

PRIMARY RESEARCH

# Momentum effects and Pakistan stocks exchange

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Momentum  
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## Abstract

Using a sample of 466 non-financial firms from Pakistan Stock Exchange for the period from 2007 to 2017, this thesis examines the momentum effects by employing 25 momentum strategies. Furthermore, this thesis also used Capital Asset Pricing Model (CAPM) and Carhart four factors model for risk factors analysis. The results of Carhart four factor model shows that there is a robust relationship between risk and returns because of systematic risk and likewise, the coefficient of size factor (SMB) positive and statistically highly significant implies that small minus big stock is explain the portfolios returns. Conversely, the coefficient of factors (HML) and momentum factors (MOM) negative and highly significant implies that the momentum and HML factor perfectly negatively explains the dependent variable and the momentum profits are almost vanished. Furthermore, it is concluded that Carhart models is able to define variation in stock return for above given factors and is appropriate for Pakistan Stock Exchange. The results of short term momentum monthly 25 momentum strategies as well as long term 16 Strategies indicates the in-existence of momentum in Pakistan stock. Furthermore, this thesis found that only 1/3 and 6/9 strategies produce abnormal return and this returns is due to systematic risk and manager performance respectively. This study concluded that all momentum portfolios confirmed that there are no momentums effects exist in Pakistan Stock Exchange. This study suggests that investors should avoid investing in Pakistan capital market based on momentum strategies. This thesis recommends that sample should be increased and used to daily stock, bond, commodities data to revisit the momentum effects. Furthermore, contrarian momentums as well as early and late stage momentum strategies should apply in order to see the existence and robustness of momentum.

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## INTRODUCTION

Momentum effects is a one of the most important issue in international literatures and momentum strategies is a best tools to detect the momentum effects in capital markets across countries. For investors, momentum is undiscovered style, an important tool for building diversified portfolios through investor's normal return profit. According to [S. Khan, Saddiqui, Ali, and Khan \(2016\)](#) Momentum is the tendency of investment to show persistence in their relative performance. Investment that has typically well in the past will tend to perform well in the future. In the same vein, the investment that has performed relatively poor, continue to perform poorly. Furthermore, Momentum is well organized and systematic styles of Investments in stock prices, currencies, bond, and commodities prices ([Fatima, Majeed, & Saeed, 2017](#); [S. Khan et al., 2016](#)). Those share which

are performed well, it's simple mean that this act is due to number of unique risk associated with momentum return. However till now not any of the risk factors robustly recognized. If it's not the Efficient Market Hypothesis (EMH) which is compensating for risk, the existence of momentum seem to be challenge for the EMH that performance of past price give no proof for the future price or express differently for the prediction of future information the past return can't be used. According to prior research the capital market the momentum is inefficient because of the investor's reaction similar to bandwagon effect, low response to new information with disposition effect. Some investor's reaction explanation has been place ahead when new information comes to the market first investor behavior show low response to that new information. According to the EMH assumption when the information comes to the mar-

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ket this information should be available freely on time to the investors of the all market and the price of stock will adjust instantly the information (Fama, 1970) but in fact many investors, buyers or sellers or spontaneous investors get news from many sources and respond with different time and predict to a different way. The anchoring and correction is related to behavioral occurrence in which individuals gradually update themselves as new information receiving and continuously accept its influence. Several proofs support the low response to the latest information theories. Many firm replying to earnings and dividend announcement for the examination and little reluctance for the updating of their forecast.

Social economists with the investigational psychologists said about the momentums effect that this is disposition effect due to these are dependent on individual nature and investor as a human being vulnerable and want to get the investment according to their nature. Obviously, most of the investors tend to sell winner portfolios before the maturity for the purpose to earn abnormal profit and hold the loser portfolios until the price come to the level in order to avoid from the loss (S. Khan et al., 2016; Zia, Saeed, & Khan, 2018). This behavior develop fake headwind because if good news is announce the price of selling assets does not promptly rise due to early selling while if bad news is announce, investor are reluctant to sell and due to this the price drop down less.

Thirdly the momentum reason is because of the investor behavior is overreaction and its simply called the effect of bandwagon in keeping with effects the broker which are short term may use the updated performance of concern market as a Signal about the assets through this signals they are selling and buying the assets while the other long term investors go after short term investors and verify their buying and selling. Basically one sell and buy the others will follow the same method. The act of short term and long term investors of selling and buying of an assets can go the price high and low because of buying and selling that might be continuous for some months until the last correction. The major examples from the history are financial and energy rally during 2007 to 2008 and Bandwagon influence is related to Technology bubble during 1990. Since over the last few decades and until now the momentum literatures has been increasing and still momentum is hot topic in momentum literature around the worlds. From the findings of different papers, we can infer that momentum neither an effects to disappear if the transaction cost are included, nor a random incidents.

### Types of Momentum Strategies

Different types of momentum strategies have been discussed in literatures. Among those strategies, the most commonly known strategies are price momentum, earning and industry momentum use by institutional and re-tails investors. Price momentum strategies refer to the individuals stock prices. Purchase past winner stock and sell past losers. The earnings momentum strategies refer to the company's stock. Buy past best performing company stock and sell past worst performing company stock. Last but certainly not least industry momentum strategies related to specific industries (Ali, Ahmad, & Saeed, 2018). Buy the stock and hold of the past best performance industries while sell the stock of the past worst performance industries. This thesis will only study the price momentum effects and will apply the price momentum strategies for several purposes. First of all, to check the presence of momentum impact in emerging capital market of Pakistan, additionally, we examined the existence of momentum in different portfolios based on formation and holding period by employing CAPM technique which will check the hypothesis that momentum return is because of manager performance or market risk. Furthermore, this thesis also checks the Applicability of Carhart four factors on Pakistan Stock Exchange.

