
A Test of Size Effect on the Short-run Momentum in Japanese Stock Market

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Abstract

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The purpose of this study is to identify the relationship between firm size and the momentum effect in Japanese stock market. The research performed statistical analyses on the monthly, quarterly, semiannual, and annual average returns of all stocks included in TOPIX 1500 index that are also listed on the Tokyo Stock Exchange (TSE). To test for the effect of the firm size factor, the sample was subdivided into three equal parts, representing high-cap, medium-cap, and low-cap stocks respectively based on their market capitalization. The results of this study proved that momentum effect exists in Japanese stock market in the short-run and momentum investment strategy, where investors buy the winner stocks and short the loser stocks, generates abnormal return. Furthermore, regardless of the size effect, winner stocks presented stronger momentum than loser stocks. Considering the size effect, the abnormal return of momentum investment strategy was higher in high cap stocks than in low cap stocks. These results of the study will be a potential source for portfolio managers who are using or attempting to use the momentum investment strategy.

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Chapter 1 Introduction

1.1 Background

A momentum is a concept in physics. According to the first law of Newton, a momentum means that a moving body tends to be on the move except that a force is exerted externally on it. That is to say, this law is true in market too, based on this law, a price procedure tends to remain until it is prohibited by an external force. This strategy includes investing in market direction. This paper aims to study the impact of momentum effect on stock return, by considering the low and high performance stock returns and also controlling the effects of firm size.

Momentum effect indicates the situation that winner securities in the past period will continue the winning status, and loser securities in the past period will continue the losing status based on a short-term time period. This study will focus on short-term period (1-3 months), medium-term period (6 months), and long-term period (1 year) of momentum effect. In order to define winners and losers, Rastogi, Chaturvedula, and Bang (2009) suggested that median average return can be applied as a benchmark, so that the stocks with a higher average return related to the benchmark can be identified as winners, while losers are the stocks with a lower average return than the benchmark.

Investors normally invest in assets that have been winning in recent periods and short or clear stocks that have been losing, rather than investing based on their own evaluation and forecasting analysis (Sapp and Tiwari, 2004); This study will also

provide the analysis and conclusion related to the difference between winner average returns and loser average returns, and a hypothesis test of the significance of momentum effect. The difference between winner's average returns and losers average returns indicates the momentum investment strategy where investors invest in recent winning stocks and short in recent losing stocks. As a result, an abnormal return is generated when the result is relatively significant and positive, while a subnormal return is generated when the result is significant and negative.

1.2 Purpose of Study

The purpose of study is to test the effect of firm size on short-term momentum returns in the Japanese stock market. Most recent researches on momentum effect included size effect as a factor; however, the firm size effect on short-term momentum is unknown.

Recently, most researchers have examined momentum effects on security markets, and many of the studies attempted to provide explanations for momentum effect through investor behavior (Hvidkjaer, 2006; Rastogi et al., 2009; Goetzmann and Massa, 2002), while many of them provided the test result based on industry basis (Moskowitz and Grinblatt, 1999; Scowcroft and Sefton, 2005). Other than the researches mentioned above, studies were also conducted with a focus on the effect of analyst coverage on the momentum (Boni and Womack, 2006; Hong, Lim, and Stein, 1999). Despite the fact that researchers included firm size effect as a factor while the momentum effect on stock returns was tested, the degree of momentum effect in

differently sized firms was not tested; therefore, a test of the momentum investment strategy on abnormal return when investors invest in winning stocks and short losing stocks would be helpful for portfolio managers to conduct their investment decision in their daily operation based on momentum strategy.

Most recently conducted researches on momentum effect categorized financial assets into winners and losers; and subdivided firms into different categories based on the size effect; therefore, the categories are high-cap, medium-cap, and low-cap firms. After the procedures stated, a statistical analysis (T-test) would be performed on the average returns of winning stocks and losing stocks in each category. A statistically significant result of the return indicates that the trend of the price is continuous with a statistically stable return of a specific category, which is winner or loser, presenting the momentum effect evidence. Moreover, the concentration becomes to be the firm size effect on short-term momentum effect on stock returns.

As well as applying statistical tests to examine the momentum effect on stock returns, this research will examine whether the returns from momentum investment strategy on high cap firms are significant and larger than those on low cap firms, or vice versa.

Moreover, whether there is a positive or negative relation between momentum factor and future stock return has been recently discussed and studied. That is to say, if the momentum effect is positive, investors can earn unusual and excess return through

buying past winners' stock and selling past losers' stock. On the other hand, when the momentum effect is negative, investors can earn profit by using a contrarian strategy (selling the past winners' stock and buying the past losers' stock).

The result of this test can be applied as a potential source for portfolio managers who would include momentum effect and firm size effect as factors while conducting investment decisions. As an example, if the abnormal return of the investment strategy in high-cap firm indicates a significant result, the portfolio manager of the financial asset earn an abnormal return by investing in high-cap category; in the opposite side, the portfolio manager might decide to invest in low-cap category.

This study will focus on the relationship between firm size and momentum effect, which indicate the change in stock return accompanied with the change of firm size in the same period. The result of this research will be an essential resource for investors who apply investment strategy in their investment decision making process. The momentum strategy, which indicates the phenomenon that investors invest in winner stocks and short loser stocks, generate abnormal return or subnormal return in different firms based on the size difference. By gaining the result of firm size effect on abnormal return or subnormal return based on momentum investment strategy, this research will attempt to conduct an investment strategy that generates a higher profit than regular investment strategies for investors that include momentum effect in their investment decision generating process.

