*JKAU: Islamic Econ.,* Vol. **29** No. 2, pp: 37-54 (July 2016)
DOI: 10.4197 / Islec. 29-2.3

# Risk and Returns of Sharīʿah Compliant Stocks on the Karachi Stock Exchange – A CAPM and SCAPM approach

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***Abstract.*** This study documents the asset pricing mechanism of Sharīʿah compliant securities listed on the the Karachi Stock Exchange. We select the CAPM market model to test for the impact in variations of stock returns on a sample of Sharīʿah-compliant companies on ten years monthly data (2001-10). We first test the basic CAPM (Capital Asset Pricing Model) and its modified form known as the Sharīʿah-compliant asset pricing model (SCAPM). We also analyse return differences due to size (market capitalization), book to market (B/M) value, price-earning ratio (PER), and cash-flow yield (CFY). Our results find a strong impact of the market index on stock returns (adj-$R^2$ 70%) and confirm the anomalies of size, B/M, CFY, and PER, while SCAPM is slightly better in explaining variations in cross-sectional stock returns.

***Keywords:*** CAPM, SCAPM, Sharīʿah-compliant securities, size, book to market, cash flow yield, price earnings ratio, asset pricing.

**KAUJIE Classification:** L41.

## 1. Introduction

Islamic finance is an emerging business area where activities of financial market players are regulated by Sharīʿah (Islamic law). The major differences between conventional and Islamic finance include: (i) prohibition of *ribā* (interest) in business dealings (ii) law of prohibited and permitted business activities (iii) profit and loss sharing by the financier (iv) prohibition of *gharar* (uncertainty/excessive risk) and (v) prohibition of *maysir and qimār* (gambling/ speculation). Islamic Financial Institutions (IFIs) operate worldwide with an asset base of about US$ 1,700 billion by the end of 2013 (WIBCR-2014). The Islamic finance industry has shown tremendous growth in the first decade of the 21st century. Globalassets of Islamic finance increased by 21% per annum from 2007-13 and depicted a growth of 38% and 25% in 2007 and 2008 respectively (IFSL-2013)(1), an era of economic downturn in the developed world. Although IFIs have succeeded in

(1) Growth calculated by author through equation, $FV = PV(1+G)^n$.

getting the trust of depositors and collect deposits on a profit and loss sharing basis, however, investment avenues for IFIs are limited in comparison with conventional banks due to Sharīʿah constraints. IFIs cannot invest in interest based instruments of financing, hence, government securities, corporate bonds, and other interest-based investment schemes are eliminated. Even for investment in equities, IFIs have to screen out the firms, for investment, through Sharīʿah compliance filters (KMI-2008).

Under the Islamic financial system, risk and return relationships are yet to be developed in a statistical/ mathematical model form, however, the principle is well defined; the whole philosophy of business/ investment under the Sharīʿah framework is based on the principle of bearing risk to earn profit. According to a famous *ḥadīth*: *"Sales transaction of something which is not in your possession is not lawful, nor is the profit arising from something which does not involve liability"* (English translation by Khan, 1989, 72). A well-defined and established principle of Islamic financing is that there is no risk-free return opportunity. Profit on the underlying project is linked to bearing the risk of loss; otherwise, it is *ribā* (interest) which is forbidden in Sharīʿah. Rationality states that return on less risky projects should be lesser in comparison to high-risk projects.

The capital market is one of the major mecahnisms thatdiverts funds from savers to investors. According to AAOIFI[2] Sharīʿah standards no. 12, 17, 20 and 21, except for a few activities[3] conventional capital market operations are in line with Sharīʿah teachings. Islamic finance is expanding in the capital market in the form of Islamic indexes, *ṣukūk*, money market and equity market funds. One of the major challenges for the Islamic financial industry is liquidity management through investment in marketable securities. Sharīʿah compliance of the underlying security (equity, bond) is a pre-requisite to qualify for investment by an Islamic bank/asset management company. Investment in equities is allowed with certain restrictions to ensure the Sharīʿah-compliance of the investee. As a matter of fact, only those companies qualify for investment by Islamic banks which display a Sharīʿah-compliant character in operations as well as finances. Ideally, two major features of Sharīʿah-compliance including interest free finances and *ḥalāl* (permitted) business are required in their entirety, however, keeping in view the existing business environment, expectation of complete adherence to these features by an equity security may be inappropriate. Hence, *ʿulamā'* have accepted a minor violation, although income generated through *ḥarām* sources must be utilized for charitable purposes. There are about ten Islamic indexes operating worldwide, engaged in the filtration of securities through Sharīʿah compliance tests. There exist differences in filtering criteria of these indexes and it is possible that a company is Sharīʿah-compliant under one index and not under other(s). Derigs and Marzban (2008) have documented such differences.

How to value a security under a Sharīʿah-compliant financial system is a major concern for investors and researchers. Under conventional finance, the intrinsic value of a security is determined through the discounted cash flow method. To determine the required rate of return, a large number of models have been developed by researchers including: opportunity cost; capital asset pricing model (CAPM); arbitrage pricing theory (APT); and a range of multifactor models. The Capital Asset Pricing Model (CAPM), developed by Sharpe (1964), states that expected return on an asset is a linear function of the expected risk of the asset (measured through beta). CAPM is the most widely used and tested model due to its simplicity and easy application being reliant on a single risk factor (i.e. beta). Under the Sharīʿah compliant financial system, applications of CAPM in its original form may be limited due to the use of a risk-free return (RFR), and as such, modified forms have been suggested for Islamic finance, by replacing RFR with the *zakāh* rate (Ashker, 1987), NGDP (Sheikh, 2010) and inflation (Hanif, 2011).

(2) AAOIFI (Accounting and Auditing Organization for Islamic Financial Institutions), based in the state of Bahrain, has issued accounting, auditing, and corporate governance and Sharīʿah standards for guidance of the Islamic finance industry. Sharīʿah Standard (SS) 12 is about partnership and modern corporations, SS 17 is about investment *ṣukūk*, SS 20 is about commodities in organized markets, and SS 21 is about shares and bonds.

(3) Including preference shares, *tamattuʿ* shares, purchase of shares through interest based loans, margin sale, short selling, lending of shares, application of *salam* contract, futures, options, swapping, renting of shares and trading of interest based bonds.

This study examines the valuation process of Sharīʿah compliant securities listed on the Karachi Stock Exchange, covering the ten year period of 2001-10. To determine the required rate of return, CAPM and its modified form, the Sharīʿah compliant asset pricing model (SCAPM) is tested. We want to document the significance of the relationship and impact of the market index on stock returns of Sharīʿah compliant securities. Also, this study checks for CAPM anomalies based on firm size, book to market value, cash flow yield and the price-earnings ratio. Our study varies from the previous literature in several regards:

(a) This is the first study conducted on a unique sample of Sharīʿah compliant securities.

(b) We analyze the role of size, book-to-market (B/M), cash-flow-yield (CFY), and price-earnings-ratio (PER) in the return generating process; and

(c) This study includes tests of CAPM and the modified CAPM (replacing RFR with inflation).

