Momentum Return in Chinese Capital Market and The Influences of Size, Liquidity and Historical Return

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Abstract

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This paper investigates short term to intermediate-horizon momentum effect in Chinese capital market. The result of the research supports the assertion that momentum effect exists in Chinese capital market. Using momentum strategies could create return in excess of market average return. This paper also examines influence of firm size and average trading volume on the effectiveness of momentum strategies. We found that firm size has a negative relationship with momentum return and that relationship is statistically significant. On the other hand, our results confirm a negative relationship between trading volume and momentum return and that relationship is not as significant as firm size effect. The regression analysis also conclude that historical returns contribute the most to momentum return, indicating that momentum effect is not subsumed by size and liquidity effect.

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Chapter 1

Introduction

1.1 Background

Efficient market hypothesis is one of most profound foundation hypothesis in Finance for many decades. It is the most widely known basis for many financial theories. As it suggests an efficient market should react quickly, effectively and accurately to new information that is available in the market place. However, some previous studies demonstrate contradiction of the hypothesis. One of most widely known anomalies is the momentum effect in equity markets. The momentum effect was firstly suggested and studied by Jegadeesh and Titman in 1993. It refers to an abnormal returns provided by conducting momentum investment strategies, by which investors continually rebalance their portfolios by longing the winners of last period and shorting the losers. Previous studies suggest that excess return can be earned purely based on historical market information by conducting the momentum strategy. Moreover, the effectiveness of momentum strategy seems to be varying from companies with different characteristics, which implies that some factors could affect the usefulness of momentum effect; for example, size of the company is the widely recognized factor that affects the momentum effects. Therefore, the study of momentum effect should take these factors into consideration.

1.2 Purpose and Objectives

An effective momentum strategy provides investors a power of predicting the market merely based on historical market information. In other words, investors could build an easy-to-use, but effective pattern from historical market in order to predict the market and make excess return. The purpose of this study is to find out whether momentum strategy is a feasible way to predict the market and make excess return. In addition, this study also seeks to identify the influence of some potential factors in the determination of the effectiveness of momentum strategy. Specifically, three factors will be examined in the study: size, liquidity and historical return of companies. By identifying the influence of the three factors, the study will be able to provide a guideline of how investors could utilize momentum strategy more effectively. In order to serve the purpose of the study, the following to particular objectives need to be reached:

- To test the existence of momentum effect by investigating the return on momentum portfolio in excess of market return
- To test if the momentum effect differs across companies of different sizes
- To test if the momentum effect changes as the liquidity of companies changes
- To investigate how these three factors affect the momentum return interactively: size, liquidity and historical return

These tests aim to give investors an idea of whether momentum effect exist in Chinese capital market and the how the size and liquidity solely and interactively affect the

utilization of momentum strategy.

1.3 Limitation of the study

There are some limitations involved in this research paper. One of the major limitation is that this paper assumes that there is no transaction cost, which might be significantly affect the feasibility of momentum strategy. Large investors can take advantage of economies of scale and enjoy relatively lower transaction costs of rebalancing investment portfolios compared to small investors. In this research paper, we focus on how momentum strategy could assist investors predict the market movement and develop momentum strategies based on such prediction.

A potential limitation of this research is the measurement of factors whose impact on momentum strategies. For example, in order to test the influence of size and liquidity on momentum effect, we will use market capitalization and average daily trading volume to represent the size and liquidity of the company, respectively. However, the average trading volume might not be able to capture all the effects of liquidity. In this sense, the average trading volume of the company can only be used as an proxy of liquidity.

1.4 Structure of the research

This research paper is consisting of five chapters. The first chapter gives a brief

introduction of this research project. In the second chapter, some of the important previous researches will be reviewed to provide a general direction and understanding about this topic. Some widely accepted conclusions from previous studies would be used as guidance for the design of theoretical test. In chapter three, the data and methodology we are going to use in this paper will be discussed. The discussion will be regarding to how the data is collected and how we are going to design the test to examine the momentum effect and the influence of the factors. The fourth chapter the result will be presented in tables along with some discussion and analysis about the result of the test. Finally, we will be trying to draw some conclusions and give some recommendations according to our research to investors in the last chapter.