The method for identifying high-cap, medium-cap, and low-cap has become an obstacle to this research due to the difficulty in placing a range of values as the limit of market capitalization for each group. As an example, a firm considered small firm ten years ago may become a high-cap today, while it is still classified as a low-cap.

The issue stated above is definitely significant to the research, since the firm size effect is the focus of this research to examine momentum effect, and the approach of identifying the firm size becomes the core of the research. In order to obtain the relationship between the firm size and the abnormal return of momentum investment strategy is one of the objectives of this research. The resolution of the issue stated above could be conducted through sorting the stocks by market capitalization in a descending order, and subdivide the stocks into three parts in equally basis. The top 1/3 will be considered high-cap; the bottom 1/3 will be considered low-cap, as well as the rest of stocks belong to medium-cap.

1.3 Objective of Study

Following the classification of the firms into winner (W) and loser (L) categories, the generation process of “winner minus loser” (W-L) category and subdividing the sample stocks into high-cap, medium-cap, and low-cap retains the condition of the statistical analysis (T-test) on the average return of each category. A significant test result indicates that the existence of momentum effect is significant, due to the fact that a continuous trend of the stock price exists statistically, and the return is

statistically stable. In contrast, an insignificant statistical analysis result would indicate that the momentum effect in Japanese stock market during the tested period is absent, which states that no evidence of continuous trend of stock price is explored in Japanese stock market. Significant returns in (W-L) category in any two differently sized firms can be compared to test whether firm size is an important factor related to the return of the stocks.

Through the test, significant returns are expected in each category, which is stating that the momentum effect is effective during the tested period, and also the relationship between the abnormal return of the momentum investment strategy and firm size effect. The relationship, as discussed above, is a potential resource for portfolio managers to conduct their investment decisions.

1.4 Hypotheses

This study intends to test the following hypotheses:

Hypothesis 1: The short term momentum effect exists in the Japanese stock market, and the momentum investment strategy can generate abnormal returns.

Hypothesis 2: The momentum effect is more significant in high cap stocks than in low cap stocks.

Hypothesis 3: The abnormal returns of momentum investment strategy on high cap stocks are higher than on low cap stocks.

1.5 Organization of the Paper

This study conducts test on the size effect of the short-run momentum effect in the Japanese stock market. This thesis consists of five chapters. Chapter one has set the stage for the study. Chapter two discusses the studies related to momentum effect in previous literatures and lists three hypotheses of this study. Chapter three introduces the data that has been used during this study. Chapter four provides the results of research and analyses of the results. Chapter five concludes the whole study and gives some recommendations.

Chapter 2 Literature Review

2.1 Factors Explaining Momentum Effect on Stock Markets

The popularity of the return momentum effect in stock market has been showing an increasing trend over the time passing recently. Many studies attempted to conduct the examination of the relationship between momentum effects along with other related factors.

In the examining process of momentum effects, researchers conducted tests on many factors tests, such as industrial based research on momentum, the effect of analyst coverage on momentum effects, as well as that of behavioral factor on momentum effect.

2.1.1 Industrial based research on momentum effect

Another important factor that has influence momentum effect is industrial effect.

Different industries may have different stock returns, which would result in different degrees of momentum effect; therefore, when the examining industry is vary, the momentum strategy may vary as well. In fact, investing in different industries may result in different returns of the stocks, so that even though investors apply the same momentum strategy, the return they have may vary in the examined period.

Grinblatt and Morkowitz (1999) explained that there was an important momentum effect between different industries. They found out that buying the firms' stock in

winner industries and selling the firms' stock in loser industries have an excess return.

Nijman, T.E, Swinkels, L.A.P and Verbeek, M.J.C.M (2004) did an investigation about whether individual stock momentum in Europe is subsumed by country or industry momentum. They introduced a portfolio-based regression approach, which directly allows testing hypotheses about the existence and relative importance of momentum, value, and size. Their resulting suggested that the positive expected excess returns of momentum strategies in European stock markets are primarily driven by individual stock effects, and more important than momentum and country momentum.

Lior Menzly(2006) documented a strong cross-momentum effect among industries related to each other along the supply chain. That is, investing accordingly to a trading strategies that buy and sell industries based on respectively high and low past returns in related upstream or downstream industries would recognized that Cross-industry momentum is distinct from previously documented stock- and industry-level momentum, and other known return factors.

Laurens A. P. Swinkels and Liam Tjong-A-Tjoe (2008) analyzed the profitability of industry momentum strategies based on two sets of exchange traded funds. By estimating the transactions costs on these industry momentum strategies, accounting for (a) the bid-ask spread, (b) the broker commission and (c) short selling costs, they

found that, given our estimated transactions costs, the paper profits from industry momentum strategies disappear in real-life.

2.1.2 The effect of analyst coverage on momentum

Harrison Hong, Terence Lim and Jeremy C. Stein (1988) tested one such theory--based on the gradual-information-diffusion model of Hong and Stein (1997)--and established key result of a strong asymmetry: the effect of analyst coverage is much more pronounced for stocks that are past losers than for stocks that are past winners. These findings could prove their hypothesis that firm-specific information only gradually across the investing public.

