Investment Strategies and Equity Returns

Evidence from Pakistan

By

SHOAIB GHULAM-MM 133088

MASTER OF SCIENCE IN MANAGEMENT SCIENCES

(FINANCE)

DEPARTMENT OF MANAGEMENT SCIENCES

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MM 133088

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CAPITAL UNIVERSITY OF SCIENCE AND TECHNOLOGY ISLAMABAD

Islamabad Expressway, Kahuta Road, Zone-V, Islamabad
Phone: +92 51 111 555 666, Fax: 92 51 4486705
Email: info@cust.edu.pk, Website: http"//www.cust.edu.pk

CERTIFICATE OF APPROVAL

Investment Strategies and Equity Returns: Evidence from Pakistan

By

Shoaib Ghulam

MM-133088

THESIS EXAMINING COMMITTEE

S No	Examiner	Name	Organization
(a)	External Examiner	Dr. Attiya Yasmin Javid	PIDE, Islamabad
(b)	Internal Examiner	Dr. Jaleel Ahmed Malik	CUST, Islamabad
(c)	Supervisor	Dr. Arshad Hassan	CUST, Islamabad

_____

Dr. Arshad Hassan
Thesis Supervisor
Nov, 2017

_____

Dr. Sajid Bashir
Head
Department of Management Sciences
Dated : Nov, 2017

_____

Dr. Arshad Hassan
Dean
Faculty of Management and Social Sciences
Dated : Nov, 2017

Certificate

This is to certify that **Mr. Shoaib Ghulam** has incorporated all observations, suggestions and comments made by the external evaluators as well as the internal examiners and thesis supervisor. The title of his Thesis is: Investment Strategies and Equity Returns: Evidence from Pakistan.

Forwarded for necessary action.

Dr. Arshad Hassan
(Thesis Supervisor)

STATEMENT BY CANDIDATE

This thesis includes no material which has been already accepted for the award of any other degree or diploma in any university and confirms that to the best of my knowledge the thesis includes no material previously published or written by another person, except where due reference is made in the text of the thesis.

SHOAIB GHULAM

(MM 133088)

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First of all I would like to thanks and praise Almighty Who Gave Me Courage And Strength To Complete this thesis, without his blessings , I would not able to accomplish this work on time.

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Dedication

I am dedicating this research work to my beloved parents to help me in every possible way for my successful future. Without your help, patience and confidence in me, I was not able to complete this whole journey. I love you.

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List of Abbreviations

HG	High Growth
LG	Low Growth
St.dev.	Standard Deviation
St.dev. HG	Standard Deviation of High Growth Assets
St.dev. LG	Standard Deviation of Low Growth Assets
W	Winners
L	Losers
St.dev. W	Standard Deviation of Past Winners
St.dev. L	Standard Deviation of Past Losers
HV	High Volatility
LV	Low Volatility
St.dev. HV	Standard Deviation of High Volatility
St.dev. LV	Standard Deviation of Low Volatility
CAPM	Capital Asset Pricing Model
APT	Arbitrage Portfolio theory
NYSE	New York Stock Exchange
ETF's	Exchange Traded Funds
MSCI	Morgan Stanley Capital Investment
PACAP	Pacific-Basin Capital Market
ARCH	Autoregressive Conditional Heteroskedasticity
KHI Stocks	Karachi Stocks

Abstract

The basic purpose of this study is to investigate the significant profitability of three most prominent investment strategies including asset growth premium, momentum premium and idiosyncratic volatility premium in Pakistani equity market. Monthly stocks of 120 companies for non-financial sectors which are traded at Pakistan Stock Exchange (PSX) are used for the sample period of June, 2002 to June, 2015. On the basis of these investment strategies average returns of arbitrage portfolios are calculated and two sample t-tests is used to experienced statistical differences between the average returns of all the strategies. The result of the study shows that the arbitrage portfolios based on asset growth, momentum and idiosyncratic volatility strategies do not earn abnormal return during 1 year investment time horizon. Whereas only momentum strategy is able to earn abnormal returns for 5 and 10 years investment horizon which shows that momentum effect exist in Pakistani market for extensive investment period. This opportunity is same for local as well foreign investors to earn abnormal returns by investing momentum strategy in Pakistani stock market. Time series and cross sectional analysis is used to examine the impact of asset growth premiums, momentum premiums and volatility premiums on size sorted portfolios. The result of the study shows that there is significant relationship between volatility premium and equity returns which state that only volatility premium explain equity returns while rest of the strategies found insignificant in Pakistani equity market.

Key Words: Asset Growth Premium, Momentum Premium, Idiosyncratic Volatility Premium, Equity Returns.

Chapter 01

Introduction

1.1 Theoretical Background

Single Factor Model:
Sharpe (1964), Linter (1965) and Mossin (1966)

Asset pricing theories provide that riskier asset should earn higher returns. The basic Capital Asset Pricing Model is developed almost simultaneously by Sharpe (1964), Linter (1965) and Mossin (1966). This model is proposed on the underline concept of the relationship between risk and expected return and its use in pricing of risky securities. The model is proposed to generate testable predictions about risk and return characteristics of individual asset by specifying how stocks covary with the market portfolio of all risky assets. An asset's risk, in turn, is based solely on it, response with the variability of returns of a well diversified portfolio. Since an asset's unique risk can be diversified away, it is only the asset's systematic risk (the risk which is common in all asset's/securities) that is priced. The specific measure of systematic risk used in the CAPM is called beta (βi). According to CAPM there is a linear relationship between the asset's premium and the market risk premium (or equity risk premium).

The results of the CAPM predictions are summarized as, 1) the mean realized return on a security should be positively and linearly related to the security's estimated systematic risk. 2) The intercept term Υo should not be significantly different from zero. 3) Realized returns should not be systematically related to anything except beta. 4) An asset's beta should not change over time and the model should yield the same conditional returns in each period.

Several authors' present important theoretical extensions of the CAPM, Brennan (1970) develops an after-tax CAPM that accounts for the fact that investors have to pay higher taxes on high dividend-yield stocks than on low-yield stocks if dividends are taxed at a higher marginal rate than capital gains. The principal empirical predictions of this is that high-yield stock must offer higher nominal returns than is required of low-yield stocks to compensate investors for the higher personal taxes they have to pay on dividends. Merton's (1973) intertemporal CAPM extends the one

period model into a multi-period framework-indeed into continuous time. While this model does not yield easily-interpretable empirical predictions. It does show that simple CAPM is unlikely to hold in a multi-period setting. Sharpe (1977) himself modifies the basic asset pricing model to account for more than one systematic risk factor in his multi-beta CAPM. Breeden's (1979) consumption CAPM predicts that investors are more concerned with protecting their consumption opportunities during economic contractions than with protecting the market value of their wealth. The principal empirical prediction of this model is that security returns are closely correlated with aggregate economic output, as proxied by gross national product of personal income expenditures.

In 1977 Roll present a major intellectual challenge to the CAPM. Roll asserts that the CAPM is not testable, even in theory unless the exact composition of the true market portfolio is known with certainty, and this portfolio is used in all empirical tests. Second the study argues that market premium is hidden factor for return generation process and it is linear function of n factors these factors are known as anomalies.

Anomalies have been evolved with the passage of time after Rolls critique (1977) like Price Earning Anomaly (Basu, 1977), Size Anomaly (Banz 1981 and Reinganum 1981), Market to Book Ratio Anomaly (Statman, 1985), Liquidity Anomaly (Ammer, 1993), Accrual Anomaly (Sloan's, 1996), Leverage Anomaly, Dividend Anomaly (Miller and Modigliani 1961, Brennan 1970, Litzenberger and Ramaswamy1979 and Blume 1980), Momentum Anomaly (Jegadeesh and Titman 1993), Growth Anomaly (Kochar, 1997), Operating Profit Anomaly, Volitility Premium Anomaly (Fama and French) etc.

The focus of this study is upon Idiosyncratic Volatility Anomaly, Momentum Anomaly and Asset Growth Anomaly.

1.1.1 Momentum Premium

The word momentum means pattern or trend. In finance it is typically linked with stock prices for example if the prices of certain stocks raises then they tend to keep continually raise, similarly if the prices of stock fall down then it continue to fall down. This pattern or trend is known as momentum. For the first time it is discussed by Jagadeesh and Titman (1993) who reported it as another anomaly that is considered to be the most prominent factor for abnormal return generation process. A

large sample of listed companies of New York Stock Exchange (NYSE) is examined to study the pattern or trend in the stocks. The study finds that past winner stocks earn higher returns than the past loser stocks in the future for the period of 3-12-months. Fama and French (1996) fails to incorporate short term past returns as documented by jagadesh and titman (1993) in their proposed three-factor model consisting of market risk premium, size-premium and value premium. Carhart (1997) extend the CAPM and add momentum factor to the Fama & French (1993) three factor model which is known as Carhart four-factor model. This also has been confirmed in the study of Ejaz and Polak (2015) that short term momentum effects exist in Middle East markets. Same results are documented by Ansari (2012) and Shah (2015) and Tauseef (2016) for Indian market during 1995-2006 and the Pakistani market respectively.

1.1.2 Idiosyncratic Volatility Premium

The word volatility means fluctuations of the stock prices in a specific time span. If it fluctuate rapidly then it is referred as high volatility whereas, if stock prices fluctuate slowly then it is called as security have low volatility. Black (1972) provides a theoretical contribution in which he argues that idiosyncratic volatility is irrelevant for asset pricing as an extension in capital asset pricing model (CAPM) of Sharpe (1964) and Lintner (1965). French, et al (1987) states that abnormal returns are linked with market situation as the risk increases return increases.

1.1.3 Asset Growth Premium

In finance asset growth anomaly deals with abnormal returns associated with difference in the asset growth rate of firms. Xi Li, et al (2010) reports that two year total asset growth rates indicates that companies has the ability to generate abnormal return for next four years. Cooper, et al (2009) reports that low asset growth firms outperform high asset growth stock which means that immature firm earn high returns than mature firms.

Multifactor Models:

1.1.4 Fama and French Three Factor Model

After the emergence of one factor model which is known for market risk premium CAPM by Sharpe (1964) and Linter (1965), Fama and French came up with Three Factor Model which extends asset pricing model by adding size and value factors to the market risk factor in CAPM. This model considers the fact that value and small-cap stocks outperform markets on a regular basis. By including these two additional factors, the model adjusts for the outperformance tendency, which is thought to make it a better tool for evaluating manager performance.

1.1.5 Carhart Four-Factor Model

The Carhart four-factor model is an extension of the Fama–French three-factor model which includes momentum as an extra risk factor. It is also known MOM factor (monthly momentum) in the industry. Momentum in a stock is described as the tendency for the stock price to continue rising if it is going up and to continue declining if it is going down. A stock is said to be momentum if its prior 12-month average of return is persistent whether it is positive or negative. Alike three factor model, momentum factor is defined by self-financing portfolio of buy the past winners (long positive momentum) + and sell the past losers (short negative momentum). Momentum strategies continue to be popular in financial markets, at least one year holding period or investment period in terms of 52 weeks recommended by financial analysts to see pattern or trend whether the price is high/low in their Buy/Selling.

1.2 Problem Statement

"Empirical literature provides that evidence of link between Asset Pricing Anomalies and return. These anomalies are the outcome of different investment strategies. The role of these investment Strategies in earning abnormal return in Pakistani equity market is unclear. Moreover debate on various premiums in explaining return is unclear."

1.3 Research Questions

- Whether winners outperform losers?
- Whether high volatility firm outperform low volatility firm?
- Whether low growth firm outperform high growth firm?
- Can Momentum premium explain stock return?
- Can volatility premium explain stock returns?
- Can growth premium explain stock returns?

1.4 Objective of the Study

- To provide the insight about role of Momentum strategy in explaining the stylized return.
- To investigate influence of volatility premium in explaining the stylized return.
- To explain the impact of Asset Growth premium in explaining the stylized return.

1.5 Significance of the Study

This study is significant as it facilitate the investors as well as managers to take economic decisions regarding investment opportunities in Pakistan. Literature says small size and large size returns are different to each other. Low book to market and high book to market firm returns differ from each other. The difference of theses returns are based on different investment strategies. This study explores the role of these three investment strategies to define those returns. In Pakistani market, the effect of these strategies on stylized returns has not yet been comprehensively explored.

Chapter 02

Literature Review

Fama & French (1992) identifies two anomalies size premium and market to book ratio premium and extended single factor CAPM. Later on many anomalies have been identified e.g, Price earnings ratio premium anomaly, Accrual premium anomaly, Dividend premium anomaly, Leverage premium anomaly, Liquidity premium anomaly, Momentum premium anomaly, Growth premium anomaly, Operating profit premium anomaly, Volatility premium anomaly and so on. It has been observed that these anomalies are the outcome of investment strategies.

2.1 Momentum Premium and Equity Returns

Ansari and Khan (2012) reports that in Indian Stock market strong momentum profit exits for the period of 1995 to 2006. The finding suggests that risk based models fails to explain the phenomenon as documented by CAPM and Fama-French. Stocks specific risk reveals that there is positive relation with momentum, lending support to behavioral factors.

Jegadeesh and Titman (1993) finds the significant positive returns for 3 to 12 months investment period which purchase winner stocks and sell loser stock. This also have been found that these returns are not the outcome of systematic risk or to delayed stock price reactions to common factors. However, abnormal returns dissolve in the following two years as generated in first year after portfolio formation. Same pattern of returns is documented around the earnings announcements of past winners and losers.