Chapter 2

Literature Review

There have been a number of studies discover the potential existence of market anomalies contradicting the theory of Efficient Market Hypothesis. Many of them indicate the predictability of past market information on the future stock returns. Among those many anomalies, the momentum effect, which is firstly documented by Jegadeesh and Titman (1993) has been widely recognized and studied. Even though the cause of momentum return has always been a controversial topic, there is no doubt that many studies support the existence of momentum effect. Moreover, some researches have found some reasonable theories to explain the puzzle of momentum return and some others have suggested some factors that affect the momentum effect, such as time horizon, size, liquidity of the companies and so on. The following is a review of some previous theories and studies.

2.1 Efficient Market Hypothesis

Fama introduced the efficient market hypothesis in 1965, suggested three types of market efficiency: weak form, semi-strong form, and strong form of market efficiency (Fama, 1970). Fama categorized the market efficiency based on how market is able to reflect

information:

Weak form EMH suggests that the market has reflects all the past market information including historical market prices and trading volumes. Since price patterns in the past are not necessarily repeat itself, there assumes to be no predictive power of technical analysis on the market prices in the future. However, the market has not fully reflected all the public information, which gives a way to fundamental analysis. By discovering information that is available but not widely understood by the public, fundamental analyst could find hidden abnormal return using public information.

Semi-strong efficient market refers to a market where all the public information has been fully reflected. It implies that investors cannot earn persistent excess return by implementing fundamental analysis because all the hidden opportunity will be taken immediately as it become available.

Strong form market efficiency suggests that all the existing information including private information will be reflected in the market prices of the companies, implying that investors cannot make abnormal returns even if they are using private information to trade.

Even though the Efficient Market Hypothesis has become one of the mostly used foundations of many financial theories， many researchers have found some contradiction to this hypothesis, for instances: Banz (1981) found the evidence that there is a relationship between size and market price of the company; Debondt and Thaler (1985) found that market prices tend to reverse in the long run while Jegadeesh and

Timan (1993) suggest the existence of momentum effect in the medium run.

2.2 Momentum Effect

The existence of momentum effect in capital market has been discovered by a number of empirical studies. To test the momentum effect, researchers will buy the best performing stocks and short the worst performing based on preceding period and to construct a momentum portfolio. The return of the momentum portfolio will be compared with that of a benchmark, for example, market average return or market index return. Jegadeesh and Timan (1993) found that the momentum effect exists in intermediate term (3 to 12 months) while Lehmann (1990) and DeBondt and Thaler 1985 proposed reversal effect in short term (less than 3 months) and long term (longer than one year), which implies a possibility of the reverse of momentum effect: contrarian effect. Jegadeesh and Timan's (2001) further research confirms the existence of momentum effect, and claims that momentum effect is a market anomaly rather than a result of data mining.

Since the discovery of momentum effect by Jegadessh and Timan, researchers have found that momentum effect in many countries and regions around the world: Rouwenhorst (1998) shows the existence of momentum effect in many European countries as well as many developing countries (1999); Hameed and Yuanto (2000) provide the evidence of momentum effect in Asian capital markets, The research of Isabelle et, al (2003) also support the existence of momentum effect in Australian capital market.

Even though the existence of momentum effect is widely known and studied, the cause of this market anomaly remains subtle. Many theories have been come up with to explain this market mystery.

2.3 Causes of the momentum effect

2.3.1 Behavioral theory:

Many researchers try to explain the excess return from momentum strategy from behavioral finance perspective. Daniel and Subrahmanyam (1998) and Hong and Stein (1999) attribute the momentum effect to how investors interpret and react to information. They proposed that investors tend to overreact to information in the short run, but the misunderstanding could be fixed in the long run. The process of overreaction causes the abnormal return to be generated from momentum strategy.

2.3.2 Cross-sectional variation：

The most notable theory trying to explain the abnormal return of the momentum effect comes from Conrad and Kaul (1998). They argue that the abnormal return from momentum effect originates from an inherent bias in constructing the momentum portfolio. That is, when we construct a momentum portfolio, we would select stocks from industries with higher expected return. It might be the higher expected return of certain industries that drives up the return of momentum portfolio,

rather than the effect of time-series prices; however, Conrad and Kaul (1998) didn't deny that time-series prices contribute to the high return, but proposed that time-series data might not be the whole cause of the abnormal return. Therefore, the profitability of momentum strategy is not necessarily linked to a predictive power of historical price pattern.