Boni and Womack (2006) did a test about the value of analysts as industry analysts and plied that short-run return momentum effect could be partly explained by analyst coverage of firms. Accounting to this study, Boni and Womack suggested that large firms averagely have more analyst coverage than small firms and expected that larger firms will face stronger momentum effect on their stock returns than smaller firms.

2.1.3 The effect of behavioral factors on momentum

Many researches concluded that previous market theories are unable to explain the momentum during the study of momentum effect on stock returns, since the momentum is only a price anomaly in the market. However, the attempted explanation of momentum effect through behavioral theories has opened a new

entrance for researchers to obtain new details of momentum effect. The new path leads to an increasing number of researchers attempting to apply behavioral studies on momentum effect.

Luis Muga(2007) used generally applicable non-parametric methods to sort out the possible sources of momentum in stock markets , which compromises behavioral theories or omitted risk factors. Luis Muga present the particular results, rooted in Spanish stock market, of bootstrap analysis and stochastic dominance tests, and then suggested the interest of analyzing theories that relax the unbounded rationality assumptions that support many of the classical asset pricing models.

John A. Doukas(2003) conducted an out-of-sample test of two behavioral theories that have been proposed to explain momentum in stock returns. And by testing other researcher's model John A. Doukas shows that momentum is the result of the gradual diffusion of private information and investors' psychological conservatism reflected on the systematic errors they make in forming earnings expectations by not updating them adequately relative to their prior beliefs and by undervaluing the statistical weight of new information.

2.1.4 Momentum Effect and Stock Return

The results of previous studies show that stock return relates to not only market return, but also its lagged cumulative stock return in short-term and medium-term periods. In financial literature, this phenomenon is named as “momentum effect” that

stock return is explained by its own lagged cumulative stock return. Jegadeesh and Titman (1993) and Antoniou, Lam and Paudyal (2007) concluded that in a stock portfolio analytical framework, the lagged cumulative stock return explains its future return. Bernnan, Chrdia and Subrahmanyam (1988) and Chen (2003), used each firms' lagged cumulative return as an explanatory variable to predict future returns.

Using the Taywan Stock Exchange data (from January 1985 to October 2006) they concluded that the momentum effect of the high performance stock return is positive while, it is negative for the low performance stock. They believed that the reason of these different conclusions in momentum effect is, probably, due to no separating the stock according to their performance.

2.1.5 Period research

Conradand Kaul (1998) concluded that on America Stock Exchange, the short-term (1 week) and the long-term (24-36 months) momentum effects are negative. While the medium- term (3-12 weeks) momentum effects are positive. According to the findings of Jegadeesh and Titman (1993), on America Stock Exchange, the medium-term (3-12 months) momentum effect is positive and it is negative in a long – term period (13-16 weeks). On China Stock Exchange, Kang, Liu and Ni (2002) showed that the short–term (1-12 weeks) momentum effect is negative and it is positive in a medium-term period (12-26 weeks). The different results come from these studies result in this question, why the momentum effect in different periods and markets is contradictory and what are the reasons for these contradictory results? Lo and

Mackinlay (1990) and Hameed and Kusunadi (2002) indicated that these contradictory results result from the difference between the sample size and the definitions about the short, long and medium-term periods. According to Huang (2006), the momentum effect is related to investors' different cognitive biases. In his opinion, investors are overconfident to new information during bull markets, and thus, cause market overreaction. Based on the above-mentioned subjects, it is expected that there is a significant relation between momentum effect and firms' stock return. Therefore, it seems that the separation of stock to low performance stock and high performance stock and also the study of the impact of momentum effect on their return, help us to explain these contradictions.

Jegadeesh and Titman (1993) studied the performance of the trading strategies with 3 to 12 month periods of forming and maintaining. They reported that the strategy of buying past winners' stock and selling past losers' stock can make a significant return (about %1 in a month). In their opinion, profitability of the momentum portfolios results from the lagged reaction of stock price to the firm's special information.

Using monthly return on 16 countries indexes (1970-1995), Richard (1997) proved that the momentum effect strategy resulted in a yearly excess return about %34, but for longer periods more than one year, past losers performed %5.8 better than past winners yearly. Rawen Horst (1998) examined the profitability of the momentum effect strategy on international stock markets. The findings showed that the winners' portfolios performance was %1 better than the losers monthly. He reasoned that it was

unlikely that the momentum effect profits would be by chance. Using a long term study on America Stock Exchange, Konrad and Kaul (1998) reported the success of the contrarian strategy in the long-term and the momentum effect strategy in the shortterm. They declared that the strategy success relies on this period. While, the momentum strategy was profitable in the medium-term period (3-12 months), the contrarian strategy in the short-term period (weekly and monthly) or the long-term (3-5 years) was appropriate.

2.1.6 Other factors that affect return momentum

(1) January price anomaly

Due to the fact that momentum is a category of price anomalies, momentum effect and other price anomalies may have a correlation. Chelsea Yaqiong Yao (2011) reexamined the apparent success of two prominent stock trading strategies: long-term contrarian and intermediate-term momentum. His studies demonstrated that long-term contrarian is entirely attributable to the classic January size effect, and resolved whether return autocorrelation “is really momentum” by demonstrating that the superior performance of intermediate-term momentum is due to strong January seasonality in the cross-section of returns. Chelsea Yaqiong Yao implicated that long-term contrarian must be considered largely illusory, and intermediate-term momentum must take account of annual seasonalities in returns.