This study is useful in various aspects. First, we uncover the impact of the market index on security pricing of Sharīʿah compliant securities, which is so far unaddressed to date in the Karachi market. Second, this study is conducted on a sample of Sharīʿah compliant equities, which will assist the Islamic financial industry in their investment decisions. Third, we analyse CAPM anomalies to provide evidence from the local market. Fourth, this study provides evidence about the application of modified CAPM [SCAPM] as suggested by Hanif, (2011).

The paper is structured as follows: in section two, a summary of the literature is reported, followed by a brief introduction of the Karachi Stock Exchange (KSE) and Sharīʿah compliant securities in Ssection three. Section four includes the purpose of the study and in Section five we outline the research methodology. iResults and discussion are presented in section Six. Section seven concludes.

## 2. Literature Review

Valuation of assets has remained at the heart of finance since the early decades of the twentieth century. The value of an asset, a group of assets, a firm, or a portion of the firm can be further elaborated under different valuation concepts including book value (net worth), market value (prevailing in the market), price (a customer is willing to pay) and intrinsic value (the real worth). This study focuses on the intrinsic value of risky securities. The value of risky assets is determined through the risk and return relationship i.e. riskier assets should offer a higher return, hence, lesser in value. In order to determine expected risk and return, certain forecasts are to be made including expected return of a security, timing of realization of these returns and expected variability of these returns (Harrington, 1987). Several valuation models e.g. Modern Portfolio Theory-MPT (Markowitz, 1952), Capital Asset Pricing Model-CAPM (Sharpe, 1964), Arbitrage Pricing Theory (Ross, 1976), the Multifactor model (Fama and French, 1992; Carhart, 1997) were developed to determine the value of a risky security. The basic assumption of these valuation models is that expected risk and return relationship should be analyzed in the context of a portfolio ( combination) of assets.

A landmark study in the valuation of capital asset pricingis the development of portfolio theory (MPT) by Markowitz (1952), via risk quantification (through risk-return variance analysis) . Modern portfolio theory asserts that investors are concerned about portfolio risk and return; hence, relevant measures are portfolio risk and return. Whenever a combination of assets, having less than perfect positive and/or negative correlation is formed in a portfolio, risk reduces; and in an exceptional case, it could be minimized to zero. How much diversification (inclusion of a number of securities) ensures elimination of diversifiable risk? The answer much depends upon stock selection. If one could select stocks with near to perfect negative correlation, an efficient diversification point is reached immediately. Harrington, (1987) states that the most dramatic reduction in non-market related risk was achieved with about a 14 stock portfolio.

As a further development of asset pricing theory, CAPM was introduced by the Nobel laureate, William Sharpe, in 1964. CAPM suggested beta (co-movement of a security with the portfolio of risky assets) as a measure of relevant/systematic risk, as unsystematic[4] risk can be eliminated through meaningful diversification. While Markowitz (1952)

(4) Unsystematic risk is unique to a company and not the risk of the system.

identifies variance as a measure of risk (total risk of a security), CAPM accounts for only a single portion of risk (i.e. systematic risk). To calculate the required return on an investment opportunity, we need three variables including: the return on the market portfolio; risk-free rate; and beta, under the CAPM framework. In the following paragraphs, a critical account of CAPM theory (in practice) is presented.

The basic design of CAPM was as a predictive model, however in practice, most of the time data are taken from the past. Also, calculation of beta much depends upon the length of period and frequency of observations (Harrington, 1987; Hanif, 2010). As suggested by the evidence, beta changes with the choice of length and choice of the interval, hence, every investor will not be looking for the same risk premium, resulting in placing the security at other than the security market line. Another issue is the selection of the market proxy for calculating beta. Theoretically, it is a market portfolio of all risky assets; however, organized data is available for equity markets only, hence in various studies, the market portfolio is used as a proxy for the risky portfolio, which is not a true representative of all risky assets. Also, there are different indexes [DJIA, S&P (USA), KSE-100, KSE-30 and KMI-30 (Pakistan)], leading to different results (Frankfurter, 1976; Peterson, 1972). In the presence of such a polarization, the basic assumption of CAPM of homogeneous expectations among investors is violated. Another variable in the CAPM model is the risk-free rate. CAPM assumes that a risk-free rate exists for investors and risk premium should be provided for undertaking risky investments. In reality a true risk-free rate does not exist due to the control of governments and central banks. Ideally, the risk-free rate should compose of the time value of money and inflation charge. In some economies, inflation crosses the risk-free rate. Despite these limitations CAPM is the most widely tested and practically used model in the prediction of stock returns and portfolio selection, perhaps due to the very appealing theory. Harrington, (1987, 94) documented that across a large number of studies the average R square is 0.33 between returns for a single security and the market, and for portfolios the results are even better, which is sufficient to justify existence and use of CAPM as a valuation model. However some additional questions have empirically arisen on the validity of the model including the effects of liquidity, market value (size), and basic macroeconomic variables, whether these are represented by a market portfolio (used in practice, is an index of a stock market)? Further issues include the impact of taxes, transaction cost, single period versus multi-period horizons and non-homogeneous investment horizons of investors.

Empirical evidence on the explanatory power of CAPM is mixed. Since the development of the CAPM, a number of studies have been conducted testing the validity of the model. [e.g. Lau, et. al; (1974), Hansson and Hordahl (1998), Huang (2000), Gomez and Zapatero, (2003), Fraser, et. al; (2004), Michailidis, et. al; (2006), Guo, et.al; (2008)]. In Pakistan, at least, four studies are known to the authors (Iqbal and Brooks, (2007), Javed and Ahmad, (2009); Hanif and Bhatti, (2010); and Hanif, (2010), on the Karachi stock market. Iqbal and Brooks (2007) documented that for daily data stock-returns are explained by risk factors and results are better for three factors than a single factor. Javed and Ahmad (2009) conclude that the traditional CAPM performs well in explaining the risk and return relationship but the results are only convincing for few stocks and only for few years. They support the use of the conditional multifactor model over the traditional single factor model for decision making. Hanif and Bhatti (2010) document that CAPM is not fully applicable for the KSE (Pakistani stock market) and required returns calculated through the CAPM equation cannot be used to make investment decisions.

To conclude, although results are mixed they favor the inapplicability of CAPM in its original form and demand modification. CAPM relies on a single measure of risk (beta) and ignores other factors (micro as well as macroeconomic) contributing to the risk of a security. The basic risk-return relationship, however, is not rejected and hence, the model retains its place in the literature and can be a helping hand to investors with certain modifications, especially, the inclusion of more risk factors as suggested in APT/ multifactor models.

