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ORIGINAL CONTRIBUTION

Momentum Effects and Pakistan Stocks Exchange

Aftab Hussain Tabasam [1*], Lubna Jamil [2], Muhammad Nadeem Khan [3], Aadil Farooq Khan [4]

[1,2,4] Department of Business Administration, University of Poonch, Rawalakot, Azad Kashmir

[3] Assistant Professor, Department of Management Sciences, Iqra University, Karachi, Pakistan

Abstract— This article employs 25 momentum techniques to analyze the momentum impacts using a sample of 466 non-financial enterprises from the Pakistan Stock Exchange for the years 2007 to 2017. CAPM and the Carthart four-factor model were also used to examine risk factors in this article. The Carthart four factor model results demonstrate a strong relationship between risk and returns due to systematic risk, and the positive and statistically highly significant coefficient of size factor (SMB) suggests that small minus big stocks are responsible for the returns of a portfolio. In contrast, the negative and very significant coefficient of factors (HML) and momentum factors (MOM) imply that the momentum and HML factor perfectly negatively explains the dependent variable and that the momentum profits are almost nonexistent. Furthermore, it is concluded that Carhart models are able to define variation in stock return for above given factors and are appropriate for Pakistan stock exchange.

The results of the monthly 25 short-term momentum strategies and the 16 long-term strategies show that there is no momentum in Pakistani stock. Furthermore, this article discovered that only one-third of strategies and six out of nine create anomalous returns. These returns are caused, respectively, by systematic risk and manager performance. This analysis came to the conclusion that there are no momentum effects present in the Pakistan stock exchange, according to all momentum portfolios. According to this report, investors shouldn't use momentum tactics to make investments in Pakistan's capital market. According to this article, the sample size should be enlarged, and daily stock, bond, and commodity data should be used to review 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.

Index Terms— Momentum effects, CAPM, Carthart four-factor model, Systematic risk, Manager performance

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Introduction

Anxiety is one of the psychophysiology difficulties (Callahan, Introduction Momentum techniques are the finest tools for spotting momentum effects in capital markets around the world. Momentum effects are one of the most important topics in international literature. For investors, momentum is an unexplored style and a crucial tool for creating diverse portfolios using their usual return on investment. Momentum, according to Khan et al. (2016), is an investment's propensity to exhibit consistency in its relative performance. Investments that have consistently performed well in the past will typically continue to do so. In a similar spirit, investments with relatively low performance continue to do so.

Additionally, Momentum is a well-structured and methodical approach to investing in stock prices, currency exchange rates, bond prices, and commodity markets (Khan et al. 2016, Berger et al. 2009, Fatima, Majeed). If a stock has performed well, it simply means that

[*] Email: aftabtabasam@upr.edu.pk

there are several distinct risks connected with momentum return. But none of the risk variables have yet received widespread recognition. Suppose the EMH (efficient market hypothesis) is not compensating for risk. In that case, momentum appears to be a problem for the EMH (efficient market hypothesis), as previous price performance does not guarantee future price, or, to put it another way, past return cannot be used to anticipate future information.

According to the word of Berger et al. (2009), in 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 efficient market hypothesis (EMH) assumption, when the information comes to the market, this information should be available freely on time to the investors of the all market, and the price of stock will adjust the information (Fama, 1970) instantly 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 are related to behavioral occurrences 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 firms are replying to earnings and dividend announcements for the examination, and little reluctance for the updating of their forecast.

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

Thirdly, the momentum reason is because of the investor behavior is an overreaction. It is 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 sells and buys the others will follow the same method. The act of short-term and long-term investors of selling and buying of an asset can go price high and low because of buying and selling that might be continuous for some months until the last correction. The major historical examples are financial and energy rallies from 2007 to 2008 and Bandwagon influence related to Technology bubble during 1990. Since over the last few decades and until now, the momentum literature has been increasing, and momentum is still a hot topic in momentum literature worldwide. From the findings of different papers, we can infer that momentum neither an effects to disappear if the transaction cost is included nor a random incident.

Types of momentum strategies

Different types of momentum strategies have been discussed in literature. Among those strategies, the most commonly known are price momentum, earning and industry momentum used by institutional and retail investors. Price momentum strategies refer to the individual's 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. Lastly, industry momentum strategies are related to specific industries (Ali, Ahmad, & Saeed, 2018). Buy the stock and hold of the past best performance industries while selling the stock of the past worst performance industries. This article 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 article also checks the Applicability of Carthart's four factors on Pakistan stock exchange.

