Asset Growth Anomaly and Stock Returns:
An Evidence of Karachi Stock Exchange (KSE) Market

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ABSTRACT

In efficient market, firms who make more investments are considered to have high earnings and better prospects which instantly incorporated into its share prices. However, range of studies demonstrated sturdy evidence of asset growth effect i.e."Higher returns have been enjoyed by low growth firms and vice versa" and claims this factor explains returns better than market beta of various asset pricing models (Cooper, Gulen & Schill, 2008; Li & Sullivan, 2014 and Wen, 2014). Hence, this study is an attempt to explore the profitability of asset growth anomaly on Karachi Stock Exchange (KSE) by constructing deciles portfolios from Jan 2001-Dec 2015. The results support the existence of asset growth anomaly in KSE market. The use of Generalized Methods of Moments (GMM) proved that Capital Asset Pricing Model (CAPM), Fama-French (three and five factor) models are mis-specified models in case of KSE because they all botched to elucidate the cross sectional variation in portfolios returns based on firm's asset growth. The results of current study are highly consistent with the Fama & French (1993, 2015). The empirical findings recommends investing in small growth firms is an appropriate sound strategy to generate abnormal higher returns as we claim stocks can be predicted on the basis of asset growth anomaly and through developing this investment strategy i.e. by taking the long position in low growth stocks and short position in high growth stocks, investors may generate positively higher returns in Pakistan.

Keywords: *Asset Growth Effect, CAPM, Fama-French factor models, EMH, KSE.*

INTRODUCTION

Markowitz, (1952) developed a modern portfolio theory which gives birth to a range of asset theories; among which the most commonly used is capital asset pricing model (CAPM) as it was introduced by Sharpe (1964), Treynor (1961), Linter (1965) and Mossin (1966). This model starts with the idea that individual investment accommodates two types of risks: (1) Systematic risk- referred as market risk and cannot be diversified (2) Unsystematic risk- known as specific risk which can be removed through diversification. The issue which plagues the investors most when computing the stock's return is; even by incorporating all the shares in a fine diversified portfolio in stock market, we can't eliminate systematic risk. The CAPM; therefore evolved a way to measure this systematic risk and states that, "Any variation in the return of a security is only because of systematic risk" (Black, Jensen & Scholes, 1972 and Fama & Macbeth, 1973). Consequently, on the word of Efficient Market Hypothesis (EMH) this model to appropriately price the security needs market to be efficient. Kendell, (1953) in his study "The analysis of economic time series part (i), Prices" presented this (EMH) theory. In line with, stock prices follows a random walk and reproduces all the pertinent information available in market, due to which he claimed, stock prices are impartial and un-predictable (Fama-French, 2008). Later on, in late twentieth century this model started losing its popularity as empirical evidences have been found which exhibits the existence of predictable

pattern. Such pattern whether in cross-sectional or time-series stock returns is referred as financial market anomalies[1] . The presence of any type of financial anomalies if continued violates the economic and financial theories, may leads to generate abnormal higher return (Latif, Arshad, Fatima & Farooq, 2011 and Bodie, Kane and Marcus, 2009).

These financial market anomalies can be of three types: fundamental, technical and calendar. Fundamental anomalies emerge from the use of financial data of companies, analysis of stocks and those factors which may influence the overall value of firm. (2) Technical anomalies use the momentum factor i.e. data of past three to twelve month returns are used to predict the stock returns. (3) Calendar anomalies revolve around the pattern such as month to month or year to year respectively in stock returns for the prediction purpose, such as day-of-the-week effect, year-end-effect and January-effect.

This current study emphasizes on particular type of fundamental anomaly i.e. "Asset growth anomaly". Which asserts, "Higher returns have been enjoyed by those firms who experienced low growth through share repurchase, divesture and retirement of debts, whereas firms who have high growth by increasing the investments or doing external financing have low stock returns" (Titman, Wie & Xie, 2004). However, in efficient market commonly it is alleged firms who make more investments are considered to have high earnings and better prospects, incorporated into its current prices of share. Contrary to which, various empirical studies revealed that small or large capitalization firm's asset growth effects have competence to predict stock returns (Cooper, Gulen & Schill, 2008; Chen, Yao, Yu & Zhang, 2008; Li & Sullivan, 2014; Iqbal, & Wibowo, 2015 and Wen, 2014).

It is bit controversial that existence of any anomaly is by virtue of inefficiency of market or the erroneous use of equilibrium model. Fama and French, (1993, 2008) affirmed that persistency of anomaly is vital along with efficiency of a market and abnormal returns in presence of anomalies are the consequences of only risk premium and not a result of market inefficiency. Therefore, according to them both theoretically and practically CAPM not only fails to elucidate linear relation between the risk and return but also fall short to unfold the anomalies such as: size, value and momentum effects in an efficient market. This lead the Fama and French to develop Fama and French (three & five) factors models which can capture the anomalies from size, value, profitability and investment factors besides of market risks as a risk premium.