### Problem Statement

The mentioned evidence in literature verified the momentum effect in different market of the world. For instance, (Jegadeesh & Titman, 1993, 2001) confirmed the momentum effects in American capital market. Some other papers also confirmed the momentum effects in different countries and regions (Abourachid, Kubo, & Orbach, 2017; Aggarwal & Gupta, 2017; Hu & Chen, 2011; Jegadeesh & Titman, 2001; Rouwenhorst, 1998, 1999; Spulbar, Imran, Birau, et al., 2019). So far on the capital markets of Pakistan there are only three papers published on Pakistan stock market. The first two papers were published before 2007 and that time Pakistan Stock Exchange was considered developing capital market. But the most recent published paper such as (S. Khan et al., 2016) who found the in-existence of momentum effects in Pakistan Stock Exchange and by employ 16 momentum strategies and CAPM model for risk factor analysis. Before, the 2011, Pakistan Stock Exchange considered as developing index but after 2011 Pakistan Stock Exchange was included in emerging stock market due to rapid growth and development. According to the findings of most papers, such as (Burki, Khan, & Saeed, 2020; Gharaibeh et al., 2017; Griffin, Ji, & Martin, 2005; Jegadeesh & Titman, 1993;

Zaremba, 2018) the existence of momentum has been found in developed and emerging countries around the Globe. The literatures on momentum effects from Pakistan capital market are still an early stage and there are no compressive study exist which have used short and long term as well as applied Carhart four factors model on Pakistan Stock Exchange. Furthermore, best to my knowledge, my study is the first compressive study on Pakistan Stock Exchange which not only applying the 16 commonly study from the literature but also applied 25 short term as well as 16 long term momentum strategies. In additions to first time we have used 6/9 and 1/3 strategies for risk factors analysis. Furthermore this thesis is inspired by the scholar that "is there momentum effects in Pakistan stock market, if yes, is it weak or strong. Furthermore, this thesis also fascinating to analysis the momentum returns that whether it is due to manger performance or systematic risk. In additions to this, we are also investigating the applicability of Carhart four factor models on Pakistan Stock Exchange. Giving aforementioned prevailing debate and reasons, there are gap exist to conduct a new study on Pakistan Stock Exchange.

### Research Questions of the Study

This thesis is based on the following main and sub questions using momentum strategies is there momentum effect in the Pakistan Stock Exchange? Along with this main research question we have the following sub questions:

**Q1:** Do the investment momentum return explained by rational asset pricing models CAPM?

**Q2:** Do Carhart four factors model explain the variation in portfolios returns as well as the applicability?

### Objective of the Study

The specific objective of these is following.

- The major objective of this thesis is to analyze the momentum effect in Pakistan Stock Exchange.
- To check the momentum return based on CAPM model.
- To check whether Cart hart four factors model explain the variation in portfolios stock return and their applicability on Pakistan Stock Exchange.

### Hypothesis

**H<sub>0</sub>:** Base on momentum strategies, there are no momentum effect in Pakistan Stock Exchange.

**H<sub>1</sub>:** Base on momentum strategies, there are momentum effect in Pakistan Stock Exchange.

**H<sub>2</sub>:** The return of the individual momentum return is based on systematic risk rather taking short position in loser portfolios (Manager Performance).

**H<sub>2</sub>:** The return of the individual momentum return is not based on systematic risk rather taking short position in loser portfolios (Manager Performance).

### LITERATURE REVIEW

There is a growing literature on momentum effects on regional level as well as country level, by employing different kinds of strategies based on short and long formation and holding period, as well as employed different techniques and obtained different results for different countries, regions, panels and aggregate countries panel. In some developing countries momentum effects has been found weak while in emerging and developing countries momentum effects has been reported strong. The exploration of momentum effects in the different capital market of different countries and regions, this thesis has been put forward some previous papers (Nadeem, Saeed, & Gul, 2020).

For instance, Hurn and Pavlov (2003) they describe that momentum is the tendency of Investment portfolio which is based on the buying the Past winner stock and selling the past loser stock to earn some normal profit which is a common documented features of portfolio return in the united states. They examine that there is a frequent explanation and empirical feature of momentum effect. They further investigate that there is strong midterm presence of momentum effect in Australian stock market.

Hu and Chen (2011) investigate performance of the momentum strategies in the stock market of 48 countries over the period of 1999 to 2007. They propose that investor preferring to buy past winner and want to sell past losers stocks. They said that there is big different between momentum strategies and contrarian strategies. In the contrarian Strategy the investor prefers to buy the past loser and want to sell past winner. They further used four strategies of momentum and examine that these all four strategies show significant continuation of return above the medium horizon. They exhibit that the most profitable momentum strategy is during the ninth month holding period and one month is formation period and the second profitable momentum strategy is the holding period of ninth month and formation period of three months, generally movement profit decline slowly after that and reverse upward later than one year for long formation period and two years for short formation periods. The result show that the investor can get high returns when the testing period more than two years and the formation period above ninth months. They further conclude their examination and show that investment portfolio consist of winner outperform those one which is based on losers. They also put forward that under

or over reactions is not explaining the momentum affects behavior but supporting the random walk theory which are important in elucidation momentum return. Furthermore they provided evidence that the use of momentum strategies shows the best performance in Asia Pacific, Europe and America.

[Petr and Abdullah \(2012\)](#) examine that momentum effect have many variant and sub variants. in which the main variants of momentum effect is the momentum price strategy which have three main sub variants are trading base momentum strategy and weekly base Price momentum strategy and the third one is monthly price momentum strategy. They further analyzed to find the momentum return for sub variants in different distances of time. They further investigate that which sub variants is profitable and which one is recommended by main investors for the making of momentum portfolio they use the methodology of [Jegadeesh and Titman \(1993\)](#). For that process they choose the Australian Stock Exchange. They further examine that the monthly price momentum strategy is more profitable among these three strategy while the weekly price momentum strategy show average return and the third one trading volume momentum price strategy is low profitable. They suggest that the potential investor have to use the monthly price momentum strategy along with weekly basis price momentum strategy for the abnormal average return.

Using a 16 momentum strategies and by employing the CAPM model based on non-overlapping, equal weight and docile methods, [S. Khan et al. \(2016\)](#) examine the momentum effects in Karachi Stock Exchange. They found that a very mild momentum effects. They provided evidence that losers profitless are most profitable while winner are less, whereas only 4 winner-minus-losers portfolio produced positive return which indicates a very low momentum effects. They have also used CAPM to explore the risk factors that boost return between systematic risk and manger performance. Their results indicate that the return has been gained due to manger performance which suggested short position in loser portfolios. They concluded that firms in Karachi stock exchange with regard to winner and zero cost portfolios does not go after the momentum effects whereas opposite is true for losers portfolios.