Problem statement

The mentioned evidence in literature verified the momentum effect in different markets of the world. For instance, (Jegadesh & Titman 1993; Jegadeesh & Titman 2001) confirmed the momentum effects in American capital market. Some other papers also confirmed the momentum effects in different countries and regions (Rouwenhorst, 1998; Rouwenhorst, 1999; Jegadeesh & Titman 2001; Hu et al., 2011; Aggarwal & Gupta 2017; Abourachid et al., 2017; Spulbar et al., 2019; Khan, Kaewsaeng-on, & Saeed, 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 when the Pakistan stock exchange was considered a developing capital market. But the most recent published paper, such as Khan et al. (2016) found the inexistence of momentum effects in Pakistan stock exchange by employing 16 momentum strategies and CAPM model for risk factor analysis. Before, the 2011, Pakistan stock exchanged 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 (Titman &

Jeegadesh 1993; Griffin et al., 2005; Polak & Abudullah, 2012; Zaremba, 2018; Gharaibeh, 2017; Burki, Khan, & Saeed, 2020), the existence of momentum has been found in developed and emerging countries around the Globe. The literature on momentum effects from Pakistan capital market is still an early stage, and there are no compressive studies exist that have used short and long-term as well as applied Carthart four factors model on Pakistan stock exchange. Furthermore, best to my knowledge, my study is the first compressive study on Pakistan stock exchange that not only applies the 16 commonly studied from the literature but also applies 25 short-term as well as 16 long-term momentum strategies. In addition, to first time, we have used 6/9 and 1/3 strategies for risk factors analysis. Furthermore, this article is inspired by the scholar: "Are their momentum effects in Pakistan stock market, if yes, is it weak or strong? Furthermore, this article is also fascinating to analyze the momentum returns that are due to manager performance or systematic risk. In addition to this, we are also investigating the applicability of Carthart four-factor models on Pakistan stock exchange. Given the aforementioned prevailing debate and reasons, a gap exists in conducting a new study on Pakistan stock exchange.

Research questions of the study

This article 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:

- Does the investment momentum return explain rational asset pricing models (CAPM)?
- Does the Carthart four factors model explain the variation in portfolio returns and applicability?

Objective of the study

The specific objective of these is following.

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

Hypothesis

Ho: Based on momentum strategies, there are no momentum effect in Pakistan stock exchange.
Ho: Based on momentum strategies, there are momentum effects in Pakistan stock exchange.
Ho: The return of the individual momentum return is based on systematic risk rather taking a short position in loser portfolios (Manager Performance).
Ho: The return of the individual momentum return is not based on systematic risk rather taking a short position in loser portfolios (Manager Performance).

Literature Review

There is a growing literature on momentum effects on regional and country levels by employing different kinds of strategies based on short and long formation and holding period, as well as employing different techniques and obtaining different results for different countries, regions, panels, and aggregate countries panel. In some developing countries, momentum effects are weak, while momentum effects have been reported to be strong in emerging and developing countries. In exploring momentum effects in the different capital markets of different countries and regions, this article has been put forward in some previous papers (Nadeem, Saeed, & Gul, 2020).

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

Hu et al. (2011) investigate the performance of the momentum strategies in the stock market of 48 countries over the period of 1999 to 2007. They propose that investors preferring to buy past winners and want to sell past losers' stocks. They said there is a big difference between momentum and contrarian strategies. In the contrarian Strategy, the investor prefers to buy the past loser and wants to sell the past winner. They further used four-momentum strategies and examined 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 the formation period, and the second profitable momentum strategy is the holding period of the ninth month and formation period of three months. Generally, movement profit declines slowly after that and reverses upward later than one year for long

formation periods and two years for short formation periods. The result shows that the investor can get high returns when the testing period is more than two years and the formation period is above the ninth month. They further conclude their examination and show that an investment portfolio with a winner outperforms those based on losers. They also put forward that under or over-reactions is not explaining the momentum that affects behavior but supports the random walk theory, which is important in elucidation momentum return. Furthermore, they provided evidence that the use of momentum strategies shows the best performance in Asia, Europe, and America.