2.4 Influence of liquidity

As we mentioned before, the abnormal high return can be attribute to the overreaction of investors, suggesting that a higher degree of information asymmetries might be closely related to high abnormal return of momentum strategy, because the information cannot be accurately interpreted. At the same time, liquidity of a company could be related to momentum effect, as a liquid company has a low level of information asymmetries. Lee and Swaminath's (2000) study confirms that. They propose that the trading volume of company is closely related to the effectiveness of momentum strategy in a way that: companies of lower trading volume have higher momentum return in the future because investors tend to misinterpret the information of a company that is illiquid and has high degree of information asymmetries.

2.5 Influence of firm size

The size effect on the return of companies has been realized by many researchers, Banz

(1981) suggest that small firms tend to have a higher expected return than large firms. But he doesn't explain how the size and momentum return related. Hong ect, al (2000) discovered that momentum return can be attributed to size. Momentum strategy demonstrates highest returns among companies of smallest capitalization.That means a momentum strategy works better for small companies. Isabelle et, al (2004)'s research support the findings; moreover, they found that even though the momentum effect seems to exist in large firms, the statistical model demonstrate an insignificant result; while the momentum effects among small firms are positive and significant.

Summary

This part has reviewed the efficient market hypothesis and some market anomalies that have been revealed by many previous studies and researches. In terms of momentum effect, we also summarize some characteristics of the effect found by other researchers. They have provided a consistent result that the strength of momentum effect is a function of different factors. Among all of the factors, we are interested in time horizon, size and liquidity effect. Previous researches demonstrate that momentum effect exists in medium term, shows significance among small companies and has a negative effect with liquidity.

Chapter 3

Data and Methodology

3.1 Source of Data

This research paper will study the momentum effect in Chinese capital market using historical data from 2001 to 2011. A sample with 900 companies will be selected randomly from all the companies listed in Chinese capital market. Historical prices, market capitalization and average trading volume will be collected from Bloomberg database. The average return of the sample will be used as proxy of market return.

3.2 Methodology

Since previous shows that momentum effect exits in medium term but weaken in short and long term, this research will examine momentum effect in 1 month, 3 months, 6 months and 12 months interval. That means the winners and losers are estimated based on their stock prices performance during various time intervals. Then the portfolio will be held for different period of time until they get rebalanced. The periods during which winners and losers are estimated are regarded as estimation periods (K=1, 3, 6, 12 months), while the periods that portfolios are held after being formed are termed as "prediction period" (L=1, 3, 6, 12 months). We will follow Jegadeesh and Timan

(1993)'s method of constructing a momentum portfolio, which is long the winners and shorting losers. Returns of winners and buyers are equally weighted average of buy-hold return. Moreover, the effect of firm size and trading volume will be considered. In order to do so, we will rank the companies by sizes, and trading volumes. The momentum effect will be tested for each ranking to find out how sizes and trading volume change the momentum effect.

3.3 Procedure of Testing

In order to test momentum effect, we will firstly construct momentum portfolios using winners and losers of different time intervals. To do so, we will compute the buy-hold return of all the stocks using their historical price at the end of each month, and rank them in ascending order.The winners (W) are defined as companies with the top 10% of all companies with highest buy-hold returnin excess of market return; while losers (L) are the bottom 10% companies with the lowest buy-hold excess return among all the companies in the sample. The momentum portfolios are constructed by longing winners and shorting losers (W-L). The winners and losers will be evaluated based on returns of different length of estimation period. Specifically, we will use 1, 3, 6, 12-month (K=1, 3, 6, 12 months) buy-hold return of the companies to construct four types of portfolios. In addition, we can choose the prediction period for each of the 4 portfolios. That is, how long we will be holding these portfolios (L=1, 3, 6, 12 months). By constructing

portfolios with different combination of estimation and prediction portfolios, 16 in total different momentum portfolios can be created to test the effectiveness of different momentum strategies.

