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Capital Asset Pricing Model and Shariah-Compliant Capital Asset Pricing Model: Evidence from Pakistan Stock Exchange

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Abstract:

The key objective of this study is to recommend a novel approach in pricing Shariah based financial assets by testing Shariah-Compliant Capital Asset Pricing Models which can potentially replace the conventional CAPM in PSX. Using eighteen years extracted data from Thomson Reuters Data Stream over the period of January 2001 to December 2018 and by deploying Generalized Method of Moments (GMM), this study develops and analyses Shariah-Compliant Capital Asset Pricing Model. The returns of the stocks traded on PSX are calculated through the CAPM equation with Risk-Free Rate, without Risk-Free Rate, Zakat, NGDP and Inflation. The impact of size anomaly is also gauged in the study. The findings are surprising and specify that the Shariah CAPM can be the alternate of the conventional CAPM. The results of this study may show a new way to the investors, corporates and banks to calculate the required rate of returns of their securities.

Keywords: CAPM, Shariah-Compliant Capital Asset Pricing Model, GMM, Zakat, Size Anomaly

1. INTRODUCTION

Shariah finance has shown a rapid growth in the last two decades. The foundation of Shariah finance is based upon Islamic principles. Mainly, Islam forbids an interest or 'Riba' and encourages making of profits (Hasan and Dridi, 2011). Besides, due to complete abstinence from interest-based activities, it is assumed that Shariah-compliant firms are being operated under different models as compared to their counterpart i.e. Non-Shariah or conventional firms (Ahmad and Azhar, 2015). In other words, Shariah finance considers the moral and

ethical responsibilities as well as the rights of consumers. Therefore, they adopted those methods where both profit and loss of the organization are distributed equally or at agreed proportion among investors (Kenton, 2018). Furthermore, investment opportunities for Shariah-compliant firms are significantly limited because most capital and money markets are dominated by interest-bearing debts and equity instruments. In the same vein, Shariah-compliant firms are not allowed to cross the defined threshold for availing debt facilities and also restricted to involve in all those businesses which are prohibited in Islam such as non-halal products, traditional insurance, business of alcohol and tobacco, usury etc (Ramli and Haron, 2017). Nevertheless, the relative association between Shariah and Non-Shariah models is hard to explain. Furthermore, in terms of risk-return, most earlier studies specify that Shariah-compliant model is engaged in low earnings management (see for example, Farooq and Alahkam, 2016; Farooq and AbdelBari, 2015; Ahmad and Ibrahim, 2002). Owing to this reason, Shariah- compliant model gives rise to several complex issues and questions that require an extensive research to be addressed appropriately. Although, the emergence of Shariah finance around the world has given rise to several Shariah-compliant securities but there is still a need to evaluate the existing investment arenas according to Shariah laws. Another significant issue that requires attention is precise Capital Asset Pricing Model (CAPM).

The CAPM defines the relationship among systematic risk and projected return for assets. In addition, CAPM is a widely known model used to calculate the price of the required rate of return of assets (Derbali, Khaldi and Jouini, 2017). Basically, CAPM calculates the risk, more specifically the systematic risk which is known as Beta. Risk-free rate and market return are the other components. CAPM is the oldest model after the Markowitz's Mean Variance (MV) framework which is used in the financial sector. Precisely, the traditional CAPM is established in the interest-based system and not compatible with Shariah model (Hasanah and Maspupah, 2017). Notably, only few researchers are agree that Capital Asset Pricing Model (CAPM) is applicable in Shariah- compliant model (Derbali, Khaldi and Jouini, 2017; Hakim, Hamid and Meera, 2016; Selim, 2008). Therefore, the advancement of Shariah finance which is interest-free model, leads to the important question that whether or not CAPM is in accordance with Shariah principles and used for pricing of Shariah firms' assets (Derbali, Khaldi and Jouini, 2017). Likewise, there is consensus that CAPM if applied to the Pakistani market cannot provide accurate results (Hanif and Bhatti, 2010; Eatzaz and Attiya, 2008). Hence, an elaborate analysis of the shares in PSX under the conventional and Shariah CAPM is warranted. By considering all of the above discussion, the core objectives of this study include:

- To measure the compatibility of shares in PSX under the Shariah CAPM,
- To examine how the Shariah-compliant changes to the traditional CAPM influence stock evaluation,
- To identify the difference between conventional i.e. Non-Shariah and Shariah Compliant CAPM,
- To check the size effect by using Shariah CAPM in PSX.

