THE LOW VOLATILITY PUZZLE: EVIDENCE FROM KSE 100 OF PAKISTAN

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ABSTRACT: Modern portfolio theory suggests that investors hold a portfolio of stocks to diversify idiosyncratic risk. The capital asset pricing model (CAPM) builds on the portfolio theory and predicts that all investors hold the market portfolio in equilibrium. As a result, only systematic risk is priced in equilibrium and idiosyncratic risk is not.This study investigates the relation between idiosyncratic volatility and returns in Karachi Stock Exchange (KSE) 100 index of Pakistan for the period July 2009 to June 2015. The results show that there is a negative relationship between idiosyncratic risk and expected returns and the internationally documented strong performance of low volatility stocks relative to high volatility stocks is present in Pakistan.

Terms: Risk Management, Pakistan Stock Exchange, Stock Market, Volatility, Portfolio Management, CAPM, Risk Measurement

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INTRODUCTION

One of the most commonly accepted relationships in financial markets is the positive relationship between risk and return. The capital asset pricing model (CAPM) explains risk as covariance with the market and furthermore outlines that all investors will invest in that portfolio which gives the maximum return per unit of risk. Recent studies explore the relationship between past volatility and returns and found that low-volatility stocks have a tendency to earn too high risk –adjusted returns, as they have a significantly higher Sharpe ratio than stocks with higher volatility. Important contributions regarding this phenomenon are made by Ang et al. (2006), Clarke, de Silva, and Thorley (2006), Blitz and Vliet (2007), Ang et al. (2009), Scherer (2010), Baker, Bradley, and

Wurgler (2011), Blitz and van Vliet (2011) and Frazzini and Pedersen (2011).

Risk is defined as the probability that an actual return on an investment will be lower than the expected return. It can be divided into systematic and unsystematic/idiosyncratic risk. Systematic risk is the uncertainty inherent to the entire market or entire market segment. It is also known as market risk or un-diversifiable risk. Unsystematic risk or idiosyncratic risk is the type of uncertainty that comes with the company or industry you invest in. it is also called as specific risk or diversifiable risk or residual risk. It can be reduced through diversification.

According to Markowitz (1952) the portfolio construction vanishes the idiosyncratic risk, and portfolio earns on the basis of systematic risk. But the results of different studies corroborated that

idiosyncratic volatility appears to be negatively related to relative returns and the finding of a similar relationship between total volatility and relative returns, are questioning the fundamentals of financial theory and asset pricing models. On the other side there are number of studies which corroborated that idiosyncratic volatility is positively related with the returns. Both results concluded that there is volatility puzzle in developed markets. This relationship is opposite to the commonly accepted link between risk and return. Since idiosyncratic risk is diversified away in the classic asset pricing models, the finding that high idiosyncratic stocks have low risk adjusted returns is a pure anomaly. Even if the investors may not be perfectly diversified, the finding can still be classified as an anomaly considering the findings of Merton (1987) and Levy (1978) who propose that in the presence of undiversified investors the relationship between idiosyncratic volatility and return should be positive.

In literature this concept has become known as the "low volatility puzzle" and has been explained in three different versions and each version uses different measures of volatility to explain stocks' return risk. The first version is the beta puzzle. It was early introduced by Haugen and Heins (1975) and recently it is further studied by Frazzini and Pedersen (2011). The systematic risk as defined by CAPM is the risk measure in this version. Using idiosyncratic risk as the measure of risk is the second version. Ang et al. (2006; 2009) have made major contribution regarding this version. The third version uses total volatility as the measure of risk, combining the results from the other two. The study conducted has incorporated controls for many factors in order to explain the effect, such as the CAPM, Fama and French factors, the momentum effect and others. There are two main types of explanations for the puzzle; one set of rational explanations and one set based on behavioral finance.

Research Gap

As the research conducted till now is mostly focused on developed markets, the main contribution of this thesis is to inquire whether the negative relationship between past idiosyncratic volatility and relative returns is also exist in emerging markets. According to BBVA report (2015) the South Asian emerging markets are growing tremendously which includes Bangladesh, India and Pakistan. The purpose of this study is to determine the presence of low volatility anomaly in KSE-100.

Problem Statement

Portfolio theory and concept of diversification is well defined in literature but studies have shown abnormal behavior of markets especially developed one. If there is any such anomaly then keeping in view the importance of emerging markets, it must be explored so that investor better form their investment policies etc.