To test the existence of momentum effect, the returns and t-statisticsof winners, losers and momentum portfolios will be provided. To test how momentum effects differentiate among companies of different sizes and liquidity, we will test the impact of sizes and liquidity by doing the following: rank the companies by sizes and average trading volume (as a proxy of liquidity), and divide them equally into three rankings: small size, medium size, large size (by sizes) and low trading volume, medium trading volume, high trading volume (by trading volume).The same 16 momentum portfolios will be constructed for each of those rankings. We can then test the difference of momentum effect between companies with different sizes or liquidity and see how those two factors itself affect the effectiveness of momentum strategies. However, in order to test how those three factors jointly contribute to the momentum return, we would like to use a regression model.

3.4 Regression Model

To identify which of these three factors: size, trading volume and historical returns contribute the most to excess return of momentum strategy, a three factors regression model proposed by Isabelle et, al (2003) will be employed.

The model states as:

$$(R_p - R_m)_{t+1} = \alpha + \beta_1(R_p - R_{m)_t} + \beta_2 \log(\text{size})_t + \beta_3 \text{liqiudity}_t$$

Where:

R_p = Return of momentum portfolio

R_m =Return of market

$(R_p - R_m)_{t+1}$= Excess return in prediction period

$(R_p - R_{m)_t}$= Excess return in estimation period

$\log(\text{size})_t$= Logarithm of market capitalization at the end of period t

liqiudity_t= Logarithm of average trading volume during period t

As we illustrate above, the coefficient of each factors could give us a idea how those three factors jointly contribute to a momentum return in prediction period. An positive coefficient indicates a positive relationship between the factors and momentum return, and vice versa. Even though there are 16 different momentum strategies, the regression analysis won't test all of them in this paper. We will only use the regression model to test the momentum strategies with same estimation and prediction period. For instances, we will only test strategy which K=1 and L=1, or K=3 and L=3.

3.5 Expectation

As the momentum portfolios are formed by using winners and losersfrom four different intervals and held for different interval of subsequent periods, it gives us 16 different momentum strategies. In this paper, we will test which whether those strategies provide an abnormal return. Additionally, since we divide the sample into three rankings based on either their sizes or average trading volume, we can also test the how those strategies work for each of three rankings based on the either sizes or trading volumes. For each of the two partitions, size and average trading volume, returns and t-statistics of 48 portfolios will be tested and presented in a summary table. Hopefully, some of the portfolios can demonstrate positive and significantexcess return; some might be positive but not statistically significant.

The regression analysis is expected to demonstrate a positive relationship between previous return and a negative relationship between firm sizes and momentum return. It's likely that we will see a negative relationship between trading volume and momentum excess return. The relationship between historical return and momentum return is expected to be significant; while relationship between size and momentum return or trading volume and momentum return might or might not be significant.

Chapter 4

Results and Analysis

4.1 Existence of momentum effect

Table 1. Momentum return and t-statistics

		L=1		L=3		L=6		L=12	
		Return	t-stat	Return	t-stat	Return	t-stat	Return	t-stat
K=1	W	1.23	2.78	2.12	2.56	5.21	2.38	4.32	4.98
	L	0.38	1.43	-0.45	2.78	0.23	3.21	-2.12	3.81
	W-L	0.85	1.55	2.57	2.64	4.98	2.79	6.44	4.23
K=3	W	0.66	3.42	4.36	3.78	4.01	3.98	5.36	4.23
	L	-0.87	3.99	-1.56	3.45	-0.76	3.24	-2.45	4.78
	W-L	1.53	4.02	5.92	3.64	4.77	3.77	7.81	4.54
K=6	W	0.84	3.94	4.72	3.98	6.12	4.23	5.88	3.98
	L	-0.64	4.07	-0.94	3.12	0.35	5.12	-2.71	4.65
	W-L	1.48	4.12	5.66	3.54	5.77	4.76	8.59	4.21
K=12	W	1.03	3.68	3.27	4.32	6.11	3.23	6.21	2.57
	L	-0.75	4.72	-1.66	4.02	-2.1	4.53	-2.73	2.14
	W-L	1.78	4.33	4.93	4.12	8.21	4.17	8.94	2.33