More specifically, this study tests whether the returns of the stocks with conventional CAPM can be compared with the Islamic or Shariah-compliant CAPMs. Also, this study assumes that conventional CAPM can be replaced by one of the Shariah CAPMs. The study is being conducted to test the different models of Shariah CAPM and its statistical results.

The rest of this study is organized as follows: The Section 2 presents the literature review, data & methodology is explained in section 3, while the section four explains the results and discussion and the last section 5 focuses on conclusions.

2. LITERATURE REVIEW

2.1 Markowitz's Mean-Variance Framework

Harry Markowitz (1952) introduces Markowitz's Mean Variance Analysis (MV) Framework. MV framework is an analytical tool that is used by financial managers to measure the risk of the assets in which businesses plan to invest. Fundamentally, it is a tool to measure the variance against the expected return of the assets. It is assumed that investors tend to make rational decisions when they have an ample amount of information, also they tend to choose the less risky asset if given a choice between two assets with the same returns. There are two main results of the study of Harry Markowitz.

1. Any investor's motive is to maximize the returns of the stocks and his portfolio.
2. The risk of the stocks can be reduced by making the portfolios of unrelated assets.

The MV framework or MPT model assumes that investors want to maximize the returns and minimize the risk, means that investors are risk averse. Through this assumption, it can also be inferred that investors will only invest in a high-risk stock if the profit is lucrative as well. Remarkably, a portfolio's overall risk will be calculated through the risks of individual stocks/assets. The correlation between the assets will form the overall risk of the portfolio. According to the MPT framework, there are two components of risk in any stock.

1. Systematic Risk
2. Unsystematic Risk

Technically, systematic risk is the risk of any market which cannot be hedged/avoided. The other type of risk can be mitigated through diversification in the portfolio stocks. On the contrary, Unsystematic risk is the risk that can be mitigated by the investor (Hanif, 2011).

2.2 CAPM

A tool to calculate the required rate of return on Assets is CAPM (CAPM). It was developed by Jack Treynor (1961) and William Sharpe (1964). It states that risk has a linear relation with the expected return on the asset (Hanif, 2011). This model associates the risk measure as well. CAPM incorporates the security price in such a way that the expected return of the stock covers the investor for the associated risk of that particular security. There are two types of risks in it 1. Systematic Risk (diversifiable risk) 2. Unsystematic risk (undiversifiable risk) (Sadaf and Andleeb, 2014). Beta is the risk measure of the systematic risk, it is the

movement of an asset concerning with the movement of the market (Hanif, 2011). CAPM is also based on the Markowitz Modern Portfolio Theory, that supports the view that investors want to maximize returns and minimize the risks associated with the particular stock/asset.

2.3 Limitations of CAPM

Empirical studies suggest that CAPM does not account for the factors mainly stock anomalies that can alternate the return of the stocks and securities. Crashes, economic conditions and anomalies are not incorporated in CAPM rather they are caught by realizing the psychological factors related to them. Another factor of the abnormal and the unexpected behavior of the market depends upon the behaviors and trading movements of the market participants. This factor is also not incorporated in the CAPM and very important and relevant in Pakistan's market and environment. Here, the market moves with the sentiments of the investors. The extension of the CAPM model developed in 1992 by Eugene Fama and Kenneth French, is known as the Fama-French three-factor model (Schulmerich and Hwa Eu, 2014).

