TESTING LONG RUN CONSISTENCY OF FUNDAMENTAL FACTOR MODELS WITH MOMENTUM AND GROWTH AS PRICE RISK FACTOR: EVIDENCE FROM EMERGING MARKETS

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ABSTRACT: *This study examines the long term relationship of risk premium and fundamental factors in emerging stock markets of China, India and Pakistan keeping in view leading contribution of Fama and French [1] and Carhart [2] models. Unlike to the macroeconomic multifactor models, this study incorporates firm-specific risk factors related to the market premium, viz. explaining risk premium. The firm-specific growth factor is derived from the work of Ho, et al. [3], and incorporated by employing factor (UMD) which is based on assets to market equity of the firm. A Sample of 1198 companies from the three emerging markets for the period of 2001-2013 indicated that market risk premium is the leading factor affecting risk premium in market of India and Pakistan. Accordingly, though market momentum being high enough to overestimate coefficients in the short run, it converges to stabilization and adjustment in the long run. By contrast, Chinese markets appears to be predominantly reflective of risk factor explaining risk premium, are relatively much stable and efficient and clearly represent maturity of the Chinese markets. Small value happens to deliver higher returns with higher volatility that is apparently consistent to the general notion of high risk associated with high returns. The growth stocks outperform value stocks in these economies.*

Keywords: Fama-French; HML; SMB; WML; Market Gearing; Long term relationship.
JEL Classification: G1, G3

1. INTRODUCTION

Performance of stock markets using stock returns has long been contemplated by the researchers in the area of finance. The first ever explanation of variation in stock returns was given by Black, et al. [4], Lintner [5], and Sharpe [6] in respect of different versions of the Capital Asset Pricing Model (CAPM). CAPM remained core of discussion among the financial economists for many decades until anomalies of this model were identified. Applicability of sole CAPM in different stock markets in order to measure efficiency through estimation of required rate of return and risk premium has not been a successful experience in various economies. This insufficient explanation of the efficiency of capital markets compelled researchers to include other factors that explain the cross sectional variations in returns other than excess market returns or market risk premium.

Studies[i] have identified many other factors such as size of firms (SMB), book to market equity (HML) and leverage causing variation in stock returns. Fama and French [1] defined the cross-sectional variation in the average market return as the common risk factor associated with the stock returns. They developed and employed variables such as Small-minus-big (SMB) and High-minus-Low (HML) that explain the cross sectional variation in the stock returns and risk premium of the individual stocks. Findings of Connor and Sehgal [14] from Indian stock markets also support Fama and French model. O'Brien, et al. [15] could not prove application of Fama and French model on Australian market and identified inability of Fama and French model in explaining the portfolios returns in the middle sized quantiles. Contradictory results of the previous studies[ii] might be on account of methodological issues, economic conditions of the different economies, firm specific factors and the sample. Mostly, inconsistencies are related to emerging markets studies. The concept of emerging markets emerged in 1980s that described the countries with specific characteristics like, less industrialized, less developed equity markets, but having significant growth potential and more intended to economic liberalization [21]. Fama and French [22] indicated that emerging markets have value premium in their stock returns. Additionally, emerging markets require special criterion to deal with their market information because of differential behavior of the stakeholders. This led the researchers to study the emerging economies that have specific characteristics. This study is also targeted towards emerging markets where investors have had similar behavior in the race of emerging economies Pakistan, India and China. Pakistan and India are now trying to catch up China in the race of economic growth and process of development.

This study attempts to test Fama and French model by redesigning the model specification and evaluating consistency of relationship in the long run. This study also incorporates SMB, HML, and WML as the common risk factors in the determination of stock returns. WML representing the trend and momentum[iii] of the market built on winning and losing firms is incorporated for momentum risk factor[iv]. UMD represents another risk factor related to growth prospects of the firm based on asset-market-equity-ratio in this study. Effort has been made to capture the significance of firm-specific risk factors for risk premium in the emerging markets contrary to the findings of Fama and French [22]. Fama and French [1] model explains only the rational behavior of pricing[v]. Incorporation of firm-specific growth factors measured through market leverage (UMD) might

determine stock returns to an extent. Previous studies provide evidence of linkage of market leverage and stock returns[vi][27]. Market leverage, as defined in the section 3, as the price risk factor is incorporated in this study.

Methodologically this study employs autoregressive models to compare the short-term and long-term relationship of risk premium and firm-specific factors such as market premium, SMB, HML, WML and UMD. The sample of 1198 companies includes 324 companies of KSE, 534 companies of SSE in Shanghai 'A' share Index and 340 companies of BSE from CNX 500 for the period of 2001-2013. The data has been collected form Thomson Reuter DataStream Database for SSE, BSE, and a certain proportion from KSE and published reports of State Bank of Pakistan[vii]. Thus, scope of the current study is different from the multifactor models employed by Merton [28] and Ross [29].

2. REVIEW OF LITERATURE

Behavior of stock returns in relation with risk factors has been major focus of the researchers and academicians in the area of financial economics during the last couple of years. The pioneer work relating stock return with risk is studied in terms of Asset Pricing Model of Sharpe [6], Lintner [5], and Black, et al. [4]. Sharpe, Lintner and Black (SLB) explain the stock return through market risk premium. The capital asset pricing model (CAPM) developed the way for the practitioners to think about the relationship between risk and return.

So far CAPM has been tested empirically by many studies whose findings are diverse. The first study on the CAPM was conducted by Lintner [5] and Douglas [30]. These studies revealed that the intercept was much bigger than risk free rate and beta had lower value, though statistically significant. Diverse results related to CAPM are attributed to measurement error and data related issues [31]. Just after one year Fama and MacBeth [12] performed the standard test of CAPM on portfolio for cross-sectional validation and found out weak significant beta. Tinic and West [32] found unusual results indicating no effect of residual risk on assets returns with intercept much greater than risk free rate. Findings of these studies do not support CAPM and nor do they support the assumptions of CAPM. Previous studies[viii] also reveal security market line which is flatter than the one estimated by the CAPM.

On account of diverse results from the estimation of CAPM, financial economists introduced other factors. Banz [7] introduced firm size as the factor affecting returns of security. The firm with small size produces higher returns [1]. Similarly, Bhandari [11] explains that the leverage effect is also associated with the risk and return. Stattman [9], Rosenberg, et al. [10] affirm the positive relationship between average return and book to market equity ratio. Basu [8] finds out significant impact of earning to price ratio (E/P). The results show statistically significant relationship of E/P with returns after controlling firm size and beta.