Petr et al. (2012) examine that momentum effect have many variants and sub-variants. in which the main variant of momentum effect is the momentum price strategy which has three main sub-variants are trading base momentum strategy, and weekly base Price momentum strategy, and the third one is a monthly Price momentum strategy. They further analyzed to find the momentum return for sub-variants in different distances of time. They further investigate which sub-variants are profitable and which Main investors recommend one for the making of a 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 the three strategies. In contrast, 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 16 momentum strategies and employing the CAPM model based on non-overlapping, equal weight, and docile methods, Khan et al. (2016) examine the momentum effects in the Karachi stock exchange. They found very mild momentum effects. They provided evidence that losers profitless are most profitable while winners are less, whereas only 4 winner-minus-losers portfolios produced a positive return, indicating a very low momentum effect. They have also used CAPM to explore the risk factors that boost return between systematic risk and manager performance. Their results indicate that the return has been gained due to manager performance which suggested short position in loser portfolios. They concluded that firms in Karachi stock exchange concerning winner and zero cost portfolios does not go after the momentum effects, whereas opposite is true for losers portfolios.

Hussaini et al. (2016) examined in the Thailand stock Exchange that selling of those stocks which are performed low in past and buy those stocks which are performed high in past that will make a 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; furthermore, they Study the momentum profitability in Thailand stock exchange for that purpose they made six portfolio base on the size and their past performance and calculated the return every month from 2010 to 2014. They examine that momentum showed a significantly positive return in the large stock and show negative in small Size stocks for the period of 2010-2013.

Abourachid et al. (2017) investigated profitability and return while using 16 momentum strategies in overall 10 European countries over the period 2004 to 2015. They further investigate that Out of sixteen strategies, ten strategies statistically result in a significant return. They used two different time period. The result is that low momentum of stock return is assigned to Market situation over the 2007 to 2012 sub-period. They further class the stocks by size and result that the big stock leads to insignificant momentum returns in two sub-periods.

Yang et al. (2017) examine the difference in momentum portfolio return with a different strategy of holding and formation periods. They examine that there is no existence of momentum effect in the 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 throughout 2000-2011. They further examine that while considering the volume factor, there is no momentum effect in the china stock market. This means if the investor follows the historical return of the stock, they will meet the losses if they choose any strategy of holding and formation period in the past eleven years, in case of selecting the combination of trading volume and Past returns, so there is a big probability of losses.

Gharaibeh (2017) examines that there is a presence of the momentum effect in the Arabic market over the period of 1989 to 2013. He examines that momentum profit are presence in the 10 Arabic market indices, which is economically and statistically significant for the general formation period. To earn some profit, the investors must buy and sell the past short-term winner and short-term loser portfolios accordingly.

Vo et al. (2018) investigated the Ho Chi Minh City Stock Exchange's momentum between 2007 and 2015. They further discover the strategy that advises investors to buy a stock that has performed well over the previous six months and hold it for nine months to make a sizeable profit. They investigated sixteen momentum effect strategies, only finding the momentum effect in ten of the tactics. The results of this study refute the theory of stock market efficiency, which amply demonstrates the distinctive characteristics of emerging markets (Farid et al., 2021).

Zaremba (2018) uses panel data from 78 nations to analyze the impact of momentum across borders while predicting 40 cross-sectional within-market anomalies for the years 1995 to 2015. The empirical findings indicate that half of the return patterns are reliable and steady. He also offers proof that companies that are formed and held for six and twelve months would function admirably in the future. Additionally, he discovered that momentum strategies at the level of individual countries are only weakly related. He says momentum tactics based on prior performance can be useful for international investors (Gul, Ali, & Saeed, 2021).

Subrahmanyam (2018) overawe the literature of previous studies in cross-sections capital market equities to make useful suggestions. He concluded that so far no one has given the real causes of the momentum effects. He suggested that researchers, investors, and policymakers should be required to conduct tests that pay attention not to testing one particular theory but to find alternative explanations. Giulio et al. (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 the size and factor premiums are highly profitable. They further found a 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 et al. (2019) observed the momentum effect in the Pakistan stock exchange from 2007 to 2016. They further used some strategies and techniques like full rebalancing method, equal weighted, and docile. For that, they collect data from the Pakistan stock exchange 100 indexes over the period of 2007 to 2016. Furthermore, they use STATA for constructing a momentum portfolio and result that top 25 stock Measure winners stocks and the bottom 25 stocks measure loser stocks; they conclude that there is a presence of momentum in the PSX-100 index (Pakistan stock exchange). Their results show that the Investor can earn enough profit while constructing a portfolio for the short-term formation period, like three months, and then hold it for the period of three, six, and twelve months (Khan et al., 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, proving the existence of strong momentum effects. They further suggest that more study can be carried out by applying daily and weekly price momentum. To investigate the momentum effect the, future researchers should focus on daily price momentum strategies and weekly price momentum strategies (Ullah et al., 2021).