2.4 Extension of CAPM

Fama – French 3 Factor Model

After the limitations of CAPM coming into prominence, Eugene Fama and Kenneth French expanded the traditional CAPM (CAPM) using three factors that make it more suited to measure the performance of small-cap stocks. This model has seen three iterations since it was introduced. Initially Fama and French explained that the expected returns of value stocks can be calculated using a three-factor model that incorporates market risk, company size and value factors (Griffin, 2002). While CAPM can only explain a 70% rise of a 5% rise in individual stocks. Fama and French demonstrated that the three-factor model can explain 95% of the same 5% rise in the value of the stock, thus, makes it a more accurate representation of the market performance. In later years, Drew et al. (2006) categorically tested the FF 3 Factor Model to promulgate that there exists a high correlation between volatility between the firms' size and expected ROR. The testing was done to answer whether an asset pricing model considering multiple factors can result into certain cross-sectional returns. The data collected from Germany and United Kingdom stock exchanges are divided into six categories based on small vs. large and book vs. market. The results in Germany confirmed the significance of the FFT 3 Factor Model, as it highlights that the contribution of small firms is positive, on the contrary, big firms barely affect the variable SMB.

Fama – French 5 Factor Model

Over the time frame of 20 years, it became quite prominent that the 3-factor model had faced difficulty to extensively explain the cross-sectional variation in expected returns, precisely related to profitability & investment among other anomaly factors. More specifically, these anomaly factors accruals (Sloan, 1996), net share issues (Ikenberry, Lakonishok, and

Vermaelen 1995; Loughran and Ritter, 1995), momentum (Narasimham and Titman 1993), and idiosyncratic variability (Ang, Hodrick, Xing, and Zhang 2006), maximum daily returns (Bali, Cakici and Whitelaw 2011), liquidity risk (Pastor and Stambaugh, 2003), and many others. To address these anomalies, the five-factor model was also introduced. This is directed at capturing the size, profitability, value and investment patterns in stock returns that were average. Several studies have shown that the five-factor model performs much better at explaining variations in the return of stocks with common variations (Erdinc, 2017). Fama and French (2015) also tested the performance of the five-factor model in the U.S. market using the data from July 1963 to December 2013, which resulted in the better performance of five-factor model than the three-factor model of Fama and French (1993).

2.5 Shariah-Compliant CAPM

As interest is prohibited in Islam, Tomkins and Karim (1987) are of the view that CAPM can be made Islamic, if the risk-free rate is removed from the equation. The shape of Islamic CAPM can be used in Islamic economics and finance (Tomkins and Karim, 1987).

$$\mathbf{K_E = R_m\ \beta} \quad ----- \quad (1)$$

Kahf (2006) describes the view that fixes amount on loan which is interest can be replaced by Profit and Loss sharing and Mudarbah model. This model is very common in Pakistani context and is widely used in the banking industry of Pakistan. This model is the alternate of working capital requirements of creditors fulfilled by the commercial and Islamic banks. This model enables banks to participate in the businesses of the borrowers and be there as investors. Islamic Banks claim their profits which is more or less equal to the conventional banks' interest rates. The borrower gets the money from the banks and acts as an agent of the bank to purchase the desired goods needed for manufacturing.

El-Ashker (1987) proposed in his book that the risk-free rate in the conventional CAPM equation can be replaced by the Zakat rate in Islam which is pre-fixed 2.56% on the wealth of any individual. This should be done to attract investors and encourage them to save and invest instead of spending. The equation proposed by Askher would be as follows (Ashker, 1987).

$$\mathbf{R_P = Z + \beta\ (R_m - Z)} \quad ----- \quad (2)$$

This model has been made on the assumption that the Zakat rate is fixed by the Islamic scholars and it is obligatory on Muslims to pay zakat on their wealth, whoever falls in that specific domain. Any Muslim, who has wealth can price its assets by replacing the risk-free rate through the zakat rate. This model has been made to attract investors and wealthy people to encourage them to save rather than spending. The return of zakat rate will enable them to save which must be paid by them.

