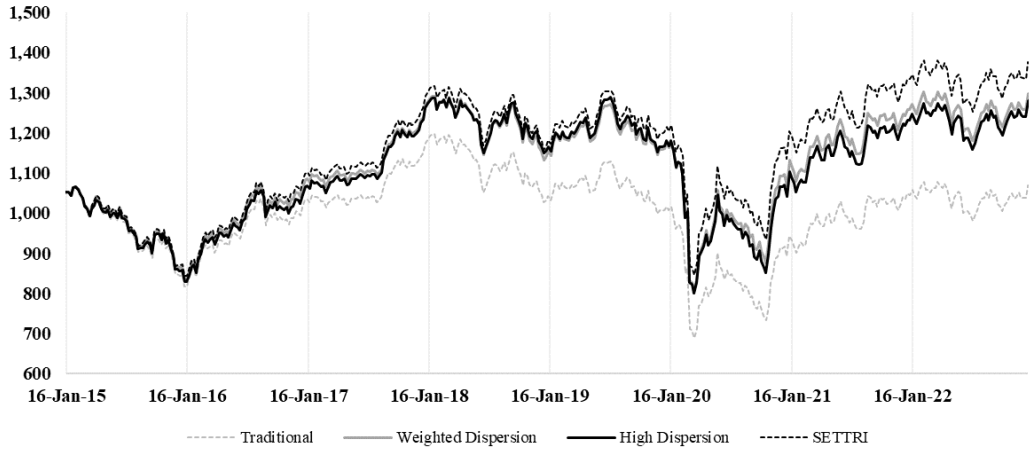


Table 7: Standard Deviation and Maximum Drawdown result of portfolios & SETTRI (2015-2022)

Portfolios	Annualized return	Standard Deviation	Maximum Drawdown
Traditional Momentum	0.97%	1.96%	42.37%
Weighted Dispersion Momentum	3.80%	1.97%	37.63%
High Dispersion Momentum	3.59%	1.97%	37.83%
SETTRI	4.68%	1.98%	35.77%

The study involves a distinctive investment methodology that comprises a comparative examination of momentum strategies in relation to the SETTRI for the period spanning from 2015 to 2022. This study examines the utilization of momentum strategies as a zero-cost overlay to an underlying investment in the SETTRI index. The principal amount is primarily assigned to the SETTRI, however the utilization of momentum strategies is employed to potentially enhance returns without necessitating extra investment in capital. The objective of this study is to determine whether using momentum strategies could improve the already strong performance of the SETTRI.

The risk and return characteristics of each portfolio and the SETTRI are presented in Table 7. Although momentum strategies are considered to be costless, their effectiveness in improving returns differs. The SETTRI demonstrates a robust basis, exhibiting the highest annualized return of 4.68% while maintaining a comparable standard deviation of 1.98%. This indicates a well-balanced risk-reward profile, as evidenced by the lowest maximum drawdown of 35.77% among the portfolios under examination.

The Weighted Dispersion Momentum strategy demonstrates an annualized return of 3.80% and a standard deviation of 1.97%. Similarly, the High Dispersion Momentum strategy exhibits an annualized return of 3.59% with a comparable standard deviation. In comparison, the Traditional Momentum strategy yields a modest annualized return of 0.97% and experiences the highest maximum drawdown of 42.37%. Consequently, both the Weighted Dispersion Momentum and High Dispersion Momentum strategies outperform the Traditional Momentum strategy.

The analysis suggests that incorporating return dispersion into momentum strategies can enhance returns. However, during the time under examination, investing solely in the SETTRI would have been the most advantageous strategy. This conclusion is drawn by integrating the findings presented in Figure 3 and Table 7. The results indicate that the benefits of implementing a zero-cost momentum method may not outweigh the consistent and higher returns offered by the SETTRI.

CHAPTER 7: CONCLUSION & FUTURE RESERCH

7.1 Conclusion

The primary goal of this comprehensive investigation was to enhance comprehension of market return dispersion in order to enhance profitability in the momentum investment strategy within the Stock Exchange of Thailand (SET). Momentum trading is an approach of a short-term nature that aims to exploit the persistence of recent market trends. Traders attempt to generate profits from short-term market swings by strategically picking assets exhibiting robust relative strength and capitalizing on momentum. This study aims to assess fluctuations in prices by utilizing market return dispersion. In the event of a large market return dispersion, whereby the size of market returns is also substantial, it is plausible to consider this as a potential indicator for enhancing profitability within a momentum investment strategy.