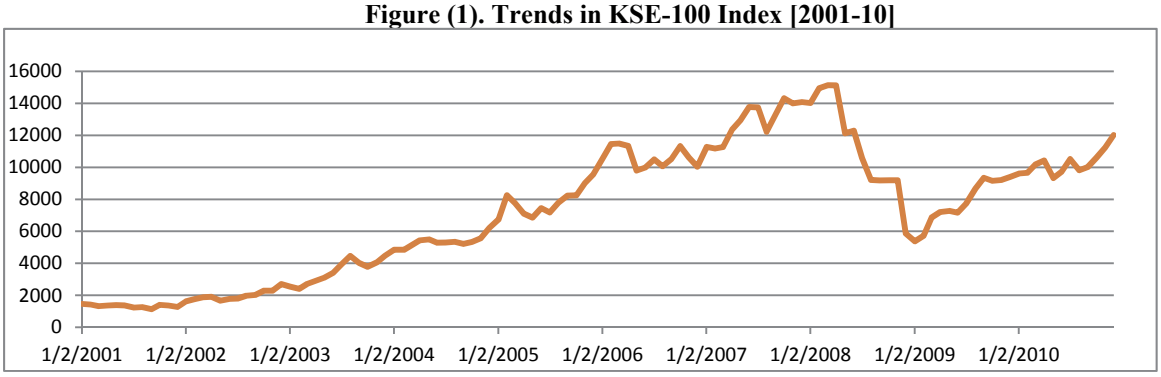
Under the Sharīʿah framework, the risk-free return is not allowed and so the basic CAPM model is inappropriate as discussed by Ashker, (1987); Tomken and Karim (1987); Sheikh, (2010); and

Hanif, (2011). Replacement of the risk-free rate was suggested as the *zakāh* rate, NGDP growth, and inflation. Inflation is a more appropriate replacement than the other two variables, ensuring capital maintenance for the investor. This study will provide evidence on application and anomalies of CAPM and its modified form [SCAPM] from an emerging market on a sample of Sharīʿah compliant securities.

## 3. Institutional Settings

The stock market in Pakistan consists of three stock exchanges i.e. Karachi Stock Exchange (KSE-100), Lahore Stock Exchange (LSE-30) and Islamabad Stock Exchange (ISE-10). KSE was established in 1947. LSE was established under the Companies Act 1913 on 5th October 1970 and started working by December 1970(5). The Islamabad Stock Exchange (ISE) was incorporated as a limited company on 25th October 1989 in the Islamabad capital territory of Pakistan(6). The capital market is regulated by the Securities and Exchange Commission of Pakistan (SECP) established in 1997 (earlier known as Corporate Law Authority, established in 1947). KSE is the main national market. Although the decade of 1960's is known for industrialization in Pakistan and the number of total companies rose to 318 in 1971 (Qayyum and Kemal, 2006), however, the momentum could not last for a longer period and in the 1970s government started and completed mass nationalization. The nationalization policy was reversed in the late 1980s and massive privatization started. In the early 1990s, reforms took place in the capital market, whereby the market opened for international investors; repatriation of investment proceeds was allowed; the economy was deregulated; establishment of commercial banks in the private sector was permitted; the foreign exchange market liberalized and the opening and maintenance of foreign currency accounts was allowed. As a result of these measures the stock market showed tremendous progress and the number of companies listed on KSE rose to 542 and the market was ranked third after Argentina and Columbia in 1991 (Qayyum and Kemal, 2006). In the first decade of the 21st century, KSE displayed tremendous performance and was declared the best-performing stock exchange in 2002 by the international magazine "Business Week"(7). After liberalization and reforms, the KSE-100 index showed tremendous upward movement from 1,989 in July 1997 to 15,125 in March 2008. Figure 1 shows trends in the KSE Index during the study period (2001-10). As at January 1, 2001, the index value was 1,462, which reached its highest point of 15,125 on March 3, 2008 and declined to 7,202 on April 1, 2009, and reached 12,359 on January 3, 2011, displaying an average annual growth of about 33%.

**Figure (1). Trends in KSE-100 Index [2001-10]**




*Source: Authors*

(5) http://lse.com.pk/#/LSE/History.aspx accessed on 28/05/2014.
(6) http://ise.com.pk/ accessed on 28/05/2014.
(7) http://lse.com.pk/#/LSE/History.aspx accessed on 28/05/2014.

In Pakistan, *Al-Meezan* Investment Management Ltd (AIML), took the initiative and started the screening of KSE listed securities through Sharīʿah compliance filters and developed the KSE-*Meezan* Index (KMI-30). Tests of Sharīʿah compliance of stocks is done under the guidance of qualified and reputed Sharīʿah experts. For a stock to be Sharīʿah compliant, based upon KMI criteria, it must meet all the six key tests given below.

i. *The core business of the company must be ḥalāl (not prohibited by Islamic law) and in line with the dictates of Sharīʿah.*
ii. *Debt to Assets ratio should be less than 40%. Debt, in this case, is classified as any interest bearing debt.*
iii. *The ratio of Sharīʿah non-compliant investments to total assets should be less than 33%.*
iv. *The ratio of Sharīʿah non-compliant income to total revenue should be less than 5%, and any dividend received by IFI must be given to charity in a proportional amount.*
v. *The ratio of illiquid assets to total assets should be at least 20%.*
vi. *The market price per share should be greater than the value of net liquid assets per share.*

With the introduction of screening for Sharīʿah compliance of securities listed on KSE, investment opportunities for the Islamic financial industry have been increased and one can expect an increase in investments and liquidity of IFIs in the local market.

## 4. Purpose of Study

This study is intended to understand and document the impact of the market index on the pricing of Sharīʿah compliant securities and explain variations in stock returns on the Karachi Stock Exchange (KSE). This study shall test the comparative performance of CAPM and SCAPM on a sample of Sharīʿah compliant securities during the period of 2001-10. This study shall also uncover CAPM anomalies (if any) due to size, book to market, cash flow yield and price-earnings ratio. In summary, the following are the research objectives of the study:

(a) To document the significance of the relationship and impact of the KSE-100 index on stock returns and Sharīʿah compliant securities' pricing in the Pakistani market through the application of CAPM and SCAPM.

(b) To test the impact of market returns on purpose-built portfolios based on size, book to market, cash flow yield, and price to earnings in variations of stock returns.

Based on the literature cited above, the following hypothesis are proposed for testing.

$H_1$: Market index has a significant impact on the variation of stock returns for Sharīʿah compliant securities.

*Sub Hypothesis:*

(i) Proxy of inflation used in SCAPM is a better explanatory of intercept than risk-free rate used in CAPM.

(ii) CAPM anomalies including size, book to market, cash flows and earnings are present in the domestic market.

## 5. Research Methodology

The sample includes 100 companies screened by Sharīʿah experts at AIML as at December 31, 2009. All Securities forming KMI-30 are included being part of the list of 100 companies. Security prices were taken from DataStream and any missing price of a company was obtained through the KSE website and ksestocks.com. Firm-specific variables are calculated directly from the balance sheets of companies, prepared by the State Bank of Pakistan. Out of 100, three financial companies were taken out and the final sample formed 97 companies only. Monthly data for ten years (2001 to 2010) was used to test the impact of the market index on security prices. The risk-free rate is obtained from the national savings scheme of regular income certificates (National Savings, 2012). Analysis was conducted through Eviews-8 software. Prices were converted into returns by applying the formula:

$$R_t = ln\ (P_t/P_{t-1}) \quad (1)$$

Where, $ln$ is the natural log; $R_t$ is the return in month t; $P_t$ is the price in month t; and $P_{t-1}$ is the price in the previous month. Prior empirical studies have used both discrete and logarithmic returns. Strong (1992) offers an excellent review of the relevant literature. In our study, we use prices, adjusted for dividends, to estimate returns. Therefore, $R_t$ reflects the returns inclusive of both capital gains and dividend yield.