Research Questions

This study strives to find the answers to the following questions

1.   Does low volatility anomaly present in KSE-100?

2.   Does idiosyncratic volatility effect the returns of portfolio?

3.   Is there any evidence of efficiency of emerging market?

Research Objectives

Following are the major objectives of the study:

1.   To determine the presence of low volatility anomaly in KSE-100.

2.   To determine whether idiosyncratic volatility effect the returns of portfolio.

3.   To determine whether the Pakistani market is efficient or not.

Significance of the Study

As the research conducted till now is mostly focused developed markets, the main

contribution of this study is to check whether the relationship between past idiosyncratic volatility and relative returns also present in emerging markets. The purpose of this study is to determine the presence of low volatility anomaly in KSE-100. Developed markets even showing a link between idiosyncratic risk and return which is negation of diversification concept, so analysis on emerging markets required to explore this relationship or anomaly. If this anomaly persist than investment strategy for investors would be different.

LITERATURE REVIEW

One of the fundamental topics in finance is the relationship between risk and return and it has been extensively studied in literature. Section 2.1 discusses the idiosyncratic volatility puzzle. Section 2.2 addresses the beta puzzle while section 2.3 reviews the total volatility puzzle. Section 2.4 describes the explanations behind the existence and persistence of the low volatility puzzle. There are two main types of explanations for the puzzle; one set of rational explanations and one set based on behavioral finance.

The Idiosyncratic Volatility Puzzle

In case of traditional asset pricing models idiosyncratic risk can be fully diversified away, and hence should be unrelated to returns. So the finding that stocks with high idiosyncratic volatility tend to have low risk adjusted returns is a pure anomaly. Even if the investors are not perfectly diversified, this finding is still an anomaly if we consider the results of Levy (1978) and Merton (1987) who suggest that the relationship between idiosyncratic volatility and returns should be positive.

Studies Finding a Negative Relation between Idiosyncratic Risk and Returns

The finding of a negative relation between idiosyncratic volatility starts with Ang et al. (2006). They uses Fama and French (1993) model to define the idiosyncratic volatility and examine the cross-sectional relationship between idiosyncratic volatility and expected returns. They use one month time period for measuring volatility and find out that in the period 1963 to 2000, the U.S stocks with high idiosyncratic volatility have abnormally low average returns. In 2009 Ang et al. investigate that whether the relationship between idiosyncratic volatility and average returns found in U.S. data also present in other markets. The results show that stocks with high idiosyncratic volatility have low average returns world-wide, suggesting that the findings from Ang et al. (2006) is not just a country-specific nor a sample-specific.

Ang et al. (2009) examine possible explanations for the anomaly such as trading structures, information dissemination, higher momentums, and the leverage interaction of Johnson (2004) by using U.S. data. The findings show that these hypotheses are generally rejected and the article concludes that further studies are required to examine if there are sources of economic risk that lies behind this anomaly which is causing the stocks with high idiosyncratic volatility to have low average returns.

Studies Finding a Positive Relation between Idiosyncratic Risk and Returns

Various studies from the classical paradigm suggest a positive relation between idiosyncratic volatility and expected return (Staumbaugh, Yu, and Yuan 2013). Levy (1978), Merton (1987), Malkiel and Xu (2002) and Jones and Rhodes-Kropf (2003) give reasons behind a positive relation and argue that a premium for taking idiosyncratic risk will be demanded by the undiversified investors. In a recent study, Eiling (2013) suggests that high idiosyncratic stock's exposure to industry specific human capital returns can explain the positive relation. Barberis and Huang (2001) give behavioral models that support to a positive relation between high idiosyncratic volatility and returns. Lintner

(1965b) and Douglas (1969) show a significant relation between idiosyncratic volatility and returns. Tinic and West (1986) and Malkiel and Xu (2002) find that portfolios with high idiosyncratic volatility have higher return. Residual variance has a positive significant coefficient in cross-sectional regressions (Lehmann 1990). Fu (2009) uses an EGARCH model to estimate expected idiosyncratic volatilities and the results show a positive relation between the estimated conditional idiosyncratic volatilities and returns.

Studies Finding No Relation between Idiosyncratic Risk and Returns

After controlling the methodological issues raised by Miller and Scholes (1972), Fama and Macbeth (1973) find no relation between idiosyncratic volatility and return. Bali and Cakici (2008) also conclude that there is no relation between idiosyncratic volatility and expected returns. They argue that methodological differences such as data frequency used to calculate idiosyncratic volatility, the weighting schemes used to compute average portfolio returns, breakpoints in sorting stocks into quintile portfolios and different filter rules, all play an important role in finding out the significant relation between idiosyncratic volatility and return. When using daily data to calculate idiosyncratic volatility, Bali and Cakici (2008) find that there is a significant negative relation between idiosyncratic volatility and expected returns, the results are same as find by Ang et al. (2006). However, they are of the point of view that monthly data is more accurate proxy for the expected future volatility than the daily data. They find that the relation between idiosyncratic volatility and cross-section of expected returns is flat or very weak when monthly data is used. When equal-weighted portfolios are used the negative relation also becomes insignificant or even positive. Thus, Bali and Cakici (2008) conclude that

the negative trade-off between risk and return does not exist

The Beta Puzzle

Fama and French (1992) find that after controlling for size, the relationship between market beta and average return is flat. In a recent study by Frazzini and Pedersen (2011) they find that investing in high beta securities results in a lower alpha than investing in low beta securities. Leverage restrictions are the main reason behind why high beta assets seem to give lower returns which is opposite to what CAPM predicts.