Table 1 shows the result of momentum effect testing. The table shows the return of winners, losers and momentum portfolios. As the table illustrate, all of those 16 momentum strategies provide a significant return in excess of market return. The average monthly returns firstly increase as the holding period of the portfolios increase, and the excess return reach the peek when estimation period and prediction period are both three months (K=3, L=3). It yields 5.92% in three months holding period (average 1.97 per

month). As the holding period extends longer than 3 months, the average monthly returns start to decline. The returns become the lowest with an estimation period of 6 months and holding period of 12 months (K=6, L=12), which yields 4.21% in 12 months (average 0.72% per month). It implies that rebalancing the portfolios every 3 months seems to be a great strategy for investors to follow. Less frequent rebalancing might result a decline in excess return of the momentum portfolios. The t-statistics shows the significance of excess return. As being presented in the table, 15 out of 16 portfolios' excess return are significant at the confidence level of 5%. The only exception appears when estimation and prediction period are both short (K=1, L=1). This result strongly suggests that the momentum effect exist in Chinese capital market.

4.2 Size Effect on Momentum

Table 2. Momentum return to size-sorted portfolios

		L=1		L=3		L=6		L=12	
		Return	t-stat	Return	t-stat	Return	t-stat	Return	t-stat
K=1	Small	1.14	1.74	2.66	2.17	5.11	2.43	8.99	5.45
	Medium	0.77	1.52	2.54	2.44	4.36	2.77	6.78	4.96
	Large	0.74	1.44	2.17	2.96	3.98	2.14	5.42	4.31
K=3	Small	1.17	3.17	6.24	3.54	5.35	3.67	8.21	4.77
	Medium	0.53	3.68	4.78	3.86	4.17	5.64	6.62	4.68
	Large	0.66	2.64	4.67	3.27	4.23	3.23	6.12	3.34
K=6	Small	1.21	3.67	5.78	3.12	6.62	4.66	9.65	3.81
	Medium	1.01	3.66	5.01	3.33	4.98	3.96	7.02	2.24
	Large	0.86	2.78	4.86	3.18	5.67	3.19	6.87	4.12
K=12	Small	0.92	3.64	4.12	3.98	8.65	4.88	9.75	2.78
	Medium	0.67	4.01	3.83	4.36	7.14	3.66	8.87	3.67
	Large	0.58	3.98	3.71	2.17	7.62	3.12	7.96	1.96

Table 2 demonstrates the result of the test of momentum effect sorted by firm sizes. The result reveals how firm size affect the effectiveness of momentum strategy. In general, momentum effect weakens as the sizes of companies grow using the same momentum strategy with same estimation periods and prediction periods. This result agrees with many of the previous studies that the momentum effect is strongest in small-cap stocks and declines as the company's market capitalization increases. The result also suggest a similar result as table 1 presented, that is the momentum return peeks in medium term when holding periods are 3 months, and declines as prediction period become longer. For example, the most successful strategy, which using 6 month historical information to form the portfolio and hold it for 3 month, provides a excess return of 5.78% in 3 month (1.92% per month) if investors apply this momentum strategy to small companies. Additionally, t-statistics tends to give the same result as table 1 presented, which is that most of the excess returns statistically significant, except for the strategy that K=1 and L=1.

4.3 Liquidity Effect on Momentum

Table 3. Momentum Returns to Volume Partition

		L=1		L=3		L=6		L=12	
		Return	t-stat	Return	t-stat	Return	t-stat	Return	t-stat
K=1	Low	1.21	1.98	3.65	4.35	5.21	5.35	6.42	5.04
	Medium	0.85	2.31	3.12	5.04	4.62	4.39	5.17	5.17
	High	0.81	1.95	2.17	3.17	3.78	4.77	4.68	4.03
K=3	Low	1.45	2.67	5.54	4.89	6.17	4.38	6.78	6.77
	Medium	0.98	4.78	4.13	5.66	5.42	3.79	4.89	6.32
	High	0.71	4.32	3.78	3.78	4.56	4.12	5.21	5.86
K=6	Low	1.07	6.32	6.78	5.71	6.33	6.01	7.04	4.71
	Medium	1.38	4.55	5.32	4.65	4.65	3.12	5.66	5.86
	High	1.17	5.32	4.76	4.12	5.31	4.66	4.71	5.27
K=12	Low	0.98	6.17	6.23	6.32	6.38	5.78	6.23	5.31
	Medium	1.23	5.53	5.87	5.45	5.57	4.66	5.43	4.12
	High	1.42	5.78	5.44	6.17	4.35	4.17	5.22	4.48