From balance sheet analysis, for each company size (market price x number of shares), B/M (book value per share/ market price per share) and P/E (market price per share/ earnings per share) and CFY (cash flow/market price) is calculated. After obtaining required data we run multiple regression tests. First regression on the whole sample, second regression on big companies and third on small companies, sorted on the basis of market value in order to note the difference. Further, we also run regressions by breaking the whole sample into two portfolios (high B/M and low B/M) annually on the basis of the book to market ratio, and cash flow yield (high CFY and low CFY) and on the basis of the price earnings ratio (high PER and low PER). We test the basic equation of CAPM with certain modifications. We also test the Sharīʿah compliant asset pricing model (SCAPM), by replacing RFR with inflation (Hanif, 2011). Changes in the Consumer Price Index (CPI) is used as a proxy for inflation in our model. In accordance with the Islamic ideology that no investment should generate a risk-free return, we use the rate of inflation to proxy $R_f$ (the risk-free asset) in the conventional CAPM. Black (1972) proposed an equilibrium model similar to that of CAPM which does not require the existence of a risk-free rate. This model is commonly known as a zero-beta CAPM, in which investors create a portfolio of risky assets that have 'zero' covariance with the market portfolio, as follows:

$$E(R_i) = E(R_z) + B_i\,[E(R_m) - E(R_z)] \qquad (2)$$

Where $E(R_z)$ is the return expected from the zero-beta portfolio Z (which has the minimum variance of all available portfolios and is uncorrelated with the market portfolio). The main implication of the zero-beta model is that beta is still the correct measure of systematic risk and has linear properties, however, it also implicitly assumes that 'short-sales' are possible. The use of inflation to proxy the risk-free rate assumes that inflation is uncorrelated with the market return. Past empirical evidence has been mixed on this premise (Gultekin, 1983). The following regression models are tested in this study:

$$R_{pt} - R_f = \alpha + B_{pt}\,(R_m - R_f) + \varepsilon \qquad (3)$$

$$R_{pt} - N_t = \alpha + B_{pt}\,(R_m - N_t) + \varepsilon \qquad (4)$$

Where, $R_{pt}$ is portfolio return, $R_f$ is risk free rate, $B_{pt}$ is beta of the portfolio and $R_m$ is the market return, ε is error term assuming with zero mean, α is the intercept and $N_t$ is inflation.

## 6. Results and Discussions

This section includes testing of CAPM, SCAPM, calculation of return differences based upon size, B/M, PER, and CFY. It also includes descriptive statistics, multicollinearity tests, and regression analysis based on purpose-built portfolios of stock returns. In order to achieve the research objectives and testing of hypothesis, this study conducted the following analysis using EViews 8 and MS Excel software. We used the OLS regression technique for capturing the influence of the market index (independent variable) on returns for our Sharīʿah compliant sample (dependent variable). We test for the impact of the market index on average returns of our Sharīʿah compliant sample, big ( market cap) companies' portfolio, small (market cap) companies' portfolio, a high book to market companies' portfolio, low book to market companies' portfolio, high PER companies' portfolio, low PER companies' portfolio, high CFY companies' portfolio and low CFY companies' portfolio.

### *(A) Descriptive Statistics and Trends*

Descriptive statistics are presented in Table 1. Mean values are very close to the median, which shows that data is normal and almost free of effects of outliers. The highest level of variation was found in low CFY, followed by returns of low B/M, big companies, high PER and average returns of the sample. The single highest figure of standard deviation is found in KSE index returns, followed by low CFY, the big company portfolio and least variation for the risk-free rate. The maximum monthly change was found in returns of big companies (based on market capitalization), followed by KSE returns, low PER, and high B/M portfolios returns, while least in RFR. Trends in return series are presented in graphical form in Figures 2 to 6 in the appendix.

**Table (1). Descriptive Statistics of Return Series-CAPM**

| *Description* | *KSE* | *SA* | *RFR* | *PI* | *High-PER* | *Low-PER* | *High B/M* | *Low B/M* | *Big* | *SMALL* | *High CFY* | *Low CFY* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mean** | 0.017 | 0.010 | 0.008 | 0.008 | 0.009 | 0.015 | 0.016 | 0.007 | 0.009 | 0.014 | 0.020 | 0.007 |
| **Median** | 0.019 | 0.008 | 0.008 | 0.006 | 0.007 | 0.011 | 0.013 | 0.008 | 0.014 | 0.008 | 0.020 | 0.010 |
| **St. Dev.** | 0.089 | 0.062 | 0.002 | 0.009 | 0.064 | 0.073 | 0.071 | 0.066 | 0.079 | 0.061 | 0.065 | 0.072 |
| **C. of Var.** | 5.321 | 6.064 | 0.218 | 1.121 | 7.355 | 4.928 | 4.289 | 9.508 | 8.453 | 4.349 | 3.11 | 10.41 |
| **Kurtosis** | 5.844 | 0.919 | -0.92 | 0.706 | 0.165 | 1.028 | 0.860 | 0.560 | 3.197 | 0.008 | 0.2828 | 1.212 |
| **Skewness** | -1.21 | -0.58 | 0.127 | 0.796 | -0.414 | -0.380 | -0.285 | -0.505 | -0.89 | 0.107 | -0.377 | -0.717 |
| **Maximum** | 0.241 | 0.147 | 0.013 | 0.033 | 0.144 | 0.223 | 0.209 | 0.141 | 0.242 | 0.162 | 0.1698 | 0.1533 |
| **Count** | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 108 | 108 |

Source: Authors
KSE = Market; SA = Sample Average; RFR = Risk free rate; PI = Inflation; PER = Price-earnings ratio; B/M = Book-market ratio; and CFY = Cash flow yield

### *(B) Differences in Stock Returns*

The differences in stock returns are presented in Table 2. Under size-based portfolios, although results are mixed and out of ten monthly and annual returns, five are positive and five are negative, however, overall results for ten years of SMB are positive. In fact, small firms outperformed big firms by 0.46% on average per month and 5.61% on average per year during the sample period (2001-10). As per CAPM theory, beta coefficient of small firms should be high and of big firms should be low, given the returns provided to (required by) investors. In the case of the book to market distribution for the sample (as high B/M and low B/M), results are calculated as HML (average returns of the high book to market companies minus average returns on the low book to market companies). High B/M companies have outperformed low B/M companies in monthly average returns as well as annually. Out of ten years' figures, seven times HML is positive and only three times is it negative. In fact high B/M companies have provided superior returns to investors at an average of 0.95% per month and 11.50% per year. As per CAPM theory, beta coefficient of high B/M companies should be more than that of low B/M companies.