[Hussaini, Shafae, and Garang \(2016\)](#) examine in the Thailand Stock Exchange that selling of those stock which are performed low in past and buy those stocks which are performed high in past that will make statistically good return in future, different scholar from different country study well about this strategy, the suggestion from the scholar study is past winner portfolio tend to outperform past loser in

future, further more they study the momentum profitability in Thailand Stock Exchange for that purpose they made six portfolio base on size and their past performance and calculated the return on monthly basis for the period of 2010-2014. They examine that momentum was show significantly positive return in the large stock and show negative in small size stocks for the period of 2010-2013.

[Abourachid et al. \(2017\)](#) investigate profitability and return while using 16 momentum strategies in over all 10 European countries over the period 2004 to 2015. They further investigate that out of sixteen strategies ten strategies are statistically result significant return. They used two different time period. They result that low momentum of stock return are assign to market situation over the period of 2007 to 2012 sub period. They further class the stocks by size and result that the big stock lead to insignificant momentum returns in two sub periods.

[Yang and Li \(2017\)](#) work to examine the different in momentum portfolios return with different strategy of holding and formation periods. They examine that there is no existence of momentum effect in Chinese stock market via testing the volume adjustment with the return and with no volume adjustment of every traded stock in Shenzhen Stock Exchange and Shanghai Stock Exchange over the period of 2000-2011. They further examine that while considering the factor of volume there is no momentum effect in china stock market its mean if investor follow the historical return of stock they will meet the losses if they choose any strategy of holding and formation period in past eleven years, in case of selecting the combination of trading volume and Past returns so there is big probability of losses.

[Gharaibeh et al. \(2017\)](#) examine that there is a presence of the momentum effect in the Arabic market over the period of 1989 to 2013. He examine that momentum profit are presence in the 10 Arabic market induces which is economically and statistically significant for general formation period. To earn some profit the investors have to buy and sell the past short term winner portfolio and short term looser portfolio accordingly.

[Vo and Truong \(2018\)](#) investigate that the momentum in ho chi minh city stock exchange from the period of 2007 to 2015 they further find the strategy that investor should buy a stock which is performed well in last 6 month and hold this stock for 9 months will generate significant profit. They further analyzed sixteen strategies of momentum effect in which they find the momentum effect only in 10 strategies the finding from this paper does not support the hypothesis of stock market efficiency, which clearly characterizes the distinct features of emerging markets ([Farid et al., 2021](#)).

Zaremba (2018) examine the effect of momentum in cross-country by employing the panel data of 78 countries and by estimating 40 cross-sectional within-market anomalies over the period from 1995 to 2015. The empirical results show that half of return pattern are robust and consistent. He further provides evidence that with six month of formation and twelve month of holding period are perform outstanding in the future. In additions, he found that momentum strategies at individual country-level are weakly associated. He further suggests that momentum strategies based on past performance might a good instrument for global investors (Gul, Ali, & Saeed, 2021).

Subrahmanyam (2018) overawe the literatures of previous studies in cross-sections capital market equities for the purpose to make useful suggestions. He reached to conclusions that so far no one is given the real causes of the momentum effects. He suggested that researchers, investors and policy maker should require to do and to construct tests that are paying attention not so much on testing one particular theory, but on finding out alternative explanations.

Triglia and Wang (2019) find the presence of momentum effect in London capital market from 1920 to 1930 by employing dividend and price momentum strategies. They found that long-term reversals are not profitable while size and factor premium are highly profitable. They further found momentum effect in dividends; additionally they stated that price momentum and dividend momentum are not subsumed by each other. They concluded that there is no momentum return found in our chosen sample.

Rasheed, Saood, Alam, and Ullah (2019) observed the momentum effect in Pakistan stocks exchange during the periods from 2007 to 2016. They further used some strategy and techniques like full re-balancing method, equal weighted, docile. For that they collect data of Pakistan Stock Exchange 100 index over the period of 2007 to 2016. Furthermore they use STATA for constructing momentum portfolio and result that top 25 stock Measure winners stocks and bottom 25 stocks measure looser stocks, they conclude that there is a presence of momentum in PSX-100 index (Pakistan Stock Exchange). Their result show that Investor can earn enough profit while constructing portfolio for the short term formation period like three months and then hold it for the period of three, six and twelve months (J. Khan, Saeed, Ali, & Nisar, 2021).

By applying 16 momentum strategies on Hong Kong stock exchange Spulbar et al. (2019) examine the effects of momentum. The empirical results show that all 16 momentum strategies produce a positive return which proofs the existence of strong momentum effects. They furthered suggest

that more study can be carry out by apply daily and weekly price momentum. For investigating momentum effect the future researchers should focus on daily price momentum strategies and weekly price momentum strategies (Ullah et al., 2021).

Herberger, Horn, and Oehler (2020) examine the effects of momentum in German stock market by chosen sample only from German blue chip stock index, over the period October, 2013 to December, 2014. They employed the methodology adopted by Jegadeesh and Titman (1993) as well as using realized transaction prices. They applied both momentum and reversal 16 momentum strategies each with formation and testing periods of 60, 45, 30, or 15 (momentum strategies) and 300, 180, 120, or 60 (reversal strategies). They found no momentum return in stock prices while the opposite is true for contrarian or reversal momentum strategies. They put forward that the return of constrain strategies are significant but very low. They further found the efficiency of stock market. Based on empirical results they suggested that due to very low return which might not covers the cost transaction. Therefore the retails investors should avoid to pursuing intra-day contrarian or momentum strategies either by themselves or by third party such as social trading platform.

Giving the aforementioned prevailing discussions based on previous literature on momentum effects, it is found that some of papers e.g., Herberger et al. (2020); Rasheed et al. (2019) and S. Khan et al. (2016) did not confirmed the momentum effects while some have confirmed the momentum effects such as Abourachid et al. (2017); Hussaini et al. (2016); Hurn and Pavlov (2003); Gharaibeh et al. (2017); Petr and Abdullah (2012); Rasheed et al. (2019); Spulbar et al. (2019); Trigilia and Wang (2019) and Vo and Truong (2018). There are only two paper which have carried out on Pakistan stock such as Rasheed et al. (2019); S. Khan et al. (2016) although those study methodology are quite different in term of strategies and techniques e.g., I have used 25 momentum strategies as well as long-period momentum 16 strategies which have never applied before on Pakistan Stock Exchange. Furthermore, this study also applied CAPM model on 1/3 and 6/9, in additions to this study also used Carhart four factors model which have never been used before on Pakistan Stock Exchange data. Therefore, I concluded this is the first comprehensive studies by employing different methodology and momentum strategies as well as techniques to fill the gap.