Thus, this study embarks on to investigate any predictable pattern in Karachi stock market by examining the asset growth effect not yet explored in Pakistan. Likewise Cooper, Gulen, and Schill, (2008) this study also considered the "Total asset growth effect" rather than the components of assets because whole gives more accurate analysis than parts. For this purpose, CAPM model is used to check the profitability of the firms along with Fama and French three and five factor models. Though this study do not undertakes any direct test of market efficiency but it provides evidence whether or not asset growth anomaly exists in Karachi Stock Exchange (KSE). This research for that reason provides empirical evidence to the investors about the profitability of asset growth effect in their portfolio selection decisions.

1- Market anomalies: shows any other information (besides the pertinent information as explained by market beta in CAPM), predicts the abnormal stock returns.

Objectives

The literature is replete with a range of studies exploring predictable patterns, for example: Size effect (Banz, 1981), liquidity effect (Amihud and Mendelson, 1991), leverage effect (Bhandari, 1988), asset growth effect (Titman, Wie and Xie, 2004) and book to market value (Fama and French, 1992) failed to be explained by asset pricing models. These studies are either done in developed or emerging economies but in terms of developing countries or more specifically in Pakistan, this anomaly is not yet explored. Therefore, the main objective of this study is to observe any predictable pattern such as asset growth anomaly in Karachi stock market.

- To analyze portfolios on asset growth ratio yields abnormal or higher stock returns on KSE market.
- To recommend investment strategies accordingly to the financial investors based on asset growth effect in their portfolio selection decisions.

Research Questions

- Do portfolios sorted on asset growth ratio yields abnormal or higher stock returns on KSE market?
- Do CAPM, Fama & French (three and five factor) models explain the profitability of asset growth effect?
- Do the asset growth of the listed Non- Financial companies (dead or alive) possess negative or positive link with the stock return or asset growth anomaly exists in Karachi stock market or not?

Significance

This present empirical study is of paramount importance to the financial investors, spectators, brokers in developing portfolios and taking the decisions over the buying and selling of stocks respectively. This study helps them to predict the movement of stock prices by using asset growth information of firms listed or non-listed in KSE. The findings of this study on empirical evidence recommends the following investment strategies, in which if financier takes long position on low growth portfolios may yield privileged returns as compare to making investment in high growth portfolios. Similarly, if financier would take short position in higher growth portfolios this would yield lower returns in comparison to the higher one. These strategies will help the financier to take benefit from the financial information of firms which helps in predicting the movement of stocks through which they can beat the market and generate abnormal higher returns.

LITERATURE REVIEW

In this chapter, firstly asset growth anomaly is discussed along with its various determinants to measure this growth effect (Sloan, 1996; Titman et al., 2004; Loughran and Ritter, 1995; Dechow et al., 2008 and Lyandres et al., 2008). The criticism has also been discussed over different methods to measure the asset growth anomaly and some of the theories related to risk and mispricing based explanations (Lyandres et al., 2008; Fama and French, 1993, 2008; Lakonishok et al., 1994; Cochrane, 1991, 1996; Jensen, 1986 & Sun and Zhang, 2008 etc). Then leading studies are also discussed to implement broader definition of total asset growth which gives more apposite and robust results (Cooper et al., 2008; Wen, 2013, Lipson et al., 2010 and Li & Sullivan, 2014).

Asset Growth Anomaly

Titman, Wie and Xie, (2004) explicitly disseminated the negative relationship of investment and stock return and introduced the term "asset growth effect". In which they pledges empirical evidence of, "The events of the firms associated with asset expansion (acquisitions, mergers, public debt offerings, public equity offerings, bank loans undertakings etc) subsequently attains low adjusted stock return and vice versa, this effect is known as "Asset growth anomaly" in asset pricing literature. Generally, it is perceived that stock prices of the firms should increase with its investments but it is bit intricate to formulate any elucidation where high stock returns are followed by high investments, because of the reason that firms only make constrained announcement that actually shows positive impact. Therefore, some studies claimed firms who make more investment results in negative returns of stocks (Loughran & Ritter, 1995). The reasons may include non- proper discloser of the investment opportunities and the risk embedded with the investment and poor performance of managers (Jansen, 1986). This asset growth effect is precisely defined by Richardson, Tuna and Wysocki, (2010) as: "Asset growth anomaly is a pattern in cross-sectional and time series stock returns, according to which corporate events associated with asset expansion in the balance sheet tend to be followed by periods of abnormally low returns, whereas events associated with asset contraction in the balance sheet tend to be followed by periods of abnormally high returns".

Determinants to Measure the Asset Growth Effect

The definition mentioned above of asset growth effect delineated, asset expansion of any firm can be computed from various factors. These factors are linked with accruals, investment and external financing effects. Accruals effect shows, the firm's growth or contraction through both the assets and liability sides of a balance sheet. Accrual anomaly was firstly introduced by Sloan (1996), by using the firms operating cash flows along with the non cash items in order to have more accurate figure of accounting income. In which he found that the firms with high accruals reports low stock returns in subsequent years. Investment effect shows, the growth or decline of a firm through the asset side of a balance sheet. Investment effect was firstly documented by Titman et al. (2004). In which they have used the proxy of capital expenditures (CAPEX) to measure the investments of firm's capital to study that how free cash flow and the low financial opportunities affects the investment and returns relationship. Similarly, liability side of a balance sheet as depicted by Loughran and Ritter (1995) claims that the debts and equity issuers under performs in the market in comparison with the non-issuers. The concept behind this is the q- theory of investment which states that, the more the issuer invest the lower his expected stock return will be. Different studies have discussed the relation of these three anomalies. Some researchers have found the link between the accruals and asset growth anomaly whereas, other found link between accruals with investment of a company. However, the relationship between the asset growth effects in different items of balance sheet with stock returns has been discussed in various studies. For instance, Dechow, Richardson and Sloan (2008) has found, anomaly of external financing is caused by accrual anomalies as their empirical findings supports it is the strong predictor of future abnormal returns. Similarly, Lyandres et al. (2008) also linked the investment climate of a firm with that of external anomalies.