Page & Auret (2017) reports highest level of excess returns for investment periods between six and nine months. Excess returns have been found when equally weighted momentum compared to value weighting. Momentum profits constantly increase when skip the most recent estimation month in Bid-ask bounce and microstructure effects on the JSE, Asness (1997 Asness, C. S. (1997). They also studied when liquidity and momentum are compared it becomes more sensitive to direct transaction costs.

Shoaib and Siddiqui (2017) find in short run market momentum miscalculate betas whereas it is stabilized and corrected in the long run. In contrast, Chinese markets are found more insightful, stable and efficient in explaining the risk premium, which vividly represents their maturity.

The study of Aggarwal, Navdeep; Gupta and Mohit (2017) demonstrate that by using momentum strategy actual returns are generated when adjusted for risk under Fama-French (1993) conditions. Even after bookkeeping for all sorts of transaction costs and exchange imposed restrictions profits can be generated through momentum strategy in Indian stock market. Marginal improvements can bring with early momentum strategy by expanding with volume information. However, for short run portfolio formation and portfolio investment period sounds good while it does not recognize medium or long run momentum stock return in Indian stock market. Deeper investigation required for these momentum returns have whether behavioral, risk based or some proportion of both reasons.

Hypothesis 1:
Past winner stocks outperform past loser stocks.

2.2 Idiosyncratic Volatility Premium and Equity Returns

It has been observed that volatility of aggregate stock market is inconsistent, and changes with the passage of time. Officer (1973) has used statistical models like standard deviations as many economists proposed such model to capture this time disparity in unpredictability have given way to parametric ARCH or stochastic-volatility models. Same models have been used by Bollerslev, Chou, and Kroner (1992), Hentschel (1995), Ghysels, Harvey, and Renault (1996), and Campbell, Lo, and Mackinlay (1977) to capture the volatility.

Volatility experienced by holders of cumulative index finances is of course important in almost any theory of risk and return. Individual stock return is the only component for aggregate market return. For individual stock return specific firm level and industry level stocks are also important. In the volatilities of these components there are several reasons to be involved.

First, many investors fails to diversify the way financial theory recommend who have large holdings of individual stocks, or their holdings may be limited by corporate return policies. As the situation of market volatility alters these investors are affected by change in industry-level and idiosyncratic volatility. Second, those investors who hold a portfolio of 20 or 30 stocks can diversify their risk.

This is insightful that those portfolios are well diversified which eliminated all idiosyncratic risk. However, the capability of this estimate depends on the level of idiosyncratic volatility in the stock making up the portfolio. Third, those used to arbitrage face risks that are related to idiosyncratic return volatility to exploit the mispricing of individual stock rather than aggregate market volatility.

According to Ingersoll (1987) when individual firm-level volatility is high then larger pricing errors are possible. Lastly, total volatility of the stock return which includes industry-level and firm specific stock volatility as well as market volatility affects the price of an option on an individual stock.

Astonishingly limited empirical studies conducted on volatility at industry or firm level. Black (1976), Christie (1982), Duffee (1995) studies "leverage" effect, in which it is found that volatility has the capability to raise negative returns. Engle and Lee (1993) studied persistence properties of firm-level volatility for few large stocks by using a factor ARCH model.

A number of researchers Loungani, Rush, and Tave (1990), Bernard and Steigerwald (1993), Brainard and Cutler (1993) have test macroeconomic models of reallocation across industries or firms by using stock market data, or to discover the relationship between volatility and investment at firm level as documented by Leahy and Whited (1996). Rolls (1992) and Heston and Rouwenhorst (1994) study the inference for international diversification in which industry and country specific effects rotted by world market volatility. To study the volatility in emerging markets Bekaert and Harvey (1997) determine individual firm dispersion.

Shoaib and Siddiqui (2017) find that high returns earned by small stocks with higher volatility which is consistent with the universal concept of high risk linked with high returns.

The study of Rajesh Pathak and Amarnath Mitra (2017) reports that smirk in index options with an auto–regressive structure significant volatility exist. To the control of major risk factors marginal returns and predictability is found strong in smirk prediction. Volatility smirk found significant predictor by open interest of calls and puts, along with market risk premium and momentum premium. From volatility risk perspectives the results are helpful in enhancing returns on investment in Index based funds and designing options strategies.

Guo and Savickas (2008) report that stock market returns are significantly explained by idiosyncratic volatility. Whereas cross section of stock return is explained by idiosyncratic volatility performs just as well as the book- to-market factor. The results suggest that asset prices important determinant by the hedge against changes in investment opportunities.

Baillie and DeGennaro (2009) report that weaker relationship exists between mean returns and variance. The results suggest that other risk measure to be more important than the variance of portfolio returns by the investors. However result shows that relationship between mean returns on a portfolio of stocks and the variance of those

returns founds no evidence. This involve that further research using alternative measures of risk is suggested because simple mean-variance models are inappropriate.

Ang, Hodrick, Xing and Zhang (2006) low average returns of stocks with high sensitivities to innovations in aggregate volatility have been found. Low average returns Stocks with high idiosyncratic volatility relative to the Fama and French (1993) model.

Lintner (1965) shows that in cross-sectional regressions idiosyncratic volatility carries a positive coefficient. Lehmann (1990) also finds that equity returns have significant, positive relationship with coefficient on idiosyncratic volatility. Similarly, Tinic and West (1986) and Malkiel and Xu (2002) do not report any significance levels for their idiosyncratic volatility premiums and reports that portfolios with higher idiosyncratic volatility have higher average returns. On the other hand, Longstaff (1989) finds that an insignificant negative sign carried by a cross-sectional regression coefficient on total variance for size-sorted portfolios.

The difference between in the results may arises either past literature does not examine idiosyncratic volatility at the firm level, or does not directly sort stocks into portfolios ranked on this measure of interest. 20 portfolios are sorted by Tinic and West (1986) on the basis of market beta, whereas Malkiel and Xu (2002) work only with 100 portfolios which are further sorted on the basis of market beta and size. Malkiel and Xu (2002) only use the idiosyncratic volatility of one of the 100 beta/size portfolios to which a stock belongs to proxy for that stock's idiosyncratic risk and, thus, do not examine firm-level idiosyncratic volatility. Hence, by not directly computing differences in average returns between stocks with low and high idiosyncratic volatilities, previous studies miss the strong negative relation between idiosyncratic volatility and average returns.

The volatility of stock returns has been a major topic in finance literature. Empirical researchers have tried to find a pattern in stock return movement or factors determining these movements. The discussions on stock return volatility are mainly two-fold. First, contemporary financial theory asserts that stock return volatility is closely related to movement of macroeconomic variables (Schwert 1989, Ferson and Harvey 1991). This is because stock market reflects fundamental information about the macro economy. Therefore, understanding factors that affect stock return volatility is a vital task in many ways.

Another approach to explain stock return volatility underscores the linkages between volatility in one market and international economic environments such as interest rates or stock prices in developed countries. Eun and Shim (1989) report the transmission of the innovations in the US stock market to the rest of the world. Hamao et al (1989) report that price volatility spillover across markets.

Chaudhuri and Koo in 2001 find that both domestic macroeconomic variables and international variables are found to have explanatory power for stock return volatility. The evidence strongly suggests the presence of a significant infection effect and mixing of capital markets in this region. The study also document that the role of government in terms of fiscal and monetary policy in the smooth functioning of the stock market is crucial in this region.

Bartram, Brown and Stulz (2012) find that the volatility of U.S. firms is higher mostly because of good volatility. Specifically, stock volatility is higher in the United States because it increases with investor protection, stock market development, new patents, and firm-level investment in R&D. Each of these factors is related to better growth opportunities for firms and better ability to take advantage of these opportunities.

In the study of French, Schwart and Stambaugh (1987) positive relationship have been found between expected market risk premium and predictable volatility of stock returns which means that as the level of risk increases return also increases. Whereas, negative relationship documented between abnormal returns and unexpected change in the volatility of stock returns which indicates indirect evidence of positive relationship between expected risk premiums and volatility.

Hypothesis 2:

High volatile stocks earn more return than low volatile stocks.

2.3 Asset Growth Premium and Equity Returns

In 2012 Ying and Didier, finds that asset growth related measures has the ability to predict in the MSCI World Universe which include all developed market. This power is particularly stronger for two-year total asset growth rates and is robust to adjustments of size and book-to-market. The study is also finds that two-year total asset growth rates have the ability to generate abnormal returns for up to four years after its initial measurement period.

Persistent negative relation exits between asset growth and subsequent stock returns (Chen, Yao, Yu, Zhang, 2008) which prevails the existence of inefficient financial systems in allocation of capitals and evaluation of investment opportunities however the relation is weaker relative to the U.S. market. The study further examine factors affecting the difference in the magnitude of the asset growth effect across the PACAP markets and the difference between the PACAP region and the U.S., such as homogeneity of asset growth, persistence in growth and profitability, overinvestment tendency, and corporate financing choices.

In the study Cooper, Gulen, and Schill, (2008) abnormal returns are strongly predicted by Asset growth rates. Even for large capitalization stocks asset growth retains its forecasting ability. Firm's annual asset growth rates come into sight as an economically and statistically significant predictor of the cross-section of US. Stock returns when asset growth rates are compared with the previously documented determinants of the cross-section of returns (i.e., book-to-market ratios, firm capitalization, lagged returns, accruals, and other growth measures).

Strong negative relationship documented by Cooper, Gulen and Schill (2010) between the growth of total firm assets and subsequent firm stock returns using a broad sample of U.S. stocks. Low asset growth stocks outperform high asset growth stocks with a return premium of 20% per year, over the past 40 years. The asset growth return premium begins in January following the measurement year and persists for up to five years. The firm asset growth rates are economically and statistically important to predict returns in both large capitalization and small capitalization stocks. In the cross-section of stock returns, the asset growth rate maintains large explanatory power with respect to other previously documented determinants of the cross-section of returns (i.e., size, prior returns and book to market ratios). The study concludes that risk-based explanations have some difficulty in explaining such a large and consistent return premium.

In Pakistani and Indian market, market risk premium is the main factor which affect risk premium (Shoaib and Siddiqui, 2017) whereas growth stocks perform well than value stocks in the economies of Pakistan, China and India.

Firms with higher asset growth rates subsequently experience lower stock returns in international equity markets as documented by Watanabe, YanXu, TongYao and TongYu, (2012), which is consistent with the U.S. evidence. In more developed capital markets where stocks are more efficiently priced, but are not related to country characteristics in lieu of limits to arbitrage, investor protection, and accounting have strong negative effect of asset growth on returns. The evidence suggests that the cross-sectional relation between asset growth and stock return is more likely due to an optimal investment effect than due to over-investment, market timing, or other forms of mispricing.

Strong association documented by Cooper et al. (2008) between total asset growth and stock returns in the US. This study is also consistent with Australian equity market where an asset growth effect also exists during the period 1983 to 2007. This also has been observed that low-growth big stock stocks well perform a portfolio of high growth big stocks when equally weighted portfolios are constructed.

Hypothesis 3:

High growth firms outperform low growth firms.

Chapter 03

Data Description and Research Methodology

3.1 Data Description

This study is descriptive and quantitative in nature which uses secondary data for analysis perspective. The study investigated the role of following investment strategies i.e. Momentum strategy, idiosyncratic volatility and asset growth strategy in explaining the size anomaly for sample period from June, 2002 to June, 2015. Monthly stocks of 120 companies which are traded at Pakistan Stock Exchange (PSX) for non-financial sectors are used in time series and cross sectional regression setting. Selection of the companies is based on market capitalization. Size sorted portfolios are used as dependent variables. One hundred twenty companies are distributed in 30 portfolios comprising of 4 companies in each portfolio. Formation of these portfolios is based on market capitalization while momentum, idiosyncratic volatility and asset growth premiums are used as independent variables in this study.

Table 3.1.1 exhibits list of companies from different sectors which are included in the sample.

Table 3.1.1 Sample Composition

Sr. No.	Sectors	No. of Companies
1	Spinning & Weaving	23
2	Textile	20
3	Pharmaceutical & Chemical	12
4	Cement	9
5	Automobile assembler, parts and accessories	8
6	Sugar Mills	7
7	Food and Personal Care	6
8	Technology and Communication	5
9	Paper	4
10	Refinery	2
11	Power Generation and Distribution	2
12	Glass and Ceramics	2
13	Oil and Gas	2
14	Steel	1
15	Paints	1
16	Garments	1
17	Tobacco	1
18	Miscellaneous	14
	Total	**120**

Monthly stock prices of 120 companies are collected from KHI stocks. The data is used for calculation of market capitalization for size sorted portfolios while risk free rate is obtained from official website of the State Bank of Pakistan. These sources of information are considered to be reliable.

3.2 Measurement of Variable

The variable of size as calculated as follows;

3.2.1 Size

No. of proxies have been used to measure a company's size i.e. market capitalization, total asset or total sales. In this study size is measured by market capitalization that is also used by Fama & French (1992, 1993).

Size = Market Capitalization = MPS * No. of Shares

3.3 Construction of Portfolio's

Portfolios are formed on the basis of different criteria.