Similar to Table 2, Table 3 presents the momentum excess return sorted by average trading volume. It shows the excess returns of companies of different average trading volume generated by using various momentum strategies as we have mentioned in previous section of this paper.The result discloses a fact that the trading volume is negatively related to momentum return. In other words, smaller trading volumes (lower liquidity) could amplify the momentum effect, while increase in liquidity would decrease the excess returns generated by momentum strategies. It's in line with Lee and Swaminath's (2000) study that lower trading volume closely link to higher momentum return. It suggests that momentum strategy is more effective when it is applied to relatively illiquid stocks.

4.4 Regression Analysis

Table 4. Results of Regression Model

Period	Intercept		Return	Size	Volume	R-Squared
1-1	-0.023	(-1.74)	0.23 (2.89)	-0.07 (-8.42)	-0.004 (-0.46)	0.37
3-3	0.036	(1.86)	0.56 (6.71)	-0.16 (-6.44)	-0.015 (-1.03)	0.71
6-6	0.051	(1.45)	0.37 (5.42)	-0.11 (-5.87)	-0.017 (-0.87)	0.56
12-12	0.064	(2.67)	0.24 (4.78)	-0.06 (-5.28)	-0.012 (-0.65)	0.39

Finally, we use regression model to analyze the influence of three factors as we mentioned to see how the historical excess return, sizes and liquidity in estimation period contribute to excess return in prediction period. The Table 4 shows the coefficient and t-statistics of each factors as well as R-squared for each regression equations. Coefficients demonstrate how changes in factors affect excess return in prediction period. For example, for K=3, L=3, a 1% increase in excess return of estimation period would result in a 0.56% growth in excess return in prediction period; while a 1% change in average trading volume would link to a 0.015% decrease in excess return in prediction period.

As the Table 4 shows, lag excess returns in estimation period contribute the most to the excess return in prediction period followed by size factor. As lag return has a positive relationship with excess return in perdition period, both size and average trading volume are negatively related to excess return in prediction period. The figures in the brackets show the t-statistics of the parameters, which provide a way to test thesignificance of

those parameters. The results suggest that the relationship between lag return, size and excess return in the future are significant while relationship between trading volume and prediction period excess return are insignificant. R-squared of the equation tells that how much of change in dependent variable can be explained by independent variables. As the results shows, the three factors can only explain parts of the excess return in prediction period. The 3-3 period model provides the largest explanatory power where three factor models explain 71% of the excess return in prediction period.

Chapter 5

Conclusions

This research has investigated a medium term momentum effect in Chinese capital market. It suggests that the momentum effect does exist in Chinese capital in medium term. Following momentum strategy could provide investor an excess return in medium term. The research also explore how different formation of momentum portfolio could affect the momentum return and how size, and trading volume ranking could be used to change the momentum returns. We found that a medium term momentum portfolio with 3 months estimation period and 3 months yields the highest excess return in prediction period. The excess return declines as holding period increases longer than 3 months. In terms of the influence of size and liquidity effect, we found that the momentum effect is strongest among small stocks and low trading volume stocks and weaken as the firm sizes and trading volume increase.

We also use a regression model to explore how the historical returns, firm sizes and trading volume contribute to the momentum return. The result suggest that the momentum return are link to preceding period return and firm size; however, the influence of trading volume is unclear as the t-statistics shows a insignificance of the parameter. Those findings are consistent with many of the previous studies conducted in other capital market.

Those results give a conclusion that investors could use momentum strategy to get excess

return in Chinese capital market, especially in small-cap stocks; Even if the testing suggest a negative effect of trading volume on momentum returns, the relationship remains ambiguous as it's not statistically significant.

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