Total Asset Growth Effect & Related Studies

The different determinants to measure the asset growth effect inaugurate another interesting debate on this ground that whether or not these accruals, investment and external financing anomalies are caused by the overall asset growth anomaly.

In this regard, Fama and French (2008) in their study of "Dissecting Anomalies" have analyzed the asset growth anomalies through considering the effects of size, value, momentum, accruals and net stock issues. In which they concluded that there exists an asset growth anomaly in case of small cap and small stock firms but not in larger stock firms. The question may arise, why Fama and French (2008) failed to evidenced the asset growth anomaly in case of large stock firms? Lipson et al. (2010) here extenuated that as they have captured the asset growth effect from different aspects rather than considering the single broad definition of total asset growth they left the external financing factor which is vital factor for the large firms. Similarly, Xing (2008) also claimed asset growth effect exists in all sizes of firms even in the very large companies which are usually left behind by most of the studies who work on asset growth anomalies as they measures asset growth effect of firms through some other measure.

Thus, the answer to the above question lies in the use of single broad definition of asset growth of a company. Cooper et al. (2008) have introduced the use of "Total asset growth" instead of using only asset growth components and claimed its simple definition can capture the overall firm's financing and investment activities. Through making the comparison of various determinants such as: Book-to-market value, size, accruals and other related growth factors; his study concluded that total asset growth is the best predictor. Therefore, this current research has also considered the total asset growth as a measure of company's growth to examine the asset growth anomaly in case of KSE.

Further, Wen (2013) extended the research of Cooper et al. (2008). In which they examined whether the firm level asset growth effect exists in aggregate stock market or not and found strong evidence of negative relation between the aggregate asset growth and future abnormal returns. They revealed that, aggregate asset growth is a strong predictor of stock returns but in a short run. Eventually, their findings claimed that the behavior or the sentiments of investors towards the firm's investment decisions is been captured by aggregate asset growth, consistent with the catering theory of investment. Conversely, Li and Sullivan (2014) have found evidence of asset growth anomaly on a global level exists and also revealed that this type of anomaly is a result of some combination of global systematic risk and mispricing in the market.

Theoretical Background of Asset Growth Anomaly

Several different arguments and theoretical explanations[2] for asset growth anomaly lead us to conclude that there are two prominent reasons behind the negative relationship between asset growth and stock returns. One is risk factor, compensated by companies for making the investments (Lyandres, Sun & Zhang, 2008) and the other is behavior of the investors which may cause anomaly when they over reacts on some information or news spread by the firms

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2- Theoretical explanation revolves around the rational or irrational asset pricing models. The rational asset pricing model referred as failure of CAPM model (Fama and French, 1993, 2008). Whereas, irrational asset pricing models are those which saves CAPM but makes the Efficient Market Hypothesis (EMH) wrong (Fama and French, 2004).

regarding the future investment decisions. This behavior of investors creates mispricing in the stock prices. Subsequently to make the correction for the real value of investments, returns of these firms lowers down during that period (Lakonishok, Shleifer &Vishny, 1994). Thus, the main argument here revolves around the rational or irrational asset pricing models with these two factors.

The irrational asset pricing model is one, as discussed earlier which fails to explain the linear relation between the risk and return but also fails to explain the anomalies such as size, value and momentum effects (Fama and French, 1993, 2008). In the context of risk based explanations, the firms who faced low asset growth and expansions are considered more risky by the investors for this reason they claimed higher returns to be compensated for the risk and vise versa. Thus according to this, anomaly occurs due to the compensation of risk factors made by the firms to investors (Lyandres et al. 2008).

Since priced risk explanations are not so apparent in traditional asset pricing models. One of the prominent explanations for rational asset pricing model is given by Tobin's (Q) theory (Cochrane, 1991, 1996). In which investment based asset pricing model explains that company's net present value (NPV) of its investments depends on discount factor of that company. This results in increasing the overall optimum level of investment if its NPV is increased along with the low cost of capital or expected returns. Thus, high investments are made by the companies who offer low returns; this has given rise to the concept of risk based explanations of asset growth anomaly with the discount factor. Another model which is based on risk explanation is real options model (Lyandres et al. 2008). This model explains that the companies which possessed real options which are related to the growth of their firm, the value of the company is thus based on the overall value of the total assets and the growth associated with real options. Due to the chances of un-certainty associated with these options they are considered riskier by the investors. Therefore the companies which holds limited or lesser amount of options are considered less risky. Thus due to the low risk premium, large growth companies offers low returns as compare to the smaller growth firms.