## RESEARCH METHODOLOGY

### Population of the Study

The universe for this thesis composes of all firms listed at Pakistan Stock Exchange and for risk factor analysis this thesis will use the KSE-100 index.

### Sampling and Simple Size

There are more than 500 non-financial firm listed at Pakistan Stock Exchange. Out of all those non-financial firms listed at Pakistan Stock Exchange, 466 firms is randomly selected based on the availability of data during the period from 2007 to 2017. The momentum strategies are analyzed based on the closing prices of each firms. While to generate the market premium factors, this thesis used the KSE-100 index and risk free data.

### Data and Data Source

This thesis will use the secondary data in order to reach the conclusions of the research questions that have been raised in first chapter of this thesis. The nature of data is the time series data and for momentum strategies we have taken the closing process of non-financial firms listed at Pakistan Stock Exchange. This thesis also used Karachi stock exchange 100 indexes which have been taken from the Pakistan Stock Exchange official website. This thesis also used the risk free data in order to calculate the market premium factor and portfolios returns and the data have been taking from the official website State Bank of Pakistan. This thesis also used the outstanding share along with share prices of all the non-financial firms in order to calculate the market capitalization which has been used to form different portfolios such as SH, BM, BH etc. which required calculating size (SMB) and value (HML) factors for four factors model. The data of outstanding share have been also downloaded from the official website of Pakistan Stock Exchange.

### Different Techniques

There are multiple techniques have been used in Literature. Based on the analyzed previous literatures, this study also used the following Techniques while selecting the momentum strategies.

#### *Docile strategies*

There are two well-known method have been used in literatures while ranking the portfolios stock. The one is Docile and another is weighted relative strength strategies. This thesis will use the docile strategies because there are on big problem of weighting another method. Based on docile, stocks are placed on the basis of their past performance. Take long positions in top portfolios while take short position in bottom portfolios.

#### *Equally-weighted*

There are two commonly used methods in literature while formed the portfolios. The first one is equally weighted method and the second one is Value weighting. In the value weighting method the portfolios are constructed irrespective of market capitalization. This thesis will use the equal weight method to construct portfolios because if we use another aforementioned method it is problematic to construe that either effect entire sample or in those stock that have higher market capitalization or entire sample.

#### *Full re-balancing*

Furthermore, there are two well-known methods in literatures that had used. The first one partial re-balancing (non overlapping period) and second one is full re-balancing (overlapping period). This thesis will use overlapping (full re-balancing) method for the reason of to increase the total number of observation. This method is also good for to compare the result with others preview result like [Jegadeesh \(1990\)](#); [Jegadeesh and Titman \(1993\)](#) and [S. Khan et al. \(2016\)](#). Below given is the table of overlapping period table.

**TABLE 1.** Example of full re-balancing (overlapping)

Months	Overlapping/ Full Rebalancing			
January	Formation			
February		Formation		
March	Holding	Formation		
April		Holding	Formation	
May			Holding	Formation
June				Holding
July				
August				
September				
October				
November				
December				

**Formation and Testing Period**

First of all the important matter is to decide the ranking and testing period. Over the last three decade, many papers have used different kinds of strategies based on daily, quarterly, monthly, annual data. However, the most commonly used strategies in literature are 3/3, 3/6, 3/9, 3/12

Habib-Ur-Rahman and Mohsin (2012); Jegadeesh (1990); Jegadeesh and Titman (1993) and S. Khan et al. (2016) which based on monthly data. The aforementioned strategies each strategy is further extend to 4 strategies which are equal to 16 strategies. This thesis has also added one

more strategies that to 1/1 to short term monthly strategies which become total 25. Furthermore, this thesis also used long term momentum strategies based on long formation and holding period such as 12/24, 16/24, 20/24, 24/24 and furthered divided into four which become 16 strategies. The results of these strategies are given next chapter. This thesis also checks the risk factors analysis. So for risk factors this thesis use the 6/9 strategies because this strategies produce abnormal profits and never been used in previous studies which is novel contributions to the momentum literature. So 6/9 strategy having ranking period of six months and holding period of nine months. After the end of ranking period of six months, the long and short portfolios are constructed. The long portfolios are formed by taking the long positions in best performing stock while the opposite is true for short portfolios. These portfolios are held for nine months. This strategies process is given below.

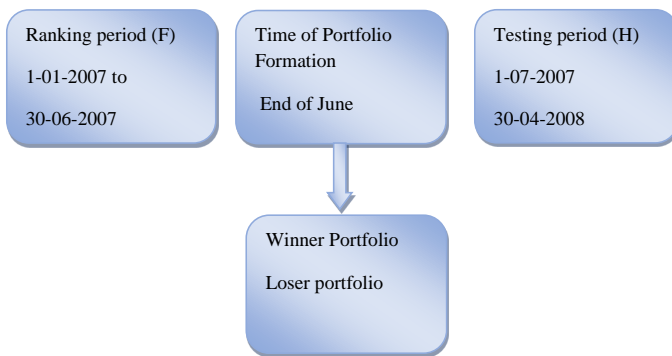


FIGURE 1. Example of the momentum investment process (6/9)

TABLE 2. Overview of our momentum strategies

		Holding Period (H)				
		1	3	6	9	12
Formation Period F	1	1/1	1/3	1/6	1/9	1/12
	3	3/1	3/3	3/6	3/9	3/12
	6	6/1	6/3	6/6	6/9	6/12
	9	9/1	9/3	9/6	9/9	9/12
	12	12/1	12/3	12/6	12/9	12/12

**Variables and Econometric Model**

This study include many variables such as monthly stock returns ( $R_i$ ) of all non-financial firms, monthly return of KSE-100 index ( $R_m$ ), excess monthly returns of the portfolio ( $R_p - R_f$ ), risk premium ( $R_m - R_f$ ), value premium (HM), size premium (SMB), momentum, winner, losers and winner minus losers etc. To calculate the aforementioned variables there are some basic roles for calculating variables. First, this thesis will used continue compound return because it give some benefits over discrete compound return. The equation is as following.

$$R_{it} = \log \left( \frac{P_{it}}{P_{it-1}} \right)$$

Whereas the  $P_t$  is the price of share of the current month and  $P_{t-1}$  price of share of prior month. The other important variable is zero cost portfolios which can be calculated taking the returns of long as well as the short portfolios:

$$Zr_{M,t}(R) = Zr_{wt}(K) - Zr_{lt}(K)$$

Where  $Zr_{mt}(k)$  is the zero cost portfolio and  $Zr_{wt}(k)$  is the return of winner portfolio and  $Zr_{lt}(k)$  is the return of loser portfolio.