**Table (2). Differences in Stock Returns based on Size, B/M, PER and CFY**

| Description | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **SMB-Monthly** | 0.0187 | -0.0189 | -0.0012 | 0.0208 | -0.0143 | 0.0115 | 0.0083 | 0.0431 | -0.007 | -0.014 | **0.0046** |
| **SMB Annually** | 0.2246 | -0.2272 | -0.0146 | 0.2496 | -0.1717 | 0.1378 | 0.0999 | 0.5174 | -0.0849 | -0.167 | **0.0561** |
| **HML B/M Monthly** | 0.0187 | 0.0078 | -0.0017 | 0.019 | -0.0011 | 0.014 | 0.0007 | 0.0128 | 0.023 | -0.004 | **0.0095** |
| **HML B/M Annually** | 0.2238 | 0.0938 | -0.0210 | 0.228 | -0.0137 | 0.1684 | 0.008 | 0.1536 | 0.3595 | -0.051 | **0.1150** |
| **HML PER Monthly** | -0.009 | -0.0062 | 0.0053 | -0.021 | -0.0084 | 0.0023 | -0.004 | 0.0043 | -0.0260 | 0.0022 | **-0.0062** |
| **HML PER Annually** | -0.112 | -0.0748 | 0.0644 | -0.260 | -0.1010 | 0.0273 | -0.050 | 0.05252 | -0.3128 | 0.0269 | **-0.0741** |
| **HML CFY Monthly** | | 0.0026 | -0.0019 | 0.0213 | 0.0196 | 0.0142 | 0.0085 | 0.0243 | 0.0329 | 0.0037 | **0.0139** |
| **HML CFY Annually** | | 0.0321 | -0.023 | 0.2561 | 0.2353 | 0.1711 | 0.1022 | 0.2925 | 0.3957 | 0.0450 | **0.1675** |

*Source: Authors*

In the case of the price-earnings ratio (PER), the whole sample is broken down from median PER into two parts (portfolios) as high PER and low PER portfolios. Results are presented as HML-PER (returns on high PER minus low PER portfolios). Out of ten averages of monthly, as well as an annual return; six times low PER portfolio showed better results than high PER portfolios and on average, low PER displayed superior results of 0.62% per month and 7.4% per year. As per the CAPM model, the beta coefficient should be more for low PER companies as compared to high PER companies based on returns. In order to document the impact of cash flow, this study divided the sample into two portfolios based on median CFY. The difference in average returns was calculated on monthly as well as on an annual basis. The monthly average difference in returns was 1.39% while annually it amounted to 16.75%. As per CAPM beta of HCFY should be more than LCFY. To test the theory of CAPM, we conducted regression analysis based on size, B/M, PER and CFY, and the results are reported in the next section.

### *(C) Regression Results*

As per CAPM, the market index captures the variation in returns of companies and beta coefficient represent systematic risk, hence, we start the analysis by applying the basic model of CAPM and the results are presented in Panel-A of Table 3. According to the results, the overall explanation of variation in stock returns is 70% and the market beta coefficient is 62%. The intercept is statistically insignificant; hence, the rate on regular income certificate (RIC) used in this study is a good proxy for the risk-free return. Durbin-Watson statistics is appropriate and the results appear reliable. The fitness of model to data is good as depicted by F statistics at the1% significance level. Risk premium represented by beta is statistically significant at the 1% level, however, the market coefficient is 62% which means the market explains variations up to this level and 38% of variation in stock returns is contributed by other factors. As we are working with a special sample of companies, which are Sharīʿah compliant and the concept of the risk free rate is not present under the Islamic financial system, we replace risk-free returns in the basic model of CAPM with inflation, as suggested by Hanif, (2011), and the results are presented in Panel-A of Table 3. According to the results, the adjusted R square, beta coefficient of the market and F statistics have shown a slight improvement, however, the Durbin-Watson statistic has fallen slightly. We can conclude that in the local market, during the period under review, the behavior of the risk-free rate and inflation remained similar / complementary and also SCAPM is equally practicable in addition to CAPM for investigatin stock return beahvior. In fact, we obtained slightly better results through SCAPM as compared to the basic equation of CAPM. Although in calculation it does not make much difference, however, theoretically, SCAPM is recommended for valuation under the Islamic financial system. As this study has regressed the risk premium only, by deducting risk-free rate from average portfolio returns as well as from market index returns, hence, ideally, the intercept should be zero. Although negative intercept is about $1/6^{th}$ of 1% per month, however, is statistically insignificant.

**Table (3). Results of Regressions based on Size, B/M, PER, CFY**

$$(1) R_{pt} = R_f + B_j (R_m - R_f) + \varepsilon \quad (2) R_{pt} = PI_t + B_j (R_m - PI_t) + \varepsilon$$

| Description | Intercept (T value) | Durbin-Watson Stat | Adj. R Square | F-Stat (*Significance F*) | Coefficient- Rm (T and P value) |
|---|---|---|---|---|---|
| **Panel-A: Whole Sample** Sample- CAPM | -0.0018 (-0.56) | 1.833 | 0.703 | 279 (0.00) | 0.624 (16 and 0.00) |
| Sample-SCAPM | -0.0016 (-0.50) | 1.804 | 0.708 | 289 (0.00) | 0.635 (17and 0.00) |
| **Panel-B: Size Based** | | | | | |
| B-Portfolio CAPM | -0.0057 (-1.83) | 2.102 | 0.816 | 529 (0.00) | 0.807 (23 and 0.00) |
| B-Portfolio SCAPM | -0.0056 (-1.7929) | 2.090 | 0.821 | 547 (0.00) | 0.8130 (23 and 0.00) |
| S-Portfolio CAPM | 0.0019 (0.44) | 1.747 | 0.406 | 82 (0.00) | 0.442 (09 and 0.00) |
| S-Portfolio SCAPM | 0.0022 (0.50) | 1.714 | 0.422 | 88 (0.00) | 0.459 (09 and 0.00) |
| **Panel-C Book/Market Based** | | | | | |
| H-B/M-Port- CAPM | 0.0028 (0.71) | 2.021 | 0.619 | 195 (0.00) | 0.629 (14 and 0.00) |
| H-B/M-Port-SCAPM | 0.0030 (0.75) | 1.993 | 0.630 | 204 (0.00) | 0.641 (14 and 0.00) |
| L-B/M-Port- CAPM | -0.0066* (-1.95) | 1.790 | 0.688 | 264 (0.00) | 0.618 (16and 0.00) |
| L-B/M-Port-SCAPM | -0.0064 (-1.86) | 1.769 | 0.696 | 274 (0.00) | 0.629 (17 and 0.00) |
| **Panel-D Earnings Based** | | | | | |
| H-PER-Port- CAPM | -0.0046 (-1.36) | 1.719 | 0.664 | 237 (0.00) | 0.587 (15and 0.00) |
| H-PER-Port-SCAPM | -0.0044 (-1.27) | 1.695 | 0.673 | 246 (0.00) | 0.5998 (11 and 0.00) |
| L-PER-Port- CAPM | 0.0009 (0.23) | 2.028 | 0.636 | 209 (0.00) | 0.658 (14and 0.00) |
| L-PER-Port-SCAPM | 0.0011 (0.27) | 2.005 | 0.646 | 218 (0.00) | 0.670 (14 and 0.00) |
| **Panel-E Cash Flows Based** | | | | | |
| HCFY-Port- CAPM | 0.0056 (1.43) | 2.028 | 0.612 | 170 (0.00) | 0.577 (13 and 0.00) |
| HCFY-Port-SCAPM | 0.0056 (1.37) | 1.981 | 0.623 | 178 (0.00) | 0.590 (10 and 0.00) |
| LCFY- Port- CAPM | -0.0095* (-2.42) | 1.651 | 0.689 | 238 (0.00) | 0.678 (15 and 0.00) |
| LCFY- Port-SCAPM | -0.0095 (-2.39) | 1.6373 | 0.698 | 248 (0.00) | 0.688 (13 and 0.00) |