(2) Credit rating

Doron Avramov (2007) establishes a robust link between momentum and credit rating. Due to momentum profitability is large and significant among low-grade firms, rather than among high-grade firms. Doron Avramov documented the momentum payoffs in the literature are generated by low-grade firms that account for less than 4% of the overall market capitalization of rated firms. According to Doron Avramov's study, the momentum payoff differential across credit rating groups is unexplained by firm size, firm age, analyst forecast dispersion, leverage, return volatility, and cash flow volatility.

Sirajum Munira and Yaz Gulnur Muradoglu (2008) accounting to momentum returns, mainly earned by speculative grade stocks and during contractions, observed momentum returns of about 2 percent per month (23 percent per annum) in speculative grade stocks and that are more pronounced returns of more than 3 percent per month (25 percent per annum) during contractions. They found the result that momentum returns of speculative grade stocks disappear when controlled for macroeconomic risk factors and concluded that therefore momentum is a reaction of the investors to high uncertainty either due to increased business risk of stocks or due to increased macroeconomic risk.

(3) Trading volume

Yung-Chou Lei(2005) used the change, an increase in trading volume reflects a rise in investor sentiment, as a measure of investor sentiment on individual stocks. He

documented a negative and significant cross-sectional relation between the trading volume trend and stock returns, both in the short term and in the long run. This relation and its phenomenon suggest that the negative effect of the trading volume trend on stocks returns is robust. And according to the survey of a composite trading volume trend Yung-Chou Lei supported that the trading volume trend contains information on investor sentiment, and that investor sentiment has a valuation effect on stocks.

Philip A. Stork (2008) according to Europe's fifty largest shares showed strong evidence of medium-term momentum effects. Philip A. Stork found that due to losers and winners are affected differently, momentum returns increase after trading volume decreases.

(4) Market state

Kuei-Yuan Wang, Ching-Hai Jiang and Yen-Sheng Huang examines the impact of market states on the profitability of momentum strategies using weekly data from the Taiwan Stock exchange over the 10-year period 1997-2006. In their study, they assumed according to the market return in the six-month period following the different formation period the momentum profits appear to different trend in a bearish holding period and a bullish holding period. Thus, they suggest that the market states in the holding period also provide information regarding the profitability of the momentum strategies.

Kathy Hung and John L. Glascock (2008) investigated Real Estate Investment Trusts' momentum returns in different market states, and explained the momentum phenomenon with a risk-based dividend growth theory of Johnson (2002). Their result showed that momentum returns of REITs are higher during up markets, and found that momentum returns are higher after the legislation change of REITs in 1992, and that dividend/price ratios of REITs are also higher after 1992. Kathy Hung and John L. Glascock suggested that momentum returns of REITs can be jointly explained by a time-varying factor, such as market state, and cross-sectional variance in dividend yields.

Luis Muga and Rafael Santamaria (2006) accounting to studying the phenomenon that the momentum effect appears in the wake of both up-market and down-market states in the Spanish stock market contradicted predictions of Cooper et al (2004), and provided the rationale for taking into account the disposition effect among the possible explanatory factors behind the momentum effect in a behavioral theory context.

(5) Growth rate

Johnson (2002) pointed out that momentum effects in stock returns need not be explained by investor irrationality, heterogeneous information, or market frictions. In his study, an enhanced model, under which persistent growth rate shocks occur episodically, can match many of the features documented by the empirical research.

Johnson reported that the stock prices were strongly correlated with the growth rate of the firm and continually increased stock prices, resulting in the momentum effect on stock prices as well as stock returns, were enhanced by a high growth rate.

Chan, Jegadeesh, and Lakonishok (1996) tested the effect of market's underreaction to the past earning news on the predictability of future returns for past returns, and then implied that past market information did not have a strong relationship with market performance. In other word, market was influenced by the new market information. The conclusion now has been approved to be wrong, but the results of this study casted a valuable problem into research of the application of momentum effect.

(6) Countries strategy

Han and Tankez (2001) studied the unusual stock returns in case of using the momentum effect strategy on England stock market. The results showed that the momentum effect strategy was profitable as an investment tool in 1977-1996 but this profitability was not seen from 1955 to 1976.

The study done by Griffin, Ji and Martinin (2003) reviews the momentum effect strategy in 40 countries. The findings of this study show that the momentum effect strategy is profitable in Latin and North America and Europe. But it does not have a considerable profitability in Asia. Using Tehran Stock Exchange data (1997-2002), Foster and Kharazi (2006) studied the profitability of the momentum effect and the

contrarian strategy. They did not find any behavior that showed there was a contrarian strategy. But their findings confirmed the existence of a medium-term (3-12 months) momentum effect.

2.2 Summary

The literatures listed and discussed above have provided sufficient information for the up-coming studies on momentum effect or other related topics in the future. The three hypothesis statements in chapter one are listed based on these literatures. In this study, all of the three hypothesis statements will be tested. As well as listed in chapter one, the hypothesis statements are listed as follow:

Hypothesis 1: The short term momentum effect exists in the Japanese stock market, and the momentum investment strategy can generate abnormal returns.

Hypothesis 2: The momentum effect is more significant in high cap stocks than in low cap stocks.

Hypothesis 3: The abnormal returns of momentum investment strategy on high cap stocks are higher than on low cap stocks.