The Total Volatility Puzzle

The relationship between risk and return has been examined in several studies by using total volatility as a risk measure instead of separating the risk into systematic and unsystematic components. Since high (low) securities typically have high (low) total volatility these studies are relevant to the idiosyncratic volatility. Similarly, high (low) beta securities tend to have high (low) volatility so these studies are also closely connected to beta puzzle.

Clarke, de Silva, and Thorley (2006) find that minimum-variance that do not rely on any expected return show value addition over the market capitalization benchmark. At a significantly lower risk level the minimum variance portfolios are capable of delivering same or higher returns than the market portfolio. They also find that the minimum variance portfolios tend to have a value and a small size bias. The Sharpe ratios of the minimum-variance portfolios are still relatively high even after controlling for these biases.

By using Fama-French factors and two characteristic anomaly portfolios, Scherer (2010) explain the variation of the excess returns of the minimum variance portfolio, comparative to a capitalization weighted alternative. The hypothesis of this study is to check that the excess returns of the minimum variance portfolio are a function

of risk related factors. The results shows that 83% of the variation can be attributed to the suggested risk related factors.

Blitz and van Vliet (2007) find that stocks that have low historical volatility tend to have higher risk adjusted returns. The results of this study are consistent with Ang et al. (2006) and find significantly lower risk and high Sharpe ratios for minimum variance portfolios. Blitz, Pang, and van Vliet (2013) find strong evidence of low volatility effect in emerging markets as well.

Baker and Haugen (2012) conducts a country level analysis of the low volatility anomaly. The study finds that the low volatility anomaly present in all testable developed and emerging markets.

Explanations behind the Low Volatility Anomaly

There are many theories and studies in the literature that suggest explanations behind the existence and persistence of a low volatility effect. There are two main types of explanations for the puzzle; one set of rational explanations and one set based on behavioral finance.

Rational Explanations

Shorting Limits: On a risk adjusted basis when low volatility stocks perform well then high volatility stocks, one of the clear strategy would be to short the high volatility stocks and go long the low volatility stocks. The observed low volatility anomaly in the market would be arbitrage away through this strategy. Baker, Bradley, and Wurgler (2011) find that the key reason the anomaly seems to persist is that the high volatility portfolio is typically consist of small stocks which are costly to trade in large quantities. According to Staumbaugh, Yu, and Yuan (2013) high idiosyncratic volatility stocks are more subject to mispricing and due to arbitrage asymmetry it creates a negative relation between expected returns. The short sellers who are trying to exploit overprice face more constraints then the purchasers

who are trying to exploit underpricing. The effect is that high idiosyncratic volatility stocks that are overpriced tend to stay overpriced longer than the idiosyncratic stocks that are underpriced. As a result the high idiosyncratic stocks tend to have lower future returns. The risk caused by potential margin requirements due to short-run price variations and the high tail-risk for short-sellers due to the intrinsic skewness in compounded returns are included in short selling constraints. Many investors groups have investment policy limitations that inhibit them from taking short selling positions at all such as mutual funds and pension funds. Boheme et al. (2009) finds that in the absence of shorting constraints there is a positive relation between idiosyncratic volatility and expected returns for firms with low visibility. George and Hwang (2011) find that due to low analyst coverage the high volatility stocks are mispriced and the idiosyncratic volatility anomaly is caused by the low performance of these high idiosyncratic volatility stocks.

Leverage Limits: Investors cannot take full advantage of the anomaly because shorting constraints prevent them to do so. But at least they should overweight the low volatility portfolio even if they cannot short the high volatility portfolio. They could then lever this portfolio to match their risk preference. However, the individual investors and the investors of pension funds and mutual funds are restricted in terms of how much leverage they can take on. As a result in order to meet their expected return requirements, instead of using leverage they overweight risky stocks, even though these stocks have lower Sharpe ratios. Frazzini and Pedersen (2011) find that an important explanation behind the low returns on high beta stocks are leverage constraints.