2.1 Fama and French Explanation

The failure of CAPM model leads to the development of multifactor model like ICAPM by Merton [28] and APT by Ross [29] based on macroeconomic factors, but the pattern of change in macroeconomic variables is much different from the variation pattern of stock returns and capital market-specific factors. Ball [33] introduced the yield surrogates (proxies for identifying underlying risk) for explaining the average returns. Based on the surrogates identified in the literature Fama and French [1] developed their model. Significant variables of the model which current study has also employed, include capability of size and book to market equity in explaining the cross-sectional variation of expected returns. Fama and French [1] also included book leverage, and earning to price ratio in explaining the cross sectional variations of the expected return and they found that book to market equity and size both explained the cross-sectional variation in the expected return. The leverage and E/P ratio is by design incorporated when size and book to market equity are used to define the cross-section. The current study employed the two significant variables of the Fama and French [1] such as HML and SMB along with two other factors for determining stock returns and their effectiveness in the long run. The average stock returns are not positively related to market beta when portfolios are formed based on size and beta [1].

Fama and French [13] investigated the explanatory power of the cross-sectional variation through the variables employed by Fama and French which revealed that maximum variation in stock returns were explained by book to market equity and size. The returns on small stocks are more sensitive to the risk captured by size factor than the returns on big stocks. Further, Fama and French [34] analyzed the consistency of the behavior of stock-returns in relation to size and BE/ME and behavior of earnings in relation to size and BE/ME. The results show weak consistency especially concerning the value factor which is attributed to the measurement error of the variables. Fama and French [23] explain the pattern of stock-returns which are not explained by the capital asset pricing models. The CAPM model is unable to explain long term reversal in stock-returns and short term stock-returns. However, the Fama and French three factor model explains much of the anomalies of CAPM model except the continuation of short term returns. The results show that the three factor model explains reversal of long term returns. Yet there are other anomalies which are still unaddressed. These anomalies are beyond the scope of this study.

2.2 Testing of Fama and French Model

Many studies like Connor and Sehgal [14][ix]; Faff [35]; Drew, et al. [36]; Prajutasen [18] and Srimarksuk [37] generalized Fama and French model in different countries and identified linear exposure of stock returns to market returns, size and value factor. Additionally these studies explain cross-sectional variation in stock returns by employing methodology of Fama and French [13] model.

Many studies [17, 38-40] have come up with results different from Fama and French model. Malin and Veeraraghavan [41] tested the robustness of Fama and French model in the developed countries and revealed growth stocks generating higher returns than the value stocks which is contrary to the Fama and French model. Chang, et al. [42] revealed significance of SMB and HML in the higher-order systematic co-moments in the cross-sectional regressions for portfolio returns but statistically SMB and HML emerged as insignificant.

The CAPM and Fama and French three factor models are usually tested in different markets[x]. O'Brien, et al. [15][xi]; Bartholdy, et al. [43]; and Lam [19][xii] compared the validation of these models. Fama and French outperforms CAPM in explaining variation of required return in different markets. Diverse efficiency of the Fama and French in different markets might be on account of stock price anomalies through SMB and HML. Empirically error term in FF has been observed less than that observed in the CAPM [23]. The error term of CAPM was three to five times greater than Fama and French model [23]. Studies attribute success of the Fama and French model to survivorship bias [40], Data snooping [44].

2.4 Extension in Fama and French Model in Special Cases

Application of the Fama and French model in different markets also reveal favorable results[xiii]. However, Fama and French model is unable to explain factors involved in persistence of mutual funds' performance in the short run. Hendricks, et al. [45], Goetzmann and Ibbotson [46], Brown and Goetzmann [47], Grinblatt and Titman [48], and Wermers [49] claimed persistence of mutual funds' performance in the short run which can be attributed to the "hot hands" or common investment strategies or asymmetric information.

Inability of Fama and French model in explaining persistence of returns was also identified in the Fama and French [23]. The anomaly of persistence of returns, which is also known as momentum anomaly, motivated Carhart [2] to develop extension of three factor Fama and French model by introducing the momentum factors. Evidence of testability of this model is consistent with size, book to market and momentum factor in explaining the persistence of returns. The study recommended that the funds with higher past returns lead to higher than average returns in the following period. The present study tests this lagged effect of the risk premium on the current risk premium by employing autoregressive models. L'Her, et al. [50] explored implications of four factor model of Carhart [2] in Canada and revealed results consistent with the Carhart four factor model.

Financial theorists consider debt as primary source of financial risk. Previous studies identified diverse findings related to the influence of gearing on stock returns. Modigliani and Miller [51] (henceforth MM) pointed in first proposition that the returns from real assets affect the value of a firm. Second proposition of MM depicts levered firm value remaining constant, but the cost of equity increasing with increasing risk. Different empirical studies like Hamada [26], Masulis [52], Bhandari [11], Dimitrov and Jain [24] and Korteweg [53] provide diverse evidence on gearing and stock returns. Strong and Xu [27] examined market gearing as directly associated with returns and book gearing as inversely associated with stock returns. Ho, et al. [3] pointed out market gearing revealing conditional pricing relation with returns. Gomes and Schmid [25] examined positive relation of returns with market gearing but statistically insignificant relation of stock returns with book gearing. Fama and French [1] explain positive relationship of market gearing with returns, but association becomes negative with adoption of book gearing. George and Hwang [54] reveal negative relation of gearing with returns because of sensitivity of high levered firms to financial distress risk. Garlappi and Yan [55] adopts dynamic model to identify the link between distress-risk and asset returns by incorporating gearing and find out gearing explaining stock returns particularly for the firms with high probabilities of default. However, none of these studies identified the market gearing as a price-risk factor. Most of the studies identified relationship between market gearing and stock returns. Whether the market gearing is the price-risk factor which explains variation in the stock returns and the concept of irrational pricing is still unaddressed.