Chapter 3 Data Source and Methodology

3.1 Introduction to Research Design

The assumption of momentum effects is the past winner stocks will continue the winning status in the current and future market while past loser stocks will continue the losing status in the current and future market based on short-term market trend. In order to test momentum effects in Japan's stock market, based on the assumption stated above, identifying winner stocks and loser stocks has become the first issue to resolve. Presented as "winner minus loser", after the identification of winner stocks and loser stocks, W-L as a different category can be identified as well based on the previous identification progress. According to the assumption of momentum effects, investors would attempt to buy or hold winner stocks and short loser stocks. For each category listed above, a test to the statistical significance of the average return would provide an indication of the existence of momentum effects. In the mean time, accounting to the effect of firm size, the categories of "high", "medium", and "low" will be identified as well.

According to the statement above, the discussed test of momentum effect can be conducted with the following steps:

(a) Identify "winner" (W) and "loser" (L) categories, then generate "winner minus loser" (W - L) category;

(b) For each category, find the average returns and perform statistical test to examine

the significance of the average returns;

(c) Subdivide sample stocks into "high-cap", "medium-cap", and "low-cap" groups, and perform statistical test for W and L categories;

(d) Perform statistical test on the return of (W-L) category in "high-cap", "medium-cap", and "low-cap" groups.

3.2 Data Source and Collection Procedures

The data was collected from the monthly prices of all the TOPIX1500 stocks listed on Tokyo Stock Exchange (TSE) from BLOOMBERG Terminal. In Japanese stock market, TOPIX1500 stocks are settled in Yen. There are 800 members selected from TOPIX1500. Since some of the stocks were not listed on TSE during the early years of 2000 to 2010, the stocks that have no returns were not included in the dataset of research. The prices were selected from January 2000 to December 2010. To test the momentum effect within different short-term intervals, returns were generated based on monthly interval, quarterly interval, semiannual interval, and annual interval.

Table 3-1 shows the general information of the observations and intervals.

Table 3-1 Number of observations and intervals

Interval	Observations	# of Intervals	(Observations)*(# of Intervals)
Monthly	800	120	96000
Quarterly	800	40	32000
Semiannual	800	20	16000
Annual	800	10	8000

3.3 Methodology

3.3.1 Identifying "Winner" and "Loser" categories

The identification of “winner” and “loser” is the first step of the test, which provides the source and reasoning to the conclusion before generating a “winner minus loser” category. The significance of the classification of “winner” and “loser” is that the categorization is the core of the whole study in terms of accuracy. Due to the fact that the identification determines the basis of the test, the identification progress needs to be accurate. Furthermore, the category of “winner minus loser” is important as well, since it is the essence of testing the efficiency of momentum investment strategy. The average return of the category of “winner minus loser” will present the efficiency of momentum investment strategy discussed in this study.

The average return is applied as the benchmark to classify winner stocks and loser stocks in the first step. The stocks with an average return above the benchmark would

be classified into the category of “winner”, while those with an average return below the benchmark would be classified into the category of “loser”. Table 3-2 presents the average return within different period intervals- monthly, quarterly, semiannually, and annually- as well as the number of winner stocks and loser stocks. As an example, the average monthly return is 0.39%, 386 stocks within the collected data can be classified as “winner”, due to the higher monthly average return than the benchmark. In addition, 414 stocks are classified as “loser” since their monthly average returns are below the benchmark.

Table 3-2 Average returns: overall.

Interval	Average Return	Winner	Loser
Monthly	0.39%	386	414
Quarterly	1.43%	380	420
Semiannual	2.74%	358	442
Annual	7.68%	353	447

In addition to "winner" (W) and "loser" (L) categories, the category of winner minus loser" (W - L) is also created. (W - L) representing the momentum investment strategy, where investors long the past winner stocks and short the past loser stocks. The average return of (W - L) is act as an indicator of the efficiency of the momentum investment strategy. For instance, a positive and significant average return of (W - L) means that the momentum investment strategy generates abnormal return, implying

an efficient momentum investment strategy, while an insignificant average return indicates that the momentum investment strategy may not generate abnormal return or subnormal return.

The average returns of each category - W, L, (W - L) - implies the performance of the stocks. Performing statistical includes testing on each average return and getting the T-statistics and p-value. The statistical tested on the average returns will get the significance level of each average return, which provide evidence of presence or absence of the momentum effect. Since there is a continual trend of price and statistically stable return, significant average returns demonstrate the presence of momentum effect, while insignificant average returns indicate no momentum effect exists.

3.3.2 Firm size

In the second step, because of the fact that firm size effect is the only one factor tested on the momentum effect, adding it into this study is important for constructing the procedure of the whole test. In order to test the firm size effect on the momentum

effect of stock returns, the sample stocks are subdivided into three different groups: high-cap stock, medium-cap stock, and low-cap stock.

In this step, all of the sample stocks sorted by their market capitalizations in descending order have been separated equally into three parts. The top 1/3 and the bottom 1/3 are classified as "high-cap stock" and "low-cap stock" respectively, and the rest are classified as "medium-cap stock". The reason of using this approach has been stated in the last section of chapter 1. In doing so, stocks can compare with others in a relative way.

Table 3-3, 3-4, and 3-5 present the average returns of each group within different intervals - monthly, quarterly, semiannual, and annual - as well as the number of winner stocks and loser stocks. For example, in table 3-3, monthly average return of high-cap stocks is 0.40%. 123 stocks with average returns over 0.40% are classified as "winner", while 144 stocks are "losers" since their average returns are lower than 0.40%. Table 3-4 demonstrates the information of medium-cap stocks. The monthly average return is 0.46%, so 129 stocks are termed as "winner" and 137 are classified as "losers". Table 3-5 contains the information of low-cap firms. The monthly average

return is 0.31%, and 133 stocks are "winners" and 134 stocks are classified as "losers".