Herberger (2020) examined the effects of momentum on the German stock market using a sample that was exclusively drawn from the German Blue Chip Stock Index between October 2013 and December 2014. They used realized transaction prices in addition to the methods used by De Bondt and Thaler (1985) and Jegadeesh and Titman (1993). They used 16 momentum strategies with formation and testing periods of 60, 45, 30, or 15 for the momentum strategies and 300, 180, 120, or 60 for the reversal strategies (reversal strategies). In contrast to contrarian or reversal momentum techniques, they discovered no momentum return in stock prices. They argue that constraint tactics have a sizable but very poor return. They also discovered the effectiveness of the stock market.

Given the aforementioned prevailing discussions based on previous literature on momentum effects, it is found that some of the papers (e.g., Khan et al., 2016; Rasheed et al., 2019; Herberger, 2020) did not confirm the momentum effects, while some have confirmed the momentum effects such as (Hurn et al., 2003; Petr et al., 2012; Hussaini et al., 2016; Abourachid et al., 2017; Gharaibeh, 2017; Vo et al., 2018; Giulio et al., 2019; Rasheed et al., 2019; Spulbar et al., 2019). Only two papers have been carried out on Pakistan stock, such as Khan et al., (2016) and Rasheed et al. (2019);. However, those study methodologies are quite different in terms of strategies and techniques e.g., I have used 25 momentum strategies and long-period momentum 16 strategies which have never been applied before on Pakistan stock exchange. Furthermore, this study also applied CAPM model on 1/3 and 6/9. In addition to, this study also used Carthart four factors model, which have never been used before on Pakistan stock exchange data. Therefore, I concluded this is the first comprehensive study that employs different methodology and momentum strategies and techniques to fill the gap.

Research Methodology

Population of the study

The universe for this article composes of all firms listed on Pakistan stock exchange, and for risk factor analysis, this article will use the KSE-100 index.

Sampling and simple size

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

Data and data source

This article will use secondary data to reach the conclusions of the research questions raised in the first chapter of this article. 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 article also used the Karachi stock exchange 100 indexes taken from the official Pakistan stock exchange website. This article also used risk-free data to calculate the market premium factor and portfolio returns. The data have been taken from the

official website State bank of Pakistan. This article 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 outstanding share data have also been downloaded from the Pakistan stock exchange's official website.

Different techniques

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

Docile strategies

Two well-known methods have been used in literature while ranking the portfolios stock. One is Docile, and another is weighted relative strength strategies. This article will use docile strategies because one big problem is weighing another method. Based on docile, stocks are placed based on their past performance. Take long positions in top portfolios while taking a short position in bottom portfolios.

Equally-weighted

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

Full rebalancing

Furthermore, there are two well-known methods in the literature that had used. The first one is partial rebalancing (non over lapping period), and the second is full rebalancing (overlapping period). This article will use the overlapping (full rebalancing) method to increase the total number of observations. This method is also good for comparing the result with other preview results (Khan et al., 2016; Titman and Jeegadesh, 1990, 93; Polak & Ejaz 2012). Below given is the table of the overlapping period table.

Formation and testing period

First, the important matter is to decide the ranking and testing period. Over the last three decades, many papers have used different strategies based on daily, quarterly, monthly, and annual data. However, literature's most commonly used strategies are 3/3, 3/6, 3/9, 3/12 (Khan et al., 2016; Habib-Ur-Rahman & Mohsin, 2012; Titman, Titman & Jeegadesh, 1990, 93; Polak & Ejaz, 2012) which based on monthly data. The aforementioned strategies each strategy is further extended to 4 strategies which are equal to 16 strategies. This article has added one more strategy to 1/1 to short-term monthly, which becomes a total of 25. Furthermore, this article also used long-term momentum strategies based on long formation and holding periods such as 12/24, 16/24, 20/24, and 24/24 and further divided into four which become 16 strategies. The results of these strategies are given next chapter. This article also checks the risk factors analysis. So for risk factors, this article uses the 6/9 strategies because these strategies produce abnormal profits and have never been used in previous studies, which is a novel contribution to the momentum literature. So 6/9 strategy has a ranking period of six months and a holding period of nine months. After the end of the 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 stocks, while the opposite is true for short portfolios. These portfolios are held for nine months. This strategy's process is given below.