In the context of previous studies[xiv] related to the Fama and French model main gaps have been identified in terms of improper sample selection, model specification and the inability of model to explain irrational behavior for which two factors from the literature have been identified as WML and Gearing ratio with a view to capture momentum effect and gearing effect. The present study incorporates leverage as the proxy for market gearing. These effects may explain irrational behavior as price risk factor. The long-term relationship reveals consistency of risk premium as response variable to the market premium, SMB, HML, WML and UMD. The present study estimates both the short-term and long-term relationships in order to single out the adjustment process in the long run[xv] which further provides efficiency content of the markets. The amount of work done in studying Fama and French model in emerging countries is much less than its empirical significance. Studies[xvi] on emerging economies, single out the gap in the academic literature.

This study is an effort to bridge the gap identified from the previous studies. The current study incorporates extended data set based on listed companies of KSE, BSE, and SSE with normal history. Methodologically present study employs one of the efficient models such as the concept of partial adjustment using autoregressive distributed lagged models and quantile regression method in order to describe long-term consistency and adjustment pattern of stock returns using risk premium. Findings of such models also provide some important implications about efficiency of the markets. The quantile regression is an attempt to compare variation across various quartiles of the companies through median effect of independent variables on the dependent variable such as risk premium. Focus of this study is the employment of data from emerging economies of China, India and Pakistan

. **METHODOLOGY**

Expected return and risk premium are significantly important for the investors and their estimation has been done by some of the leading studies of fundamental factor models[xvii] in finance. CAPM, Fama and French [1] models, and Carhart [2] four factor models are a few to mention.

This study employs the methodology of Fama and French [1] in defining the variables. The objective of this study is estimation of long-term consistency of relationship between risk premium and the fundamental factors following the findings of Carhart [2] wherein stock-returns take significant boost from their lagged values.

Partial adjustment model has been constructed for estimation keeping in view inability of Fama and French (1996) model in explaining persistence of returns (known as momentum anomaly) and introduction of momentum factors by Carhart [2]. Their findings that the funds with higher past returns lead to higher than average returns in the following period justify application of partial adjustment of risk premium using the autoregressive models. Additionally, quantile regression is employed to see median effect of fundamental factors on the risk premium.

3.1 Partial Adjustment and Autoregressive Model

Considering the adjustment of actual returns (Y_t) to the desired returns (Y_t^*). Partial adjustment model assumes that actual changes are equal to proportional optimal change. Mathematically relationship of actual and desired returns can be written as

$$Y_t - Y_{t-1} = \lambda(Y_t^* - Y_{t-1}) \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

Where, λ is the adjustment coefficient[xviii], which can also be considered as the speed of adjustment. The greater the speed of adjustment, the higher the efficiency and the higher the value of λ. Though traditionally the value of λ cannot be greater than 1 but following findings of Carhart [2] "that the funds with higher past returns lead to higher than average returns", the value of adjustment coefficient can be greater than 1.

The desired stock returns can be plotted against independent variables (the factors) as shown in the equation (2).

$$Y_{it}^* = \beta_1 + \beta_2 X_{it} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

Where the X_{it} is the independent variable(s) and Y^* is desired value of the dependent variable. Being noise or friction as component of the market, the gap between actual and desired is bound to exist. Incorporating such a market-oriented reality of noise the equation (3) is derived from the first two equations.

$$Y_{it} = Y_{i(t-1)} + \lambda(Y_{it}^* - Y_{i(t-1)}) + \mu_{it} \quad \ldots\ldots\ldots \quad (3)$$

Where, μ_{it} is the non-adjusted gap in each period. Putting equation (2) in (3) that is

$$Y_{it} = Y_{i(t-1)} + \lambda(\beta_1 + \beta_2 X_{it} - Y_{i(t-1)}) + \mu_{it} \ldots \quad (4)$$

$$Y_{it} = \lambda\beta_1 + \beta_2\lambda X_{it} + (1-\lambda)Y_{i(t-1)} + \mu_{it} \ldots \quad (5)$$

So, the operational expression of the equation 4 can be written according to the variables under investigation.

$$(R_i - R_f)_{it} = \lambda\beta_1 + \beta_2\lambda(R_m - R_f)_{it} + (1-\lambda)(R_i - R_f)_{i(t-1)} + \mu_{it} \quad \ldots \quad (6)$$

$$(R_i - R_f)_{it} = \lambda\beta_1 + \beta_2\lambda(R_m - R_f)_{it} + \beta_3\lambda(SMB)_{it} + \beta_4\lambda(HML)_{it} + (1-\lambda)(R_i - R_f)_{i(t-1)} + \mu_{it} \quad \ldots\ldots \quad (7)$$

Based on the Carhart [2] model the momentum factor is incorporated and based on previous studies, the mimic risk factor based on market leverage as proxy for gearing[xix] is also incorporated in the model

$$(R_i - R_f)_{it} = \lambda\beta_1 + \beta_2\lambda(R_m - R_f)_{it} + \beta_3\lambda(SMB)_{it} + \beta_4\lambda(HML)_{it} + \beta_5\lambda(WML)_{it} + (1-\lambda)(R_i - R_f)_{i(t-1)} + \mu_{it} \quad \ldots \quad (8)$$

$$(R_i - R_f)_{it} = \lambda\beta_1 + \beta_2\lambda(R_m - R_f)_{it} + \beta_3\lambda(SMB)_{it} + \beta_4\lambda(HML)_{it} + \beta_5\lambda(WML)_{it} + \beta_6\lambda(UMD)_{it} + (1-\lambda)(R_i - R_f)_{i(t-1)} + \mu_{it} \quad \ldots \quad (9)$$

The equations (8) and (9) provide short-term relationship between the dependent and the independent variables. The long-term relationship can be estimated by dividing each coefficient by the estimated value of λ.

3.2 Quantile Regression Analysis

Quantile regression provides estimates of the linear relationship between regressors and a specified quantile of the dependent variable [59]. 'Least absolute deviations (LAD)' is one of the special cases of quantile regression which corresponds to fitting the conditional median of the response variable (the risk premium).