Furthermore, to calculate the average returns of momentum strategies, first we take the average of all momentum strategy constructed during the period from 2007 to 2017. Secondly, after taking the average, then we divided by length of the testing period. The following is the equations of average monthly returns.

$$AR = 1/H \sum_{t=1}^T Zr_{m,t}(K)$$

For all the above variables will be computed in Stata and for momentum portfolios the portfolios will be generating by using ASM code.

**Risk identification**

If there are any momentum strategies that produce abnormal return, this thesis would use those strategies to make out the factors that which factors is driven the abnormal return. For the aforementioned purpose, the results of CAPM will analyze in next chapter to see whether abnormal return of winner minus losers is due to systematic risk that takes long positions in long portfolio or by manager performance taking short position in short portfolios. The aforementioned relationship will be investigated by CAPM results and the equation is following.

$$R_p - R_f = \alpha + \beta (R_m - R_f) + \varepsilon$$

Whereas  $R_p$  denote the monthly return of individual portfolios,  $R_f$  represents the risk free rate,  $R_p - R_m$  denote the returns of portfolios,  $R_m$  represent the return of market and  $r_f$  is risk free rate, whereas  $R_m - R_f$  represents the market premium.

**Carhart 4-Factor Model**

The Carhart 4-Factor Model is an extension of Fama and French three factor model by adding momentum factors based on the findings of Jegadeesh and Titman (1993), which is given below:



$$R_{it} = \alpha_{iT} + \beta_{iT}RMRF + s_{iT}SMB_t + h_{iT}HML_t + P_{it}PRIYR_t + \varepsilon_{it}$$

where  $R_{it}$  is the return on a portfolio  $i$  excess over excess of a three-month  $R_f$  return,  $RMRF$  is the excessive return on a value weighted market proxy in excess of the  $R_f$  return,  $SMB$  and  $HML$  are the size factor and value factor respectively.  $SMB$  measures the return of small stocks minus the return of large stocks in period  $t$ ,  $HML$  measures the return of high book-to-market ratio minus the return of low book-to-market ratio in period  $t$ .  $PRIYR$  is the new additional momentum factor that is constructed as the zero-cost portfolio recommended by Carhart (1997) to capture the one-year momentum in stock returns as suggested by Jegadeesh

and Titman (1993, 2001). This model is called Carhart four-factor model including momentum factors.

## RESULT AND DISCUSSION

This chapter will present the results of short and long term momentum strategies as well as the discussions and findings with regard to momentum return. This chapter also presents the results and discussion about the CAPM and Carhart four factors model. Furthermore, the correlations results and descriptive statistic is also the part of this chapter.

**TABLE 3.** Descriptive statistics

Variables	<i>N</i>	Mean	St.Dev	Min	Max
Rmrf	35324	.007	.059	-.373	.188
MOM	23266	-.59	4.719	-23.095	11.176
BL	35069	2.08	6.416	-26.4	19.321
BM	35069	1.094	6.356	-19.011	18.93
BH	35069	.235	7.875	-37.1	20.461
SL	35069	1.884	7.518	-15.778	22.351
SM	35069	.526	7.248	-18.045	23.481
SH	35069	-.785	7.579	-44.9	18.225
SMB	35069	-.595	2.994	-9.818	14.619
HML	35069	-2.257	5.383	-34.477	21.271

*N* represents number of observation, St.Dev represents standard deviation, and min and max denote the minimum and maximum respectively

As shown in Table 3, the first column is the variables and six portfolios, and the second, third and fourth columns are number of observations, means, standard deviation, minimum, and maximum respectively. The mean and standard deviation value of risk premium ( $rm\_rf$ ) are .007 and 0.59, greater than size ( $SMB$ ), which is -.595 and 2.994 respectively. A high standard deviation indicates higher risk or volatility and vice versa. If we look at the four risk factors, the highest average return of .007 is reported for market risk factor, while the lowest average returns of -2.257 for  $HML$ . The highest volatility among four risk factors returns are reflected in monthly standard deviations that  $HML$ . In additions, size factors are negative and given lower mean

return in small share, which indicates that large caps over performed small caps. If we look at the other six portfolios, the portfolios with higher returns are  $BL$ ,  $BM$ ,  $SL$  and  $SL$  with 2.08, 1.094, 0.235 and .526 respectively.  $BL$  has the highest return while  $SH$  has the lower return as well as standard deviation, suggesting high and low level of risk for both portfolios respectively.

## Correlation Among Different Portfolios

The correlation shows the interdependency between two or one variable with other variables. Table 4 represents the correlations between the variables and the different portfolios.

**TABLE 4.** Correlations

	BL	BM	BH	SL	SM	SH	ri_rf	rm_rf	SMB	HML	
BL	1.000										
BM	0.778	1.000									
BH	0.469	0.661	1.000								
SL	0.633	0.697	0.513	1.000							
SM	0.634	0.758	0.633	0.750	1.000						
SH	0.533	0.730	0.842	0.593	0.716	1.000					
ri_rf	0.251	0.284	0.261	0.248	0.285	0.288	1.000				
rm_rf	0.392	0.525	0.810	0.235	0.402	0.636	0.200	1.000			
SMB	-0.177	-0.027	-0.018	0.484	0.437	0.247	0.062	-0.264	1.000		
HML	-0.344	-0.021	0.548	-0.304	0.002	0.457	0.039	0.521	-0.067	1.000	
MOM	0.009	-0.106	-0.340	-0.223	-0.282	-0.433	-0.092	-0.232	-0.366	-0.338	1.000