Another model of Shariah-compliant CAPM model was proposed by Shaikh in 2010, he is of the view to replace the risk-bearing element in CAPM equation by Nominal gross domestic

product (NGDP) growth rate to compensate the investor against inflation in the economy. Principally, NDGP is gross domestic product (GDP) that is estimated in current or present market prices. Moreover, this will enable them to purchase the same amount of goods and their purchasing power will also remain intact. The equation proposed by Shaikh is as follows(Salman, 2010).

$$\mathbf{R_P = NGDP + \beta\ (R_M - NGDP_g)} \quad ----- \quad (3)$$

Later, another model was proposed by Hanif (2011). In this model, he amended the conventional CAPM equation and proposed to replace the risk-free rate with the Inflation rate in the economy. This rate will keep investor and borrower purchasing power intact and their wealth will also remain the same. This model has been structured in viewing that if any person is not purchasing anything then he should be able to purchase the same in future as well. For this reason, the Inflation rate in the economy should be part of the CAPM equation. This model enables the investor to keep the wealth intact and his actual wealth would remain the same even after the impact of the inflation. The new proposed equation given by Hanif would be as follows (Hanif, 2011).

$$\mathbf{R_P = I + \beta\ (R_M - I)} \quad ----- \quad (4)$$

In Pakistani context, Sadaf and Andleeb (2014) calculated the stocks returns of 28 firms listed on the PSX KMI-30 index. The methodology includes the calculation of returns of the assets by using three equations. 1) Conventional CAPM 2) CAPM without risk-free rate and 3) Shariah Compliant CAPM proposed by Hanif (2011) (replacing the risk-free rate with inflation rate).The results represent that the returns of the conventional CAPM equation and the Shariah-compliant equation in which the risk-free rate is replaced by Inflation rate are almost equal and they are overlapping each other on the graph. This shows that the risk-free rate on assets that is prohibited in Islam can be replaced by the Inflation rate and investors can be saved from un-Islamic activity.

Hanif and Dar (2011) conducted another investigation on the listed stocks of the Pakistan Stock exchange. The researcher made 10 equally weighted portfolios comprising of a total of 100 stocks. The research was done by extracting the data of 9 years and the model was run on conventional CAPM and Shariah-compliant asset pricing model. The portfolios formed were based on the market capitalization of the stocks. The results of this study indicate that no portfolio has shown the statistically significant relationship; neither higher capitalization nor lower capitalization portfolio. The portfolios which gave statistically significant results were the medium-sized portfolios. The results of the medium-sized portfolios are better in model with Inflation as compared to the conventional CAPM. This shows that medium portfolios project better results when the risk-free rate is being replaced by inflation. Notably, the researchers have used two proxies of inflation 1. WPI and 2. CPI. The conclusion of the overall study indicates that the CAPM used in Pakistan Stock Exchange gives misleading

results while the results achieved by the use of Inflation as a proxy give better results than the conventional CAPM.

2.6 Size Effect Anomaly

The size effect anomaly states that smaller firms tend to outperform better than larger firms because of their risk-adjusted returns. Earlier, in Pakistani context, Haq and Rashid (2014) tested data of 10 listed firms over the period 2007 to 2011 and clarified the existence of size effect anomaly in the PSX. The portfolios were constructed from P1 to firm P10 based on the sizes of the stocks. Likewise, two equally weighted portfolios were constructed on their sizes which include the total assets and sales of the company. The sorting of portfolios returns was based on the excess returns of all the stocks i.e. smaller and larger portfolios. All in all, it was evident that size effect anomaly exists in Pakistani market, likewise, in terms of return and risk adjustment smaller size portfolios outperformed than the larger size portfolios.

3. DATA & METHODOLOGY

From the onset, this study follows the mono-quantitative method and explanatory in nature. The eighteen years monthly data over the period of January 2001 to December 2018 is collected from the Thomson Reuters Data Stream and Pakistan Stock Exchange Data Portal. This study uses Eviews statistical software and Microsoft Excel to analyse the extracted data. The unit of analysis is the PSX all index organizations both listed and delisted (dead and alive) financial and non-financial firms. Technically, the reason to incorporate the dead and alive firms is to bypass the problem of survivorship biases which is very common when running the models (Jawed and Kashif, 2017). Likewise, sorting method of post ranking or single sorting is used in which all the stocks are sorted monthly (t-1) from January 2001 to December 2018 in ascending order based on their book to market value. Subsequently, data is arranged into the 10 portfolios or deciles i.e. from P1 to P10. After portfolio constructions, these portfolios are tested on the different models of Shariah-compliant CAPM and conventional asset pricing models. In addition, the beta is calculated on monthly basis for each stock. In short, the analysis is performed to calculate both value-weighted returns and equally weighted returns.