Quantile regression describes better conditional distribution of the response variable than conditional mean in the OLS analysis. Researchers can analyze any selected proportion of the response variable affected by the regressors included in the model. It is robust method of modeling because it is not based on assumptions related to the normal distribution (***i.i.d***). Quantile regression model[xx] corresponds to linear regression model as described in (10).

$$(R_i - R_f)_{it} = \beta_1^{(p)} + \beta_2^{(p)}(R_m - R_f)_{it} + \beta_3^{(p)}(SMB)_{it} + \beta_4^{(p)}(HML)_{it} + \beta_5^{(p)}(WML)_{it} + \beta_6^{(p)}(UMD)_{it} + \mu_{it}^{(p)} \quad \ldots \quad (10)$$

Where $0 < p < 1$ indicates the proportion under quantile at *p*. Expected value of the error terms is 0 in linear regression model. Corresponding quantile regression is shown in equation (11).

$$Q((R_i - R_f)|(R_m - R_f)_{it}, SMB_{it}, HML_{it} = \beta_1^{(p)} + \beta_2^{(p)}(R_m - R_f)_{it} + \beta_3^{(p)}(SMB)_{it} + \beta_4^{(p)}(HML)_{it} + \beta_5^{(p)}(WML)_{it} + \beta_6^{(p)}(UMD)_{it} \quad \ldots(11)$$

The difference in the error term of the different quantiles can be written as shown in equation (11)

$$\mu_{it}^{(P)} - \mu_{it}^{(q)} = (\beta_1^{(p)} - \beta_1^{q}) + (\beta_2^{(p)} - \beta_2^{(q)})(R_m - R_f)_{it} + (\beta_3^{(p)} - \beta_3^{(q)})(SMB)_{it} + (\beta_4^{(p)} - \beta_4^{(q)})(HML)_{it} + (\beta_5^{(p)} - \beta_5^{(q)})(WML)_{it} + (\beta_6^{(p)} - \beta_6^{(q)})(UMD)_{it} \quad \ldots\ldots\ldots (12)$$

Where R_i = Stock returns of the i^{th} company at time t, R_f = Risk free rate, R_m = Market return of the stock market using KSE 100 Index as proxy, SMB = Small minus big in terms of size, HML = High minus low in terms of value factor, WML= Winner minus Looser in terms of average stock returns at t-1, UMD= Up minus Down in terms of market gearing ratio

Variables used in the model are described in the paragraphs to follow.

3.3 Small minus Big (SMB)

Overall value of the firm defines size factor. Fama and French [1] defined size as the market value of a share (at year end December 31st) times outstanding shares. In this study 'size' variable is represented by the market value of a share (at year end December 31st) times outstanding shares.

The SMB means small minus big stock returns of the portfolio. In other words, SMB is the difference between the stocks returns of the small firms' portfolio and stock returns of the big firms' portfolio. The portfolios are developed in the same manner as in original model of Fama and French [1]. The SMB is calculated by developing six weighted portfolios S/H, S/N, S/L, B/H, B/N, B/L as based on size and book to market. The number of firms varies in each group and weighted average of difference is identified

$$SMB = \frac{(S/L - B/L) + (S/N - B/N) + (S/H - B/H)}{3}$$

Fama and French [13], Fama and French [34] found non market risk factors as important source in explaining the cross-sectional average returns. According to Fama and French [13], SMB variable mimic the risk factor associated with the size of the firm.

3.4 High minus Low (HML)

The book to market equity ratio is calculated as book value of equity (BE) of the firm divided by market value of equity (ME) of the firm. Fama and French [1] considered common equity plus deferred taxes as the book value and market price of share as on 30 June (fiscal year end) times the outstanding shares as market value.

The HML variable is developed to incorporate value factor that explains variations in the stock returns. The HML means high minus low, which is, the difference between returns of the portfolio with high BE/ME and the returns of the portfolio with low BE/ME. The portfolios are developed in the same manner as in original model of Fama and French [1]. The HML is also the average value weighted portfolio of difference among value and growth stock portfolio.

$$HML = \frac{(S/H - S/L) + (B/H - B/L)}{2}$$

According to Fama and French [13] HML mimic the risk factor in stock returns associated with the value of the stock. Studies[xxi] identified that slope of HML remains same for small and big stock. HML is also a proxy for the co-movement that leads to the mispricing of the stocks.

3.5 Winner Minus Looser

The winner minus looser is developed to incorporate the momentum factor that explains the variations in the stock returns. The WML is the winner minus looser that is the difference between portfolio of top performer stocks and portfolios of lower performer stocks. The portfolios are developed in the same manner as in original model of Carhart [2]. The six value weighted portfolio average is developed with interaction of size and performance which are S/W, S/L, B/W, B/L.

$$WML = \frac{(S/W - S/L) + (B/W - B/L)}{2}$$

According to Carhart [2], the anomaly of the Fama and French [1] that is related to persistence of returns that is also known as momentum anomaly due to which the Carhart [2] developed the momentum factor that leads to further studies in momentum effect [61].

3.6 Up minus Down

The gearing ratio depicts financial risk employed by the firm. The market leverage as proxy for gearing is being calculated as total assets divided by market price of shares (As on Year end December 31st) times outstanding shares as calculated in Strong and Xu [27] and many other studies.

The up minus down is developed to incorporate the impact of firm future growth opportunity that can explain the variations in current stock returns. The UMD is up-minus-down and is the difference between the returns of portfolio of higher market gearing and returns of the portfolio of lower market gearing. The portfolios are developed in the same manner as in original model of Fama and French [1]. The value of weighted portfolio average is developed with interaction of size and market value of leverage which are S/U, S/D, B/U, B/D as shown in the formula given below.

$$UMD = \frac{(S/U - S/D) + (B/U - B/D)}{2}$$

According to Strong and Xu [27] and Gomes and Schmid [25] the market gearing has impact on stock returns. However, this study identifies whether the market gearing is the price risk factor or not. For this purpose the portfolio are developed on the basis of market gearing and price risk factor is developed in the same manner as in Fama and French [1].

3.10 DATA

This study employs 13 year monthly stock prices of 324 companies listed in Karachi Stock Exchange (KSE); 340 companies of BSE included in CNX 500, and 534 companies of SSE included in Shanghai for the period of January-2001 to December-2013. Annual and biannual reports of the companies were quite handy in the construction of SMB and HML. The source of data is Thomson Reuter DataStream Database for India and China, but for Pakistan Annual Reports of the Companies, State Bank of Pakistan, and Thomson Reuter DataStream database were accessed. Long span of the data set provides an opportunity to critically explore application of fundamental factor models under different economic situations.