The minimum value of correlation between MOM and BM is -0.106, which is negative while the maximum value of correlation is 0.8424 between SH and BH. The value above .50 and close to 1 indicates the positive correlation while the negative value shows negative correlation whereas value close to 0 shows no correlation (Gujarati, 2010). It is concluded that overall correlations between the several portfolios are positive and only few variables have negative correlations, which indicate that the variables have interdependency. The correlation between the market risk factors (rm\_rf) and value factors (HML) is weak (0.521), whereas there is low negative correlation between market risk factor and the momentum factors (MOM) (-0.232), which implies that all zero cost portfolios have beta values might close to zero. As suggested in the previous studies, [Jegadeesh and Titman \(2001\)](#) and [Vas and Absalonsen \(2014\)](#) find that the beta values for 6/6 winners minus loser's portfolios are -0.04 and -0.03 respectively. Moreover the market and the size factors have a weak negative correlation. Likewise, the size (SMB) and the value (HML), and the size (SMB) and the Momentum (MOM) show very weak negative or almost no

interdependency. There is very low negative association between the momentum and the value factors and same for others two factors as well. Our results are in line with regard to correlations with the study of [Vas and Absalonsen \(2014\)](#) for the three risk factors, market, value and size risk factors. It is concluded that small minus big stocks offered a good foundation for size factor that is objectively free from market risk factor (RmF).

### Momentum Strategies and Returns

The below given Tables 5 and 6 represent the monthly returns of short term and long term momentum effects. I start our analysis by exploring 25 momentum strategies in Pakistan Stock Exchange. Table 5 shows the average monthly returns of the momentum strategies from 2007 to 2017. These 25 momentum strategies based on overlapping holding periods. The first column is a list of portfolio names, and the second column and first row is the combination of the overlapping holding and formations period. The third, fourth, fifth, sixth and seven columns are monthly returns with respect to winner, loser and winner minus loser portfolios or zero cost portfolios respectively.

**TABLE 5.** Short term 25 momentum returns

Formation or Ranking Period(F)		Testing or Holding Period (H)				
		1	3	6	9	12
Winner	1	-1.7334**	-0.5015	-0.3992	0.2532	-0.2334
Loser		3.2541***	1.3865*	0.5944	0.8354	0.2103
Winner-Loser		-4.9875***	1.3865***	-0.994***	-0.582***	-0.444**
Winner	3	-1.7496*	-0.7439	-0.1445	-0.4724	-0.0987
Loser		2.2902***	1.2221	0.7624	0.1367	0.2764
Winner-Loser		-4.0398***	-1.9660***	-0.9069***	-0.6090*	-0.3751*
Winner	6	-0.8116	-0.3433	-0.1395	-0.2504	-0.0308
Loser		2.6117***	0.8093	0.5563	-0.2647	0.5792
Winner-Loser		-3.4234***	-1.1526***	-0.6958	0.0143*	-0.6100

Table 5. continue

Formation or Ranking Period(F)		Testing or Holding Period (H)				
Winner	9	-0.2088	-0.5003	-0.5287	-0.8344	-0.1650
Loser		2.1357***	0.7994	0.0210	-0.2633	0.4333
Winner-Loser		-2.3445***	-1.2997***	-0.5497	-0.5711	-0.5983
Winner	12	-0.5056	-0.2835	0.4629	0.3439	0.8239
Loser		1.1401	0.6882	0.6888	1.1209	1.4631
Winner-Loser		-1.6457***	-0.9717*	-0.2259	-0.7770	-0.6392

\*, \*\*, \*\*\* represents the significant level at 0.1, 0.05, and 0.01 respectively

Tables 5 shows that 4 strategies out of 25 winner portfolios result a positive return as we assume that winner portfolios and winner minus loser portfolios will generate a positive return and vice versa, which confirms the momentum effect. For loser portfolios, the returns are positive in 23 strategies out of 25, which reject the assumption in loser portfolios. For the winner minus loser's portfolios (zero cost portfolios), 2 out of 25 strategies are positive and statistically significant but 8 strategies are statistically insignificant out of all strategies, which confirms the very mild existence of momentum effect.

However, the strategy with one month of formation period and three months of holding period (1/3) generates a significantly high return, which is a new contribution to current literatures, and same for 6/9 strategies, as well as it is statistically significant. Previous research argue that, due to the high volatility in the emerging markets, the momentum strategies do not generate significant momentum returns. S. Khan et al. (2016) argue that this might be due to low sample size and low inefficiency in the market. The winner minus loser's highest return strategies are 1/3; one month of formation period and three month of testing period, that

produces 1.387 returns and statistically significant. The second highest producing return strategies are 6/9, which produce 0.0143\* and also statistically significant. On the other hand, the lowest return has been found in 1/1 with -4.9875. The second and third worst performing zero cost portfolios are in 3/1 and 9/1 with -4.0398 and -2.3445 respectively. These results are consistent with findings of (S. Khan et al., 2016) who find no momentum effect with respect to Pakistan capital market. Based on the results of long minus short portfolios, there is no existence of momentum found which follow the traditional efficient market hypothesis of momentum. If we observe the overall results, we find that the winner portfolios are the best performance portfolio while the losers are worst performance. As for the time period, it seems to be lucrative to take long position in winner portfolios. The results also indicates that neither short nor long based formation and holding period produces statistically positive returns, therefore we suggest that retail investors should not invest individually or through third party such as online trading platform on the basis of momentum strategies.

TABLE 6. Long term 16 momentum returns

Formation or Ranking Period(F)		Testing or Holding Period (H)			
		24	36	48	64
Winner	12	1.4192*	1.2341	1.1676	-0.1167
Loser		2.1327**	2.0211	1.9481	0.0726
Winner-Loser		-0.7134	-0.6421**	-0.7805	-0.1894
Winner	16	0.5659	1.1523	0.8991	-0.1147
Loser		1.0709	1.1651	1.9741	0.3679
Winner-Loser		-0.5050	-0.0128	-1.0750*	-0.4825
Winner	20	-0.1581	0.0336	-0.2586	1.3608
Loser		-0.0324	0.4738	0.8095	2.6432
Winner-Loser		-0.1257	-0.4402	-1.0681**	-1.2824
Winner	24	-0.1738	1.2052	-0.8008	-0.7522
Loser		0.8531	1.9444	-0.5487	0.9271
Winner-Loser		-1.0269	-0.7393	-0.2521	-1.6793*

\*, \*\*, \*\*\* represents the significant level at 0.1, 0.05, and 0.01 respectively