Besides the risk, behavior of investor also causes financial anomalies. One such imperative theory explains the behavior of investor, partially linked with the behavioral finance field named as, "management's empire building theory". This theory is based on the argument presented by Jensen (1986), in which he claimed that due to the effect of agency costs and empire building behavior of management, company makes excessive investment decisions and accumulates excessive assets but when share holders realize that their investments are not optimally allocated, the price adjusts to this behavior.

Thus, brief literature and theories related to the asset growth anomaly reveals that most of the studies are consistent with both the mispricing and risk based explanations. Consequently it is exceptionally difficult to conclude that the variation in the stock returns is due to risk or mispricing factors.

RESEARCH METHODOLOGY

This chapter first explains the research paradigm and the overall design of this study. Then in detail research procedure of this study is discussed in which measurement of variables, asset pricing models, data collection, methodology to capture the asset growth anomaly in stock market and construction of the deciles portfolios is illustrated.

Research Paradigm

The research paradigm of this study is post-positivist with deductive approach, through which the hypotheses are tested to answer out the fundamental research questions that, whether asset growth anomaly exists or not. Moreover, this study assumes the validity of scientific theories for example: Theory of modern portfolio, Efficient Market Hypothesis theory (Markowitz, 1952 and Kendell, 1953) and claims validity of this research accordingly.

Research Design & Data Collection

This empirical study is explanatory in nature and mono- quantitative method is followed. For this purpose data set is collected through Thomson Reuters Data Stream and Karachi Stock Exchange from (Jan 2001- Dec 2015). The annual frequency of asset growth ratios (selection criterion t-1) is considered. On the other hand market value (MV) is measured monthly at time (t-1) and the returns at time (t) monthly. The selection of the time period span is based on the accessibility of data and over the results of sorted portfolios. The unit of analysis is (KSE) all index, both listed/delisted (dead or alive) non-financial companies[3] . The reason to incorporate both dead and alive is to avoid the survivorship biasness[4] (Kostakis, Kashif & Siganos, 2011).

Research Procedure

Portfolio Construction & Variables Calculation

Campbell et al., (1997) acknowledged that portfolios are more appropriate as compare to individual stock returns, as individual stock returns contains idiosyncratic or company specific noise due to which it create obstacles in detecting the predictable pattern. However it can be tackled easily by constructing the portfolios. Portfolio has the lowest residual variance due to which its betas are better than individual stocks betas and are more stable over time in the presence of changes in risk or size of business (Cochrane, 2005). This study thus considered portfolio approach on monthly basis which requires the computation of discrete returns, market value, asset growth ratios.

Discrete returns of each non- financial (listed and de-listed) company in KSE all index is computed, because discrete returns are the sum of value weighted of each individual security, where the weights on each assets shows the portfolio's share in total investment in that asset (Campbell et al., 1997). For example: the return on portfolio (p) at time (t) using discrete method is

$$R_{pt} = \sum W_{i,p}.R_i, \quad where \quad i = 1,2,3,4. \tag{1}$$

3- Non-financial companies are considered because the capital structure of the financial companies is different, which in turns may affect the overall results. Number of companies listed and delisted in KSE all index (1995-2010) were (906), after excluding all the financial firms included investment houses, insurance firms, mudarabbas, banks etc, the Number of companies available for the analysis include only 655 (Non-financial companies from the period of 1995-2010).
4- The presence of survivorship biasness shows higher returns of the stocks as it incorporates only those firms which generate high returns which may misleads the overall results.

The data of Market Value (MV) is gathered from Thomsen Reuters DataStream with the mnemonic code of (MV). The Total asset growth effect is measured from this equation as suggested (Cooper et al., 2008).

$$AssetGrowth(t) = Totalassets(t) - Totalassets(t-1) / Totalassets(t-1) \qquad (2)$$

Where, Asset Growth (t) = Asset Growth ratio of a company at time t. Asset Growth (t-1) = Asset Growth ratio of a company at time t-1. Total Assets (t-1) = Total assets of a company at time t-1. Data of the Total asset growth (TA) was also available at Thomson Reuters Data-stream with the Mnemonic code[5] (wc02999).

Sorting Criteria & Portfolio Construction

Post ranking or more specifically single sorting method is adopted. In which we have sorted all the stock returns (monthly at time t) in ascending order based on each stock's asset growth ratio (annually at time t-1) and the MV is sorted (monthly at time t-1) in order to compute the portfolio sorted returns at time (t). Data is then arranged in ten portfolios or deciles (P1-P10) ranging from low asset growth to highest. Both equally weighted (EW) and value weighted (VW) returns are formed to check the robustness of all the portfolios (Kashif, 2013). The profitability of both equally weighted (EW) and value weighted (VW) asset growth based portfolios are then checked through using three different asset pricing models.