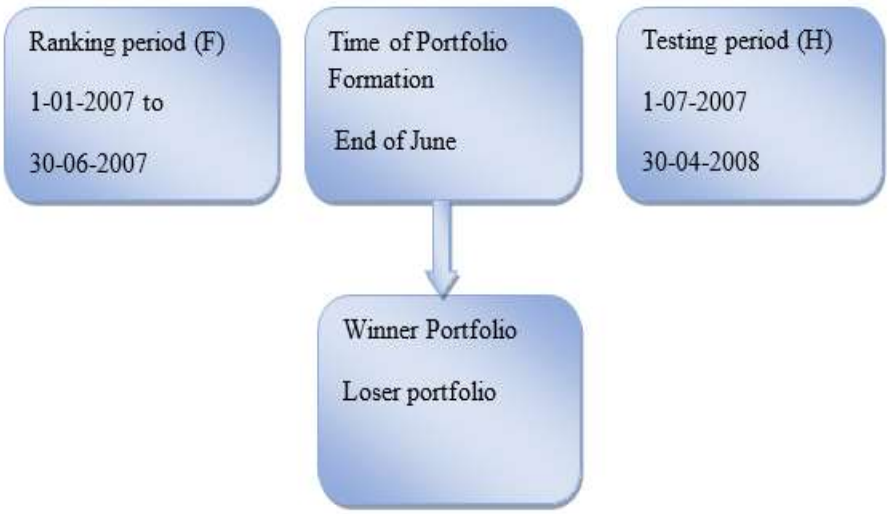

Fig. 1. Example of the momentum investment process (6/9)

Table I
Overview of our momentum strategies

Holding period (H)						
formation period(F)		1	3	6	9	12
	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 includes 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 article will be used to continue compound return because it gives 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 the share of the current month and the P_{t-1} price of the share of the prior month. The other important variable is zero-cost portfolios which can be calculated by taking the returns of long as well as the short portfolios:

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

Where $Zr_{wt}(K)$ is the zero cost portfolio and $Zr_{wt}(K)$ is the return of winner portfolio, and $Zr_{It}(K)$ is the return of the loser portfolio. Furthermore, to calculate the average returns of momentum strategies, we first take the average of all momentum strategies constructed from 2007 to 2017. Secondly, after taking the average, we divided it by the testing period's length. The following are the equations of average monthly returns.

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

All the above variables will be computed in Stata and for momentum portfolios the portfolios will be generated using ASM code.

Risk Identification

If any momentum strategies produce an abnormal return, this article will use those strategies to determine the factors that drive the abnormal return. For the aforementioned purpose, the results of CAPM will be analyzed in the next chapter to see whether abnormal return of winner minus losers is due to systematic risk that takes long positions in long portfolios or by manager performance taking short positions in short portfolios. CAPM results will investigate the previous relationship, and the equation is following.

$$R_P - R_f = \alpha + \beta\left(R_m - R_f\right) + \varepsilon$$

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

Result and Discussion

This chapter wills presents the results of short and long-term momentum strategies as well as the discussions and findings concerning momentum return. This chapter also presents the results and discussion about the CAPM and Carthart four factors model. Furthermore, the correlation results and descriptive statistic is also the part of this chapter.

Table II
Descriptive statistics

Variables	N	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

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

The variables and six portfolios are listed in the first column of Table II, and the number of observations, means, standard deviation, minimum, and maximum are listed in the second, third, and fourth columns, respectively. The size (SMB) has a mean and standard deviation of -.595 and 2.994, respectively, while the risk premium (r_m r_f) has a mean and standard deviation of.007 and 0.59. Higher risk or volatility is indicated by a large standard deviation and vice versa. If we examine the four risk variables, the market risk factor has the highest average return. of 007 and the lowest average return of -2.257 for HML. Monthly standard deviations that HML show the four risk factors returns with the highest volatility.