The Benchmarking Hypothesis: Baker, Bradley, and Wurgler (2011) find out that a manager who needs to beat a certain

benchmark without using too much leverage has incentives to pick stocks with higher volatility to achieve this. Thus, the manager will be hesitant to underweight low alpha and high beta securities or overweight high alpha and low beta securities. Managers are normally reluctant to invest too much in low volatility securities since it would increase their tracking error against the benchmark.

Mutual Funds and Cash Inflows:Karceski (2002) give a model where incentives are given to the fund managers to include more high-beta securities in their portfolios, and as a result these securities underperform relative to their CAPM equilibrium returns. The three arguments on which his model is based are: First, the investors of mutual funds invest more in those funds that have showed strong performance recently relative to their peers. Second, when a market has moved significantly upwards, there are higher inflows of money to the mutual fund industry. Thirdly, high-beta securities are excellent vehicles for appealing more money, since they outperform in bull markets and as a result this creates extra demand for high volatility stocks.

Sell-Side Analyst Behavior:Hsu, Kudoh, and Yamada (2012) find that sell-side analysts tend to inflate earnings growth forecasts more for high volatility stocks. This is done because they assume that it would be difficult for clients to identify inflation in growth forecasts for securities with highly impulsive growth. If investors cannot adjust to these biased forecasts then this could push up the prices of high volatility securities and as a result it will reduce their future returns.

Corporate Information Disclosure:A link between idiosyncratic volatility puzzle and strategic company behavior in information disclosure is studied by Jiang, Xu, and Yao (2009). Based on theory firms may have an advantage to announce good news and to withhold bad news about future earnings,

they find out that disclosing less information results in higher volatility in the form of future negative earnings shocks. They find that the market does not properly adjust for those high idiosyncratic volatility securities that have poor disclosure quality, thus results in a negative relationship between high idiosyncratic volatility securities and returns.

Behavioral Explanations

Stocks as Lottery Tickets:Kahneman and Tversky (1979) find that individuals who are offered with a bet that has a high chance of a small loss and low chance of a large gain, often will take the gamble. They claim that individuals overweighting of low probabilities may contribute to the charm of both insurance and gambling. Linking this to the stocks market it can be observed that high volatility securities are generally low priced with a small chance of multiplying in value, but a significantly higher chance of decreasing in value. In this way, a high volatility stock be like a lottery ticket. Baker, Bradeley, and Wurgler (2011) argue that due to the behavioral biases such as individual's preferences for lotteries, irrational investors will avoid low risk stocks and overpay for risky stocks. Blitz and Van Vliet (2007) refers to Shefrin and Statman (2000)'s behavioral portfolio theory and finds that deviation of the investor from risk-averse behavior may cause low risk securities to be underpriced and high risk securities to be overpriced. Because the investors would like a shot at the riches, they will overpay for those securities which they perceive as lottery tickets.

Overconfidence: A human bias that has been heavily studied within the experimental psychology literature is overconfidence. "People tend to overestimate the precision of their beliefs or forecasts, and they tend to overestimate their abilities" (Bodie, Kane, and Marcus 2011, 411). Cornell (2009) suggest that investors who believe that they

have greater skills will want to invest in stocks with high volatility because in return they find the highest incentive for security selection talent. Such securities will be overpriced, if they have overvalued their skill. Baker, Bradley, and Wurgler (2011) find out that because of high confidence in their own estimates, investors who disagree on stock valuation will likely stick to their own valuation.

The Representativeness Heuristic: When estimating the probability of an event or a sample, and individual will often judge the probability by how well it represents certain salient features of the population from which it was drawn. Bodie, Kane, and Marcus (2011) finds that people usually do not take into account the size of the sample. Baker, Bradely, and Wurgler (2011) give an example that explains how the representativeness heuristic could explain the irrational preference for high volatility securities. They consider how the rational and the layman will answer the question of defining great investments. The layman might think of companies like Microsoft and conclude that road to riches is paved with investments is speculative technologies; after all, they seem representative of high returns based on the (small) sample the layman has seen. Thus by ignoring the high rate of failure among small, speculative investments the layman tends to overpay for risky securities. The rational investor however will analyze the full sample and conclude that high risk stocks are generally a speculative investment.

Hypothesis

H1: Low volatility anomalypresent in KSE-100

H2: Idiosyncratic volatility effect the returns of portfolio.

H3: Pakistani market is efficient.

METHODOLOGY
GARCH Test
To test the variability in the market, GARCH have been applied. This test is applied only to check the variation in the market. The following mean and variance equation is used year wise and then on the combined data set.