Table 3-3 Average returns: high-cap.

Interval	Average Return	Winner	Loser
Monthly	0.40%	123	144
Quarterly	1.47%	127	140
Semiannual	2.57%	117	150
Annual	7.68%	109	158

Table 3-4 Average returns: medium-cap.

Interval	Average Return	Winner	Loser
Monthly	0.46%	129	137
Quarterly	1.62%	124	142
Semiannual	3.16%	116	150
Annual	7.71%	115	151

Table 3-5 Average returns: low-cap.

Interval	Average Return	Winner	Loser
Monthly	0.31%	133	134
Quarterly	1.19%	131	136
Semiannual	2.48%	129	138
Annual	16.11%	97	170

3.3.3 Test of momentum effect

After grouping the stocks by the market capitalization, the third step of this study is to test the momentum effect of each sized stock in monthly, quarterly, semiannual, and annual interval. To test the effect of momentum, one can perform T-test on the average returns of W, L, and (W - L) categories, respectively.

A significant average rate of return on stocks of winner have shown that there is momentum effect exists in winner stocks, and a significant average return on loser stocks shows the existence of momentum effect in loser stocks. A significant and positive average return means the momentum investment strategy generates abnormal return, while a significant and negative average rate of return is refers to the momentum investment strategy generating subnormal return. An insignificant result may be explained by the absence of momentum effect, because there is no return that significantly different from zero. It means that there is no consistent tendency of stock prices or statistically stable return exists.

In addition, if each time interval of the statistical test shows a certain pattern from the high to the low-cap stocks, there might be an evidence to explain the impact of

company size on the momentum effect. For instance, if the statistical test of "winner" stocks decreases from high-cap stock to low-cap stock, it can explain as high cap stocks have stronger momentum effect than low cap stocks. This method can be used to test the impact of firm size on momentum effect in "winner" and "loser" categories. However, the objective to test the impact of firm size on momentum effect is to find out the relationship between the firm size and the rate of return of momentum investment strategy. This finding will used as a potential reference for investors who working on momentum investment strategy.

3.3.4 Test of momentum investment strategy

The study of the final step is to test the relationship between the firm size and the momentum investment strategy of return. A similar method of the test of momentum effect which discussed before, to test the relationship between firm size and return of momentum investment strategy, one can perform statistical analysis on the average return of the "winner minus loser" category. An significant and positive average rate of return is refers to the momentum investment strategy generates abnormal returns, and a significant and negative average return shows that the momentum investment strategy produce subnormal return. A trivial result implies that the momentum

investment strategy may not have any difference, since the average return of momentum investment strategy is not statistically significant different from zero.

Chapter 4 Analysis of Results

The objective of this study aims to evaluate impact between firm size and the return of momentum investment strategy. With reference to this study, the relationship will be able to answer the question "whether the momentum investment strategy generates higher return on high cap stocks than low cap stocks". In order to further verification, three hypotheses were stated at the end of chapter one. This study on the basis of testing three hypotheses tries to identify the relationship between firm size and return of momentum investment strategy. For convenient reading, the three hypotheses mentioned in chapter one are now stated as the following:

Hypothesis 1: The short term momentum effect exists in the Japanese stock market, and the momentum investment strategy can generate abnormal returns.

Hypothesis 2: The momentum effect is more significant in high cap stocks than in low cap stocks.

Hypothesis 3: The abnormal returns of momentum investment strategy on high cap stocks are higher than on low cap stocks.

Based on these three hypotheses, this chapter consists of three parts, related to the three hypotheses, respectively.

4.1 Existence of Momentum Effect

The first hypothesis relates to the momentum effect from an overall perspective. This test performs statistical analysis based on both of the winner stocks and loser stocks, regardless of firm size effect. Simultaneously, the "winner minus loser" category represented the momentum investment strategy, where investors tend to buy the winner stocks and short the loser stocks, is also performed statistical analysis.

Table 4-1 provides further comfort as to the results of this test. The numbers in the parentheses are the statistical test of average returns. The asterisks "****", "***", and "**" denote significance at 1%, 5%, and 10%, respectively. In this table, the average returns of all categories are significant within monthly, quarterly, semiannual, and annual intervals. Although the monthly average return of loser stocks is not as significant at 1% level as other categories, it is significant at 10% level.

The data of table 4-1 provide evidence of the existence of momentum effect in Japanese stock market. The momentum investment strategy, where investors tend to buy the winner stocks and short the loser stocks, generates significant abnormal returns in each interval. Furthermore, it could result that the longer the interval the higher the abnormal return generated by the momentum investment strategy. However,

please note this study about short term momentum effect. For intervals longer than one year, the returns may be a completely different result.

Table 4-1 Test on the overall momentum effect

Interval	Winner	Loser	Winner-Loser
Monthly	0.90% (26.61)***	-0.074% (-1.71)*	0.974% (21.80)***
Quarterly	3.13% (24.84)***	-0.12% (-3.86)***	3.25% (18.76)***
Semiannual	6.56% (22.69)***	-0.36% (-10.39)***	6.92% (12.48)***
Annual	16.28% (21.91)***	0.89% (17.70)***	15.39% (11.61)***

“***”, “**”, and “*” denote significance at 1%, 5%, and 10%, respectively.