Furthermore, size characteristics are unfavorable and associated with a lower mean return in tiny shares, suggesting that large caps outperformed small caps. If we examine the other six portfolios, BL, BM, SL, and SL have the highest returns, with respective returns of 2.08, 1.094, 0.235, and.526. While SH has the lower return and standard deviation, BL has the highest return, indicating that both portfolios are at different risk levels.

Correlation among different portfolios

The correlation shows the interdependency between two or one variable with other variables (Guajarati, 2010). Table III represents the correlations between the variables and the different portfolios.

Table III
Correlation

	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 correlation value between MOM and BM is -0.106, which is negative, while the maximum correlation value is 0.8424 between SH and BH. A value above .50 and close to 1 indicates a positive correlation, while a negative value shows a negative correlation, whereas a value close to 0 shows no correlation (Gujarati, 2010). It is concluded that overall correlations between the several portfolios are positive, and only a few variables have negative correlations, which indicates that the variables have interdependency. The correlation between the market risk factors (r_m_r_f) and value factors (HML) is weak (0.521). In contrast, there is a low negative correlation between the market risk factor and the momentum factors (MOM) (-0.232), which implies that all zero-cost portfolios have beta values that might be 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 a very low negative association between the momentum and the value factors and the same for the other two factors. Our results are in line with correlations with the study of Vas and Absalonsen (2014) for the three risk factors, Market, value, and size. It is concluded that small minus big stocks offered a good foundation for size factor that is objectively free from market risk factor ($R_m f$).

Table IV
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
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

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

However, the strategy with a one-month formation phase and a three-month holding duration (1/3) generates a statistically significant high return and adds something new to the existing literature. The same is true for 6/9 of the methods. According to Hameed and Kusnadi (2002), the extreme volatility in emerging markets prevents momentum techniques from producing meaningful momentum returns. According to Khan et al. (2016), this can result from small sample size and little market inefficiency. The winning plus losing techniques with the highest return are 1/3; one month of formation, and three months of testing; this combination generates 1.387 returns and is statistically significant. The 6/9 return strategy comes at number two, producing 0.0143* and statistically significant. On the other hand, the lowest return was discovered in 1/1 with -4.9875. The second and third poorest performing zero-cost portfolios, with -4.0398 and -2.3445, respectively, are in the 3/1 and 9/1 ranges. These findings concur with those of Mohsin and Abduallah (2012) and Khan et al. (2016), who find no evidence of a momentum impact in the Pakistani capital market. According to the outcomes of long minus short portfolios, no momentum that adheres to the conventional efficient market hypothesis of momentum has been discovered. If we look at the total outcomes, the winning portfolios have the best performance, while the losing portfolios have the worst performance. Regarding the time frame, taking a long position in winning portfolios appears profitable. The findings also show that neither a short nor a long-based formation and holding duration delivers statistically favorable returns. Therefore, we advise retail investors not to make individual or indirect investments based on momentum techniques through third parties such as online trading platforms.

Table V
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*

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

To begin our investigation, we examine 16 long-term yearly momentum strategies on the Pakistan Stock Exchange. The momentum methods' typical annual returns from 2007 to 2017 are displayed in Table V. These 16 momentum techniques use overlapping holding periods as their foundation. A list of portfolio names appears in the first column, and the overlapping holding and formation periods are combined in the second column and first row. The third, fourth, fifth, sixth, and seventh columns show monthly returns for winning, losing, winning plus losing, and zero-cost portfolios. As we expect winner and winner minus loser portfolios to yield a positive return and vice versa, Table V demonstrates that 9 out of 25 winner portfolios exhibit a positive return, with one being statistically significant. This verifies the momentum effect. Two out of the sixteen solutions for loser portfolios have negative returns, rejecting the premise for loser portfolios. All 16 strategies are positive and statistically significant for the winner minus loser's portfolios (zero cost portfolios), but 12 methods are statistically insignificant overall, proving that there is no momentum effect on the Pakistan stock exchange. We are looking into Jeegadesh and Titman's (1993) theory employing first-time long-term annual tactics. From the long-term momentum strategies outcomes, we can conclude that Jeegadash and Ttiman's (1993) theory, which provides evidence that momentum strategies yield a high return over the 3–12 timeframe, is correct.

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 models, and the results are reported in table VI.