Capital Asset Pricing Model (CAPM)

In first step of empirical analysis, the formal test of CAPM by Sharpe (1964); Lintner (1965) and Mossin (1966) is used through which the profitability of both equally weighted (EW) and value weighted (VW) returns of asset growth based portfolios is checked. This asset pricing test is based on two types of techniques i.e. Cross sectional and Time series regression. In time series approach, the model estimates that all the factors which priced the stocks returns are known. Through this method sensitivity of the returns can be estimated very easily by knowing the values of all the factors. This technique considers only one factor at different period of time. Whereas, in the cross sectional regression the values of the factors are predicted by the model on the basis of returns and their sensitiveness at particular period of time (Sharpe et al., 1999). Fama and French, (1993) has evaluated the performance of returns through using the time series regression and also proved that the intercept term in the time series regression via CAPM or any asset pricing model can be used for evaluating the portfolio's returns performance where the slope shows the risk factors details which are used to explain the estimated asset returns. Therefore, this study has also adopted the time-series approach. The CAPM equation is as follows:

$$R_{i,t} - R_{ft} = \alpha_{(jensen)} + \beta_i (R_{m,t} - R_{ft}) + \varepsilon_{i,t} \qquad (3)$$

Hypothesis of CAPM test includes:
H0: $\alpha i = 0$
H1: $\alpha i \neq 0$ [where, i = 1,2,3...10]

5- Mnemonic code, is the special code for each individual series in Thomson Reuters Data stream

Where: (R_i,) is the return of portfolio i in month t, (R_{tf}) is the risk-free rate for month t, captured by 6 months (T-bill rate) at time (t) monthly rate, (R_m) is the return on market portfolio, captured by Karachi Stock Exchange all index, (R_m, $-$ R_{tf}) is the excess market portfolio return in month t, (β_i,) is the exposure of portfolio i to the (market return). This model holds to be valid, if Jansen alphas in sorted portfolios results significant zero value presenting that market is efficient.

Fama-French Three Factor Model

Several different models were constructed to relax some assumptions of basic CAPM (Jensen, Black & Scholes, 1972). In the second step of empirical testing Fama and French (1993) three factor asset pricing model is applied as:

$$\left(R_t - R_t^f\right)^p = \alpha_t^{3factor} + \beta_t\left(R_m - R_t^f\right) + \gamma_t SMB_t + \delta_t HML_t + \mu_t \tag{4}$$

Where, SMBt[6] is a size factor, HML[7] is book-to-market risk factor, γ_t and, δ_t both are partial regression co-efficient which captures the risk sensitivity of size and book-to-market value factors.

Fama-French Five Factor Model

This Fama-French three factor model is further expanded to Five Factor model by Fama & French (2015), in which profitability[8] RMWt and investment factor[9] CMAt are also included: [see: appendix (B)]

$$\left(R_t - R_t^f\right)^p = \alpha_t^{5factor} + \beta_t\left(R_m - R_t^f\right) + \gamma_t SMB_t + \delta_t HML_t + \theta_t RMW_t + \lambda_t CMA_t + \mu_t \tag{5}$$

GMM (Generalized Methods of Moments)

For the estimation purpose the system of equation is constructed based on method of Newey and West's (1987) GMM (Generalized Moments Method) is used for the estimation of "W" an estimator of weighting matrix which can tackle both the autocorrelation and hetro-skedasticity problem in non- normal data (Cochrane, 2005) [see: appendix (A)].

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Application of Wald Test

Lastly, Wald test similar to the Chi-square test is used to test that how the estimated parameters are far from zero in standard errors under null hypothesis. It is a joint significance test which shows overall fit of a model.

6- SMBt shows more differences in asset return with respect to time as the small firms are more profitable than the big ones, this size factor can capture the risk sensitivity in stock returns. The data of this variable is considered on market capitalization as mimicking portfolios constructed in Fama & French (1993, 2015)
7- HMLt captures more volatility in returns in stochastic process. The low b-to-m ratio shows high market price and vice versa. For this variable data on book-to market equity ratio is used.
8- Profitability may have effects on book-to-market equity ratio. Therefore it can be priced in asset pricing model. For which data on operating profits after deducting dividends is used.
9- The future returns depend on Investment decisions. The aggressive investment with no earnigs or vice versa both may affect firm's cash flows and then its returns. For which, data on net change in total assets from the fiscal-year t-2 to fiscal-year t-1.

Data Collection Method

Secondary data of all the companies listed (dead or alive) is collected from the Thomson Data stream of the variable named asset growth ratios of all listed (dead or alive) companies (easily available with the Mnemonic code (wc02999)) and stock returns from the KSE official data-base on monthly basis. However, risk-free rate on monthly basis, is captured by KIBOR (Karachi Inter Bank Offer Rate) from (1995-2010) monthly.

Variables

This study includes the following dependent and independent variables along with their proxies:

Dependent Variable

- R_i,t is the portfolio sorted return of portfolio i in month t, minus $R_t f$ is the risk-free rate for month t, captured by KIBOR (Karachi Inter Bank Offer Rate),

Independent Variable

- $R_t f$ is the risk-free rate for month t, captured by KIBOR (Karachi Inter Bank Offer Rate),
- Rm is the return on market portfolio, captured by Karachi Stock Exchange all index and
- $(Rm, - R)$ is the excess market portfolio return in month t.
- βi, is the exposure of portfolio i to the Rm (market return).

EMPIRICAL RESULTS & ANALYSIS

In this section, we firstly represent preliminary descriptive statistics of deciles portfolios of asset growth anomaly. The study has constructed both Equally Weighted (EW) & Value Weighted (VW) returns which are the annualized average monthly returns of EW & VW portfolios. The deciles portfolio ranges from (P1-P10). P1 represents the lowest asset growth companies and P10 represents the highest. The difference of P1-P10 shows the level of spread. The second part explains the results of time series asset pricing test where risk adjusted performance of equally weighted and value weighted returns are discussed.