3.3.1. Size Sorted Portfolios

For formation of size-sorted portfolios, market capitalization is calculated each year for one hundred twenty companies and this process continues from June, 2002 to June, 2015. In order to construct portfolios companies are sorted in the ascending order on the basis of market capitalization. Once companies are sorted on the basis of market capitalization then monthly average returns are calculated of each four companies in the form of portfolio from S1 to S30 in a given year by using the following formula.

$$R_{i,t}=\ln\frac{P_t}{P_{t-1}} \qquad i=1,2,3,4$$

Where,

$R_{i,t}$ = Return of each company 'i' for each month 't'

P_t = Market price of company's stock in current month

P_{t-1} = Market price of company's stock in previous month

Monthly average returns of each portfolio (S1 to S30) are calculated as follows:

$$R_{avg\ S_{n,t}} = \frac{\Sigma R_{i,t}}{4} \qquad n=1,2,\ldots\ldots,30$$

Where,

$R_{avg\ S_{n,t}}$ = Monthly average returns of each portfolio (S1 to S30) for month 't'

This process is repeated for each year from Jun-2002 to Jun-2015.

3.3.2 Momentum Based Portfolios:-

Momentum premium is constructed as in Jegadeesh and Titman (1993). Stocks are sorted on their cumulative return over the formation period (month's t_m-6 to t_m-1). The momentum strategy involves buying the winner portfolio (P5), selling the loser portfolio (P1), and holding both positions for six months in order to calculate average return from Dec to May. The study skips a month between the formation and holding periods to avoid the potential impact of short-run reversal. Then companies are sorted on the basis of these returns. Portfolio of sixty companies with low average returns named as loser (negative) stocks. Whereas, another portfolio of sixty companies with high average returns are named as winner (positive) stocks. Monthly return of winner stocks and loser stocks are calculated for twelve months in a given year by using the following formula.

$$R_{i,t} = \ln \frac{P_t}{P_{t-1}} \qquad i=1,2,\ldots\ldots,60$$

Where,

$R_{i,t}$ = Return of each company 'i' for each month 't'

P_t = Market price of company's stock in current month

P_{t-1} = Market price of company's stock in previous month

Monthly average returns of each portfolio (winner, loser) is calculated as follows:

$$R_{avg\ W,t} = \frac{\Sigma R_{i,t}}{50} \text{ (60 winner stocks)}$$

$$R_{avg\ L,t} = \frac{\Sigma R_{i,t}}{50} (60 \text{ loser stocks})$$

Where,

$R_{avg\ W,t}$ = Monthly average return of winner portfolio at time 't'

$R_{avg\ L,t}$ = Monthly average return of loser portfolio at time 't'

This process is also repeated for each year from Jun-2002 to Jun-2015.

3.3.3 Volatility Based Portfolios

Idiosyncratic volatility is computed as the sum of the stock's squared monthly returns minus the sum of the squared monthly returns on the KSE-100 index. The strategy conditions on prior month and involves buying P1 (lowest volatility), selling P5 (highest volatility). A month is skipped between the formation and holding periods to avoid the potential impact of short-run reversal. On the basis of standard deviation companies are sorted in ascending order first sixty companies are low volatile while last sixty companies are high volatile. Portfolio of sixty companies with low volatility is named as low volatile portfolio whereas, portfolio of sixty companies with high volatility is named as high volatile portfolio.

3.3.4 Asset Growth Based Portfolios

Cooper, Gulen, and Schill(2008), the asset growth anomaly conditions on the percentage change in total assets from December of year t_2 to December of year t_1. The strategy involves buying P1 (lowest growth), selling P5 (highest growth), and holding both from July of year t to June of year t-1.

Companies are sorted in ascending order on the basis of percentage in total assets with respect to previous year (Growth Rate). Portfolio of a first sixty companies is named as Low Growth firms. Whereas, portfolio of last sixty sorted companies is named as High Growth firms.

3.4 Construction of Arbitrage Portfolio's

After the construction and calculation of monthly average returns of portfolios each year based on momentum strategy, idiosyncratic volatility and asset growth strategy, their arbitrage portfolios are constructed in the following manner:

Monthly average returns of loser portfolios are subtracted from monthly average returns of winner portfolios each year. The resulting portfolios are named as Momentum Arbitrage Portfolios for each year and their returns are calculated as follows:

$$R_{arb\ mom,t} = R_{avg\ W,t} - R_{avg\ L,t}$$

Where,

$R_{arb\ mom,t}$ = Monthly Return of Momentum Arbitrage Portfolio at time 't'

This process is repeated each year for all the strategies from Jun-2002 to Jun-2015.

Monthly average returns of low growth portfolios are subtracted from monthly average returns of high growth portfolios each year. The resulting portfolios are named as Growth Arbitrage Portfolios for each year and their returns are calculated as follows:

$$R_{arb\ G,t} = R_{avg\ HG,t} - R_{avg\ LG,t}$$

Where,

$R_{arb\ G,t}$ = Monthly Return of Growth Arbitrage Portfolio at time 't'

This process is repeated each year for all the strategies from Jun-2002 to Jun-2015.

Monthly average returns of low volatility portfolios are subtracted from monthly average returns of high volatility portfolios each year. The resulting portfolios are named as Volatility Arbitrage Portfolios for each year and their returns are calculated as follows:

$$R_{arb\ VOL,t} = R_{avg\ HV,t} - R_{avg\ LV,t}$$

Where,

$R_{arb\ VOL,\ t}$ = Monthly Return of Volatility Arbitrage Portfolio at time 't'

This process is repeated each year for all the strategies from Jun-2002 to Jun-2015.

3.5 Methodology

According to Capital Asset Pricing Model proposed by Sharpe (1964), Linter (1965) and Mossin (1966) only market risk factor can explain the cross-sectional variation in the equity returns. Whereas, according to Arbitrage Pricing Theory (APT), there are many other risk-factors which affect the equity returns these factors symbolizes as 'k'. Jagadeesh and Titman (1993), Fama & Macbeth (1973) and Cooper, Gulen, and Schill (2008) identify momentum premium, volatility premium and asset growth premium respectively as extra-risk factors that can explain the cross-sectional variations in the equity returns. Methodologies implemented by above mentioned authors are used in this study for the construction of portfolios.

3.6 Model Specification

This study uses two pass regression analyses to investigate the above stated relationship.

First Pass Regression:-

The time series regression is used as first Pass Regression to estimate the Betas (β)

$R_t = \beta o + \beta_1(\text{Momentum Premium})_t + \beta_2(\text{Volatility Premium})_t + \beta_3(\text{Asset Growth Premium})_t + \beta_4(\text{Market Premium})_t$----------(1)

$$R_t = \beta o + \beta_1 (WML)_t + \beta_2 (HVMLV)_t + \beta_3 (HGMLG)_t + \beta_4 (MKTP)_t \text{----------} (1)$$

The betas calculated from above equation used as independent variables in second pass regression under cross sectional regression.

Second Pass Regression:-

In second pass regression equity returns are regressed on betas calculated from equation 1.

$$R_i = \gamma_o + \gamma_1 \hat{\beta}_{1i} + \gamma_2 \hat{\beta}_{2i} + \gamma_3 \hat{\beta}_{3i} + \gamma_4 \hat{\beta}_{4i} \quad \text{---------- (2)}$$

Chapter 04

Empirical Results and Discussion

4.1 Descriptive Statistics

The selected behavior of various size sorted portfolios is examined by using descriptive statistics. Table 4.1 reports the mean, median, standard deviation, kurtosis, skewness, minimum and maximum of size sorted portfolios.

Table 4.1

Descriptive Statistics of Size Sorted Portfolios

	Mean	Median	St.Dev.	Kurtosis	Skewness	Minimum	Maximum
S1-L	0.0198	0.0000	0.1557	2.5337	0.1578	-0.5112	0.6491
S2	0.0155	0.0070	0.1592	1.2835	0.4700	-0.4781	0.4836
S3	0.0073	0.0014	0.1405	1.7090	0.4928	-0.3552	0.5933
S4	0.0212	0.0000	0.1352	3.9757	0.0457	-0.5529	0.5490
S5	0.0109	0.0000	0.1251	3.6484	0.5733	-0.4565	0.5873
S6	0.0074	0.0000	0.1243	1.5513	0.3574	-0.3617	0.4260
S7	0.0094	0.0021	0.1029	1.3972	0.1066	-0.2824	0.3212
S8	0.0086	-0.0008	0.1265	4.7621	-0.4169	-0.5889	0.4502
S9	0.0135	0.0109	0.1230	1.5764	0.0036	-0.4614	0.4122
S10	0.0016	0.0008	0.0987	1.8590	-0.0353	-0.3422	0.3241
S11	0.0025	0.0000	0.0960	6.9009	0.3892	-0.4491	0.5001
S12	0.0069	0.0000	0.0898	0.7133	0.4390	-0.2195	0.2895
S13	0.0034	0.0000	0.1001	2.9630	0.0662	-0.4010	0.3639
S14	0.0067	0.0006	0.0800	1.6056	0.4995	-0.2397	0.3181
S15	-0.0011	0.0005	0.0991	2.4446	-0.6942	-0.4481	0.2446
S16	0.0059	0.0000	0.0879	0.7116	0.2154	-0.2448	0.2823

S17	0.0127	0.0048	0.0953	1.3177	0.2106	-0.2321	0.3782
S18	0.0135	0.0181	0.1092	3.7485	-0.8876	-0.5016	0.3560
S19	0.0032	0.0023	0.0839	0.8309	0.0997	-0.2734	0.2481
S20	-0.0001	0.0024	0.1192	4.6819	-0.5142	-0.5224	0.4374
S21	0.0062	0.0107	0.0850	1.4558	-0.1465	-0.3125	0.3118
S22	0.0128	0.0063	0.1104	6.3813	0.0232	-0.4846	0.5787
S23	0.0115	0.0053	0.0919	1.4017	-0.3770	-0.3650	0.2417
S24	0.0143	0.0173	0.0848	1.0110	0.0485	-0.2328	0.3205
S25	0.0066	0.0007	0.0991	6.5721	-0.7650	-0.5522	0.3728
S26	0.0144	0.0132	0.0877	2.5340	-0.6413	-0.3755	0.2510
S27	0.0079	0.0037	0.0917	0.6463	0.2010	-0.2224	0.3454
S28	0.0185	0.0107	0.1025	4.4232	0.4176	-0.3690	0.5402
S29	-0.0004	0.0000	0.0941	2.4848	-0.5232	-0.4035	0.3050
S30-H	0.0095	0.0060	0.0878	2.5268	-0.1586	-0.3518	0.3063

Results clearly indicates that portfolio S1 with small size stocks (low market capitalization companies) earns on average more than the portfolio S30 with large size stocks (high market capitalization companies). It is consistent with the theory as risk of small size stocks' portfolio is higher than the risk of large size stock's portfolio. Portfolio S1 earns 1.98% in a month with standard deviation of 15.57% while portfolio S30 earns 0.95% in a month with standard deviation of 8.78%. Portfolio S1 has median of 0.00% while median of portfolio S30 is 0.60% which means in portfolio S1 50% of companies earn more than 0.00% in a month and for portfolio S30, 50% companies earn more than 0.60% in a month. Among all the portfolios, the highest return earns by the portfolio S4 (relatively small size stock's portfolio) which is 2.12% in a month with standard deviation of 13.52%. Moreover, the maximum gain in a month is incurred by the portfolio S1 which is 64.91% in a month while maximum loss is incurred by the portfolio S8 which is -58.89% in a month.

Kurtosis is a measure of peachiness (flatness) of the data with flatter (thinner) tails. If the kurtosis value is equal to 3, then the data has mesokurtic distribution which is

most similar to the normal distribution with respect to peakedness and tailedness. If kurtosis value is greater than 3, then the data has leptokurtic distribution having thin and tall peak with thin tails. If kurtosis value is less than 3, then the data has platykurtic distribution having flatter peak with thick tails. Results indicate that only nine portfolios S4, S5, S8, S11, S18, S20, S22 S25 and S28 have leptokurtic distributions while rest of the portfolios have platykurtic distributions.

Skewness is measure of asymmetry of the data distribution from the normal distribution. For a normal distribution, value of skewness is zero. Results indicate that all the portfolios have non-significant skewness within an acceptable range of -0.5 and +0.5 except portfolios S15, S18, S20, S25, S26, S29 are with significant negative skewness and portfolios of S5, S7 are with significant positive skewness.

Skewness and kurtosis are strongly depends on sample size. For large sample size, both measures have relatively non-significant values. The presence of skweness and kurtosis in size-sorted portfolios may be due to the small sample size of each portfolio. Each portfolio consists of only four stocks. Secondly, the assumptions of zero skewness and kurtosis are difficult to fulfill in the economic data practically.

Table 4.1.2 reports the measures of central tendency and variability of volatility, momentum and asset growth premiums respectively. Results clearly indicate that all the premiums associated with volatility and momentum strategies are positive except the asset growth premium. Momentum premium has highest value of 3.42% in a month. The standard deviation of the momentum premium is highest among all which is 7.23%. The maximum gain of 27.46% in a month is incurred by the momentum premium while maximum loss is also incurred by the momentum premium of 24.29% in a month.