Mean Equation $\qquad r_t = \beta_0 + \beta_1 r_{t-1}$

Variance $\qquad\qquad\qquad$ **Equation**

$$\sigma_t^2 = \beta_0 + \beta_1 U_{t-1}^2 + \beta_2 \sigma_{t-1}^2$$

Definition of Idiosyncratic Volatility
In this study idiosyncratic risk is defined as the variance of the error term in the Fama French 3 factor model which is consistent with Ang et al. (2006).

$$r_{i,t} - r_{f,t} = \alpha_{it} + \beta_{i,t}(r_{m,t} - r_{f,t}) + s_{i,t}SMB_t + h_{i,t}HML_t + \varepsilon_{i,t}$$
(1)

In equation (1) idiosyncratic volatility is defined as Var (ε_{it}).The other factors are standard as defined in Fama and French (1993),

Where

$r_{i,t} - r_{f,t}$ = the excess return of stock i at time t

$r_{m,t} - r_{f,t}$ = the excess return of the market

$sSMB_{it}$ = the return of a portfolio of small stocks in excess of the return on a portfolio of large stocks.

$hHML_{it}$ = the return of a portfolio of stocks with a high book-to-market ratio in excess of the return on a portfolio of stocks with a low book-to-market ratio.

Portfolio Formation:
A portfolio of one hundred companies has been formed and these companies have been selected on the basis of market capitalization each year. This portfolio is then sorted into two categories Small and Big portfolio on the basis of market capitalization. A weighted average portfolio method is used to form these broad categories. The following formula is used;

(Company's market capitalization/ total capitalization of Small cap companies)* Returns(2)
(Company's market capitalization/ total capitalization of Big cap companies)* Returns(3)

It has been assumed that the company's market capitalization would remain the same throughout the period under consideration.

In the next step returns have been calculated to get standard deviation and then these portfolios would be sorted further on the basis of standard deviation. In this step the four categorize would be small portfolio with high standard deviation, small portfolio with low standard deviation, big securities with high standard deviation, and big securities with low standard deviation. Therefore, *S/H, S/L, B/H, and B/L* portfolios would be formed by taking the averages of the sorted categories.

SMB and HML portfolio have been constructed then by using the following formulas:

SMB = ((S/H - B/H) + (S/L – B/L))/4(4)
HML = ((S/H – S/L) + (B/H – B/L))/4(5)

This method is consistent with Fama and French methodology but instead of forming HML portfolio on the basis price-to-earnings ratio, I formed these portfolios on the basis of standard deviation for total volatility analysis. These portfolios are formed to check the relation between total volatility and returns.

But for idiosyncratic volatility analysis through FF3F model, HML portfolio is formed on the basis of price-to-earnings ratio. To check the relation of idiosyncratic risk with returns, regression is run on equation (1) to get the residuals. Idiosyncratic volatility is obtained by taking the square of these residuals. Now returns have been sorted according to low and high volatility. Then these returns have been

regressed with their respective idiosyncratic volatility in order to find out that is there any significance relation exists between idiosyncratic risk and returns.

Total Volatility Approach

According to the traditional finance, there is a positive relationship between risk and return i.e. higher risk higher return and low risk low return. Using total volatility approach it is inquired that whether there exists a negative relation between risk and return. There are four dependent variables S/H, S/L, B/H, B/L and three independent Variables RM, SMB, HML and for each year and for the all years combined data set the following 4 regressions have been run:

(S/H –RF) = (RM-RF) +SMB+HML (6)
(SL –RF)= (RM-RF) +SMB+HML (7)
(B/H –RF)= (RM-RF) +SMB+HML (8)
(B/L –RF) = (RM-RF) +SMB+HML(9)

Measuring Idiosyncratic Volatility through FF3F Model

According to Markowitz (1952) the portfolio construction equalizes or diminishes the idiosyncratic risk, and portfolio earns on the basis of systematic risk. Since unsystematic rick is totally diversified away in traditional asset pricing model, the methodology used by Ang et al. (2006) is used to check whether idiosyncratic volatility is having any relation with the returns of the portfolio. Equation (1), which is the base model of this research is used to get the residual series.

Idiosyncratic volatility is obtained by taking the square of the residual series and the returns have been sorted in high and low category with respect to their idiosyncratic volatility i.e. returns with high idiosyncratic volatility and returns with low idiosyncratic volatility. The following two equations are showing that the returns are regressed on the

lag value of their respective idiosyncratic volatility.

$$B_t = \alpha_0 + \beta_0 HIGH\_IVOL_{t-1} \quad (10)$$

$$S_t = \alpha_0 + \beta_0 LOW\_IVOL_{t-1} \quad (11)$$

B_t represents the portfolio of those stocks which are having high idiosyncratic volatility whereas, S_t denotes the portfolio of stocks having low idiosyncratic volatility.