For the analysis, the derivation of CAPM can be executed, however, to ensure the validity the capital market line (CML) approach is also considered. More specifically, CAPM is a basic tool to calculate the returns of stocks. It includes various components that complete the equation of CAPM. However, CML approach is applied to those portfolios which are in correlation with the market returns, also they are called efficient portfolios. In CML approach, an investor has two options: either to select a risk-free assets investment or the existing market portfolio. The below equation defines the return on the efficient portfolios concerning its total risk.

$$\mathbf{R_p = R_f + \frac{R_m - R_f}{\delta_m} \delta_p} \quad \text{--------(5)}$$

Where, the dependent variable R_p is the return on an efficient portfolio, R_f is the risk-free rate, R_m is the return on the market portfolio, δ_m is the standard deviation of returns on the market portfolio and δ_m is the standard deviation of returns on efficient portfolio *p*. Afterward, the above equation is transformed into the CAPM equation through algebraic operations and the result is the CAPM equation that is expressed as follows:

RP = Rf + (Rm-Rf) β − − − − − (6)

As discussed, this study includes the monthly data of the portfolios to calculate returns of conventional and Shariah-compliant CAPM. Returns of each stock will be calculated through 5 different equations and comparison is done on the basis of results.

1. **Conventional CAPM - CAPM = $R_F + \beta (R_M - R_F)$** − − − − − (7)
2. **CAPM** without risk free rate - **$K_E = R_m \beta$** − − − − − (8)
3. **RFR** replaced by **Zakat rate - $R_P = Z + \beta (R_m - Z)$** − − − − − (9)
4. **RFR** replaced by **Nominal GDP growth rate - $R_P = NGDP + \beta (R_M - NGDP_g)$** − − − − − (10)
5. **RFR** replaced by **Inflation rate** in the economy **- $R_P = I + \beta (R_M - I)$** − − − − − (11)

The beta will be calculated of each company by the following formula

β = (COV X.M)/Var M − − − − − (12)

The book-value of each stock is calculated through the formula.

Book to Market Value = BE_{t-1} / ME $_{t-1}$ − − − − − (13)

Where, MEt−I is the market value of the equity at the end of the fiscal or financial year (t – 1) and BEt−1 is the book value of the equity besides with the balance sheet deferred taxes if any and the difference of the book value of preferred stocks at the end of the calendar or fiscal year (t – 1).

This study employs Newey and West (1987) proposed Generalized Method of Moments (GMM) to estimate the CAPM models. This method is used to calculate "W" which is an estimator of weighting matrix. Remarkably, GMM can tackle both the autocorrelation and heteroskedasticity issues of non-normal data. Likewise, to ensure the validity of GMM findings, the Chi-square test and the Wald test is used. Technically, the Chi-square and Wald tests are used to evaluate how estimated parameters are far from zero in standard errors and null hypothesis. This shows the overall fitness of the model. Besides, by considering PSX background, this study implies the required rate of return as a dependent variable. Similarly, the six selected independent variables that influence on dependent variable are **Risk-Free**

Rate (It is the T-Bills rate issued by the State Bank of Pakistan), **Zakat Rate** (This rate is fixed at 2.56% on the wealth of the Muslim), **Nominal GDP growth rate (**This is the GDP growth rate with inflation in the economy), **Inflation Rate** (This rate is the change in the Consumer Price Index monthly), **Market Return** (In this study, this is considered as an average return of the Pakistani market i.e. the Pakistan Stock Exchange), **Beta (**It is the risk associated with the stock).

4. RESULTS AND DISCUSSION

The descriptive statistics presented in Table 1 depicts the deciles portfolios of the returns calculated by CAPM model for both conventional and Shariah model as well.