*Source: Authors*

*Significant

Table 3 shows results of the whole sample as a single portfolio under CAPM and SCAPM under Panel-A, where results of SCAPM are slightly better. Also, results of regression size based [big and small] portfolios are presented in Panel-B, where the beta coefficient of big (0.80) is much higher than small (0.44). Ideally, the beta of small should be more than big given the superior returns, as per CAPM theory; hence, a question mark on the applicability of the model is raised. Results of CAPM and SCAPM based on book/market are presented in Panel-C which are not in line with the theory of CAPM. Under Panel-D results based on cash flows are presented which are also not in line with theory, however, in the case of earnings (Panel-E), results are in line with the theory.

In order to check the validity of CAPM across cross-sectional returns, we divided the sample into two portfolios including big and small, based upon market capitalization of the underlying companies. Regression results of big (size based) portfolio are presented in Panel-B of Table 3. In the case of big companies, results are even better and during the period under review the market index explained variation up to 80%, at the 1% significance level. The intercept is statistically insignificant, in line with theory, as we regressed excess return of market and Sharīʿah compliant sample. The value of the adjusted R square reached 81% with good Durbin-Watson statistics. Overall fitness of model is good as depicted by a high F statistic at a 1% significance level. One of the reasons for the high association of big companies with the market index is the makeup of the market index itself [(8)]. In order to test SCAPM, on the big companies' portfolio, we ran another regression by replacing RFR with inflation and the results are presented in Panel-B of Table 3. According to results, we found a slight improvement in the value of adjusted R square, beta coefficient of market and value of F statistics while there was a minor reduction in value of the Durbin-Watson statistics. So again SCAPM with a proxy of inflation performed better than CAPM. After documenting evidence on big companies' portfolio, we tested the impact of the market index on returns of small companies' (size based) portfolio by using CAPM as well as SCAPM and results are presented in Panel-B of Table 3. According to the results, the value of the adjusted R square is just 40% as opposed to 70% for the whole sample and 81% for big companies, with a reasonably good value of Durbin-Watson statistics. The beta coefficient of the market is just 44% at the 1% significance level depicting that the market explains only 44% variation in cross-sectional stock returns of small companies. Overall the model fit is good as depicted by the F statistics at the 1% significance level. Results for SCAPM with the inflation proxy instead of the risk-free rate are presented in Panel-B of Table 3. According to the results, we found the slightly better coefficient of the market index, the value of adjusted R square and value of F statistics, while a minor decrease in value of Durbin-Watson statistics, clearly, the inflation proxy is superior over the risk-free rate. As we discussed in the previous section and presented in Table 2, on the basis of size, small companies have outperformed big companies as far as the average returns of the period under review is concerned, hence as per CAPM, the beta coefficient of small companies' portfolio should be higher in order to match the actual/required returns by investors. However, the beta coefficients of small companies are lower than the sample-portfolio and portfolio of big companies. This phenomenon raises a question as to the application of CAPM as a market equilibrium model. Beta is the only risk measure under CAPM and portfolios with higher beta require higher returns and vice versa. However, in the case of small companies' portfolios with lower betas application of CAPM may/will mislead investors. Certainly there are other factors which proxy for risk and investors in small companies must not rely on CAPM alone as a pricing model.

After noticing the small firms' anomaly in CAPM, this research divided the sample into two portfolios based on the median book to market value, as high B/M and low B/M portfolios for further analysis. Regression results of high B/M portfolio are also presented in Panel-C of Table 3. As we have regressed the risk premium only, by deducting risk-free rate from average portfolio returns as well as from market returns, hence, ideally, the intercept should be zero. Although a negative intercept of less than 1% per month emerged, however, it is statistically insignificant. The value of the adjusted R square, as well as beta coefficient of the market index, is 62%, explaining about 2/3$^{rd}$ of variations in stock returns. Overall fitness of model to data is good as depicted by F statistics Also, the Durbin-Watson statistic i signifies that the results are reliable; however the market beta is less than sample average beta. Likewise, when we replace the intercept proxy of CAPM (RFR) with inflation (PI) as suggested by Hanif, (2011) for Sharīʿah compliant asset pricing model, the study obtained slightly better results, similar to the size based estimates, as explained earlier. The value of R square, the beta coefficient of the market index and F statistics slightly improved, while the Durbin-Watson statistics slightly decreased;

(8) KSE-100 index includes 34 big companies of each sector, while the remaining 66 companies are selected openly from the stock universe based on market capitalization; hence the use of market index as a proxy for portfolio of risky assets is itself questionable.

once again SCAPM turned out to be slightly better than traditional CAPM. After documenting evidence on high B/M portfolio, we ran OLS regressions on low B/M companies' portfolio by using CAPM and SCAPM in parallel. According to results, the market index explains 61% variation in stock returns of the Sharīʿah compliant sample. Intercept is insignificant, in line with theory as we deducted risk-free return from average sample returns as well as from market returns. Adjusted R square is 69% with a good value for the Durbin-Watson statistic, hence, our results are reliable. Overall fitness of model is good as depicted by F-statistics. To get more evidence on SCAPM, we ran another OLS regression by replacing the risk-free rate with inflation and results are presented in Panel-C of Table 3. We obtained slightly better coefficients for the market, value of adjusted R square and F statistic while a slight reduction in the value of the Durbin-Watson. In case of low book to market portfolio of companies based on the B/M ratio, the results almost match with the average returns of the whole sample during the period under review and the market index explained variation up to 69%, however, results for high B/M portfolios is less than for the sample average, in fact up to 62%. High B/M portfolio returns depend on less than 2/3$^{rd}$ of total variation, upon the market index of KSE-100. As discussed in the previous section and presented in Table 2 that on the basis of B/M ratio, high book to market portfolios outperform low book to market portfolios (by an average of 1% monthly and 12% annually, approximately), hence as per CAPM, the beta coefficient of the high B/M portfolio should be higher in order to match with actual/required returns by investors. However, the beta coefficient of the high B/M portfolio is not sufficiently high to capture excess returns (over low B/M). This phenomenon raises a question as to the application of CAPM as a market equilibrium model. Beta is the only risk measure under CAPM and portfolios with high beta require higher return and vice versa. However, in the case of high B/M portfolios, the beta coefficient (0.62) does not support the theory, hence, application of CAPM will mislead investors. Certainly there are other factors which proxy for risk and investors in high B/M companies must not rely on CAPM alone as a pricing model.