Table 4.1 Descriptive Statistics of Volatility, Momentum and Asset Growth Premiums

	HVMLV	WML	HGMLG
Mean	0.006099707	0.034163898	-0.000987114
Median	0.001646338	0.028111854	-0.000518117
Standard Deviation	0.055083488	0.072325032	0.030622367
Kurtosis	1.267935396	1.231229171	0.495111407
Skewness	0.434788809	-0.004627327	-0.365385716
Minimum	-0.16565159	-0.242851197	-0.095650131
Maximum	0.189863586	0.274601691	0.072673478

Volatility, Momentum and Asset growth premiums have platykurtic distributions. In case of skewness, volatility premium have positive and significant skewness while momentum and asset growth premiums have significant negative skewness within an acceptable range of -0.5 and +0.5.

4.2 Correlation Analysis

Table 4.2 reports the correlation matrix for the variables asset growth, volatility and momentum premiums used in the study.

Table 4.2 Correlation Matrix

	HGMLG	**HVMLV**	**WML**
HGMLG	1		
HVMLV	-0.21803	1	
WML	-0.06047	0.113953	1

4.3 Comparison between Returns of Portfolios

In this section, returns of different portfolios based on momentum, volatility and asset growth strategies are compared and reported. Table 4.3.1 reports the average risk and returns of Growth, momentum and volatility strategies based portfolios for the period 6/2002 to 6/2015 using 1 year investment period.

Results clearly indicate that portfolio with low growth stocks earn 0.90% return on investment with risk of 6.48% more than portfolio with high growth stocks by return of 0.81% with 5.96% risk. It is consistent with the theory because risk of low growth portfolio is higher than high growth portfolio. Figure 4.3.1 graphically represents the average returns of low growth and high growth portfolios.

Figure 4.3.1 *Average Returns of High and Low Growth Portfolios*

(1 year investment Period)

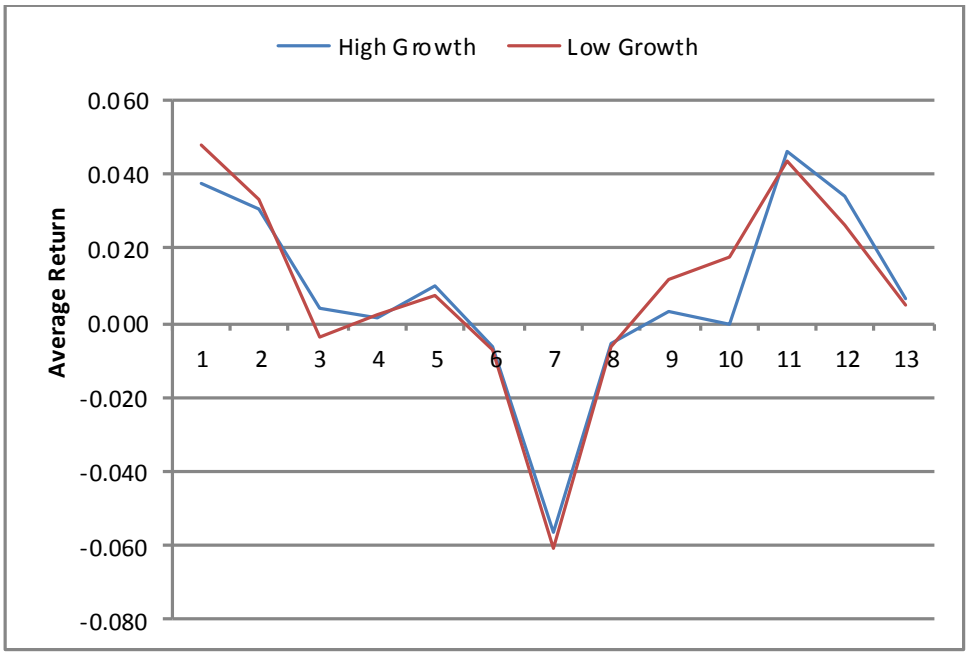


Table 4.3.1 also reports that portfolio of winner stocks earn more than portfolio of loser stocks. 2.56% return on investment in earn in winner stocks while the investment in loser stocks generate a loss of -0.86%. It is also consistent with the

theory because risk of winner portfolio is higher than risk of loser portfolio. With respect to momentum strategy, as winner portfolio is outperforming loser

portfolio, so the arbitrage portfolio based on momentum strategy earns positive abnormal return Figure 4.3.2 graphically represents the average returns of winners and losers portfolios.

Table 4.3.1 Average Risk and Returns (1 year Investment period)

Growth, Momentum and Volatility based Portfolios

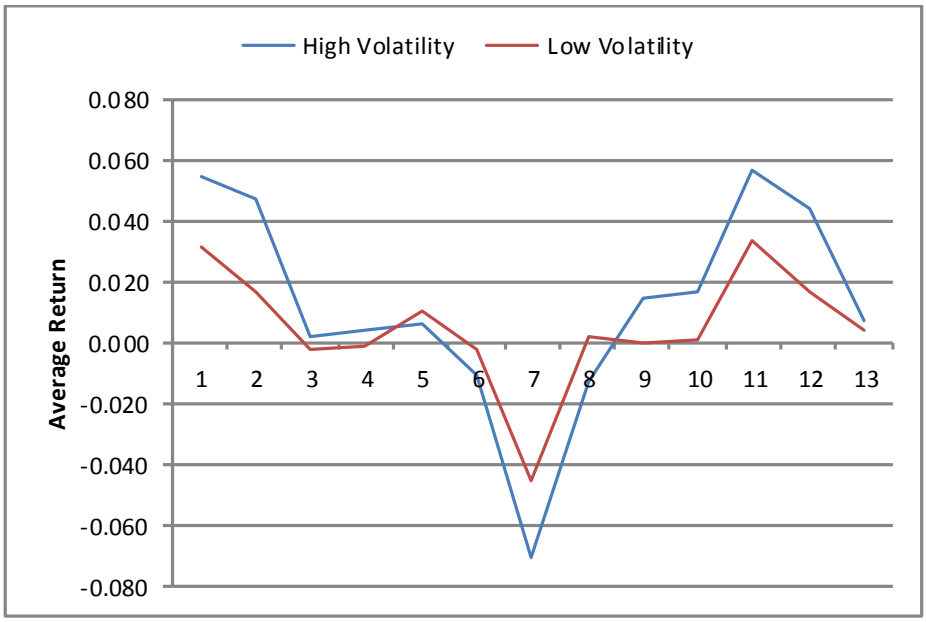
	HG	LG	St.dev HG	St.dev LG	W	L	St.dev W	St.dev L	HV	LV	St.dev HV	St.dev LV
2002-2003	0.038	0.048	0.044	0.066	0.06	0.026	0.066	0.048	0.054	0.032	0.069	0.038
2003-2004	0.03	0.033	0.064	0.084	0.047	0.016	0.105	0.052	0.047	0.016	0.105	0.052
2004-2005	0.004	-0.004	0.068	0.067	0.016	-0.016	0.052	0.089	0.002	-0.002	0.089	0.044
2005-2006	0.001	0.002	0.043	0.06	0.016	-0.013	0.042	0.065	0.004	-0.001	0.071	0.031
2006-2007	0.01	0.007	0.056	0.047	0.024	-0.007	0.07	0.045	0.006	0.01	0.067	0.035
2007-2008	-0.006	-0.007	0.054	0.047	0.007	-0.022	0.035	0.073	-0.011	-0.002	0.049	0.052
2008-2009	-0.056	-0.061	0.065	0.046	-0.041	-0.076	0.107	0.083	-0.071	-0.046	0.081	0.035
2009-2010	-0.005	-0.006	0.063	0.077	0.019	-0.03	0.065	0.087	-0.013	0.002	0.098	0.046
2010-2011	0.003	0.012	0.048	0.06	0.027	-0.012	0.056	0.065	0.015	0.000	0.072	0.037
2011-2012	-0.001	0.018	0.058	0.068	0.031	-0.014	0.094	0.033	0.017	0.001	0.093	0.033
2012-2013	0.046	0.044	0.051	0.049	0.056	0.034	0.047	0.073	0.057	0.033	0.078	0.027
2013-2014	0.034	0.026	0.084	0.106	0.047	0.014	0.094	0.103	0.044	0.017	0.133	0.057
2014-2015	0.007	0.005	0.077	0.066	0.023	-0.011	0.063	0.086	0.007	0.004	0.092	0.051
2002-2015	0.008	0.009	0.06	0.065	0.026	-0.009	0.069	0.069	0.012	0.005	0.084	0.041

Figure 4.3.2 *Average Returns of Winners and Losers Portfolios (1 Year Investment Period)*

From Table 4.3.1, it is clearly observed that high volatile portfolio earns more than low volatile portfolio. As return on investment in high volatile stocks earn 1.22% with 8.42% risk factor while low volatile stocks portfolio earn only 0.49% return on investment carrying less risk by 4.15%. It is also consistent with the theory because risk of high volatile portfolio is on higher side than risk of low volatile portfolio. We can clearly say that high volatile firms outperform low volatile firms. Figure 4.3.3 graphically represents the average returns of winner and loser portfolios.

Figure 4.3.3 *Average Returns of High and Low Volatility Portfolios*

(1 Year Investment Period)



Statistical differences between the average returns of high growth and low growth portfolio, winner and loser portfolios and portfolio returns of high volatile and low volatile firms are formed by using 1 year investment time-period window which are tested by two-sample t-test and results are reported in Table 4.3.2.

Table 4.3.2 Statistical Difference between Average Returns (1 Year Investment Period) Asset Growth, Momentum and Volatility based Portfolios

2002-2003	**Returns High Growth**	**Returns Low Growth**	**Difference**	**t-statistics**
	0.038	0.048	-0.01	-0.45
	Return of Winners	**Return of Losers**		
	0.06	0.026	0.035	1.479
	Returns of High Volatility	**Returns of Low Volatility**		
	0.054	0.032	0.023	1.006

2003-2004	**Returns High Growth**	**Returns Low Growth**	**Difference**	**t-statistics**
	0.0302	0.0334	-0.003	-0.106
	Return of Winners	**Return of Losers**		
	0.0472	0.0164	0.031	0.907
	Returns of High Volatility	**Returns of Low Volatility**		
	0.0472	0.0164	0.014	0.449
2004-2005	**Returns High Growth**	**Returns Low Growth**	**Difference**	**t-statistics**
	0.004	-0.004	0.007	0.268
	Return of Winners	**Return of Losers**		
	0.0159	-0.0157	0.032	1.06
	Returns of High Volatility	**Returns of Low Volatility**		
	0.0021	-0.0019	0.004	0.138
2005-2006	**Returns High Growth**	**Returns Low Growth**	**Difference**	**t-statistics**
	0.001	0.002	-0.001	-0.026
	Return of Winners	**Return of Losers**		
	0.0157	-0.0127	0.028	1.27
	Returns of High Volatility	**Returns of Low Volatility**		
	0.0044	-0.0014	0.006	0.261
2006-2007	**Returns High Growth**	**Returns Low Growth**	**Difference**	**t-statistics**
	0.01	0.007	0.002	0.112
	Return of Winners	**Return of Losers**		
	0.0237	-0.007	0.031	1.273
	Returns of High Volatility	**Returns of Low Volatility**		
	0.0065	0.0103	-0.004	-0.173
2007-2008	**Returns High Growth**	**Returns Low Growth**	**Difference**	**t-statistics**
	-0.006	-0.007	0.001	0.059

	Return of Winners	**Return of Losers**		
	0.0075	-0.0221	0.03	1.264
	Returns of High Volatility	**Returns of Low Volatility**		
	-0.011	-0.0024	-0.009	-0.422
2008-2009	**Returns High Growth**	**Returns Low Growth**	**Difference**	**t-statistics**
	-0.056	-0.061	0.005	0.213
	Return of Winners	**Return of Losers**		
	-0.0407	-0.0761	0.035	0.908
	Returns of High Volatility	**Returns of Low Volatility**		
	-0.0712	-0.0456	-0.026	-1.006
2009-2010	**Returns High Growth**	**Returns Low Growth**	**Difference**	**t-statistics**
	-0.005	-0.006	0.001	0.03
	Return of Winners	**Return of Losers**		
	0.019	-0.0304	0.049	1.576
	Returns of High Volatility	**Returns of Low Volatility**		
	-0.0129	0.0015	-0.014	-0.463
2010-2011	**Returns High Growth**	**Returns Low Growth**	**Difference**	**t-statistics**
	0.003	0.012	-0.009	-0.388
	Return of Winners	**Return of Losers**		
	0.0268	-0.0118	0.039	1.558
	Returns of High Volatility	**Returns of Low Volatility**		
	0.015	0	0.015	0.644
2011-2012	**Returns High Growth**	**Returns Low Growth**	**Difference**	**t-statistics**
	-0.001	0.018	-0.019	-0.72
	Return of Winners	**Return of Losers**		
	0.031	-0.0137	0.045	1.549

	Returns of High Volatility	**Returns of Low Volatility**		
	0.0167	0.0006	0.016	0.566
2012-2013	**Returns High Growth**	**Returns Low Growth**	**Difference**	**t-statistics**
	0.046	0.044	0.002	0.094
	Return of Winners	**Return of Losers**		
	0.0562	0.0335	0.023	0.903
	Returns of High Volatility	**Returns of Low Volatility**		
	0.0566	0.0332	0.023	0.984
2013-2014	**Returns High Growth**	**Returns Low Growth**	**Difference**	**t-statistics**
	0.034	0.026	0.008	0.205
	Return of Winners	**Return of Losers**		
	0.047	0.0136	0.033	0.831
	Returns of High Volatility	**Returns of Low Volatility**		
	0.0441	0.0166	0.028	0.659
2014-2015	**Returns High Growth**	**Returns Low Growth**	**Difference**	**t-statistics**
	0.007	0.005	0.002	0.067
	Return of Winners	**Return of Losers**		
	0.0228	-0.0113	0.034	1.108
	Returns of High Volatility	**Returns of Low Volatility**		
	0.007	0.0045	0.003	0.084

Results clearly indicate that average returns of high growth and low growth portfolios are not statistically significantly different for the last 12 months of each year from 2002 to 2015. Average returns of winner and loser portfolios are also not significantly

different for the last 12 months of each year from 2002 to 2015, average returns of high volatile portfolio and low volatile portfolios are not statistically different for the last 12 months of each year from 2002 to 2015.. It is worth mentioning that for 1 year holding period after the formation of portfolios, all these three returns-based trading strategies i.e growth, momentum and volatility, are unable to earn significant abnormal returns in the Pakistani market.