Table 1: Characteristics of Asset Growth in Deciles Portfolios of Full Sample   (2001-2015)

	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	(P1-P10)	(T) Values
Median (AG)	-0.16	-0.05	-0.01	0.04	0.08	0.12	0.18	0.27	0.43	0.81	- 0.96	-49.19*
EW returns, % p.a.	0.86	0.85	0.34	0.48	0.97	0.29	0.26	0.76	0.50	-0.22	1.08	1.84*
VW returns, % p.a.	0.32	0.60	0.19	-0.16	0.35	-0.00	0.37	0.06	-0.24	-1.07	1.40	2.19**
MV (Rs-Million)	2477	2373	3479	3354	3723	4467	3797	3598	4227	3509	-1032	- 3.99*
CAPM (beta)	.85	.90	.95	1.05	1.00	1.20	0.55	.85	1.00	1.10	0.25	3.75

The table represents the characteristics of the asset growth in deciles portfolios from the period of Jan 2001-Dec 2015. All the shares are sorted at month (t) in ascending order. P1 represents the lowest asset growth companies and P10 represents the highest. P1-P10 shows the level of spread. Equally Weighted (EW) & Value Weighted (VW) returns are the annualized average monthly returns of EW & VW portfolios. MV represents the average market value of shares in each portfolio. CAPM beta shows the sensitivity of market risk which is an estimate of VW returns. The last column shows the t-statistics, where the single (*) means 10% chance of rejecting true null hypothesis that there exists no difference in means between the P1 & P10 characteristic. On the other hand (**) and (***) shows 5% and 1% respectively.

The table.1 represents descriptive statistics of deciles portfolios of the full sample (2001-2015). The statistics shows that, P1 (low asset growth firms) are having low beta i.e. 0.85 means they are less risky but EW (Equally weighted) and VW (Value Weighted) returns in the table exhibits they are earning higher returns 0.86% p.a. and 0.32% p.a. respectively. On the other hand, P10 (High asset growth companies) have high beta i.e. 1.10 means they are highly risky but they suffers negatively low returns (EW) -0.22% p.a. and (VW) -1.07% p.a. respectively. However the partial difference between (P1-P10) of EW and VW returns are 1.08% (1.84) and 1.04% (2.19) respectively are both statistically significant in decile portfolios. These results are all in lined with the theory of asset growth anomaly as mentioned earlier.

Risk adjusted Performance of Returns by using three Asset Pricing Models

Risk adjusted performance of returns are also estimated to assure the asset growth anomaly. Therefore, for the evaluation process the Jensen alphas of CAPM, Fama & French (three and five factor) models are considered and for the estimation, GMM method is used.

Table 2: Jensen Alpha of Equally Weighted (EW) Asset Growth Portfolio

	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P1-P10	Chi-Sqr.
CAPM (Alpha)	0.95	1.00	0.64	0.41	0.84	0.65	0.49	1.08	0.69	-0.15	1.10	26.51
.	(2.33)**	(2.17)**	(1.72)*	(1.05)	(2.37)**	(2.30)**	(1.29)	(2.75)***	(1.83)**	(-0.35)	(2.38)**	(0.00)**
FF3 (Alpha)	1.60	1.30	1.13	0.78	1.24	1.20	0.50	1.00	0.82	-0.19	1.78	31.62
	(3.03)***	(2.33)**	(2.35)*	(1.60)*	(3.07)***	(3.03)***	(1.24)	(2.06)*	(2.06)**	(-0.36)	(3.02)***	(0.00)**
FF5 (Alpha)	1.67	1.34	1.18	0.86	1.31	1.28	0.54	0.99	0.74	-0.15	1.82*	31.12
	(3.17)***	(2.44)**	(2.34)**	(1.80)*	(3.03)***	(3.28)***	(1.28)	(2.00)***	(1.86)*	(-0.31)	(2.96)***	(0.00)**

The table represents the value weighted asset growth in deciles portfolios of sample period from Jan 2000-Dec 2010. The single (*) means 10% chance of rejecting true null hypothesis that there exists no difference in P1 & P10 alphas. On the other hand (**) and (***) shows 5% and 1% respectively.

The table (2) shows the CAPM Jensen alpha values of deciles portfolios ranging from P1-P10, It is clearly showing from the full- sample period that the Jensen-alpha values of P1 (low growth companies) shows high (positive) value i.e. 0.95. Whereas, P10 (high growth companies) shows the low (negative) value i.e. -0.15. These resulted values show some what evidence of asset growth anomaly. Furthermore, the level of spread is also found positive and statistically significant. The chi- square values elucidate clearly that there exists cross sectional variation in returns among the value weighted portfolios (P1-P10) as p-values are found less than 0.010. Therefore, we can claim that asset growth anomaly do exists. Fama-French (three & five) factors models also represents the similar results. The alphas of P1 are high (positive) with 1.60 & 1.67 values respectively and P10 shows the low (negative) values of -0.19 & -0.15 respectively. The level of spread also exhibits positive values at 1 % significance level. The overall outcome of Equally Weighted (EW) portfolios is statistically significant through CAPM, Fama & French three and five factor models. The chi- square values of all models depict that there exists cross sectional variation in returns with positive significant values. This contributes a strong evidence of Asset Growth anomaly in KSE as stated in descriptive statistics and even through the application of risk adjustment in equally-

weighted returns, anomaly remains intact. The findings empirically means that, all the three asset pricing models are mis-specified and there is an additional factor like asset growth anomaly through which stocks can be predicted.