4.2 Momentum Effect in Different Sized Stocks

The second test is basic on "hypothesis 2". It takes firm size effect into the analysis procedure. In this test, the sample is divided into three equal parts, high-cap stock, medium-cap stock, and low-cap stock, based on their market capitalizations.

Identifying the "winner" and "loser" categories, and performing statistical analysis to get average returns and their statistical test for each part. Table 4-2 shows the results of the second test. The numbers in the parentheses are the statistical test results of average returns. The asterisks “***”, “**”, and “*” denote significance at 1%, 5%, and 10%, respectively.

Table 4-2 Test on momentum effect in different sized stocks

Size	High-cap		Medium-cap		Low-cap	
Interval	Winner	Loser	Winner	Loser	Winner	Loser
Monthly	0.91% (16.33)** *	-0.03% (-2.65)** *	0.99% (16.77)** *	-0.03% (-2.53)** *	0.79% (16.18)** *	-0.16% (-0.78) *
Quarterly	3.07% (14.19)** *	0.007% (3.17)***	3.49% (16.85)** *	-0.006% (-1.12)	2.81% (15.35)** *	-0.37% (-1.93)*
Semiannual	6.17% (13.74)** *	-0.24% (-4.54)** *	7.45% (14.76)** *	-0.16% (-8.92)** *	5.97% (14.51)** *	-0.78% (-4.62)** *
Annual	16.84% (12.20)** *	1.41% (10.53)** *	18.55% (14.22)** *	1.65% (10.74)** *	24.74% (12.58)** *	11.18% (9.84)***

"***", "**", and "*" denote significance at 1%, 5%, and 10%, respectively. The absence of asterisk denotes no significant difference existing.

In table 4-2, the winner stocks of each sized of firms shows significant average returns in the monthly, quarterly, semiannual, and annual intervals. However, the average returns of loser stocks present different levels of significance. For instance, the quarterly average return of medium-cap loser stocks and the monthly average return of low-cap loser stocks are insignificant at 10% level. The monthly average return of medium-cap loser stocks is only significant at 5% level, and the quarterly average return of low-cap loser stocks just significant at 10% level. Generally speaking, the short-run momentum effect on the stock returns of larger firms more than those of smaller firms. Additionally, in the short-run, there are the longer the

period the stronger the momentum effect of stock returns. It should point out that, larger firms have higher returns than smaller firms in this test in short-term period.

4.3 Investing in Different Sized Stocks

The third test is basic on examining the abnormal returns of momentum investment strategy where investors tend to buy the winner stocks and short the loser stocks.

According to the third hypothesis, the abnormal returns based on high-cap stocks should be higher than those on low-cap stocks. By performing statistical analysis on the returns of momentum investment strategy, the results are demonstrated in table 4-3. The numbers in the parentheses are the statistical test of average returns. The asterisks "***", "**", and "*" denote significance at 1%, 5%, and 10%, respectively.

In table 4-3, all of the returns generated by the momentum investment strategy are significantly different from zero. This phenomenon indicates strong momentum effect.

In other words, accounting to the momentum investment strategy, investment for short term will get abnormal returns in any sized firms. For each length of interval, high-cap stocks always have higher returns than medium-cap stocks, which have higher returns than low-cap stocks. Furthermore, the longer the interval is, the higher the returns are in any sized firms can be proved.

The results in table 4-3 agrees with the momentum investment strategy can obtain abnormal return in Japanese stock market in the short term. What's more, these results suggest that according to the momentum investment strategy, investing in high cap stocks will get more return than investing in low cap stocks.

Table 4-3 Test on the momentum investment strategy

Interval	High-cap	Medium-cap	Low-cap
Monthly	0.45% (14.20)***	0.46% (11.03)***	0.31% (14.11)***
Quarterly	1.47% (11.61)***	1.62% (11.36)***	1.19% (12.48)***
Semiannually	2.57% (7.42)***	3.16% (7.55)***	2.48% (10.00)***
Annually	7.68% (6.84)***	7.71% (6.59)***	16.11% (6.61)***

****, ***, and * denote significance at 1%, 5%, and 10%, respectively.

Chapter 5 Conclusions and Recommendations

5.1 Conclusions

This study aims to determine the relationship between firm size and momentum effect.

Accounting to momentum effect means, in the short term, past winner stocks will

continual to be winners and past loser stocks will continual to be losers. The test takes

firm size into account when examining the momentum effect in Japanese stock

market.

If change the identity of the period as short-term (1-3 months), medium-term (6

months), and long-term (1 year), the momentum effect in different periods has no

significant contradictory in this study. It is expected that there is a significant relation

between momentum effect and firms' stock return in different period in Japanese

market.

The results of three hypotheses, in previous chapter of this study, were positive. In the

Japanese stock market, momentum effect exists in the short term and the momentum

investment strategy, where investors tend to buy the winner stocks and reduce the

loser stocks, generates abnormal return. The momentum effect is stronger in high cap

stocks than that in low cap stocks, and the abnormal return of momentum investment strategy is higher in high cap stocks than that in low cap stocks.

Based on these results above, it can be concluded as follows:

- (a) Regardless of the firm size, investors are better off buying the winner stocks, because the winner stocks are proved to have more significant return than loser stocks.