After noticing the high book to market firms' anomaly in CAPM, we divide the sample into two portfolios based on the median price-earnings ratio, as high PER and low PER portfolios for further analysis and the results are presented in Panel-D of Table 3. As per results, the market index explains above 58% of the variation in cross-sectional stock returns for high-PER Sharīʿah compliant portfolio during the period under review at the 1% significance level. Overall fitness of model is good as depicted by F-statistics. The value of adjusted R square is 66%, very close to the sample-portfolio, with a good Durbin-Watson statistics. And results of SCAPM are slightly better than CAPM. Under SCAPM the value of the adjusted R square is high (67%), F statistics is better, the beta coefficient is high, and Durbin-Watson slightly reduced. Regression results of low PER portfolio are also presented in Panel-D of Table 3. According to the results, the market explains 65% of the stock return variation of low PER companies. The value of adjusted R square is 63% with Durbin-Watson statistics above 2. Overall the fit of the model is good as depicted by the F statistic. There is no problem of heteroskedasticity as depicted by the probability of the Wald F test. Results of SCAPM are slightly better than for the traditional CAPM with improved coefficient for the market, value of F statistic and adjusted R squared. As we listed above in Table 2, returns of low PER portfolios outperform high PER, hence, as per CAPM theory the beta coefficient of the low-PER portfolio should be higher than high-PER portfolios. The results support this theory; however whether beta is sufficiently high to compensate for the required return by investors is an interesting question as the difference with high-PER is only 7% in beta.The coefficient (beta) of the market only explains 65% which is less than the sample average and also 35% variation is left unexplained.

Results of regression based on CFY division are presented in Panel-E of Table 3. Overall variation explained by the market index is 57%, and 67% for HCFY and LCFY and the results of the SCAPM are slightly better than CAPM. However, beta coefficient of HCFY is less than for LCFY, which does not match theoretical expectations suggesting an anomaly in the CAPM model. The intercept of LCFY is significant, surprisingly, and in all other cases, remained insignificant. Based on these results, we cannot reject our hypothesis including sub-hypotheses.

## 7. Conclusion

In this study we test the capital asset pricing model (CAPM) and Sharīʿah compliant asset pricing model (SCAPM) by dividing the sample on the basis of size (market cap), book to market ratio (B/M), cash flow yield (CFY) and price to earnings ratio (PER) for a sample of Sharīʿah compliant securities listed on the Karachi stock exchange during the period of 2001-10. We found slightly better results for SCAPM than CAPM and the risk-free rate and inflation index appear to have a similar influence. Based on monthly price observations, the market index explains some 60% to 70% variation in stock returns over the sample period and confirms the long run relationship between the market index and stock returns in the Karachi market. Evidence suggests that the market index acts as a strong proxy for risk. It is further documented that on the basis of size, CFY and book to market portfolios, the theory of CAPM could not support realized (required) returns by investors and beta coefficients were not sufficient to compensate for excess returns of small companies and high B/M companies. In the case of low PER portfolio, although beta coefficient were higher than high PER and support CAPM, however, the relationship with the market index is only 65% and the balance in variation in stock returns is left unexplained. As this study uses risk premiums in the regression models, the expected intercept is zero. Although we obtain some intercept values, most are statistically insignificant. We suggest that oin the basis of our findings CAPM/SCAPM has a prime role to play in gauging returns for Sharīʿah compliant securities on the Karachi exchange. The explanatory power of our models is up to 70%, so (of course) there are other risk factors, needed to be identified in addition to size, B/M, CFY, and PER. Future research should look to work on these and other factors Of course, our analysis is subject to limitations, Our analysis was conducted over the 2001-10 period and Sharīʿah compliant screening started only in 2008. Earlier, there was no such concept in the Karachi market, hence, at best we can say that these findings relate primarily to companies that found their place in the Sharīʿah compliant universe over 2009 onwards.

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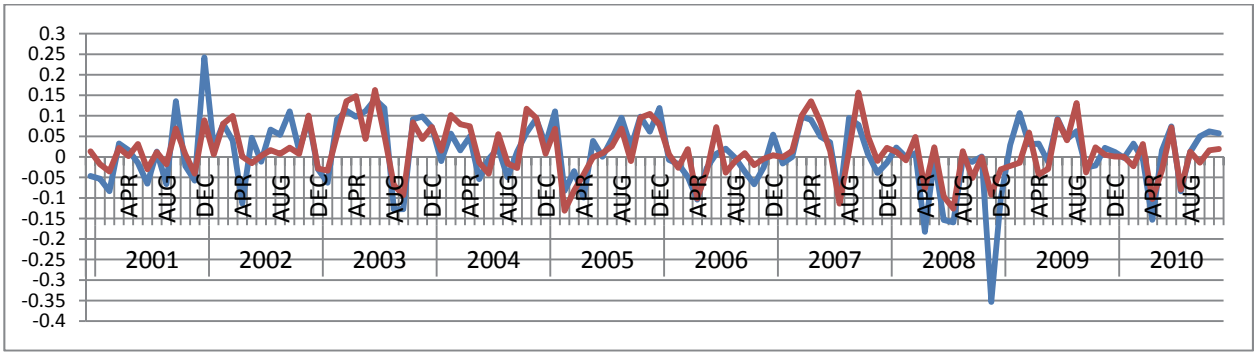
# Appendix

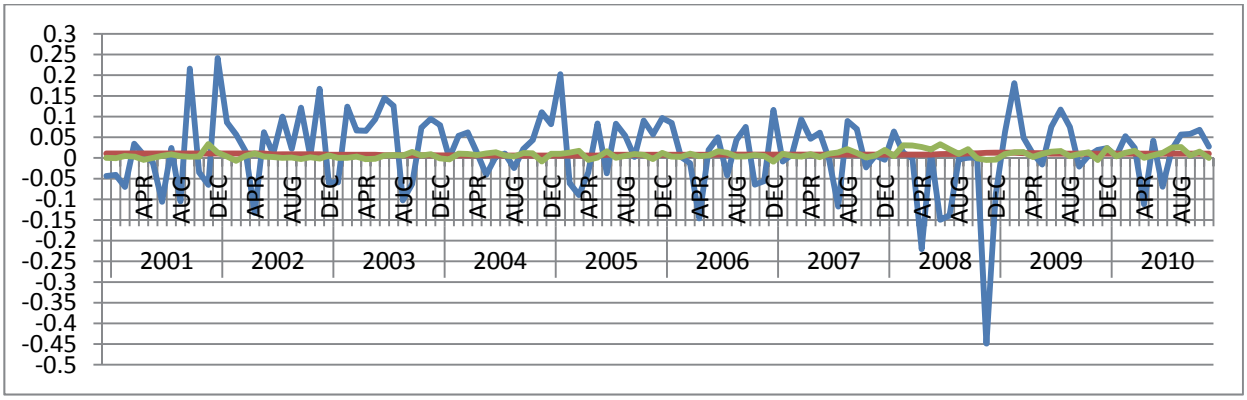
**Figure (2). Trends in returns of Size based series**