We start our analysis by exploring 16 long-term annual momentum strategies in Pakistan Stock Exchange. Table 6 show the average annual returns of the momentum strategies from 2007 to 2017. These 16 momentum strategies based on overlapping holding periods. The first column is a list of portfolio names, and the second column and first row is the combination of the overlapping holding and formations period. The third, fourth, fifth, sixth and seven columns are monthly returns with respect to winner, loser and winner minus loser portfolios or zero cost portfolios respectively. Table 6 shows that 9 strategies out of 25 winner portfolios show a positive return and one is statistically significant as we assume that winner portfolios and winner minus loser portfolios will generate a positive return and vice versa, which confirms the momentum effect. For loser portfolios, the returns are negative in 2 strategies

out of 16, which reject the assumption in loser portfolios. For the winner minus loser's portfolios (zero cost portfolios), all 16 strategies are positive and statistically significant but 12 strategies are statistically insignificant out of all strategies, which confirms inexistence of momentum effect in Pakistan Stock Exchange. We are using first time long-term annual strategies in order to investigate the hypothesis of Jegadeesh and Titman (1993). We can infer from the long-term momentum strategies results that Jegadeesh and Titman (1993) hypothesis who provide evidence that over the 3-12 horizon momentum strategies produces high return.

### Regressions Analysis for Different Models

For risk factors analysis and variations in stock prices due to different factors we are employing the one factor and four factors model and results is reported in Table 7.

**TABLE 7.** Short term momentum strategies F1H3, formation period F

Holding Period	$\alpha$	SE	$t$ -stat	$p$ -Value	B	SE	$t$ -stat	$p$ -Value	$R^2$
Winner (W) F1/H3	0.005	0.002	18.99	0.000	.005	.000	157.27	0.309	0.39
Loser (L) F1/H3	-0.0053	0.0002	-24.36	0.000	.0052	0.000	202.71	0.000	0.38
W-L- F6/H1	-0.005	0.003	-14.24	0.000	-.0041	.0203	-57.53	0.000	0.12

Table 7 reported the regression results of 1/3 winner minus loser portfolio strategies. The first column is a list of portfolio names and strategies, the second column and first, second and third row represent the value of Alpha. The third, fourth, fifth, seventh and eight columns are standard error,  $t$  static and probability value respectively, while column six and 9 denote the Beta and  $R$  square value respectively. In above table alpha  $\alpha$  signify the intercept of the model or express differently, it characterizes the manager performance. Beta measures the market or un-diversified risk and it designates the risk linked with the collection relative to the market portfolios that is a index in PSX-100 index.

The coefficient of winner portfolios Beta  $\beta$  is positive which is .0048 and statistically high significant. The significant level can be seen from the  $p$ -value in table which is 0.000. This indicates that the beta coefficient is highly significant and contributes to portfolios return. Similarly, the coefficient sign of alpha  $\alpha$  is positive and statistically high significant that can be seen from the  $p$ -value which is 0.000. Furthermore, the coefficient of loser portfolios Beta  $\beta$  is positive and statistically high significant. Conversely, the sign of

alpha  $\alpha$  is negative and statistically high significant that can be seen from the  $p$ -value which is 0.000. Moreover, the coefficient of Zero cost portfolios value of Beta  $\beta$  is -.0041, which is negative and statistically significant because the  $p$ -value is 0.000 which is less than 0.1 percent. Similarly, the alpha  $\alpha$  coefficient value is also negative which is -.0046 and statistically high significant because the  $p$ -value is less than 0.10 percent. This implies that the return of zero cost portfolios is not due to manager performance because the coefficient of alpha value is negative and also very small. This boost in the return is cause of systematic risk. The value of  $R$ -square is 0.12 which reaffirmed this relationship. The overall results confirmed the hypothesis that the profit is due to Market risk (systematic risk) in Pakistan Stock Exchange. Therefore this results suggest that the retails or institutional investors should not invest their by following momentum strategies in Pakistan Stock Exchange. We are applying CAPM model on 9/3 strategies because this strategies produce a low positive return in zero cost portfolio given in Table 3.

**TABLE 8.** CAPM model for 6/9 strategies

Holding Period	$\alpha$	SE	<i>t</i> -stat	<i>p</i> -Value	B	SE	<i>t</i> -stat	<i>p</i> -Value	$R^2$
Winner (W) F6/H9	0.308	0.103	3.00	0.003	0.936	0.015	63.72	0.000	0.119
Loser(L) F6/H9	-0.116	0.103	-1.13	0.259	0.791	0.012	63.29	0.000	0.118
W-L- F6/H9	0.029	0.110	0.26	0.004	-0.492	0.027	-17.96	0.000	0.011

Table 8 reported the regression results of 6/9 winner minus loser portfolio strategies. The first column is a list of portfolio names and strategies, the second column and first, second and third row represent the value of Alpha. The third, fourth, fifth, seventh and eighth columns are standard error, *t* static and probability value respectively, while column six and 9 denote the Beta and R square value respectively.

The coefficient of winner portfolios Beta  $\beta$  is .9362 which is positive and statistically highly significant because the *p*-value is 0.000 which is less than 0.10. Similarly, the sign of alpha  $\alpha$  is positive which is .3080 and statistically high significant that can be seen from the *p*-value which is 0.000. Furthermore, the coefficient of loser portfolios Beta  $\beta$  is positive and statistically high significant. Conversely, the sign of alpha  $\alpha$  is negative and statistically not significant that can be seen from the *p*-value which is 0.259. Moreover, the coefficient value of winner-minus loser's portfolios of

Beta  $\beta$  is -.4923, which is negative and statistically significant because the *p*-value is 0.000 which is less than 0.1 percent. Conversely, the alpha  $\alpha$  coefficient value is also positive which is 0.288 and statistically high significant because the *p*-value is less than 0.10 percent. This implies that the return of zero cost portfolios is not due to systematic risk because the coefficient of alpha value is positive and also slightly high. This boost in the return is cause of manager performance that take short position in loser's portfolios. The overall results confirmed the hypothesis that the return is due to manager performance in Pakistan Stock Exchange. Therefore these results suggest that the retails or institutional investors should invest their money by following the strategies with long formation period such as six month and long holding period such is nine month based on momentum strategies in Pakistan Stock Exchange.