Table 1. Characteristics of CAPM is Deciles Portfolios of Full Sample 2001-2018

	P1	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10**	**P1-P10**	**T - value**
EW %	1.09	0.23	0.17	0.21	0.25	0.24	0.23	0.27	0.23	0.41	0.68	-2.10
VW %	0.88	0.23	0.17	0.21	0.25	0.25	0.22	0.27	0.23	0.27	0.61	-1.92
Market Value PKR BNs	0.33481	1.545	4.88	11.77	25.45	53.12	109.20	218.51	461.61	1,989.92	1,989.58	0.019
CAPM Beta	0.38	0.42	0.36	0.44	0.48	0.61	0.60	0.76	0.84	0.97	0.58	9.26

This table shows the descriptive statistics characteristics of all the deciles portfolios from the period January 2001 till January 2018 of all KSE Index. Portfolios are created on the basis of the size of the companies. P1 refers to the small-sized firms' portfolio, whereas P10 consists of large size firms. EW returns refer to the annualized average monthly excess return of equally-weighted portfolios while VW returns refer to the annualized average monthly excess return of value-weighted portfolios. Market Value refers to the average market value of all the shares present in each portfolio (in Rs. Billions). CAPM Beta corresponds to the full data beta estimate of the portfolio's returns. In the last column we indicate the values of t-tests that refer to the null hypothesis of no difference in means between portfolios P1 and P10 characteristics.

(*) means 10% chances of rejecting the null true hypothesis showing that there exists no difference between the P1 and P10 characteristics, (**) means 5% chance of rejecting the null true hypothesis showing that there exists no difference between the P1 and P10 characteristics, (***) means 1% chance of rejecting the null true hypothesis showing that there exists no difference between the P1 and P10 characteristics.

The above table shows the descriptive statistics of the portfolios from P1 to P10. P1 is the portfolio comprising of the firms with a smaller size, on the contrary P10 comprises of the companies with a bigger size that is (book to market value) ratio and market capitalization. The descriptive statistics are significant, because the results are as desired and showing the impact of the size effect anomaly in the portfolios. Evidently, the portfolio returns that are equally weighted and Value weighted of the P1 are better than the portfolio returns of the P10. Clearly, this shows that the P1 results, either the value-weighted or equally weighted are greatly risk-adjusted. The spread check of P1 - P10 is also significant statistically showing the positive number. The returns of P1 are 1.09% and 0.88 % per annum for equally weighted and value-weighted respectively. With respect to the risk of portfolios, the beta for the smaller firms is less which specifies that the smaller firms are less risky as compared to the firms which are bigger in size. The beta of P1 and P10 are 0.38 and 0.97 respectively making the spread check of 0.58. One of the theories of this study of size effect anomaly is proved to be correct as mentioned earlier.

Likewise, Table 2 is exhibiting the Jensen CAPM alpha value for the different models of CAPM for the decile portfolios i.e. P1 to P10. Clearly, P1 are the smaller firms based on their size and P10 are the large firms based on their size. Precisely, the results are depicting the presence of size effect anomaly in the portfolios as well as they are showing that the Shariah based models are better than the conventional asset pricing model and CAPM without risk-free rate. The first row is the conventional CAPM which is the most used model for calculating the required rate of returns on the assets. The second row is of the CAPM without Rf was also proposed in the previous studies the results of these models are more or less the same as conventional CAPM. Evidently, the alpha values of all the Shariah models are better than the conventional models. The model where the zakat rate has replaced the risk-free rate is more lucrative both in P1 and P10 because of the existence of the size anomaly in the portfolios. Besides, the figures of the chi-Square (Wald Test) are vividly showing the variance amongst the portfolios. The chi-square test shows the cross-sectional variance in the returns of the portfolios as the P values of the portfolios is less than 0.010. This chi-square test applies to all models because of the value which is less than 0.010. It shows the cross-sectional variance amongst the portfolios. The conclusion of the equally weighted returns is statistically significant for the CAPM, CAPM without Rf, and all the Shariah version of CAPMs. The findings empirically show that the Shariah based capital asset models can be used to price the securities in a shariah-compliant way.