**Source: Authors**

__Big __Small

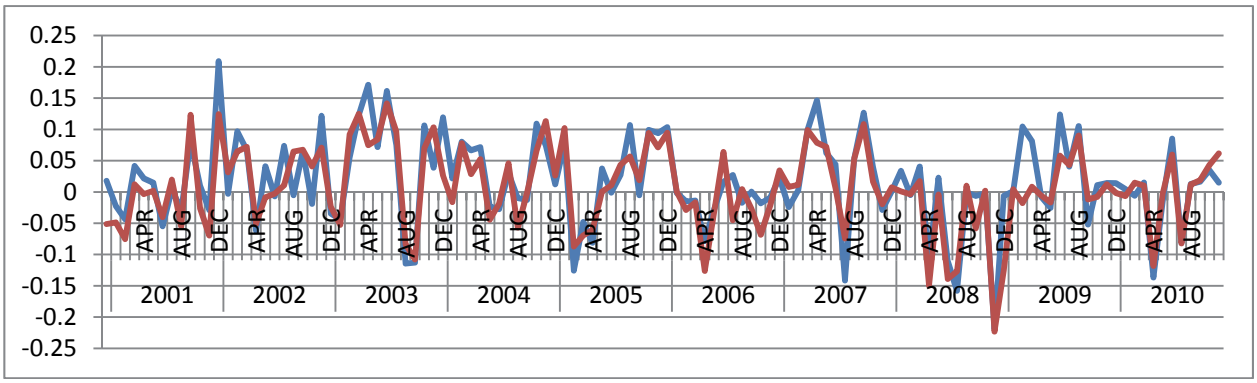
**Figure (3). Trends in returns of KSE, RFR and Inflation series**




**Source: Authors**

___KSE ___RFR ___PI

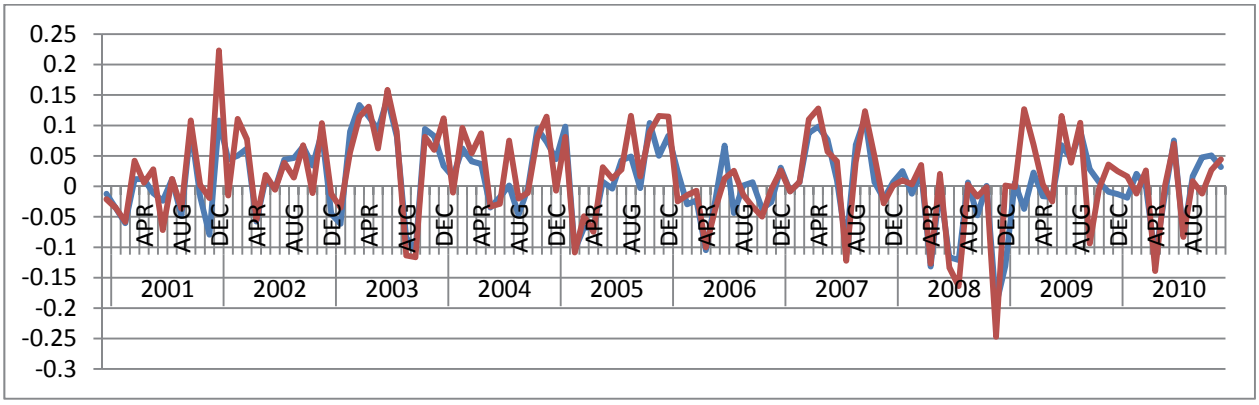
**Figure (4). Trends in returns of Book to Market based series**




**Source: Authors**

__High B/M __Low B/M

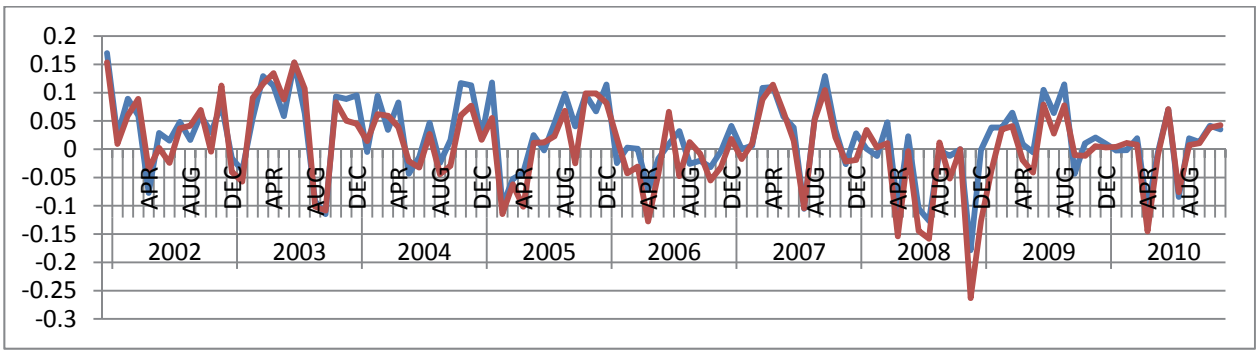
**Figure (5). Trends in returns of Price to Earnings based series**




**Source: Authors**

__High PER __Low PER

**Figure (6). Trends in returns of Cash Flow based series**




**Source: Authors**

__High CFY __Low CFY

# المخاطروالعوائد في مقطع عرضي من الأسهم المتوافقة مع الشريعة: اختبارمتانة التطبيق وعيوب نموذج تسعيرالأصول الرأسمالية (CAPM)

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**المستخلص:** تهدف هذه الدراسة إلى فهم وتوثيق آلية تسعير أصول الأوراق المالية المتوافقة مع الشريعة الإسلامية المتداولة في بورصة كراتشي. اخترنا مؤشر السوق كمتغير، المبحوث بشكل جيد في ظل دراسات سوق رأس المال التقليدية، لاختبار مدى تأثير الاختلاف في عوائد الأسهم على عينة من الشركات المتوافقة مع الشريعة الإسلامية، وذلك بواسطة البيانات الشهرية لمدة عشر سنوات من ٢٠٠١م إلى ٢٠١٠م المتوفرة على قاعدة "Data Stream". لقد اختبرنا المعادلة الأساسية لنموذج تسعير الأصول الرأسمالية (CAPM) والصيغة المعدلة لها نموذج تسعير الأصول الرأسمالية المتوافقة مع الشريعة (SCAPM). كما قمنا أيضا باختبار الاختلافات في العوائد الناتجة عن الفروق في: الحجم، نسبة القيمة الدفترية للقيمة السوقية (book to market ratio)، نسبة سعر السهم مع الكسب (price-earning ratio)، وعائد التدفق النقدي (cash-flow yield). أظهرت النتائج تأثيرا قويا لمؤشر السوق على عوائد الأسهم (معامل R مربع المعدل ٧٠٪) كما أكدت أيضا الاختلافات بسبب الحجم، ونسبة القيمة الدفترية للقيمة السوقية، ونسبة سعر السهم مع الكسب، وعائد التدفق النقدي؛ كما أن نموذج تسعير الأصول الرأسمالية المتوافقة مع الشريعة كان أفضل بقليل من نموذج تسعير الأصول الرأسمالية التقليدي في شرح الاختلافات في العوائد للمقطع العرضي من الأسهم.

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