- (b) With the momentum investment strategy, investors would better invest in high cap stocks to achieve higher abnormal return.

5.2 Recommendations

This study focuses on find a way to determine the relationship between firm size and momentum effect in the short term. Although the author has been considered the most related factors, there are some other factors that may have some connection with momentum effect, accounting to constraint of objective conditions, have not been tested in this study. Future researches should focus on identifying and testing on these

factors. For instance, one can compare the degree of momentum effect in different industries and the return of momentum investment strategy.

5.3 Limitations and Directions for Future Research

This study, like any study, suffers from some limitations. First of all, the present study examines firms without industry classification. If industry factor is taken into, the empirical findings may have variety meanings for the particular sectors under study, which may expand their explanatory power or generalizability for other sectors.

For example, high-technology sectors would have more risk for its intangible characteristic. Hence, high-technology sectors may have higher or lower momentum effect than other sector. In future research, this study should be extended to separate different sectors in order to validate further the explanatory power of the current findings.

Second, firm behavioral momentum, in this study, is analyzed in formal institutions.

In the future, the research may extend the study to examine informal institutions such as company culture, because informal institutions are also thought to be path-dependent (North, 1990; Wan, 2005).

Third, larger sample sizes are recommended to cover a wider variety of industries on a comparative analysis and cover longer time periods which will enhance and improve the validity of the findings.

Last but not least, the present study can be modified to further examine whether firm age can affect a firm's behavioral momentum. For instance, the longer the firm age, the higher chance there is that investors may perceive bureaucracy that erode the efficiency and affect profitability. Moreover, how such relationships of firm size and firm age can be moderated by a firm's strategic dimensions to advance our understanding of factors that may affect momentum from different perspectives.

Reference

- Antoniou, A., Herbert, L. & Krishna, P. (2007). Profitability of momentum strategies in international markets: The role of business cycle variables and behavioral biases. *Journal of Banking and Finance*. 31, 955-972.
- Assess, C. S. (1997). The interaction of value and momentum strategies. *Financial Analyst Journal*. 53 (2), 29-36.
- Avramov, D., Chordia, T., Jostova, G. & Philipov, A. (2007). Momentum and credit rating. *The Journal of Finance*. 62 (5), 2503-2520.
- Boni, L. & Womack, K. L. (2006). Analysts, industries, and price momentum. *The Journal of Financial and Quantitative Analysis*. 41 (1), 85-109.
- Brennan, M. J., Chordia, T. & Subrahmanyam, A. (1998). Alternative Factor Specifications, Security Characteristics, and the Cross-Section of Expected Stock Returns. *Journal of Financial Economics*. 49, 345-373.
- Chan, L., K. C., Jegadeesh, N., & Lakonishok, J. (1996). Momentum strategies. *The Journal of Finance*. 51 (5), 1681-1713.
- Chan, L., K. C., Jegadeesh, N. & Lakonishok, J. (1999). The profitability of momentum strategies. *Financial Analyst Journal*. 55 (6), 80-90.
- Cooper, M. J., Gutierrez Jr., R. C. & Hameed, A. (2004). Market states and momentum. *The Journal of Finance*. 59 (3), 1345-1365.
- Dijk, R. & Huibers, F. (2002). European price momentum and analyst behavior. *Financial Analysts Journal*. 58 (2), 96-105.

-
- George, T. J. & Hwang, C. Y. (2004). The 52-week high and momentum investing. *The Journal of Finance*. 59 (5), 2145-2176.
- Grinblatt, M. & Moskowitz, T. (1999). Do Industries Explain Momentum? *Journal of Finance*. 54, 1212–1249.
- Hong, H., Mm, T. & Stein, J. C. (2000). Bad news travels slowly; size, analyst coverage, and the profitability of momentum strategies. *The Journal of Finance*. 55,265-295
- Hvidkjaer, S. (2006). A trade-based analysis of momentum. *The Review of Financial Studies*. 19 (2), 457-491.
- Jegadeesh, N. & Titman, S. (2001). Profitability of momentum strategies: an evaluation of alternative explanations. *The Journal of Finance*. 56 (2), 699-720.
- Johnson, T. C. (2002). Rational momentum effects. *The Journal of Finance*, 57 (2), 585-608.
- Lee, C. M. C. & Swaminathan, B. (2000). Price momentum and trading volume. *The Journal of Finance*. 55 (5), 2017-2069.
- Moskowitz, T. J. & Grinblatt, M. (1999). Do industries explain momentum? *The Journal of Financ*. 54 (4), 1249-1290.
- Rastogi, N., Chaturvedula, C, & Bang, N, P. (2009). Momentum and overreaction in India capital markets. *International Research Journal of Finance and Economics*, 32.

Rowenhorst, K. G. 1998. "International Momentum Strategies". *Journal of Finance*. 53, 267-284.

Sapp, T. & Tiwari, A. (2004). Does stock return momentum explain the "smart money" effect? *The Journal of Finance*. 59 (6), 2605-2622.

Scowcroft, A. & Sefton, J. (2005). Understanding momentum. *Financial Analysts Journal*. 61 (2), 64-82.

Volkert, V. M., Lerman, D. C., Trosclair, N., Addison, L. & Kodak, T. (2008). An Exploratory Analysis of Task-Interspersa1 Procedures while Teaching Object Labels to Children with Autism. *Journal of Applied Behavior Analysis*. 41(3), 335-350.