Table 2. Jensen Alpha Equally Weighted CAPM and Shariah Compliant CAPM

	P1	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10**	**P1-P10**	**Wald-Test**
CAPM Alpha	96.99	12.81	8.69	10.21	13.72	8.81	7.61	8.01	2.48	-4.38	101.37	45.97
	(2.01)**	(2.32)**	(2.16)**	(2.19)**	(3.14)**	(2.05)**	(1.74)**	(2.02)**	(0.73)**	(-2.3)	(2.11)**	[0.00]**
CAPM Alpha (Without Rf)	96.56	8.49	9.79	13.44	8.31	7.16	7.51	1.75	-5.05	12.55	84	43.46
	(1.99)**	(2.09)**	(2.09)**	(3.04)**	(1.92)**	(1.62)**	(1.85)**	(0.51)**	(-2.55)	-2.25	-1.75	[0.00]**
CAPM Alpha (NGDP)	103.14	12.61	15.28	19.29	15.74	14.66	16.86	12.18	6.04	17.75	85.38	141.95
	-2.29	-3.39	-3.57	-4.77	-4.06	-3.68	-4.6	-3.94	-3.3	-3.47	-1.92	[0.00]
CAPM Alpha (Zakat)	111.56	18.57	23.24	27.71	26.42	25.46	30.21	27.05	21.78	25.21	86.35	538.02
	-2.53	-5.1	-5.54	-7.01	-7.01	-6.55	-8.5	-8.96	-12.47	-5.05	-1.99	[0.00]
CAPM Alpha (Inflation)	101.51	11.28	13.51	17.41	13.35	12.25	13.86	8.83	2.52	16.09	85.41	93.89
	-2.21	-2.97	-3.09	-4.21	-3.35	-2.99	-3.69	-2.8	-1.35	-3.08	-1.88	[0.00]

This table represents the alpha values equally weighted (EW) for the conventional CAPM, CAPM without and the three models of the proposed Shariah-compliant CAPM for the complete period Jan 2001-Dec 2018.

(*) means 10% chance of rejecting the null true hypothesis showing that there exists no difference between the P1 and P10 alphas, (**) means 5% chance of rejecting the null true hypothesis showing that there exists no difference between the P1 and P10 alphas, (***) means 1% chance of rejecting the null true hypothesis showing that there exists no difference between the P1 and P10 alphas.

Table 3. Jensen Alpha Value Weighted CAPM and Shariah Compliant CAPM

	P1	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10**	**P1-P10**	**Chi-Sqr**
CAPM Alpha	78.83	12.3	8.71	10.89	13.3	9.84	6.98	7.75	2.46	-8.1	86.92	45.97
	-1.92	-2.3	-2.1	-2.35	-3.1	-2.24	-1.6	-1.94	-0.75	(-5.40)	-2.13	[0.00]
CAPM Alpha (Rm)	78.5	12.1	8.48	10.47	13	9.31	6.53	7.23	1.73	-8.8	87.31	64.87
	-1.91	-2.2	-2.02	-2.25	-2.9	-2.1	-1.5	-1.77	-0.52	(-5.35)	-2.12	[0.00]
CAPM Alpha (Zakat)	90.01	24.6	19.14	23.56	27.4	27.51	24.6	30.18	26.95	20.2	69.8	570.29
	-2.38	-5	-5.1	-5.67	-7	-7.14	-6.3	-8.47	-9.2	-14	-1.85	[0.00]
CAPM Alpha (NGDP)	83.49	17.2	12.84	15.81	18.9	16.77	14	16.69	12.12	3.2	80.29	134.38
	-2.16	-3.4	-3.34	-3.72	-4.7	-4.23	-3.5	-4.54	-4.04	-2	-2.08	[0.00]
CAPM Alpha (Inflation)	82.54	15.6	11.45	14.09	17	14.37	11.6	13.66	8.79	-0.6	83.14	91.32
	-2.1	-3	-2.92	-3.24	-4.1	-3.53	-2.8	-3.62	-2.87	(-0.37)	-2.12	[0.00]

This table represents the alpha values of value-weighted (VW) for the conventional CAPM, CAPM without and the 3 models of the proposed shariah-compliant CAPM for the complete period, Jan 2001-Dec 2018. (*) means 10% chance of rejecting the null true hypothesis showing that there exists no difference between the P1 and P10 alphas, (**) means 5% chance of rejecting the null true hypothesis showing that there exists no difference between the P1 and P10 alphas,(***) means 1% chance of rejecting the null true hypothesis showing that there exists no difference between the P1 and P10 alphas.