Table 3: Jensen Alpha of Value Weighted (VW) Asset Growth Portfolios

	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P1-P10	Chi-Sqr.
CAPM(Alpha)	0.58	0.71	0.54	-0.37	0.27	0.36	0.40	0.13	-0.08	-0.21	0.79	12.47
	(1.24)	(1.15)	(1.36)	(-1.02)	(0.77)	(1.24)	(1.22)	(0.41)	(-0.18)	(-0.46)	(1.50)*	(0.26)
FF3 (Alpha)	1.02	0.63	0.77	-0.14	0.50	0.64	0.38	0.11	-0.25	-0.48	1.50	13.85
	(1.65)*	(0.92)	(1.71)*	(-0.33)	(1.32)	(1.71)*	(0.99)	(0.31)	(-0.45)	(-0.96)	(2.23)*	(0.18)
FF5 (Alpha)	0.94	0.68	0.81	-0.06	0.60	0.70	0.48	0.11	-0.25	-0.43	1.36	14.53
	(1.50)*	(1.01)	(1.70)*	(-0.14)	(1.52)*	(1.84)*	(1.13)	(0.27)	(-0.43)	(-0.85)	(1.92)*	(0.15)

The table represents the value weighted asset growth in deciles portfolios of sample period from Jan 2000-Dec 2010. The single (*) means 10% chance of rejecting true null hypothesis that there exists no difference in P1 & P10 alphas. On the other hand (**) and (***) shows 5% and 1% respectively.

The Jensen alphas results of Value Weighted (VW) asset growth portfolios failed to explain significance in any of the asset pricing model. However, the (EW) values are mostly used and preferred by portfolio managers to capture the pattern and (VW) results are more close to financial theories (Kashif, 2013). Thus, this study gives strong support of asset growth anomaly through (EW) returns.

CONCLUSION & RECOMMENDATIONS

The empirical evidence of time- series regression results support the existence of asset growth anomaly in KSE market as demonstrated in descriptive statistics and even through the application of risk adjustment in Value Weighted (VW) returns anomaly remains intact. The use of Generalized Methods of Moments (GMM) proved that Capital Asset Pricing Model (CAPM), Fama-French (three and five factor) models are mis-specified models in case of KSE because they all botched to elucidate the cross sectional variation in portfolios returns based on firm's asset growth. The results of this study are highly consistent with the Fama & French (1993, 2015).

On the basis of these results, strong argument is developed that asset growth anomaly is a key factor in stock returns of KSE as it captures the cross-sectional variation in stock returns better than asset pricing models. The empirical findings recommends investing in small growth firms is an appropriate sound strategy to generate abnormal higher returns as we claim stocks can be predicted on the basis of asset growth anomaly and through developing the strategy i.e. by taking the long position in low growth stocks and short position in high growth stocks, investors may generate positively higher returns in Pakistan. For future research, various macro-economic variables such as interest rates, exchange rates, inflation rates etc can also add-up in this study to check the persistence of asset growth anomaly even with shocks of macro-economic variables.

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APPENDIX (A)

GMM (Generalized Methods of Moments)

The system of equation is constructed based on GMM (Generalized Moments Method) both the autocorrelation and hetro-skedasticity problem is tackled. For this, Cochrane (2005) presented linear regression equation to estimate the excess returns as,

$$R_i, = \alpha_i + \beta_i F + \varepsilon_{i,t} \ (t = 1...T, i = 1...N) \tag{6}$$

This equation assumes that returns are linearly related to betas.

$$R_{i,t} = \beta_i(F) \tag{7}$$

By comparing both the equations it is found that alpha i.e. intercept=0. As Ri, shows the excess return at time t. "T" shows the length of time series period. However, F is K*1 vector which contains all the risk factors used for pricing the stock returns and βi is the vector of betas. The above model shows the linear relationship of excess returns and betas as it exhibits for only one factor. However, Black (1972) claimed that time series regression is used to estimate "N" number of asset returns. On the other hand, Cochrane (2005) proved that separate regressions of each individual asset return is only possible when the regression errors are homo-skedastic and un-correlated and further suggested that it is more appropriate to use GMM approach as it provides equation in vector form to estimate "N" asset returns. The above equation is restated as:

$$R_{tx} = \alpha_i + \beta_i(f_t) + \varepsilon(t) \tag{8}$$

Where: $Rtx = \begin{bmatrix} R_1 \\ . \\ . \\ R_{10} \end{bmatrix}$

This vector of 10x1 shows the excess returns of stocks as sorted in ten- deciles portfolios.

Similarly, $\alpha = \begin{bmatrix} \alpha_1 \\ . \\ . \\ \alpha_{10} \end{bmatrix}$

This vector of 10x1 shows the intercepts of the model.