Now, the returns of different portfolios based on growth, momentum and volatility strategies are compared by using 5 years' investment period. Table 4.3.3 reports the average risk and returns of growth, momentum and volatility strategies based portfolios for the period of 6/2002 to 6/2015 using 5 years investment period.

Results clearly indicate that portfolio with low growth stocks outperforms portfolio with high growth stocks. It is consistent with the theory because risk of low growth portfolio is higher than high growth portfolio. Figure 4.3.4 graphically represents the average returns of low growth and high growth portfolios.

Figure 4.3.4 Average Returns of High and Low Growth Portfolios

(5 Years Investment Period)

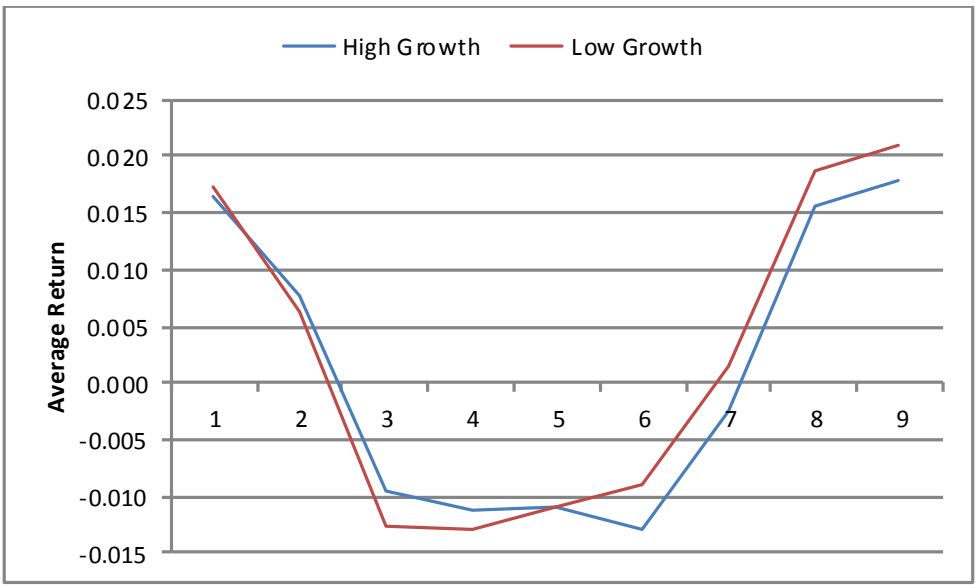


Table 4.3.3 it is clearly observed that winner portfolio outperforms loser portfolio. It is also consistent with the theory because risk of winner portfolio is on higher side than risk of loser portfolio. With respect to momentum strategy, as winner portfolio is outperforming loser portfolio, so the arbitrage portfolio based on momentum strategy earns positive abnormal return. Figure 4.3.5 graphically represents the average returns of winner and loser portfolios.

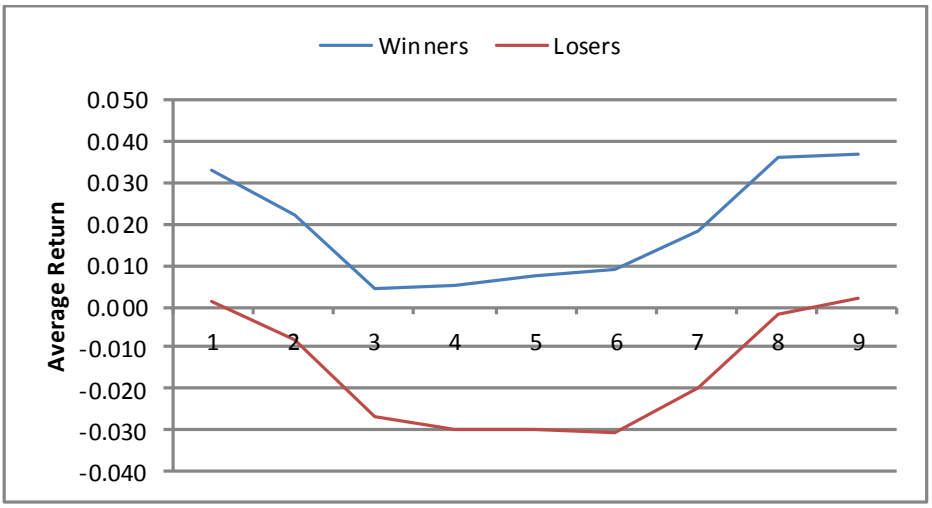
Table 4.3.3 Average Risk and Returns (5 years holding period)

Asset Growth, Momentum and Volatility based Portfolios

	HG	**LG**	**St.dev. HG**	**St.dev. LG**	**W**	**L**	**St.dev. W**	**St.dev. L**	**HV**	**LV**	**St.dev HV**	**St.dev LV**
2002-2007	0.017	0.017	0.056	0.067	0.033	0.001	0.071	0.062	0.021	0.013	0.08	0.041
2003-2008	0.008	0.006	0.057	0.062	0.022	-0.008	0.065	0.066	0.008	0.006	0.076	0.043
2004-2009	-0.01	-0.013	0.061	0.058	0.004	-0.027	0.068	0.074	-0.014	-0.008	0.076	0.043
2005-2010	-0.011	-0.013	0.059	0.06	0.005	-0.03	0.07	0.074	-0.017	-0.008	0.078	0.044
2006-2011	-0.011	-0.011	0.06	0.061	0.007	-0.029	0.073	0.074	-0.015	-0.007	0.078	0.045
2007-2012	-0.013	-0.009	0.06	0.065	0.009	-0.031	0.078	0.072	-0.013	-0.009	0.084	0.044
2008-2013	-0.003	0.001	0.064	0.069	0.018	-0.02	0.081	0.077	0.001	-0.002	0.092	0.043
2009-2014	0.015	0.019	0.063	0.074	0.036	-0.002	0.073	0.077	0.024	0.01	0.097	0.042
2010-2015	0.018	0.021	0.066	0.071	0.037	0.002	0.072	0.076	0.028	0.011	0.095	0.043
2002-2015	0.001	0.002	0.061	0.065	0.019	-0.016	0.072	0.072	0.003	0.001	0.084	0.043

Figure 4.3.5 *Average Returns of Winners and Losers Portfolios*

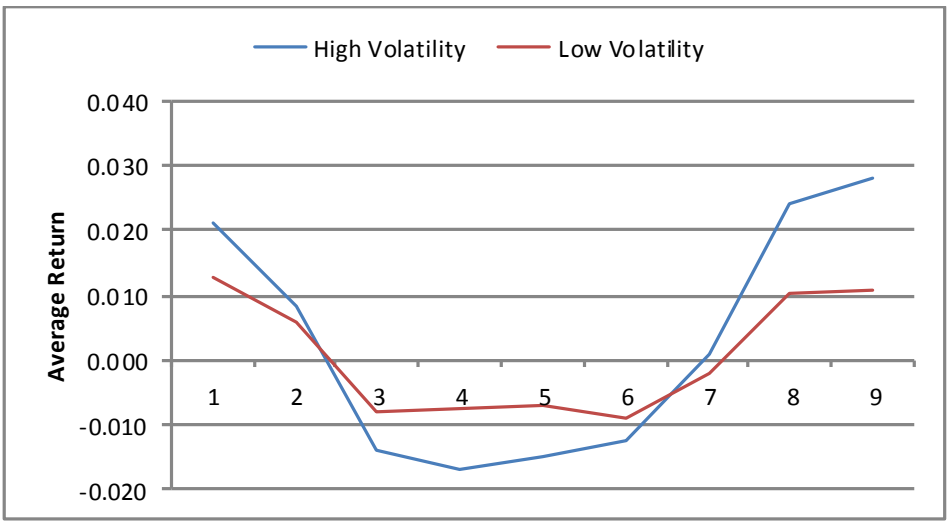
(5 Years Investment Period)



From Table 4.3.3, it is clearly stated that high volatile stocks portfolio earn more return than low volatile stocks portfolio. It is also consistent with the theory that high volatile stock has high risk while low volatile portfolios have low risk. As volatility it-self depicts risk factor. Figure 4.3.6 graphically represents the average returns of high volatility and low volatility portfolios.

Figure 4.3.6 *Average Returns of High and Low Volatility Portfolios*

(5 Years Investment Period)



Statistical differences between the average returns of high growth and low growth portfolio, winner and loser portfolios, high volatility and low volatility using 5 year time-period holding window are tested by two-sample t-test and results are reported in Table 4.3.4

Table 4.3.4 Statistical Difference between Average Returns (5 years holding period)

Asset Growth, Momentum and Volatility based Portfolios

2002-2007	**Returns of High Growth**	**Returns of Low Growth**	**Difference**	**t-statistics**
	0.017	0.017	-0.001	-0.077
	Returns of Winners	**Returns of Losers**		
	0.033	0.001	0.031	2.576
	Returns of High Volatility	**Returns of Low Volatility**		
	0.021	0.013	0.009	0.744
2003-2008	**Returns of High Growth**	**Returns of Low Growth**	**Difference**	**t-statistics**
	0.008	0.006	0.001	0.132
	Returns of Winners	**Returns of Losers**		
	0.022	-0.008	0.03	1.263
	Returns of High Volatility	**Returns of Low Volatility**		
	0.008	0.006	0.002	0.208
2004-2009	**Returns of High Growth**	**Returns of Low Growth**	**Difference**	**t-statistics**
	-0.01	-0.013	0.003	0.282
	Returns of Winners	**Returns of Losers**		
	0.004	-0.027	0.031	2.385
	Returns of High Volatility	**Returns of Low Volatility**		
	-0.014	-0.008	-0.006	-0.5
2005-2010	**Returns of High Growth**	**Returns of Low Growth**	**Difference**	**t-statistics**
	-0.011	-0.013	0.002	0.161
	Returns of Winners	**Returns of Losers**		
	0.005	-0.03	0.035	2.633
	Returns of High Volatility	**Returns of Low Volatility**		
	-0.017	-0.008	-0.009	-0.81

2006-2011	**Returns of High Growth**	**Returns of Low Growth**	**Difference**	**t-statistics**
	-0.011	-0.011	0	0.012
	Returns of Winners	**Returns of Losers**		
	0.007	-0.029	0.037	2.745
	Returns of High Volatility	**Returns of Low Volatility**		
	-0.015	-0.007	-0.007	-0.641
2007-2012	**Returns of High Growth**	**Returns of Low Growth**	**Difference**	**t-statistics**
	-0.013	-0.009	-0.004	-0.357
	Returns of Winners	**Returns of Losers**		
	0.009	-0.031	0.04	2.88
	Returns of High Volatility	**Returns of Low Volatility**		
	-0.013	-0.009	-0.003	-0.286
2008-2013	**Returns of High Growth**	**Returns of Low Growth**	**Difference**	**t-statistics**
	-0.003	0.001	-0.004	-0.324
	Returns of Winners	**Returns of Losers**		
	0.018	-0.02	0.038	2.637
	Returns of High Volatility	**Returns of Low Volatility**		
	0.001	-0.002	0.003	0.222
2009-2014	**Returns of High Growth**	**Returns of Low Growth**	**Difference**	**t-statistics**
	0.015	0.019	-0.003	-0.263
	Returns of Winners	**Returns of Losers**		
	0.036	-0.002	0.038	2.767
	Returns of High Volatility	**Returns of Low Volatility**		
	0.024	0.01	0.014	0.993
2010-2015	**Returns of High Growth**	**Returns of Low Growth**	**Difference**	**t-statistics**
	0.018	0.021	-0.003	-0.247
	Returns of Winners	**Returns of Losers**		
	0.037	0.002	0.035	2.573
	Returns of High Volatility	**Returns of Low Volatility**		
	0.028	0.011	0.017	1.262

Results clearly indicate that average returns of high growth and low growth portfolios are not statistically significantly different for the last 60 months of each 5 years' time period from 2002 to 2015. Similarly, average returns of high volatility and low volatility portfolios are also not significantly different. Whereas, the average returns of winner and loser portfolios are significantly different for the last 60 months of each 5 years' time period from 2002 to 2015. It is worth mentioning that for 5 year investment period after the formation of portfolios, among all these three returns-based trading strategies i.e growth, volatility, momentum and, only momentum based strategy is able to earn significant abnormal returns in the Pakistani market.

After comparing returns on 1 year and 5 years holding periods, the returns of different portfolios based on growth, momentum and volatility strategies are now compared on 10 years holding period. Table 4.3.5 reports the average risk and returns of growth, momentum and volatility strategies based portfolios for the period 6/2002 to 6/2015 using 10 years' time-period holding window.