Table 3 presents the results of the value-weighted portfolios that are same as the portfolios with equally weighted. However, results with equally weighted are commonly used and accurate as well. The value-weighted results of the models i.e. conventional and shariah-compliant depicts that the size effect anomaly still exists in the portfolios. The P10 (large firm portfolios) shows negative alpha values, whereas the model in which zakat has replaced the risk-free rate is supersedes the alpha number. This study supports the shariah based models of calculating the returns on assets.

Table 4. Regression Analysis

	CAPM	**Without RF**	**Zakat**	**NGDP**	**Inflation**
R-Square	0.104	0.091	0.111	0.115	0.126
Adjusted R-Square	0.050	0.035	0.049	0.050	0.061
Intercept	4.601 (2.110)	1.651 (1.290)	4.102 (1.953)	4.378 (2.127)	4.510 (2.191)
Coefficient	0.087 (2.020)	0.077 (1.748)	0.094 (1.950)	0.096 (1.991)	0.095 (1.924)
F-Statistics	5.325 [0.039]	4.278 [0.009]	5.857 [0.047]	5.926 [0.038]	6.954 [0.035]

Table 4 represents the regression results of the study. The results of the study are descriptive, and the values are different from CAPM, from Zakat, NGDP and Inflation respectively. Two measures i.e. adjusted R square and intercept value are used to test and validate the performance of the proxies. The condition is that the date of the regression should be stationary. Notably, the problem with the non-stationary data is that, it sometimes gives non-valid results and can mislead the analysts. For this reason, the data should be stationary so that the OLS regression can be applied without the problem of misleading results. Therefore, the way to convert non-stationary data into stationary data is to take the differences. Furthermore, the results specify that the R – square is highest in the inflation proxy (12.6%) followed by NGDP proxy (11.5%). Notably, the difference between the biggest and the smallest R-square is 2.2%. Hence, it can be said that the Shariah-Compliant Model of GDP is superior in comparison with conventional CAPM model. Evidently, this concludes that the Shariah-compliant model can replace the conventional CAPM. The values such as coefficient and intercept are in favour of Shariah-compliant CAPM. These results suggest that the coefficient is increasing from 8.7% to 9.5%. all the values including the F-test, coefficient and the intercept show the dominance of shariah-compliant CAPM over the conventional CAPM.

5. CONCLUSIONS

This study covers and tests the power of the CAPM in an explanatory manner and the Shariah-based CAPMs which include replacing the risk-free rate with the Zakat rate which is preset by the scholars, Nominal GDP growth rate of the economy and Inflation rate of the

economy. Conclusion of the study is according to motive of study which was to find the replacement of the conventional CAPM as most of the investors in the Muslim World are hesitant to test the required rate of returns because of the risk-bearing element in the equation. Several models were proposed by the researchers, however, the proposal of El-Ashker (1987), Shaikh (2010) and Hanif (2011) were taken into consideration based on the study conducted by Sadaf and Andleeb (2014).

The period of the data of this study was 18 years i.e. from January 2001 to December 2018. The firms that are selected for this study are listed in the Pakistan Stock Exchange all Index. This was done to remove the biases and make the study more transparent. The first book to market value of each company was calculated and sorting criteria were applied (t-1). Monthly returns were annualized, and portfolios were constructed from P1 to P10. P1 being the portfolio of smaller firms and P10 is the portfolio of the largest firms based on their sizes. The calculated returns are based on equally-weighted portfolios and value-weighted portfolios. The returns of the shariah based CAPM (Zakat) supersede the conventional and other Shariah models. Hence, it can be said that the Shariah based model can be the alternate of the conventional CAPM. However, another study can be conducted to check the accuracy and the validity of the Shariah models and one of the three can be used to price the assets and calculate the required rate of returns.

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