This is the first study of its kind that not only explains the

long-term applicability of Fama and French in emerging economies but also attempt to capture maximum anomalies of the model. The emerging countries selected in sample are India, China and Pakistan because of similar investment pattern in these countries at the start of their journey of growth fifteen years ago. Little empirical work is found on the applicability of Fama and French model in these emerging economies which motivated the selection of these countries in the sample. Moreover, these countries are the major players of the South Asia and their economic importance cannot be ignored. Based on the described criteria, cumulatively the sample of 1198 companies are incorporated in the sample over the period of 2001-2013 that leads to 185,690 observations or data points on the basis of which results are estimated.

3. ANALYSIS OF RESULTS

Findings from the estimation of the models discussed in the previous section are presented in this section. Results of the estimated quantile regression using median as the criterion are also analyzed in this section. Short-run causal relationship of risk premium and the factors such as SMB, HML, WML and UMD are explained from the results depicted in table 1. The long-term relationship of the same variables is described from the results presented in table 2. Table 3 indicates results of the quantile regression. Five determinants of risk premium are addressed in this study. These five determinants represent five different stages of development of capital market theories. The market premium represents Sharpe [6], Lintner [5], and Mossin [62]. The Fama and French [1] model is represented by additional two factors such as size factor (SMB) and value factor (HML). The model of Carhart [2] introduces momentum factor (WML) and Ross [29] model adds one more factor known as firm specific growth factor (UMD). The short run estimation of required rate of return has been shown from CAPM (1) through FF Model (2), four Factor model (3), and firm specific growth factor (4), for China, India and Pakistan.

In all the three countries, CAPM stock returns are significantly explained by the market risk premium ($p < 1\%$) but the value of beta is less than 1 (beta < 70%) in Pakistan and China whereas it is higher than 1 for India. Overall performance of the securities in the markets of China and Pakistan is defensive instead of aggressive. On the contrary performance of securities in India looks aggressive based on value of CAPM-beta greater than 1 on the average.

The stock returns are explained in Pakistan and China by the market risk premium of almost 67% and 61% respectively indicating less sensitivity of excess returns towards market risk premium in these two countries. Volatility of the risk premium is relatively higher in India than the other two countries where premium has been comparatively stable during the period from 2001 to 2013.

Regarding the Fama and French (FF) model, SMB-beta is significant ($p < 1\%$) with a negative sign in Pakistan only. The value of SMB-beta reveals bigger firms accruing better risk premium than the smaller ones in Pakistan [35, 63]. India and China have received positive and significant value of the SMB-beta representing results as per findings of the Fama and French [1, 13] that the smaller firms outperform in terms of risk premium than the larger ones.

The HML-beta is insignificant with negative sign in Pakistan and India reflecting value (factor) of the big firm having insignificant role in the determination of risk premium. However, HML-beta is significant with negative sign for the stock market of China in all the models from (2) through (4). China is the only country from amongst the three where value factor (HML) seems to have played significant role in the determination of risk premium. These results clearly represent growth of the Chinese markets to considerable maturity level. During the growth of firms, risk premium is negatively affected. Inverse relationship of value and risk premium is also reiterated from the models which include momentum factor (WML) and firm specific growth factor (UMD) [3, 64, 65]. The value of HML-beta is positive and significant on the 4th model which include firm specific growth (UMD) and momentum (WML) factors. It means Pakistani security markets return positive premium to the investors from the growth of value of their business in the event of momentum and the value factors.

Significance of the HML-beta in the presence of WML factor is supported from the positive and significant values of WML-beta and UMD-beta in the models 3 and 4 for Pakistani security markets where (p-value < 1%) in the Carhart [2] model and multifactor model [66, 67]. It can be concluded that rising leverage in fact cause an increase in the risk whereby expected returns are increased [3].

In Model (3) and (4) the WML-beta is -0.023 and -0.026 (with p-value < 1%). Momentum factor is also negative and significant for China. This negative and significant relationship is against the findings of Carhart [2]. The negative value of the momentum factor (WML-beta) indicates volatility and bearish market behavior in panic period[xxii] (Grundy and Martin [68] in the two countries India and China. The period under consideration might have occasionally faced panic in India and China and the possibility of short-call-option must be observed in these two countries only in the panic periods[xxiii].

Comparative analysis of the three countries indicates required rate of return of India being highly sensitive to market risk and inelastic to value, size, momentum, and growth beta[xxiv]. This may be attributed to attitude of investors who deliberately follow market risk rather than value, size, momentum and firm specific growth for the estimation of required rate of return. In case of China the stock returns are affected by market risk, size, value, momentum and firm specific growth factors. Such a mature attitude of the investors reflects established stock markets of China which is more efficient than the Indian and Pakistani markets.

The diagnostics such as standard error of regression, values of AIC and SBC are on the lower side which is favorable reflection of the models in terms of fitness. Significance of the F-stats shows justifies the relationship among dependent and independent variables.

The long run relationship of risk premium and its determinants (factors) are explained from the results shown in Table 2.

TABLE 1: SHORT RUN RELATIONSHIP

This table presents the short run relationship of stock returns with asset pricing factors based on fundamentals. The fundamental factor models that are estimated for studying short run relationship are CAPM (1), FF-Model (2), Carhart four Factor Model (3), and four factor model with firm specific growth factor (4). These models are estimated for India, Pakistan and China. The MPREM is the market premium, SMB is size factor, HML is value factor, WML is momentum factor, and UMD is firm specific growth factor.