Table 4.3.5 Average Risk and Returns (10 years Investment period)

Asset Growth, Momentum and Volatility based Portfolios

	HG	LG	St.dev HG	St.dev LG	W	L	St.dev W	St.dev L	HV	LV	St.dev HV	St.dev LV
2002-2012	0.002	0.004	0.06	0.067	0.021	-0.015	0.075	0.069	0.004	0.002	0.083	0.044
2003-2013	0.003	0.004	0.061	0.065	0.02	-0.014	0.073	0.072	0.005	0.002	0.084	0.043
2004-2014	0.003	0.003	0.063	0.068	0.02	-0.014	0.072	0.076	0.005	0.001	0.089	0.044
2005-2015	0.003	0.004	0.064	0.068	0.021	-0.014	0.073	0.076	0.006	0.002	0.089	0.044
2002-2015	0.003	0.004	0.062	0.067	0.02	-0.014	0.073	0.073	0.005	0.002	0.086	0.044

Results clearly indicate that portfolio with low growth stocks outperforms portfolio with high growth stocks. It is consistent with the theory because risk of low growth portfolio is higher than high growth portfolio. Figure 4.3.7 graphically represents the average returns of low growth and high portfolios.

Figure 4.3.7 *Average Returns of High and Low Growth Portfolios*

(10 Years Investment Period)

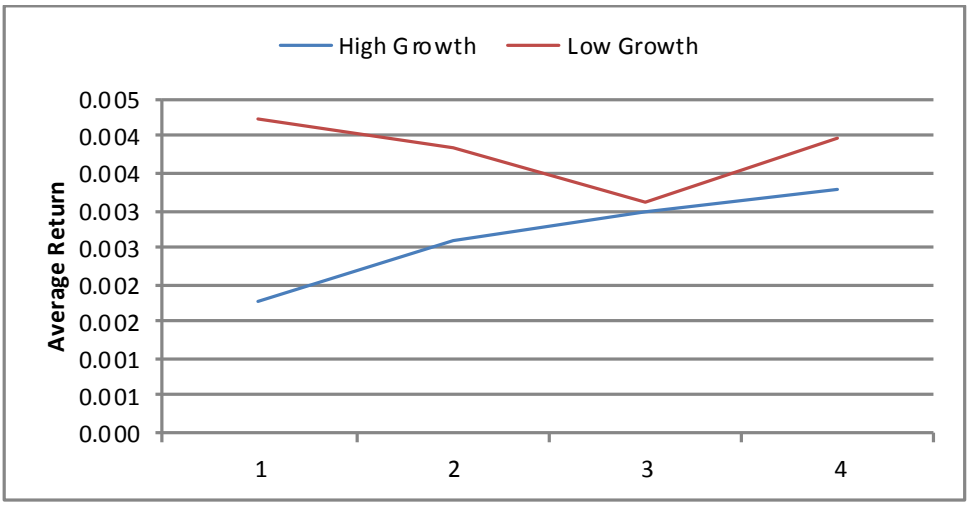
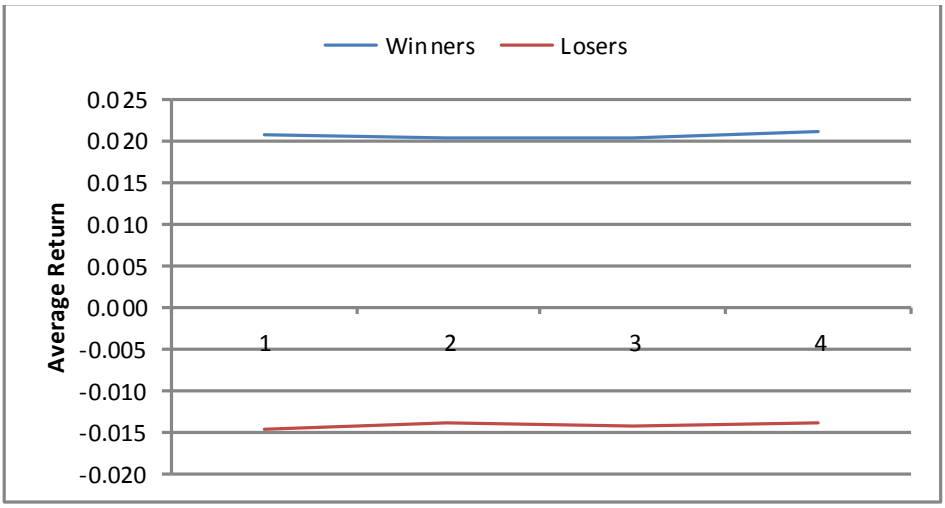


Table 4.3.5 it is clearly observed that winner portfolio outperforms loser portfolio. It is also consistent with the theory because risk of winner portfolio is on higher side than risk of loser portfolio. With respect to momentum strategy, as winner portfolio is outperforming loser portfolio, so the arbitrage portfolio based on momentum strategy earns positive abnormal return. Figure 4.3.8 graphically represents the average returns of winners and losers portfolios.

Figure 4.3.8 *Average Returns of Winners and Losers Portfolios*

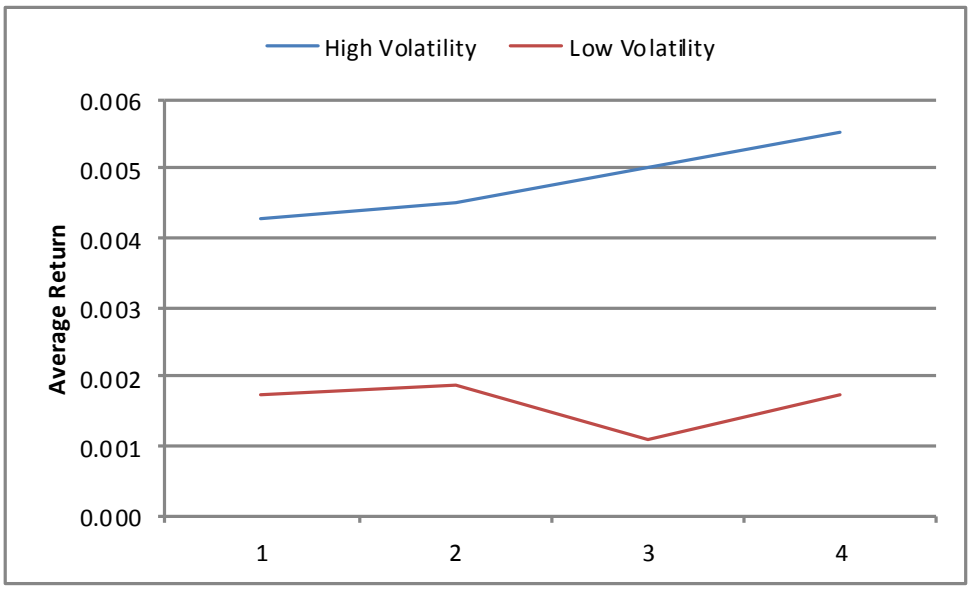
(10 Years Investment Period)



From Table 4.3.5, indicates that high volatile portfolio outperform low volatile portfolios. It is also consistent with the theory that high volatility has high risk than low volatility firms. Figure 4.3.9 graphically represents the average returns of high volatility and low volatility portfolios.

Figure 4.3.9 Average Returns of High and Low Volatility Portfolios

(10 Years Investment Period)



Statistical differences between the average returns of high growth and low growth portfolio, winner and loser portfolios, high volatility and low volatility using 10 years' time-period holding window are tested by two-sample t-test and results are reported in Table 4.3.6

Table 4.3.6 Statistical Difference between Average Returns (10 years holding period)

Asset Growth, Momentum and Volatility based Portfolios

2002-2012	**Returns of High Growth**	**Returns of Low Growth**	**Difference**	**t-statistics**
	0.002	0.004	-0.002	-0.302
	Returns of Winners	**Returns of Losers**		
	0.021	-0.015	0.035	3.804
	Returns of High Volatility	**Returns of Low Volatility**		

	0.004	0.002	0.003	0.300
2003-2013	**Returns of High Growth**	**Returns of Low Growth**	**Difference**	**t-statistics**
	0.003	0.004	-0.001	-0.154
	Returns of Winners	**Returns of Losers**		
	0.020	-0.014	0.034	3.651
	Returns of High Volatility	**Returns of Low Volatility**		
	0.005	0.002	0.003	0.305
2004-2014	**Returns of High Growth**	**Returns of Low Growth**	**Difference**	**t-statistics**
	0.003	0.003	0.000	-0.015
	Returns of Winners	**Returns of Losers**		
	0.020	-0.014	0.034	3.595
	Returns of High Volatility	**Returns of Low Volatility**		
	0.005	0.001	0.004	0.437
2005-2015	**Returns of High Growth**	**Returns of Low Growth**	**Difference**	**t-statistics**
	0.003	0.004	-0.001	-0.078
	Returns of Winners	**Returns of Losers**		
	0.021	-0.014	0.035	3.611
	Returns of High Volatility	**Returns of Low Volatility**		
	0.006	0.002	0.004	0.419

Results clearly indicate that average returns of high growth and low growth portfolios are not statistically significantly different for the last 120 months of each 10 years' time period from 2002 to 2015. Similarly, average returns of high volatility and low volatility portfolios are also not significantly different. The average returns of winner and loser portfolios are significantly different for the last 120 months of each 10

years' time period from 2002 to 2015. It is worth mentioning that for 10 years holding period after the formation of portfolios, among all these three returns-based trading strategies i.e growth, momentum and volatility, only momentum based strategy is able to earn significant abnormal returns in the Pakistani market.

4.4 Comparison of Sharpe Ratios

In this section Sharpe Ratios of arbitrage portfolios are reported to find excess return ($R_p - R_f$)each strategy is able to earn. As it is clearly identified from Table 4.3.2 that arbitrage portfolios based on growth, momentum and volatility strategies do not earn significant abnormal returns for 1 year investment period windows. Table 4.4.1 reports the Sharpe Ratios of all strategies for 1 year holding period.

Results indicate that only momentum arbitrage portfolio is able to earn average excess return of 43.52% in a month. But this excess return is insignificant as reported in Table 4.3.2.growth and volatility based arbitrage portfolios are un-able to earn average excess returns and incurred average excess losses of 23.67%, and 4.02% in a month respectively. These excess losses are also non-significant as reported in Table 4.3.2.

Table 4.4.1 Sharpe Ratios of Growth, Momentum and Volatility based Portfolios

(1 year Investment period)

Time Period	Growth based Arbitrage Port.	Momentum based Arbitrage Port.	Volatility Based Arbitrage Port.
2002-2003	-0.429	0.599	0.450
2003-2004	-0.374	0.316	0.146
2004-2005	0.043	0.410	-0.050
2005-2006	-0.229	0.509	-0.010
2006-2007	-0.203	0.408	-0.294
2007-2008	-0.221	0.403	-0.745
2008-2009	-0.038	0.184	-0.491
2009-2010	-0.158	0.607	-0.302
2010-2011	-0.513	0.528	0.195
2011-2012	-0.650	0.530	0.144
2012-2013	-0.173	0.214	0.262
2013-2014	0.041	0.421	0.251
2014-2015	-0.172	0.527	-0.079
2002-2015	-0.237	0.435	-0.040

From Table 4.3.4 it is identified that arbitrage portfolios based on growth and volatility strategies do not earn significant abnormal returns for 5 years investment period windows. Only momentum based arbitrage portfolio earns significant abnormal returns. Table 4.4.2 reports the Sharpe Ratios of all strategies for 5 years holding period.

Table 4.4.2 Sharpe Ratios of Growth, Momentum and Volatility based Portfolios

(5 years Investment period)

Time Period	Growth based Arbitrage Port.	Momentum based Arbitrage Port.	Volatility Based Arbitrage Port.
2002-2007	-0.253	0.436	0.055
2003-2008	-0.198	0.406	-0.094
2004-2009	-0.120	0.296	-0.268
2005-2010	0.028	0.086	0.049
2006-2011	-0.215	0.348	-0.274
2007-2012	-0.316	0.372	-0.171
2008-2013	-0.309	0.346	-0.052
2009-2014	-0.276	0.465	0.109
2010-2015	-0.282	0.443	0.171
2002-2015	-0.216	0.355	-0.053

Results indicate that only momentum arbitrage portfolio is able to earn average excess return of 35.5% in a month. This excess return is significant as reported in Table 4.3.4. Growth and volatility based arbitrage portfolios are un-able to earn average excess returns and incurred average excess losses of 21.6% and 5.3% in a month respectively. These excess losses are non-significant as reported in Table 4.3.2.

From Table 4.3.6 it is identified that arbitrage portfolios based on growth and volatility strategies do not earn abnormal returns for 10 years investment period windows. Only momentum based arbitrage portfolio earns abnormal returns. Table 4.4.3 reports the Sharpe Ratios of all strategies for 10 years holding period.

Table 4.4.3 Sharpe Ratios of Growth, Momentum and Volatility based Portfolios

(10 years Investment period)

Time Period	Growth based Arbitrage Port.	Momentum based Arbitrage Port.	Volatility Based Arbitrage Port.
2002-2012	-0.287	0.389	-0.072
2003-2013	-0.259	0.362	-0.067
2004-2014	-0.206	0.371	-0.040
2005-2015	-0.225	0.377	-0.043
2002-2015	-0.244	0.375	-0.056

Results indicate that only momentum arbitrage portfolio is able to earn average excess return of 37.5% in a month. This excess return is significant as reported in Table 4.3.6. Growth and volatility based arbitrage portfolios are un-able to earn average excess returns and incurred average excess losses of 24.4% and 5.6% in a month respectively. These excess losses are non-significant as reported in Table 4.3.6.