Measuring Idiosyncratic Volatility through CAPM

Assuming a single factor return generating process, I compute the idiosyncratic volatility using the CAPM.

$$r_{it} - r_{ft} = \alpha_{it} + \beta_{it}(r_{mt} - r_{ft}) + \varepsilon_{it} \quad (12)$$

Residual series are generated through equation (12)and idiosyncratic volatility is obtainedby taking the square of the series.Returns are again sorted on the basis of high and low idiosyncratic volatility and they are regressed on the lag value of their respective idiosyncratic volatility.

$$B_t = \alpha_0 + \beta_0 HIGH\_IVOL_{t-1} \quad (13)$$

$$S_t = \alpha_0 + \beta_0 LOW\_IVOL_{t-1} \quad (14)$$

It is a time series study. Daily data from July 2009 to June 2015 will be used for portfolio formation. All data have been obtained from Karachi Stock Exchange website, Business Recorder and Yahoo Finance. 6-Month T-bill rate is used as a proxy for risk free rate it is obtained from State Bank of Pakistan website. The reason for using data from 2009 is that there were huge mishaps in market earlier in 2009. Inclusion of old data without controlling the effect of crisis period would results in spurious output.

RESULTS

GARCH Results

To test the variability in the market, GARCH have been applied.

Table 1: Variance Equation

Dependent Variable	C	RESID(-1)^2	GARCH(-1)
RM			
2009	0.00	0.070	0.90
	(1.87)	(2.18)*	(22.37)*
2010	0.00	0.08	0.81
	(1.57)	(1.80)	(7.99)*
2011	0.00	0.17	0.63
	(1.57)	(2.40)*	(3.68)*
2012	0.00	0.22	0.73
	(2.19)	(3.38)*	(11.10)*
2013	0.00	0.06	0.90
	(1.11)	(1.77)	(15.53)*
2014	0.00	0.63	0.42
	(2.85)	(4.69)*	(4.95)*
2009-14	0.00	0.14	0.81
	(6.08)	(9.03)*	(46.48)*

The above table presents the values of coefficients of market returns (RM).
z-statistics is shown in parenthesis

Table 1 shows year-wise results of variance. The results exhibit that z-statistics of GARCH (-1) is significant which shows that today's volatility is influenced by previous day volatility. The 2009-14 coefficient of GARCH (-1) is positive which shows that 81.4% last day volatility is transfer in next day. The results can also refer this aspect that after the crash of stock market in 2008, the variation of market returns is higher illustrating through the results of GARCH but over the period of time, the significance of the results faded showing lesser volatility in market returns.

Total Volatility Results

Table 2: Year Wise Regression Analysis for Total Volatility through FF3F Model

Dependent Variables	Independent Variables		
	Intercept	Beta	SMB	HML
S/H				
2009	0.00 (-1.62)	0.88 (4.56)*	1.99 (2.05)*	1.87 (2.87)*
2010	0.00 (-1.94)	0.97 (4.10)*	1.99 (3.67)*	1.76 (5.94)*
2011	0.00 (-1.88)	0.77 (5.82)*	1.94 (3.68)*	1.92 (5.40)*

Year				
2012	0.00 (-1.06)	0.84 (8.86)*	1.88 (5.66)*	1.69 (4.83)*
2013	0.00 (0.16)	0.93 (6.94)*	1.78 (3.29)*	1.65 (7.64)*
2014	0.00 (-1.40)	0.83 (4.12)*	1.95 (2.18)*	1.59 (2.40)*
S/L				
2009	0.00 (-1.82)	0.91 (3.89)*	1.71 (2.65)*	-0.82 (-2.53)*
2010	0.00 (-1.09)	0.77 (2.20)*	0.94 (9.59)*	-0.38 (-3.74)*
2011	0.00 (-1.03)	0.65 (2.63)*	0.96 (8.04)*	-0.48 (-5.92)*
2012	0.00 (-1.75)	0.82 (3.70)*	1.37 (5.70)*	-0.65 (-6.79)*
2013	-0.00 (-0.20)	0.89 (3.49)*	1.40 (6.16)*	-0.47 (-5.30)*
2014	0.00 (0.34)	0.94 (7.38)*	0.98 (7.58)*	-0.61 (-5.82)*
B/H				
2009	0.00 (-1.82)	0.91 (3.89)*	-0.29 (-2.81)*	1.18 (3.74)*
2010	0.00 (-1.09)	0.77 (2.20)*	-1.06 (-10.80)*	1.62 (5.77)*
2011	0.00 (-1.03)	0.65 (2.63)*	-1.04 (-8.94)	1.52 (8.95)*
2012	0.00 (-1.75)	0.82 (3.70)*	-0.63 (-7.30)*	1.35 (4.00)*
2013	-0.00 (-0.20)	0.89 (3.49)*	-0.60 (-6.87)*	1.53 (7.37)*
2014	0.00 (0.34)	0.94 (7.38)*	-1.02 (-7.85)*	1.39 (3.24)*
B/L				
2009	0.00 (-1.62)	0.88 (4.56)*	-0.01 (-0.20)	-0.13 (-2.71)*
2010	0.00 (-1.94)	0.97 (4.10)*	-0.01 (-0.13)	-0.24 (-3.53)*
2011	0.00 (-1.88)	0.77 (2.82)*	-0.06 (-0.74)	-0.08 (-2.02)*
2012	0.00 (-1.06)	0.84 (8.86)*	-0.12 (-1.57)	-0.31 (-3.78)*
2013	0.00 (0.16)	0.93 (6.94)*	-0.22 (-3.69)*	-0.35 (-5.81)*
2014	0.00 (-1.40)	0.83 (4.12)*	-0.05 (-0.55)	-0.41 (-5.45)*