Variables	***Pakistan***				***India***				***China***			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Constant	-0.059 (-36.0**)	-0.059 (-35.7**)	-0.067 (-36.1**)	-0.065 (-35.4**)	0.002 (3.13**)	0.005 (5.86**)	0.009 (8.94**)	0.009 (8.99**)	-0.027 (-50.0**)	-0.025 (-48.6**)	-0.022 (-30.8**)	-0.025 (-33.4**)
MPREM	0.678 (52.4**)	0.683 (52.3**)	0.660 (49.7**)	0.686 (51.6**)	1.024 (141.2**)	1.084 (125.9**)	1.077 (124.6**)	1.067 (112.5**)	0.614 (112.8**)	0.558 (105.2**)	0.559 (105.4**)	0.551 (103.3**)
SMB	-	-0.020 (-4.94**)	-0.020 (-4.97**)	0.030 (6.31**)	-	0.133 (25.1**)	0.139 (25.9**)	0.133 (23.5**)	-	0.415 (73.19**)	0.407 (70.2**)	0.421 (71.6**)
HML	-	-0.008 (-1.23)	-0.007 (-1.10)	0.020 (3.15**)	-	-0.003 (-0.44)	-0.002 (-0.37)	-0.007 (-1.11)	-	-0.138 (-23.1**)	-0.137 (-23.1**)	-0.104 (-16.2**)
WML	-	-	0.021 (9.45**)	0.010 (4.16**)	-	-	-0.023 (-6.97**)	-0.026 (-7.49**)	-	-	-0.022 (-6.64**)	-0.024 (-7.05**)
UMD	-	-	-	-0.095 (-19.8**)	-	-	-	0.014 (2.82**)	-	-	-	-0.089 (-13.8**)
S.E. Regression	0.2537	0.2536	0.2534	0.2524	0.1395	0.1387	0.1386	0.1386	0.1301	0.1251	0.1251	0.1250
AIC	0.095	0.094	0.092	0.085	-1.100	-1.113	-1.114	-1.114	-1.240	-1.318	-1.318	-1.321
SBC	0.096	0.095	0.094	0.086	-1.100	-1.112	-1.113	-1.113	-1.239	-1.317	-1.318	-1.320
DW Stat	2.100	2.097	2.098	2.103	2.056	2.057	2.058	2.059	2.084	2.120	2.122	2.126
F-Stats	2416.7**	1222.0**	997.20**	903.40**	9859.6**	5159.8**	4141.4**	3452.9**	6402.4**	5128.8**	4114.0**	3468.1**

* *Significance at 5% level*

** *Significance at 1% level*

The models that are estimated in above table are

$$(R_i - R_f)_{it} = \beta_1 + \beta_2(R_m - R_f)_{it} + \mu_{it} \quad (1)$$

$$(R_i - R_f)_{it} = \beta_1 + \beta_2(R_m - R_f)_{it} + \beta_3(SMB)_{it} + \beta_4(HML)_{it} + \mu_{it} \quad (2)$$

$$(R_i - R_f)_{it} = \beta_1 + \beta_2(R_m - R_f)_{it} + \beta_3(SMB)_{it} + \beta_4(HML)_{it} + \beta_4(WML)_{it} + \mu_{it} \quad (3)$$

$$(R_i - R_f)_{it} = \beta_1 + \beta_2(R_m - R_f)_{it} + \beta_3(SMB)_{it} + \beta_4(HML)_{it} + \beta_4(WML)_{it} + \beta_4(UMD)_{it} + \mu_{it} \quad (4)$$

TABLE 2: LONG RUN RELATIONSHIP

This table presents the long run relationship of excess returns and asset pricing factor based on fundamentals. The short run results are adjusted through adjustment coefficient (λ) for attaining long run relationships and patterns. The patterns of significance remains the same. However, the factor loadings varies among short run and long run depicting vital implication to relationships.

Variables	***Pakistan***				***India***				***China***			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Constant	-0.049 (-36.0**)	-0.049 (-35.7**)	-0.055 (-36.1**)	-0.054 (-35.4**)	0.002 (3.13**)	0.005 (5.86**)	0.009 (8.94**)	0.009 (8.99**)	-0.024 (-50.0**)	-0.022 (-48.6**)	-0.020 (-30.8**)	-0.022 (-33.4**)
MPREM	0.561 (52.4**)	0.565 (52.3**)	0.547 (49.7**)	0.568 (51.6**)	1.007 (141.2**)	1.062 (125.9**)	1.056 (124.6**)	1.046 (112.5**)	0.551 (112.8**)	0.492 (105.2**)	0.494 (105.4**)	0.486 (103.3**)
SMB	-	-0.017 (-4.94**)	-0.017 (-4.97**)	0.025 (6.31**)	-	0.130 (25.1**)	0.136 (25.9**)	0.131 (23.5**)	-	0.366 (73.19**)	0.360 (70.2**)	0.372* (71.6**)
HML	-	-0.006 (1.23)	-0.006 (-1.10)	0.016 (3.15**)	-	-0.003 (-0.44)	-0.002 (-0.37)	-0.007 (-1.11)	-	-0.121 (-23.1**)	-0.121 (-23.1**)	-0.092* (-16.2**)
WML	-	-	0.017 (9.45**)	0.008 (4.16**)	-	-	-0.022 (-6.97**)	-0.025 (-7.49**)	-	-	-0.020 (-6.64**)	-0.021 (-7.05**)
UMD	-	-	-	-0.078 (-19.8**)	-	-	-	0.014 (2.82**)	-	-	-	-0.078 (-13.8**)
S.E. Regression	0.2537	0.2536	0.2534	0.2524	0.1395	0.1387	0.1386	0.1386	0.1301	0.1251	0.1251	0.1250
AIC	0.095	0.094	0.092	0.085	-1.100	-1.113	-1.114	-1.114	-1.240	-1.318	-1.318	-1.321
SBC	0.096	0.095	0.094	0.086	-1.100	-1.112	-1.113	-1.113	-1.239	-1.317	-1.318	-1.320
DW Stat	2.100	2.097	2.098	2.103	2.056	2.057	2.058	2.059	2.084	2.120	2.122	2.126
F-Stats	2416.7**	1222.0**	997.20**	903.40**	9859.6**	5159.8**	4141.4**	3452.9**	6402.4**	5128.8**	4114.0**	3468.1**

* *Significance at 5% level*

** *Significance at 1% level*

The models that are estimated in above table are

$$(R_i - R_f)_{it} = \beta_1 + \beta_2(R_m - R_f)_{it} + \mu_{it} \quad (1)$$

$$(R_i - R_f)_{it} = \beta_1 + \beta_2(R_m - R_f)_{it} + \beta_3(SMB)_{it} + \beta_4(HML)_{it} + \mu_{it} \quad (2)$$

$$(R_i - R_f)_{it} = \beta_1 + \beta_2(R_m - R_f)_{it} + \beta_3(SMB)_{it} + \beta_4(HML)_{it} + \beta_4(WML)_{it} + \mu_{it} \quad (3)$$

$$(R_i - R_f)_{it} = \beta_1 + \beta_2(R_m - R_f)_{it} + \beta_3(SMB)_{it} + \beta_4(HML)_{it} + \beta_4(WML)_{it} + \beta_4(UMD)_{it} + \mu_{it} \quad (4)$$

Where MPREM is the market premium, SMB is small minus big, HML is high minus low, WML is winner minus looser, UMD is up minus down.