Table VI
Short-term momentum strategies F1H3, formation period F

Holding Period	α	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	-.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

The regression findings for 1/3 winner minus loser portfolio strategies are shown in Table VI. A list of portfolio names and strategies appears in the first column. The alpha value is shown in the second column and the first, second, and third rows. The standard error, t-statistic, and probability values are represented in the third, fourth, fifth, seventh, and eighth columns, respectively. In contrast, the beta and R square values are represented in columns six and nine, respectively. In the table above, alpha (α) denotes the model's intercept or, put another way, the manager's performance. The risk associated with the collection in relation to market portfolios, which is an index in the PSX-100 index, is designated by the term beta, which measures the market or undiversified risk.

Winner portfolios have a positive beta coefficient of.0048, which is statistically highly significant. The table's *p*-value, 0.000, indicates that the significance level is significant. This suggests that the beta coefficient is quite important and affects the return of a portfolio. The p-value of 0.000 indicates that alpha (α) coefficient sign is also positive and statistically significant. The loser portfolios' beta coefficient is also statistically highly significant and positive. Contrarily, as can be seen from the p-value of 0.000, the sign of alpha (α) is negative and statistically highly significant.

Additionally, because the p-value is less than 0.000, the coefficient of Zero Cost Portfolios value of beta (β) is -.0041, which is negative and statistically significant. Similar to the beta (β) coefficient, the alpha (α) coefficient has a negative value of -.0046 and is statistically

significant due to the low p-value of less than 0.10 percent. This suggests that manager performance is not the reason for the return of zero cost portfolios since the alpha value coefficient is negative and very small. This increase in return is the result of systematic risk. The R-square value of 0.12 confirmed this link. The total findings supported the theory that market risk (also known as systematic risk) on the Pakistan stock exchange is what caused the profit. Thus, these findings imply that institutional or retail investors should refrain from investing in Pakistan's stock market using momentum tactics.

We are applying the CAPM model on 9/3 strategies because these strategies produce a low positive return in the zero-cost portfolio given in table II.

Table VII
CAPM model for 6/9 strategies

Holding Period	α	SE	*t*-stat	*p*-Value	*B*	SE	*t*-stat	*p*-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

The regression results of the portfolio methods for 6/9 winners minus losers are shown in Table VII. A list of portfolio names and strategies appears in the first column. The alpha value is shown in the second column and the first, second, and third rows. The standard error, *t*-statistic, and probability values are represented in the third, fourth, fifth, seventh, and eighth columns, respectively, while the beta and R square values are represented in columns six and nine, respectively.

Because the p-value is 0.000, which is less than 0.10, the coefficient of winner portfolios beta (β) is.9362, which is positive and statistically very significant. Similar to the sign of beta (β), alpha (α) is positive and statistically significant, as shown by the p-value of 0.000. The loser portfolios' beta coefficient is also statistically highly significant and positive. However, as can be seen from the p-value of 0.259, the sign of alpha (α) is negative and statistically insignificant. Additionally, because the p-value is 0.000, or less than 0.1 percent, the coefficient value of the winner-minus-portfolios loser's of beta (β) is -.4923, which is negative and statistically significant.

In contrast, the alpha (α) coefficient value is equally positive and is statistically significant at 0288. The alpha coefficient of alpha value is positive, and just a little bit high suggests that the return of zero-cost portfolios is not the result of systematic risk. This increase in return is the result of the manager's performance, who took short positions in the portfolios of losers. The total findings supported the theory that manager performance on Pakistan's stock exchange is responsible for the return. Consequently, these findings imply that retail or institutional investors should invest their funds in the Pakistan stock market by using momentum methods with extended formation periods, such as six months, and long holding periods, such as nine months.

Table VIII
Carhart four factors model

Variables	Coefficient	St.Err	*t*-state	*p*-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	-.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

The results of the Carhart four factor models are displayed in Table VIII. The market premium is the first explanatory variable, size premium is the second, value premium is the third, momentum factor is the fourth, as can be seen from Table VIII in rows 2,3,4 and 5 accordingly.