From Table 4.4.2 and Table 4.4.3 it is clearly identified that only momentum based arbitrage portfolios are able to earn significant average excess returns for 5 and 10 years investment periods. This excess return increases from 37.5% to 35.5% when moving from 5 to 10 years holding periods respectively.

4.5 First Pass Regression

4.5.1 Impact of Market premium on equity returns

Time series regression is applied to examine the role of market premiums in explaining portfolio returns. Table 4.5.1 reports the results of regression analysis with size-sorted portfolio's returns as dependent variable while market premium is used as independent variable.

Table 4.5.1 Market Premium and Equity Returns

		Constant	Rm-Rf	Adj R^2	F-Statistics	p value
S1	Coefficient	0.015	0.492	0.052	9.514	0.002
	t statistics	1.190	3.084			
	p value	0.236	0.002			
S2	Coefficient	0.008	0.665	0.095	17.363	0.000
	t statistics	0.693	4.167			
	p value	0.489	0.000			
S3	Coefficient	0.000	0.713	0.144	27.117	0.000
	t statistics	-0.017	5.207			
	p value	0.987	0.000			
S4	Coefficient	0.019	0.249	0.013	3.091	0.081
	t statistics	1.710	1.758			
	p value	0.089	0.081			
S5	Coefficient	0.005	0.592	0.124	23.027	0.000
	t statistics	0.490	4.799			
	p value	0.625	0.000			
S6	Coefficient	0.002	0.472	0.078	14.085	0.000
	t statistics	0.254	3.753			
	p value	0.800	0.000			
S7	Coefficient	0.006	0.360	0.065	11.825	0.001
	t statistics	0.703	3.439			
	p value	0.483	0.001			
S8	coefficient	0.001	0.765	0.207	41.576	0.000
	t statistics	0.055	6.448			
	p value	0.956	0.000			
S9	coefficient	0.004	0.876	0.290	64.447	0.000
	t statistics	0.512	8.028			
	p value	0.610	0.000			
S10	coefficient	-0.001	0.259	0.034	6.421	0.012
	t statistics	-0.149	2.534			
	p value	0.882	0.012			

S11	coefficient	-0.001	0.302	0.051	9.386	0.003
	t statistics	-0.089	3.064			
	p value	0.929	0.003			
S12	coefficient	0.003	0.371	0.093	16.968	0.000
	t statistics	0.427	4.119			
	p value	0.670	0.000			
S13	coefficient	0.000	0.332	0.058	10.506	0.001
	t statistics	-0.010	3.241			
	p value	0.992	0.002			
S14	coefficient	0.002	0.423	0.157	29.849	0.000
	t statistics	0.382	5.463			
	p value	0.703	0.000			
S15	coefficient	-0.005	0.353	0.068	12.244	0.001
	t statistics	-0.617	3.499			
	p value	0.538	0.001			
S16	coefficient	0.000	0.543	0.217	43.961	0.000
	t statistics	0.028	6.630			
	p value	0.978	0.000			
S17	coefficient	0.007	0.520	0.168	32.247	0.000
	t statistics	1.029	0.305			
	p value	5.679	0.000			
S18	coefficient	0.007	0.642	0.196	38.798	0.000
	t statistics	0.846	6.229			
	p value	0.399	0.000			
S19	coefficient	-0.003	0.589	0.283	62.055	0.000
	t statistics	-0.520	7.877			
	p value	0.604	0.000			
S20	coefficient	-0.008	0.761	0.232	47.818	0.000
	t statistics	-0.960	6.915			
	p value	0.339	0.000			
S21	coefficient	0.000	0.570	0.257	54.544	0.000
	t statistics	0.034	7.385			

	p value	0.973	0.000			
S22	coefficient	0.003	0.899	0.382	96.679	0.000
	t statistics	0.480	9.833			
	p value	0.632	0.000			
S23	coefficient	0.004	0.670	0.305	68.899	0.000
	t statistics	0.719	8.301			
	p value	0.473	0.000			
S24	coefficient	0.008	0.593	0.280	61.339	0.000
	t statistics	1.391	0.166			
	p value	7.832	0.000			
S25	coefficient	-0.001	0.760	0.338	80.183	0.000
	t statistics	-0.222	8.955			
	p value	0.824	0.000			
S26	coefficient	0.009	0.553	0.226	46.286	0.000
	t statistics	1.379	0.170			
	p value	6.803	0.000			
S27	coefficient	0.002	0.599	0.244	50.920	0.000
	t statistics	0.246	7.136			
	p value	0.806	0.000			
S28	coefficient	0.009	0.864	0.410	108.692	0.000
	t statistics	1.471	10.426			
	p value	0.143	0.000			
S29	coefficient	-0.009	0.789	0.406	106.868	0.000
	t statistics	-1.491	10.338			
	p value	0.138	0.000			
S30	coefficient	0.003	0.650	0.315	72.185	0.000
	t statistics	0.443	8.496			
	p value	0.658	0.000			

Table 4.5.1 reports that impact of market premium on return of portfolios from S1 to S30 is positive and significant which indicates that there exist significant positive relationship between market and equity premium which in line with CAPM. For a

portfolio comprising small stocks CAPM is able to capture return but it only explains 5.2% of variations in portfolio return. Whereas, portfolios of big stock CAPM is able to capture return with 31.5% variation in portfolio return.

4.5.2 Impact of Volatility, Momentum and Asset Growth premiums on equity returns

Time series regression is applied to examine the role of volatility, momentum and asset growth in explaining portfolio returns. Table 4.5.1 reports the results of regression analysis with size-sorted portfolio's returns as dependent variable whereas; volatility, momentum and asset growth premiums are used as independent variable.

Table 4.5.2 Impact of volatility, momentum and growth premiums on equity returns

		Constant	HVMLV	WML	HGMLG	Adj.R^2	F-statistics	p-value
S1	Coefficient	0.015	1.396	-0.126	-0.390	0.248	18.044	0.000
	t-statistics	1.268	6.883	-0.838	-1.075			
	p-value	0.207	0.000	0.404	0.284			
S2	Coefficient	0.018	1.577	-0.359	-0.095	0.294	22.561	0.000
	t statistics	1.519	7.847	-2.398	-0.264			
	p value	0.131	0.000	0.018	0.792			
S3	Coefficient	-0.003	1.552	-0.216	-0.532	0.403	35.884	0.000
	t statistics	-0.277	9.520	0.000	-1.821			
	p value	0.782	0.000	0.169	0.071			
S4	Coefficient	0.010	1.242	0.089	-0.158	0.259	19.065	0.000
	t statistics	1.008	7.107	0.683	-0.505			
	p value	0.315	0.000	0.496	0.614			
S5	Coefficient	0.012	1.241	-0.254	-0.176	0.300	23.109	0.000
	t statistics	1.270	7.891	-2.169	-0.626			
	p value	0.206	0.000	0.032	0.532			
S6	Coefficient	0.006	1.170	-0.177	-0.637	0.312	24.391	0.000
	t statistics	0.624	7.547	-1.535	-2.294			
	p value	0.534	0.000	0.127	0.023			
S7	Coefficient	0.007	0.888	-0.084	-0.399	0.246	17.862	0.000
	t statistics	0.822	6.613	-0.842	-1.660			
	p value	0.413	0.000	0.401	0.099			
S8	Coefficient	0.000	1.234	0.033	0.358	0.264	19.534	0.000
	t statistics	0.026	7.567	0.272	1.226			
	p value	0.979	0.000	0.786	0.222			
S9	Coefficient	0.003	1.140	0.098	-0.157	0.267	19.823	0.000
	t statistics	0.327	7.208	0.830	-0.553			
	p value	0.744	0.000	0.408	0.581			
S10	Coefficient	0.008	1.103	-0.377	-0.193	0.423	38.907	0.000
	t statistics	1.132	9.797	-4.500	-0.957			
	p value	0.259	0.000	0.000	0.340			
S11	Coefficient	0.011	0.875	-0.423	-0.282	0.328	26.217	0.000
	t statistics	1.623	7.397	-4.800	-1.332			

	p value	0.107	0.000	0.000	0.185			
S12	Coefficient	0.006	0.888	-0.157	-0.331	0.322	25.541	0.000
	t statistics	0.985	7.999	-1.893	-1.666			
	p value	0.326	0.000	0.060	0.098			
S13	Coefficient	0.009	0.777	-0.305	-0.245	0.212	14.924	0.000
	t statistics	1.123	5.822	-3.069	-1.026			
	p value	0.263	0.000	0.003	0.307			
S14	Coefficient	0.003	0.898	-0.054	0.154	0.353	29.228	0.000
	t statistics	0.565	9.293	-0.746	0.891			
	p value	0.573	0.000	0.457	0.374			
S15	Coefficient	0.003	0.732	-0.248	0.040	0.163	11.091	0.000
	t statistics	0.370	5.374	-2.442	0.165			
	p value	0.712	0.000	0.016	0.870			
S16	Coefficient	0.002	0.887	-0.042	0.133	0.283	21.408	0.000
	t statistics	0.308	7.935	-0.501	0.663			
	p value	0.758	0.000	0.617	0.508			
S17	Coefficient	0.008	0.606	0.020	0.153	0.102	6.845	0.000
	t statistics	1.058	4.468	0.195	0.629			
	p value	0.292	0.000	0.846	0.530			
S18	Coefficient	0.011	1.040	-0.104	0.042	0.255	18.653	0.000
	t statistics	1.280	7.341	-0.988	0.165			
	p value	0.202	0.000	0.325	0.869			
S19	Coefficient	-0.002	0.810	0.017	0.113	0.263	19.424	0.000
	t statistics	-0.344	7.489	0.211	0.585			
	p value	0.731	0.000	0.833	0.560			
S20	Coefficient	-0.003	1.285	-0.142	0.489	0.320	25.292	0.000
	t statistics	-0.297	8.702	-1.295	1.848			
	p value	0.767	0.000	0.197	0.067			
S21	Coefficient	0.005	0.706	-0.091	0.060	0.188	12.952	0.000
	t statistics	0.747	6.135	-1.068	0.292			
	p value	0.456	0.000	0.287	0.771			
S22	Coefficient	0.006	0.719	0.061	0.038	0.115	7.714	0.000
	t statistics	0.694	4.612	0.525	0.137			
	p value	0.489	0.000	0.600	0.891			
S23	Coefficient	0.005	0.887	0.042	0.109	0.266	19.754	0.000

	t statistics	0.683	7.501	0.476	0.515			
	p value	0.496	0.000	0.635	0.607			
S24	Coefficient	0.006	0.585	-0.049	-0.195	0.185	12.738	0.000
	t statistics	1.036	5.723	-0.646	-1.063			
	p value	0.302	0.000	0.519	0.289			
S25	Coefficient	-0.002	0.884	0.080	-0.206	0.255	18.702	0.000
	t statistics	-0.234	6.882	0.836	-0.895			
	p value	0.815	0.000	0.404	0.372			
S26	Coefficient	0.010	0.578	0.021	-0.262	0.140	9.408	0.000
	t statistics	1.376	4.733	0.226	-1.197			
	p value	0.171	0.000	0.821	0.233			
S27	Coefficient	0.003	0.790	0.001	-0.152	0.223	15.837	0.000
	t statistics	0.402	6.503	0.015	-0.700			
	p value	0.688	0.000	0.988	0.485			
S28	Coefficient	0.010	0.867	0.108	0.229	0.206	14.382	0.000
	t statistics	1.200	6.319	1.052	0.933			
	p value	0.232	0.000	0.294	0.352			
S29	Coefficient	-0.006	0.848	0.038	0.500	0.226	16.113	0.000
	t statistics	-0.873	6.821	0.411	2.245			
	p value	0.384	0.000	0.682	0.026			
S30	Coefficient	0.001	0.810	0.122	0.270	0.253	18.458	0.000
	t statistics	0.090	7.106	1.436	1.324			
	p value	0.928	0.000	0.153	0.188			

Table 4.5.2 reports the impact of growth, volatility and momentum premium in explaining equity returns. The volatility premium has significant and positive relationship with returns of size sorted portfolios. The relationship is positive for small as well as big portfolios. Margin effect is high on small portfolios in comparison to big portfolios.

Momentum has no impact on return of size sorted portfolios. However it is negative and insignificant for S1, S6, S7, S12, S14, S16, S18, S20, S21, S24 whereas, impact is positive and insignificant for portfolios S3, S4, S8, S9, S17, S19, S22, S23 and S25 to S30. The impact of momentum is found significant and negative for S2, S5, S10, S11, S13 and S15. Therefore mixed evidence is observed.

Returns of S1, S2, S3, S4, S5, S7, S9, S10, S11, S12, S13, S24, S25, S26 and S27 are found negatively insignificantly influence by growth premium whereas, returns of S8, S14, S15, S16, S17, S18, S19, S20, S21, S22, S23, S28 and S30 are found positively insignificantly influenced. Return of portfolio S6 is negatively and significantly influenced by growth premium which indicates that low growth firms outperform high growth firms in the said portfolio whereas return of portfolio S29 is positively significantly influence by growth premium which means that high growth firms outperform low growth firms in the said portfolio.