TABLE 3: QUANTILE REGRESSION (Median)

This table presents Quantile regression at median that identifies the impact of fundamental pricing factors on the conditional median of excess returns. This provide complete picture of distribution of excess returns over time series. The model characteristics like sparsity, standard error of regression, and significant Quasi LR stat shows the goodness of fit of the model.

Variables	***Pakistan***				***India***				***China***			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Constant	-0.065 (-67.8**)	-0.064 (-64.6**)	-0.067 (-68.1**)	-0.065 (-62.2**)	-0.008 (-11.9**)	-0.006 (-8.53**)	-0.002 (-1.93)	-0.002 (-2.0*)	-0.002 (-4.97**)	-0.027 (-50.4**)	-0.025 (-35.6**)	-0.025 (-35.4**)
MPREM	0.458 (48.1**)	0.461 (47.6**)	0.456 (47.82**)	0.463 (47.3**)	0.933 (115.2**)	0.973 (104.2**)	0.971 (105.2**)	0.966 (102.3**)	0.530 (78.8**)	0.464 (67.6**)	0.465 (67.2**)	0.462 (67.3**)
SMB	-	0.011 (4.02**)	0.008 (4.57**)	0.026 (8.94**)	-	0.084 (15.69**)	0.092 (16.62**)	0.089 (16.29**)	-	0.377 (57.7**)	0.373 (56.7**)	0.374 (56.6**)
HML	-	0.007 (2.52**)	0.009 (3.30**)	0.017 (5.19**)	-	-0.006 (-1.02)	-0.006 (-0.97)	-0.008 (-1.35)	-	-0.162 (-24.5**)	-0.160 (-23.1**)	-0.150 (-21.0**)
WML	-	-	0.009 (8.24**)	0.004 (2.82**)	-	-	-0.022 (-7.38**)	-0.023 (-7.41**)	-	-	-0.019 (-5.62**)	-0.021 (-6.07**)
UMD	-	-	-	-0.022 (-8.11**)	-	-	-	0.007 (1.33)	-	-	-	-0.034 (-4.14**)
Sparsity	0.204	0.213	0.209	0.213	0.238	0.237	0.236	0.236	0.253	0.236	0.237	0.237
S.E. Regression	0.260	0.260	0.260	0.259	0.140	0.140	0.139	0.139	0.131	0.126	0.126	0.126
Quasi LR Stat	5354.5**	5213.8**	5387.0**	5382.3**	16619.0**	17008.5**	17107.5**	17137.9**	8415.9**	15130.5**	15113.5**	15092.5**

* *Significance at 5% level*

** *Significance at 1% level*

The models that are estimated in above table are

$$(R_i - R_f)_{it} = \beta_1 + \beta_2(R_m - R_f)_{it} + \mu_{it} \quad (1)$$

$$(R_i - R_f)_{it} = \beta_1 + \beta_2(R_m - R_f)_{it} + \beta_3(SMB)_{it} + \beta_4(HML)_{it} + \mu_{it} \quad (2)$$

$$(R_i - R_f)_{it} = \beta_1 + \beta_2(R_m - R_f)_{it} + \beta_3(SMB)_{it} + \beta_4(HML)_{it} + \beta_4(WML)_{it} + \mu_{it} \quad (3)$$

$$(R_i - R_f)_{it} = \beta_1 + \beta_2(R_m - R_f)_{it} + \beta_3(SMB)_{it} + \beta_4(HML)_{it} + \beta_4(WML)_{it} + \beta_4(UMD)_{it} + \mu_{it} \quad (4)$$

Where MPREM is the market premium, SMB is small minus big, HML is high minus low, WML is winner minus looser, UMD is up minus down.

As discussed in the section related to the methodology, long run is the period indicating adjustment which take place in many short runs. The value adjustment parameter (λ) in all the models is more than unity. Carhart [2] recommended that the funds with higher past returns lead to higher than average returns in the following period. This justifies the value of adjustment parameter (λ) greater than 1.

Results presented in table 2 reveal reduced value of the intercepts in the long run. As the value of intercept tends to zero the models are validated in the three markets of China, India and Pakistan. Values of the short run risk factors are also stabilized in the long run that is why their absolute values are reduced in the long run. Sensitivity of stock returns towards factors in long run is normalized.

Long run results show that the investors give considerable importance to market risk for the estimation of stock returns in rather than size, value, momentum, and growth beta in Pakistan. The betas of size, value, momentum, and growth are further reduced in long run depicting that value of stock is explained by market risk in the long run.

Very high sensitivity of Indian market beta in the short run is reduced from an average value of 1.07 to 1.00 in the long run. The Indian market risk beta still remains major factor explaining stock returns in the long run. Here again relatively less weight is assigned by the Indian investors to size, value, momentum, and firm specific growth factors. The abnormal returns also reduced in the long run in the Indian stock markets.

The abnormal returns are also reduced in long run in the Chinese stock markets because results are normalized in the long run. However, significance all the factors affecting risk premium remains the same. These findings unequivocally reflect maturity of investors in the Chinese markets which have grown up during the period of study.

Results of quantile regression with conditional median are presented in table 3. The resulting betas of the factors under consideration (MPREM, SMB, HML, WML, and UMD) are different from the factor loadings discussed above in estimating median stock returns. In case of Pakistan, the estimate of SMB-beta is significant with positive values of 0.011, 0.008, and 0.026 in the three models. These values indicate positive risk premium attached to small firm due to higher risk of default. Similarly, the HML remains significant at median stock returns with negative sign indicating growth stock outperforming the value stock in Pakistan. The UMD retains price risk factor for median stock returns. The fluctuation in stock returns is generally explained by market risk beta despite the fact that other factors are significant but with lower values. The negative and significant value of WML-beta in India retains volatility and bearish market attitude. More or less results of the quantile regression are consistent with the findings discussed earlier.

4. CLUSIONS

This study examines the long-term consistency of fundamental factor models based on adjustment in the short run, in the emerging markets of China, India and Pakistan. This study also examines the firm specific growth factor measured by market leverage as a price risk factor explaining stock returns. The empirical findings of this study identify that factor based on market leverage is the price risk factor due to significant growth beta. The long-term consistency suggests that market momentum, is high enough to overestimate the coefficients in short run which are later, stabilized or adjusted in the long run. The stock returns in the short run might be over-estimated which are normalized in the long run. The long-term risk premium can be considered as effective required rate of return. Results of the quantile regression retain similar relationship of the required rate of return and the risk factors identified by the classic contribution of Sharpe [6], Lintner [5], Mossin [62], Fama and French [1], Carhart [2], and Ross [29]. Additionally, coefficients of quantile analysis are slightly different from the other models. The difference may be due to non-normality of the stock returns from the selected time series.