The constant value is negative and statistically significant, while the coefficient of R_m-R_f value in column 2 is positive and very significant at 98.700, suggesting that systematic risk can increase returns. According to Khan et al. (2016) and Petr and Abudllah (2012), beta measures the risk associated with individual portfolios instead of market portfolios and also represents systemic risk. On the other hand, Petr and Abudllah (2012) contend that a positive and very significant coefficient of constant or intercept value implies that the return is caused by the momentum effect rather than systematic risk. Vas and Absalonsen (2014), Petr and Abudllah (2012), and Kloster-Jensen (2006) obtain the positive constant value. However, in our situation, the alpha value is negative, indicating that market risk is a valid explanation for the momentum of profits. The outcome demonstrates a strong correlation between risk and returns due to systematic risk, and we advise against taking a short position in the loser portfolio. The positive (0.696) and statistically highly significant (P-value: 0.000) coefficient value of the size factor (SMB) suggests that the relative size of the stocks can explain the returns of a portfolio.

On the other hand, the coefficients of value factors (HML) and momentum factors (MOM) are -0.332 and -0.0061, respectively, which

is very significant and shows a negative correlation between the explanatory variables and the return on the portfolios. The findings imply that the market factor ($rm\ r_f$), which also contributes positively to the risk SMB factor, describes the volatility in stock returns. On the other hand, we discover that the HML component and momentum both perfectly negatively describe the dependent variable, and the momentum profits are all but gone. Vas and Absalonsen (2016) and Khan et al. (2016) both discovered comparable outcomes (2014). It is determined that Carhart models are suitable for the Pakistan stock market and are competent in defining variation in stock return for the aforementioned parameters.

Conclusion and Recommendations

Momentum effects have been extensively studied in different stock markets in cross-country analysis and 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. To see the existence of momentum effects in the capital market of Pakistan, check the investment momentum hypothesis and the applicability of the four factors model on the Pakistan stock exchange. This article formed 25 short term monthly price momentum strategies (e.g.,1/1,1/3,1/6,1/9,1/12, 3/3,3/6,3/9,3/12,6/3,6/6,6/9,6/12,9/3,9/6,9/9,9/12,12/3,12/6,12/9,12/12) 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 rebalancing and equal eight method. The data of 466 non-financial companies were used for analysis from 2007 to 2017. The stocks were ranked based on their return. The top twenty and twenty stocks were chosen as winners and losers, respectively. Portfolios were formed based on long positions in long portfolios and short positions in short portfolios.

The profits of the 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, only 2 strategies return positive out of 25 and found the inexistence of momentum effects? This article also found that over 1- to 3 and 6-9 months, the momentum tools yield paramount and abnormal return in the Pakistan capital market between 2007 and 2017. The most profitable long minus short portfolios select the stock based on a one-month ranking period and holds for three months, producing a monthly return of 1.3865. These results verified that this return is due to systematic risk that takes a long position in winner portfolios.

Furthermore, the results of long-term momentum strategies show that 9 portfolios produce positive returns out of a total 16, whereas losers 2 out of 16 found an increasing tendency in most portfolios. Moreover, in long minus short, all 16 portfolios produce negative returns, confirming the inexistence of momentum effects. The long and short-term momentum strategies results are similar in return, confirming the results' robustness.

This article also investigated whether returns were gained due to manager performance or systematic risk. Because the alpha value is statistically significant and negative, systematic risk is to blame for the return of the portfolios that are 1/3 long and 1/3 short. While the results of 6/9 suggest that since the coefficient of alpha value is positive and also slightly high, the return of zero-cost portfolios is not attributable to systematic risk. This increase in return is the result of the manager's performance, who took short positions in the portfolios of losers. The results of 1/9 supported the idea that management performance is what causes returns, whereas the results of 1/3 point to systematic risk on the Pakistan Stock Exchange.

The overall results of long and minus short portfolios concluded that no momentum effects exist in Pakistan stock exchange. These results are consistent with the findings of Khan et al. (2016), Mohsin (2012), Ji et al., 2003, Rouwenhorst and Chui (1999).

This article recommends some policy implications, recommendations, and future direction of the study, which are following.

- First of all, this article suggests that retail and institutional investors should avoid investing in Pakistan capital market based on momentum strategies because there are very low momentum effects.
- Secondly, this article found that only two momentum strategies which produce slightly high returns. So we applied the CAPM model to see whether momentum in portfolios 1/3 and 6/9 explains the momentum effects robustly. According to the results, this article recommended that one should use to five or six factors model for risk detection if they want to conduct further study, but it does not mean that CAPM is not an appropriate model.
- For future study, this article 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 replicate this study by analyzing the currencies or cryptocurrencies, commodities or bond prices, etc. Furthermore, they should try to use the daily, weekly, or monthly data as well as 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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