The study revealed a significant and persistent pattern of return dispersion in the stock market of Thailand, indicating a strong positive correlation between the dispersion of returns in a given period and the dispersion of returns in the preceding era. The results of the study, which are backed by a statistically significant autoregressive coefficient and further confirmed by the Dickey-Fuller test, suggest that a high level of return dispersion observed in a particular timeframe can be considered a dependable indicator of a similar level of dispersion in the subsequent timeframe. The findings of this study indicate that investors have the potential to utilize the consistent patterns observed in return dispersion as a means of making informed predictions. The identification of return dispersion trends plays a crucial role in the development of momentum investing strategies, as it enables the anticipation of

market moves and the optimization of investment decisions within the Thai stock market.

Furthermore, the objective of this investigation was to determine whether there is a persistent consistency in the stock performance of top performers (referred to as winners) throughout periods characterized by large dispersion of market returns, as opposed to periods characterized by low dispersion. Transition matrices were utilized to track the probability of stocks moving between different performance quintiles in periods characterized by high and low dispersion. The statistical significance of the observed transition patterns was assessed using the Chi-squared test. The analysis indicates that in situations of significant dispersion, equities that performed well initially had a likelihood of 28.75% of maintaining their top position, whereas stocks with poor performance had a probability of 29.92% of holding their low position. In contrast, it was shown that during periods of low dispersion, individuals classified as top performers exhibited a little higher likelihood of retention, amounting to 30.02%. Conversely, the lowest performers displayed a retention probability of 30.23%. Significantly, the chi-squared test produced a p-value of 1, indicating there was no evidence of statistically significant variations in stock transition patterns throughout the dispersion periods under consideration. This observation highlights the presence of a consistent pattern in stock behavior, regardless of the level of market dispersion. Moreover, it is important for investors who are considering momentum strategies to practice caution. The study emphasizes that the probability of stocks transitioning between performance ranks remains stable regardless of market dispersion. This suggests that the efficiency of a strategy may remain consistent in various market conditions.

Lastly, this study conducted a thorough analysis of the influence of market dispersion on the effectiveness of various momentum strategies. In the context of evaluation, this study examined three separate portfolios: Traditional Momentum, Weighted Dispersion Momentum, and High Dispersion Momentum. These portfolios were analyzed with the incorporation of the return dispersion aspect. Over the period from 2015 to 2022, an in-depth study of these portfolios in relation to several performance indicators yielded interesting observations. Significantly, out of the three momentum portfolios, the Weighted Dispersion Momentum strategy demonstrated exceptional performance by achieving the highest returns while also exhibiting the lowest level of volatility.

In summary, this study highlights the significant impact of market return dispersion on the effectiveness of the momentum investment strategy in the context of the Stock Exchange of Thailand. The observable and persistent trend of variability in investment returns offers a helpful instrument for investors aiming to enhance the performance of their portfolio. The SETTRI benchmark exhibited notable cumulative returns, whereas the traditional momentum method had challenges in the present market circumstances. The creation of the Weighted Dispersion Momentum strategy is interesting, as it highlights the significance of utilizing dispersion-aware strategies to achieve stability. The analysis suggests that solely relying on traditional momentum strategies may not be the most optimal approach. On the other hand, the integration of dispersion components into methods has the potential to provide more favorable outcomes. The persistent patterns exhibited by stocks under different levels of dispersion serve as a reminder for investors to exercise caution while using momentum strategies. This is because the effectiveness of these strategies may not

significantly change across a wide range of market conditions. The main takeaway is evident: a thorough understanding of market return dispersion, combined with strategic modifications to momentum-based approaches, has the potential to facilitate more perceptive and potentially profitable investing choices within the Thai stock market.

7.2 Future Research

Several exciting options exist for future investigations building on this research:

1. Temporal Analysis: Examine multidecade time frame to capture market cycles—bullish upswings, bearish downturns, and sluggish sideways movements. Researchers can evaluate whether Thai stock market trends are consistent or vary based on market moods and cycles by monitoring momentum trading across these periods.
2. Economic Factors: Include macroeconomic indices including GDP growth, inflation, unemployment, and interest rate changes. The analysis can determine if macroeconomic variables favor or limit momentum strategy performance by comparing return dispersion and momentum strategy performance.
3. Reconsider portfolio rebalancing frequency. Since the current study stresses 3. weekly rebalancing, experimenting with daily, monthly, or quarterly frequency may provide different results. Understanding the proper rebalancing frequency can help maximize returns and manage market volatility.

Finally, these proposed research areas can help us comprehend momentum trading in the Thai stock market and give investors a better foundation for optimizing their tactics in changing market and economic conditions.

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