Where S/H = Small Stocks portfolio with high standard deviation
S/L= Small Stocks portfolio with low standard deviation
B/H= Big stocks portfolio with high standard deviation
B/L= Big stocks portfolio with low standard deviation
t-statistics is shown in parenthesis

Table 2 is showing the results of regression analysis for total volatility thorough FF3F model. In the period of study (2009-2014), the relation of S/H with R/M, SMB and

HML is positive and significant, means variation in the market positively affects the small companies with high standard deviation and even there is high variation in the market, the small companies are earning more risk adjusted returns then the big companies. Similarly small stocks with high standard deviation are earning more risk adjusted returns than the stocks that are less volatile. S/L is showing positive and significant relation with R/M and SMB but a negative relation with HML. This negative sign shows that small stocks with low risk are giving more risk adjusted returns than the stocks that are more risky which indicates the presence of low volatility anomaly in the market. B/H is having positive and significant relation with RM and HML and a significant negative relation with SMB shows that investors are investing in big companies with higher standard deviation so that they can earn more risk adjusted returns. The negative relation with SMB depicts that small companiesrisk adjusted returns are less than big companiesrisk adjusted returns. B/L is having positive and significant relation with RM. The negative and significant relation of B/L with HML depicts that big stocks with low risk are earning more than the big stocks with higher risk which is also a proof that low risk anomaly is present in the market. It is also contradicting the traditional relation of risk and return. In the year 2013 B/L is having significant negative relation with SMB. The negative relation with SMB means that big companies with low risk are earning more returns than small companies.

Table 3: All year's combined (2009-2015) Total Volatility Results

Dependent Variables	Independent Variables		
Variables	Intercept	Beta	SMB	HML
S/H	0.00 (-1.80)	0.87 (9.20)	1.94 (4.65)*	1.73 (9.50)*
S/L	0.00 (-1.15)	0.84 (4.86)*	1.26 (3.97)*	-0.61 (-5.64)*
B/H	0.00 (-1.15)	0.84 (6.86)*	-0.74 (-8.33)*	1.39 (5.31)*
B/L	0.00 (-1.80)	0.87 (9.20)*	-0.06 (-1.93)*	-0.27 (-9.31)*

Where S/H = Small Stocks portfolio with high standard deviation
S/L= Small Stocks portfolio with low standard deviation
B/H= Big stocks portfolio with high standard deviation
B/L= Big stocks portfolio with low standard deviation
t-statistics is shown in parenthesis

Table 3 indicates the combined data result of all the years under consideration i.e. from July 2009 to June 2015. The results also support the evidence of low volatility anomaly in KSE 100 index. The negative and significant relation of SL with HML indicates that small stocks with low risk are making higher risk adjusted returns than stocks with higher risk. Similarly the significant negative relation of B/L with HML is also showing that big stocks with low risk are managing to earn more risk adjusted returns than higher risky stocks. These results are indicating the presence of low volatility anomaly in KSE 100.

Idiosyncratic Volatility Results through FF3F Model

All of the above results have established the presence of low volatility puzzle in the market though it cannot persist for a longer period of time. It can be noticed that from time to time market is behaving in different patterns. Some results are violating the traditional relationship between risk and return, hence, questioning the fundamentals of financial theory and asset pricing models.