For a portfolio comprising small stocks with volatility premium explain return while momentum and growth premiums are unable to explain return. Portfolios of big stocks are influenced by volatility premium whereas momentum premium and growth premium are unable to explain return. The explanatory power of the model remains between 10.2% to 42.3%.

4.5.3 Impact of Volatility, Momentum, Asset Growth and Market Premiums on Equity Returns

Time series regression is applied to examine the role of volatility, momentum, asset growth and market premiums in explaining portfolio returns. Table 4.5.1 reports the results of regression analysis with size-sorted portfolio's returns as dependent variable whereas; volatility, momentum, asset growth premiums and market premiums are used as independent variable.

Table 4.5.3 Impact of Volatility, Momentum, Asset Growth and Market Premiums on Equity Returns

		Constant	HVMLV	WML	HGMLG	Rm-Rf	Adj R^2	F-Statistics	p value
S1	coefficient	0.015	1.363	-0.136	-0.403	0.050	0.244	13.474	0.000
	t statistics	1.264	5.878	-0.879	-1.099	0.297			
	p value	0.208	0.000	0.381	0.274	0.767			
S2	coefficient	0.018	1.394	-0.413	-0.166	0.274	0.303	17.816	0.000
	t statistics	1.529	6.124	-2.713	-0.461	1.669			
	p value	0.128	0.000	0.007	0.645	0.097			

S3	coefficient	-0.003	1.393	-0.047	-0.593	0.238	0.412	28.105	0.000
	t statistics	-0.277	7.554	-0.383	-2.033	1.791			
	p value	0.782	0.000	0.702	0.044	0.075			
S4	coefficient	0.010	1.427	0.144	-0.086	-0.278	0.272	15.513	0.000
	t statistics	1.015	7.229	1.091	-0.275	-1.950			
	p value	0.312	0.000	0.277	0.783	0.053			
S5	coefficient	0.012	1.041	-0.314	-0.254	0.301	0.320	19.243	0.000
	t statistics	1.291	5.895	-2.655	-0.910	2.359			
	p value	0.199	0.000	0.009	0.364	0.020			
S6	coefficient	0.006	1.074	-0.206	-0.674	0.143	0.313	18.642	0.000
	t statistics	0.625	6.088	-1.742	-2.413	1.125			
	p value	0.533	0.000	0.084	0.017	0.263			
S7	coefficient	0.007	0.824	-0.103	-0.424	0.097	0.245	13.567	0.000
	t statistics	0.822	5.377	-1.009	-1.751	0.875			
	p value	0.413	0.000	0.314	0.082	0.383			
S8	coefficient	0.000	0.930	-0.058	0.239	0.457	0.316	18.888	0.000
	t statistics	0.030	5.189	-0.482	0.843	3.537			
	p value	0.976	0.000	0.630	0.400	0.001			
S9	coefficient	0.003	0.721	-0.028	-0.320	0.631	0.377	24.401	0.000
	t statistics	0.359	4.332	-0.249	-1.218	5.262			
	p value	0.720	0.000	0.804	0.225	0.000			
S10	coefficient	0.008	1.139	-0.367	-0.179	-0.054	0.421	29.136	0.000
	t statistics	1.129	8.854	-4.262	-0.880	-0.577			
	p value	0.261	0.000	0.000	0.380	0.565			
S11	coefficient	0.011	0.790	-0.448	-0.315	0.128	0.331	20.190	0.000
	t statistics	1.628	5.874	-4.982	-1.481	1.315			
	p value	0.106	0.000	0.000	0.141	0.190			
S12	coefficient	0.006	0.799	-0.183	-0.366	0.134	0.327	19.841	0.000
	t statistics	0.990	6.340	-2.171	-1.834	1.469			
	p value	0.324	0.000	0.032	0.069	0.144			
S13	coefficient	0.009	0.658	-0.341	-0.292	0.179	0.221	11.991	0.000
	t statistics	1.130	4.349	-3.366	-1.219	1.641			
	p value	0.260	0.000	0.001	0.225	0.103			
S14	coefficient	0.003	0.784	-0.088	0.110	0.172	0.369	23.662	0.000
	t statistics	0.574	7.205	-1.206	0.637	2.187			
	p value	0.567	0.000	0.230	0.525	0.030			
S15	coefficient	0.003	0.590	-0.290	-0.015	0.214	0.178	9.392	0.000
	t statistics	0.375	3.833	-2.819	-0.063	1.925			

	p value	0.708	0.000	0.006	0.950	0.056			
S16	coefficient	0.002	0.662	-0.109	0.045	0.339	0.343	21.219	0.000
	t statistics	0.325	5.425	-1.336	0.232	3.849			
	p value	0.745	0.000	0.184	0.817	0.000			
S17	coefficient	0.009	0.326	-0.064	0.043	0.422	0.181	9.546	0.000
	t statistics	1.112	2.206	-0.649	0.185	3.958			
	p value	0.268	0.029	0.518	0.853	0.000			
S18	coefficient	0.011	0.759	-0.188	-0.067	0.421	0.314	18.766	0.000
	t statistics	1.338	4.905	-1.814	-0.276	3.772			
	p value	0.183	0.000	0.072	0.783	0.000			
S19	coefficient	-0.002	0.530	-0.067	0.004	0.421	0.367	23.489	0.000
	t statistics	-0.367	4.642	-0.871	0.022	5.106			
	p value	0.714	0.000	0.385	0.982	0.000			
S20	coefficient	-0.003	0.964	-0.238	0.363	0.482	0.386	25.397	0.000
	t statistics	-0.309	6.031	-2.227	1.437	4.181			
	p value	0.758	0.000	0.027	0.153	0.000			
S21	coefficient	0.005	0.389	-0.186	-0.064	0.477	0.319	19.161	0.000
	t statistics	0.821	3.237	-2.319	-0.336	5.504			
	p value	0.413	0.002	0.022	0.738	0.000			
S22	coefficient	0.006	0.137	-0.113	-0.189	0.876	0.382	24.984	0.000
	t statistics	0.837	0.922	-1.137	-0.804	8.172			
	p value	0.404	0.358	0.257	0.422	0.000			
S23	coefficient	0.005	0.563	-0.055	-0.017	0.487	0.384	25.105	0.000
	t statistics	0.750	4.556	-0.664	-0.089	5.467			
	p value	0.455	0.000	0.508	0.929	0.000			
S24	coefficient	0.013	0.475	-0.200	-0.347	0.472	0.400	26.854	0.000
	t statistics	2.226	4.230	-2.667	-1.952	5.820			
	p value	0.028	0.000	0.009	0.053	0.000			
S25	coefficient	-0.002	0.486	-0.039	-0.362	0.599	0.409	27.812	0.000
	t statistics	-0.257	3.723	-0.447	-1.752	6.368			
	p value	0.797	0.000	0.655	0.082	0.000			
S26	coefficient	0.010	0.261	-0.074	-0.386	0.477	0.263	14.816	0.000
	t statistics	1.490	2.022	-0.861	-1.891	5.132			
	p value	0.138	0.045	0.391	0.061	0.000			
S27	coefficient	0.003	0.492	-0.088	-0.268	0.448	0.321	19.345	0.000
	t statistics	0.434	3.803	-1.012	-1.312	4.795			
	p value	0.665	0.000	0.313	0.192	0.000			
S28	coefficient	0.010	0.372	-0.040	0.036	0.745	0.430	30.206	0.000

	t statistics	1.423	2.804	-0.457	0.171	7.793			
	p value	0.157	0.006	0.648	0.864	0.000			
S29	coefficient	-0.006	0.399	-0.096	0.325	0.674	0.444	31.961	0.000
	t statistics	-1.023	3.326	-1.194	1.708	7.782			
	p value	0.308	0.001	0.235	0.090	0.000			
S30	coefficient	0.001	0.496	0.028	0.147	0.473	0.374	24.121	0.000
	t statistics	0.103	4.166	0.351	0.783	5.514			
	p value	0.918	0.000	0.726	0.435	0.000			

Finally market risk factor is added with rest of the factors. The table 4.5.3 reports that volatility premium is positive and significant for return of the portfolios.

Momentum premium has insignificant impact on returns of S1, S3, S4, S6, S7, S8, S9, S14, S16, S17, S18, S19, S22, S23, S25, S26, S27, S28, S29 and S30. While portfolios S2, S5, S10, S11, S12, S13, S15, S20, S21 and S24 are negatively significantly influenced by momentum premium.

Returns of S1, S2, S4, S5, S7, S8, S9, S10, S11, S12, S13, S14, S15, S16, S17, S18, S19, S20, S21, S22, S23, S25, S26, S27 S28, S29 and S30 are insignificantly influenced while portfolios S3, S6 and S24 are negatively significantly influenced by growth premium.

Returns of S1, S2, S3, S6, S7, S10, S11, S12 and S13 are insignificantly influenced by market premium. Whereas, portfolios S5, S8, S9 and S14 to S30 are significantly positively influenced by market which means that CAPM is able to capture returns.

For a portfolio comprising small stock with volatility, momentum, growth and Market premium CAPM is unable to capture market return except volatility but it only explain 24.4% of variation in return of portfolio studied. Whereas, portfolios comprising big stock with volatility, momentum, growth and market premium CAPM is able to capture market return.

4.6 Two Pass Regression

Cross sectional regression is applied to examine the role of volatility, momentum, asset growth and market premiums in explaining portfolio returns. Table 4.6 reports the results of two pass regression analysis with betas of size-sorted portfolio's as dependent variable whereas betas of volatility, momentum, asset growth premiums and market premiums are used as independent variable.

Table 4.6 Cross Section Regression Analysis (Second Pass Regression) (Size-sorted Portfolios, Volatility, Momentum and Asset Growth)

	Coefficients	**Std. Error**	**t Stat**	**P-value**	**Adj. R^2**	**Sig. F**
Intercept	0.005	0.005	1.096	0.284	0.208	0.042
βVolatility Prem	0.005	0.004	1.292	0.208		
βMomentum Prem	0.021	0.008	2.535	0.018		
βGrowth Prem	-0.007	0.004	-1.792	0.085		
βMktPrem	0.000	0.007	-0.045	0.965		

Two pass regression is applied on stylized portfolios to explain the predictive power of factor sensitivities. The results are reported in Table 4.5.4. The findings of study indicate that volatility beta is unable to predict portfolio returns. However, beta momentum premium is significantly positively associated with returns. Whereas, growth beta is insignificantly and negatively associated with portfolios return which indicate that growth premium beta is unable to predict portfolio returns. While market beta is insignificantly and positively associated with portfolio returns which indicate that market is also unable to predict portfolio return. The explanatory power of model is 20.8% which means it has weak explanatory power.

Chapter 05

Conclusion and Policy Recommendations

5.1 Conclusion

According to asset pricing theories only risk-adjusted returns can be earned by the investor which means that higher the risk, higher will be the returns and there is no other way to earn abnormal returns. Whereas after Roll's critique (1977) different anomalies have been identified by which one can earn abnormal returns by adopting such strategies.

After the discussion of anomalies starts, a series of anomalies are identified namely volatility anomaly in 1987, momentum anomaly in 1993 and growth anomaly 1997. On the basis of these investment strategies profit is earn from the arbitrage opportunities existed in the market. Average returns of arbitrage portfolios based on these strategies are formed. The statistical differences between the average returns of all the strategies are tested by two-sample t-tests. It is found that the arbitrage portfolios based on asset growth, momentum and volatility strategies do not earn significant abnormal returns for the 1 year investment period. Whereas only momentum strategy is able to earn abnormal returns when invest for 5 and 10 years holding period.

Time series and cross-sectional regression is applied to find the relationship between premiums of investment strategies used in the study and the returns of size-sorted portfolios. The study concludes that;

In short run arbitrage portfolios based on asset growth, momentum and volatility strategies are unable to earn abnormal return so there is no utility in short run. Whereas, in long run only momentum strategy is able to earn abnormal return. If these strategies are formed for investment then it should be considered in long run. There is significant relationship between volatility and equity returns, so volatility should be considered for estimating required rate of return or cost of equity of the business. Beta of the momentum can be used to forecast the returns.

In short run only volatility strategy does matter in the study whereas, in long run only momentum strategy does matter. Market premium is able to explain equity returns similarly volatility premium has positive and significant relationship with equity returns which indicates that volatility premiums are able to predict equity returns which proves that H2 alternate hypothesis is accepted. Whereas asset growth and momentum premium has no significant relationship with the returns of size sorted portfolio which indicates that these strategies are unable to predict equity returns in Pakistani equity market.

5.2 Policy Recommendations

1. In long run momentum strategy should be adopted.
2. Volatility strategy should be considered in estimating cost of equity and returns.
3. In short run volatility investment strategy is recommended for investors and managers.
4. In long run momentum strategy is recommended for investment purpose in Pakistani equity market.
5. For the estimation of required rate of return investors should consider volatility strategy.
6. Managers can consider beta of the momentum in estimating the required rate of return or cost of equity.

5.3 Direction for Future Research

1. Empirical research on these strategies can further be carried out in the Pakistani market by using different portfolio formation and holding period windows.
2. Further studies can use larger sample size to confirm the findings of this study.
3. This study is focused on the emerging market of Pakistan. The same study can be conducted on the other emerging markets of the world to ensure the consistency of the results.

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