**TABLE 9.** Carhart four factors model

Variables	Coefficient	St.Err	<i>t</i> -state	<i>p</i> -value
Rm_rf	98.700	2.743	35.99	0.000
SMB	0.696	0.042	16.74	0.000
HML	-0.332	0.024	-13.75	0.000
MOM	-0.0061	0.028	-2.19	0.028
Constant	-.2190	.1041	-2.10	0.035
R-square: 0.0948		R-squared = 0.0619		F(4, 23261) = 0.000

Table 9 show the results of Carhart four factors models. The first explanatory variable is the market premium, the second one is the size premium, and the third and fourth one are value premium and momentum factor respectively which can be seen from Table 8 in row 2,3,4 and 5th respectively.

The coefficient of  $R_m - R_f$  value in column 2 is 98.700 which are positive and highly significant, but constant value is negative and statistically significant, which indicates that the returns can be boosted by taking the systematic risk. As suggested by Petr and Abdullah (2012) and S. Khan et al. (2016), beta represents the systematic risk, as well as reflects the risk associated with individual portfolios rather than market portfolios. On the other hand, Petr and Abdullah (2012) argue that when the coefficient of constant or intercept value is positive and highly significant it indicates

that the return is due to momentum effect rather than systematic risk. Petr and Abdullah (2012) and Vas and Absalonsen (2014) obtain the positive alpha or constant value in their study. But In our case, we get the negative value which implies that alpha value confirm that market risk factor can explain the momentum profits. The result shows that there is a robust relationship between risk and returns because of systematic risk and we suggest that there is no need to take short position in the loser portfolio. If we look the coefficient value of size factor (SMB), that is positive (0.696) and statistically highly significant (*p*-value: 0.000), implies that small minus big stock is explain the portfolios returns. Conversely, the coefficient of value factors (HML) and momentum factors (MOM) are -0.332 and -0.0061 which is highly significant, indicating that there is a negative relationship between the explanatory variables and the port-

folios return. The results suggest that because of market factor (rm\_rf) describes the variation in stock returns and have positive contribution and similarly for risk SMB factor. Conversely, we also find that the momentum and HML factor perfectly negatively explains the dependent variable and the momentum profits are almost vanished. Similar results are found by Vas and Absalonsen (2014) and S. Khan et al. (2016). It is concluded that Carhart models is able to define variation in stock return for above given factors and is appropriate for Pakistan Stock Exchange.

### CONCLUSION AND RECOMMENDATION

Momentum effects have been extensively studied in different stock markets in cross countries analysis as well as at country level. Momentum strategies are good tools for investment in stock markets and many investors prefer to apply investment strategies in different markets in order to earn abnormal profits. For the purpose to see the existence of momentum effects in capital market of Pakistan, furthermore to check the investment momentum hypothesis as well as the applicability of four factors model on Pakistan Stock Exchange. This thesis formed 25 short term monthly price momentum strategies (e.g., 1/1, 1/3, 1/6, 1/9, 1/12, 3/3, 3/6, 3/9, 3/12, 6/3, 6/6, 6/9, 6/12, 9/3, 9/6, 9/9, 12/3, 12/6, 12/9, 12/12) as well as long-term (e.g., 12/24, 12/36, 12/48, 12/60, 16/24, 16/36, 16/48, 16/60, 20/24, 20/36, 20/48, 20/60, 24/24, 24/36, 24/48, 24/60) on the basis of partial re-balancing and equal eight method. The data of 466 non-financial companies were used for analysis from 2007 to 2017. The stocks were ranked on the basis of their return. The top twenty and bottom twenty stock were chosen as winner and losers stock respectively. Portfolios were formed on the basis of long position in long portfolios while the short position in short portfolios. The profits of long portfolio were positive 4 out of 25 strategies, whereas in loser's 2 out of 25 found an increasing tendency in most portfolios. What is more, in long minus short there was only 2 strategies returns positive out of 25 and found the existence of momentum effects. This thesis also found that over 1- to 3 and 6-9 month period, the momentum tools yield paramount and abnormal return in Pakistan capital market between 2007 to 2017. The most profitable long minus short portfolios select the stock base on one month ranking period and holds for three months; as a result produce a monthly return of 1.3865. These results verified that this return is due to systematic risk that takes long position in winner portfolios. Furthermore, the results of long-term momentum strategies shows that 9 portfolio produce positive returns out of total 16, whereas in loser's 2 out of 16 found an in-

creasing tendency in most portfolios. What is more, in long minus short there all 16 portfolios produce negative returns which confirmed the existence of momentum effects. The long and short term momentum strategies results are similar in term of return which confirmed the robustness of results.

This thesis also examined that whether returns have been earned due to systematic risk or manager performance. The return of 1/3 long minus short portfolios is due to systematic risk because the alpha value is negative and statistically significant. While the results of 6/9 imply that the return of zero cost portfolios is not due to systematic risk because the coefficient of alpha value is positive and also slightly high. This boost in the return is cause of Manager Performance that take short position in loser's portfolios. The results of 1/9 confirmed the hypothesis that the return is due to manager performance while 1/3 results indicates toward the systematic risk in Pakistan Stock Exchange. The overall results of long and minus short portfolios results concluded that there are no momentum effects exist in Pakistan Stock Exchange and these results are consistent with findings (Rouwenhorst, 1999; S. Khan et al., 2016). This thesis recommends some policy implications, recommendations and future direction of the study which are following.

- First of all this thesis suggest that retails and institutional investor should avoid to invest in Pakistan capital market based on momentum strategies because there are very low existence of momentum effects.
- Secondly, this thesis found that only two momentum strategies which produce slightly high returns. So we applied CAPM model to see whether the existence of momentum in portfolios 1/3 and 6/9 is explained the momentum effects robustly. According to the results this thesis recommended that one should use to five or six factors model for risk detecting if they want to conduct further study, but it does not mean that CAPM is not appropriate model.
- For future study, this thesis recommended that one should carry out a study on the emerging markets because most of the results recommended that emerging countries are less efficient or target that market which is less efficient.
- We also recommend that researchers should replicate this study by analyzing the currencies or crypto currency, commodities or bond prices etc. Furthermore, they should try to use the daily, weekly or monthly data as well different momentum strategies such as Intraday and weekly momentum strategies, late stages and early stage momentum strategies if they want to replicate this study.

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