However,
$$\beta = \begin{bmatrix} \beta_1 \\ . \\ . \\ \beta_{10} \end{bmatrix}$$

This vector shows the total change in the returns of the stock due to the one unit change in market risk. On the other hand, ft =[F] which shows another risk factor which can capture the asset growth anomaly if it exists.

The other error vectors is,
$$\varepsilon(t) = \begin{bmatrix} \varepsilon_1 \\ . \\ . \\ \varepsilon_{10} \end{bmatrix}$$

The overall equation is now as:

$$Rtx = \begin{bmatrix} R_1 \\ . \\ . \\ R_{10} \end{bmatrix} + \begin{bmatrix} \alpha_1 \\ . \\ . \\ \alpha_{10} \end{bmatrix} + \begin{bmatrix} \beta_1 \\ . \\ . \\ \beta_{10} \end{bmatrix} * [F] + \begin{bmatrix} \varepsilon_1 \\ . \\ . \\ \varepsilon_{10} \end{bmatrix}$$

Where, E(εt) = 0 and Cov (f t,εt)=0

Now, the ($\propto$) which refers to denote the set of unknown parameters is replaced by using the θ. Then the GMM equation will be transformed into the following quadratic equation. Where, the (W) refers to the estimator of weighting matrix and is used to account for the problems of autocorrelation and hetro-skedasticity. Furthermore, the method of Newey and West's (1987) is used for the estimation of W used in this GMM equation.

Thus the equation of GMM can be defined as:

$$Z_t(\theta) = \begin{bmatrix} (R_{tx} - \alpha - \beta_{ft}) \\ (R_{tx} - \alpha - \beta_{ft}) \otimes [f_t] \end{bmatrix} \tag{9}$$

APPENDIX (B)

Construction of Mimicking Portfolios for SMB, HML, RMW and CMA Factors

To construct the portfolios for Fama-French three factor model, we followed mimicking portfolio construction used by Fama and French (1993). The size factor data was divided into two sub-groups, small (S) and bid (B) market capitalization firms, by using median as a breakup point and book-to-market equity factor data was divided into three sub-groups, high (H), neutral (N) and low (L) book-to-market equity firms, by using 30th and 70th percentiles as breakup points. The portfolios were made on 2x3 sorting criteria, where SMB factor is a simple average of returns on small market capitalization portfolios minus big market capitalization portfolios and the HML factor is a simple average of returns on high book-to-market equity portfolios minus low book-to-market equity portfolios. On the basis of 2x3 sort of SMB and HML factors the six portfolios formed, are as under:

SH = *Portfolio of small market capitalization firms and high book-to-market equity ratio firms.*
SN = *Portfolio of small market capitalization firms and neutral book-to-market equity ratio firms.*
SL = *Portfolio of small market capitalization firms and low book-to-market equity ratio firms.*
BH = *Portfolio of big market capitalization firms and high book-to-market equity ratio firms.*
B**N** = *Portfolio of big market capitalization firms and neutral book-to-market equity ratio firms.*
BL = *Portfolio of big market capitalization firms and low book-to-market equity ratio firms.*

The construction of portfolios for Fama-French five factor model, the study used (2x3) sort, used by Fama and French (2015). The size factor and book-to-market factor data were divided into 2 and 3 categories similarly to three factor model. The profitability factor data was divided into three sub-groups, robust (R), neutral (N) and weak (W) operating profitability firms, by using 30th and 70th percentiles as breakup points. Moreover, the investment factor data was also divided into three sub-groups, conservative (C), neutral (N) and aggressive (A), same like the previous factors by using 30th and 70th percentiles as breakup points. Here, the construction of size factor is different from the three factor asset pricing model. The size factor (SMB) was constructed by subtracting nine portfolios of big stocks from nine portfolios of small stock. On the basis of 2x3 sort, the study formed eighteen portfolios, are as under:

SH = *Portfolio of small market capitalization firms and high book-to-market equity ratio firms.*
SN = *Portfolio of small market capitalization firms and neutral book-to-market equity ratio firms.*
SL = *Portfolio of small market capitalization firms and low book-to-market equity ratio firms.*
BH = *Portfolio of big market capitalization firms and high book-to-market equity ratio firms.*
BN = *Portfolio of big market capitalization firms and neutral book-to-market equity ratio firms.*
BL = *Portfolio of big market capitalization firms and low book-to-market equity ratio firms.*
SR = *Portfolio of small market capitalization firms and robust profitability firms.*
SN = *Portfolio of small market capitalization firms and neutral profitability firms.*

SW = *Portfolio of small market capitalization firms and weak profitability firms.*
BR = *Portfolio of big market capitalization firms and robust profitability firms.*
BN = *Portfolio of big market capitalization firms and neutral profitability firms.*
BW = *Portfolio of big market capitalization firms and weak profitability firms.*
SC = *Portfolio of small market capitalization firms and conservative investment firms.*
SN = *Portfolio of small market capitalization firms and neutral investment firms.*
SA = *Portfolio of small market capitalization firms and aggressive investment firms.*
BC = *Portfolio of big market capitalization firms and conservative investment firms.*
BN = *Portfolio of big market capitalization firms and neutral investment firms.*
BA = *Portfolio of big market capitalization firms and aggressive investment firms.*