The study provides unique behavior related to emerging economies in application of Fama and French [1] and Carhart [2] and addition of firm specific growth factor. This study identifies size beta being positively associated with excess returns in emerging economies. The premium is attached to small firms due to higher default risk rather than poor earning in the depression as mentioned Fama and French [13]. Moreover, the value beta is found as either insignificant or negatively associated with stock returns. Growth stocks outperform value stocks in these markets. Emerging economies suffer from long bearish trend that leads to negative momentum beta depicting volatile and bearish markets. The negative growth beta also depicts longtime down market spans in emerging economies as characterized by literature related to the emerging economies.

The study supports Fama and French [22] that claimed that the emerging economies has value premium and results are consistent with O'Brien, et al. [15] and Connor and Sehgal [14]. These results are inconsistent with the studies based on developed countries [41, 42]. This study provides the new insight to asset pricing models based on market specific and company specific factors, in the categories of fundamental factor models. This study identifies firm specific growth factor as price risk factor that may lead investor irrationality. However, there are also factors which explain excess returns. The unusual behavior of HML factor also provides dissection of value factor in the emerging economies of China, India and Pakistan.

Using the concept of Fama and French hypothesis, required rate of return is to be compared with market portfolio returns. According to the principle of high risk associated with high returns, small value happens to deliver higher returns with higher volatility and growth stocks outperform value stock in emerging economies. This risk-return relationship elucidated by Fama and French model might be very useful for medium and long term investors. In sum, small cap stocks have higher average returns than large cap stocks. China has been observed as one of the most stable market among all the three economies of India, Pakistan and China where all the risk factors play their role to determine risk premium. Contrary to this, risk premium is mostly determined by the market risk factor in India and Pakistan. Effective policy measures should be taken to bring maturity and efficiency in the Indian and the Pakistani markets.

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[vii] For details visit www.sbp.gov.pk

[viii] For details see literature of [4] F. Black, M. C. Jensen, and M. S. Scholes, "The capital asset pricing model: Some empirical tests," 1972.; [12] E. F. Fama and J. D. MacBeth, "Risk, return, and equilibrium: Empirical tests," *The Journal of Political Economy,* pp. 607-636, 1973.

[ix] [14] G. Connor and S. Sehgal, "Tests of the Fama and French model in India," London School of Economics and Political Science, LSE Library 0956-8549, 2001. also shows weak explanatory power of these variables (size, value and market) in explaining earnings growth rate.

[x] See literature of [14] ibid., [15]M. A. O'Brien, T. Brailsford, and C. Gaunt, "Size and book-to-market factors in Australia," in *21st Australasian Finance and Banking Conference*, 2008.

[xi] [15] M. A. O'Brien, T. Brailsford, and C. Gaunt, "Size and book-to-market factors in Australia," in *21st Australasian Finance and Banking Conference,* 2008. identified that Fama and French model is unable to explain the returns of middle and small size quantiles and there is a weak relationship of size on small portfolios

[xii] [19] K. Lam, "Is the Fama-French three factor model better than the CAPM?," Department of Economics-Simon Fraser University, 2005.also finds that the Fama and French model is period specific model in cross-sectional framework

[xiii] [41] M. Malin and M. Veeraraghavan, "On the robustness of the Fama and French multifactor model: evidence from France, Germany, and the United Kingdom," *International Journal of Business and Economics,* vol. 3, pp. 155-176, 2004., [17] V. T. L. Pham and T. Long, "Constructing Fama-French factors from style indexes: Japanese evidence," *Economics Bulletin,* vol. 7, pp. 1-10, 2007.

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[xv] Previous studies based the long run consistency analysis on the employment of longer time series in the model. However, this is not case as the long run adjustment identifies the long run consistency and adjustments

[xvi] [56] J. Iqbal, R. Brooks, and D. Galagedera, "Testing Conditional Asset Pricing Model: An Emerging Market Perspective. Monash University," Australia (Working Paper 3/08.)2008. Testing Conditional Asset Pricing Model: An Emerging Market Perspective. Monash University, Australia (Working Paper 3/08.).

[xvii] The models that uses observable asset or firm specific variable such as firm size, market value, dividend yield etc. for development of factors is known as Fundamental Factor Models [57] "Factor Models for Asset Returns," in *Modeling Financial Time Series with S-PLUS®*, ed: Springer New York, 2006, pp. 569-616, [58] E. Zivot and J. Wang, *Modeling Financial Time Series with S-PLUS®* vol. 191: Springer Science & Business Media, 2007.. This study used established fundamental factor models like CAPM, Fama and French Model, Carhart Four Factor Models, five Factor model based on growth factor)

[xviii] The adjustment coefficient refers to the rate at which the factor loading adjust in short runs that cumulatively leads to complete adjustment in long run

[xix] For theoretical considerations see literature of [3] R. Y. W. Ho, R. Strange, and J. Piesse, "Corporate financial leverage and asset pricing in the Hong Kong market," *International Business Review*, vol. 17, pp. 1-7, 2008, [27] N. Strong and X. G. Xu, "Explaining the cross-section of UK expected stock returns," *The British Accounting Review*, vol. 29, pp. 1-23, 1997, [55] L. Garlappi and H. Yan, "Financial Distress and the Cross-section of Equity Returns," *The Journal of Finance*, vol. 66, pp. 789-822, 2011.

[xx] For details see literature of [59] R. Koenker and G. Bassett Jr, "Regression quantiles," *Econometrica: journal of the Econometric Society*, pp. 33-50, 1978.

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[xxii] The panic period is driven by the panic selling that refers to the wide scale selling that leads to the sharp decline in the prices of stocks in the market.

[xxiii] See literature and Section 4.5 of [64] K. D. Daniel and T. J. Moskowitz, "Momentum crashes," *Swiss Finance Institute Research Paper*, pp. 14-6, 2013.

[xxiv] Firm Specific growth Coefficient is refer to as Growth beta