Table 4: Regression Analysis for High Idiosyncratic Volatility through FF3F Model

Dependent Variable		Independent Variable
B	Intercept	HIGH _IVOL(-1)
Coefficient	0.05 (2.11)	-0.68 (-2.13)*
F-Statistic	4.53	
Probability (F-statistic)	0.03	

Where B= All stocks portfolio with high idiosyncratic volatility.t-statistics is shown in parenthesis

Table 4 shows the results for equation (10). It indicates significant and negative relationship between returns and high idiosyncratic volatility which shows that with the passage of time the stocks with high idiosyncratic volatility earn less returns. The idiosyncratic risk is company specific and on the basis of higher idiosyncratic risk a portfolio cannot earn higher risk adjusted returns. It can be asserted that in market idiosyncratic risk is greater which is affecting the returns. And the companies which have high total risk their unsystematic risk is greater than systematic risk and that is the reason their stocks are not able to earn higher risk adjusted returns even though they are much riskier.

Table 5: Regression Analysis for Low Idiosyncratic Volatility through FF3F Model

Dependent Variable		Independent Variable
S	Intercept	LOW _IVOL(-1)
Coefficient	0.02 (1.54)	2.75 (0.31)
F-Statistic	3.10	
Probability (F-statistic)	0.05	

Where S= All stocks portfolio with low idiosyncratic volatility.   t-statistics is shown in parenthesis

Table 5depicts results for equation (11). It evaluates that the returns of the portfolio is not having significant relation with low idiosyncratic volatility. Such portfolios earn on the basis of systematic risk.

These findings are supporting the criticism made by Fama and French that return of a security or a portfolio is not only determined by return of the market, the single factor model used in CAPM. Return is also determined on the basis of size and value stock. Further, these results illustrate that portfolio formation does not necessarily eradicate the unsystematic risk. The idiosyncratic volatility is having negative relation with portfolio returns.

Idiosyncratic Volatility Results through CAPM

Assuming a single factor return generating process, I compute the idiosyncratic volatility using the CAPM and the results based on equation (13) and (14) are very similar to those using equation (10) and (11).

Table 5: CAPM results for High Idiosyncratic Volatility

Dependent Variable		Independent Variable
B	Intercept	HIGH _IVOL(-1)
Coefficient	0.04 (2.18)	-0.68 (-3.23)*
F-Statistic	10.46	
Probability (F-statistic)	0.00	

Where B= All stocks portfolio with high idiosyncratic portfolio.t-statistics is shown in parenthesis

Table 7: CAPM results for Low Idiosyncratic Volatility

Dependent Variable		Independent Variable
S	Intercept	LOW _IVOL(-1)
Coefficient	0.04 (3.17)	-0.29 (-0.07)
F-Statistic	0.01	
Probability (F-statistic)	0.94	

Where S= All stocks portfolio with low idiosyncratic portfolio.t-statistics is shown in parenthesis

Hence, table 6 and 7 supporting the results which have been measured by the base model for idiosyncratic volatility. Table 6 is indicating that high idiosyncratic risk

negatively impacts the return of a portfolio. It contradicts with the traditional asset pricing model that there is only one factor that determines the return of a portfolio and that the unsystematic risk diminishes through diversification.

CONCLUSION

According to the traditional finance theory, when investors take extra systematic risk, they expect to earn higher returns. According to the efficient market hypothesis, the market is efficient showing positive relationship between risk and return and one cannot earn high returns without taking high risk which is actually the risk premium. The researcher develop a portfolio to find out the volatility and return considering SMB and HML. The result reports an inverse relationship between risk and returns where investors can obtain higher returns without taking high risk. (Malcolm, Baker, and Bradley, 2014). In addition, the results suggest that low risk securities outperform high risk securities illustrating one of the greatest puzzle in theory of finance. Traditional financial theory suggests the idiosyncratic risk can be minimized thorough diversification though it is not embedded in the stock prices. Various theoretical departures from this paradigm propose a positive relationship between idiosyncratic risk and expected returns, the classical example being undiversified investors who demand a premium for the unsystematic risk component of their portfolios. Most recent studies, Ang et al. (2006) found a negative relation between idiosyncratic risk and expected returns. This can be categorized as the idiosyncratic volatility puzzle.

In addition this study also investigates the relationship between idiosyncratic volatility and returns in the Pakistani stock market. Results suggest better performance of low volatile securities relative to high volatile securities.

Recommendations

The efficient market hypothesis suggest that if the market is efficient the relationship between risk and return is positive and one can only gain high return while being exposed to a higher risk. So the recommendations from this study is to draw a mechanism with which the maximum market efficiency can be achieved. The mechanism of market governance can be improved which gives a little chance to the players in the market who exploit the inefficiency to gain abnormal profits. The government can intervene at the macroeconomic level by bringing in the fiscal and monetary policy that can help to achieve the market efficiency. Tax system can be designed in a way which can overcome distortions in the market that leads to inefficiency.

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