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The Predictive Power of Multi-Factor Asset Pricing Models: Evidence from Pakistani Banks

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Abstract

This paper compares the performance of Fama-French three-factor and five-factor models using a dataset of 20 Pakistani commercial banks for the period 2011 to 2020. We focus on an emerging economy as the findings from earlier studies on developed countries cannot be generalized in emerging markets. For empirical analysis, twelve portfolios were developed based on size, market capitalization, investment strategy, and growth. Subsequently, we constructed five Fama-French factors namely, R_M, SMB, HML, RMW, and CMA. The OLS regression technique with robust standard errors was applied to compare the predictive power of both the Fama-French models. Further, we also compared the mean-variance efficiency of the Fama-French models through the GRS test. Our empirical analysis provides three unique and interesting findings. First, both asset pricing models have similar predictive power to explain the expected portfolio returns in most cases. Second, our results from the GRS test suggest that there is no noticeable difference in the mean-variance efficiency of one asset pricing model over the other. Third, we find that all factors of both Fama-French models are statistically significant and are important for explaining the volatility of expected commercial bank returns in the context of Pakistan.

Keywords: Asset Pricing Model, Fama-French Three-Factor Model, Fama-French Five-Factor Model, GRS Test, Expected Portfolio Return

JEL Classification Code: G11, G12, G21

1. Introduction

The research on asset pricing models has a long and contentious history. The first and widely used model of asset pricing was the Capital Asset Pricing Model (CAPM) developed through the prominent work of Sharpe (1964) and Lintner (1965). Despite being a novel approach to quantify the relationship between risk and return, the CAPM model was heavily criticized by future researchers for being too simplistic as it relies only on a single factor to explain expected returns. This criticism of the CAPM was addressed by a range of multi-factor models including Arbitrage Pricing Theory (APT), Fama-French models, and Carhart models. The Fama-French three-factor model (Phuoc et al., 2018; Cochrane, 2009; Fama & French, 2015, 1993) extends the CAPM by introducing two new factors i.e. Small-Minus-Big (SMB) and High-Minus-Low (HML). Prior studies indicated that the Fama-French three-factor model has substantially better predictive power as compared to the CAPM and APT (Cochrane, 2009; Fama & French, 1993). Fama and French (2015) further extended their original model by developing the Fama-French five-factor model despite the success of their three-factor model. A review of the literature suggests that past researchers have concentrated on accessing the predictive power of Fama-French three-factor and five-factor models in the context of developed countries. However, it is problematic to generalize the findings of these studies for developing countries because of significant differences in capital market regulations and governance systems (Elsayed, 2018). In view of the importance of examining multi-factor asset pricing models and the scarce evidence from

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the financial sectors of developing countries, we compare the predictive power of Fama-French three-factor and five-factor models in the context of Pakistani banks.

The study analyses two prominent asset pricing models i.e. Fama-French three-factor and five-factor models using data from 20 Pakistani commercial banks over the period 2011 to 2020. The study is based on Pakistan as it is a developing and emerging economy in South East Asia. Previous studies have primarily focused on developed economies however, we focused on an emerging economy as the results of these studies cannot be generalized due to significant differences in institutional dynamics, regulatory framework, and investor behavior (Elsayed, 2018; Pojanavatee, 2020). For comparing the performance, we constructed twelve unique portfolios based on size, market capitalization, investment strategy, and growth. For empirical analysis, several regression specifications were estimated on the constructed portfolios. The regression analysis with robust standard errors was used to compare the predictive power of the Fama-French three-factor with the five-factor model. In addition, the Gibbons et al. (GRS) test was applied to compare the mean-variance efficiency of both the asset pricing models.

This study documents some interesting and unique results. First, both asset pricing models have similar predictive power to explain the expected portfolio returns in most cases. However, Fama-French five-factor model slightly outperforms the three-factor counterpart in explaining the expected returns of certain portfolios. Second, our results from the GRS test suggest that there is no noticeable difference in the mean-variance efficiency of one asset pricing model over the other. Third, we find that all factors of the Fama-French three-factor and five-factor models are statistically significant which suggests that the factors are important in explaining the volatility of expected commercial bank returns in the context of Pakistan. Therefore, we argue that financial analysts should give recommendations to their clients after incorporating these factors in their analysis.

This study contributes to the existing literature in several ways. First, this study focuses on financial sector companies i.e. commercial banks while earlier studies have focused on non-financial companies in the context of Pakistan. Second, we compared the performance of the Fama-French three-factor and five-factor models in the context of Pakistani listed banks while earlier studies have focused on comparing the capital asset pricing model with the Fama-French model. Third, the study will greatly assist financial analysts to understand the factors that explain the variation in expected portfolio returns which may help them to devise profitable investment strategies for their clients.

The remaining study is organized as follows. The proceeding section provides a review of the influential literature in this domain. The next section discusses the research methodology. The subsequent section presents the results and discussion. The last section concludes the study by highlighting the major findings, implications, limitations, and suggestions for future research.

2. Literature Review

Past studies have investigated the applicability of the Fama-French models using data from developed markets of the US and Europe (Fidanza & Morresi, 2015). The review of the literature suggests that there is a lack of evidence from developing countries and emerging markets. Moreover, previous studies have suggested different asset pricing models for different markets (Acaravci & Karaomer, 2017; Rahman, 2010). The performance of the Fama-French five-factor model in predicting expected returns has not been adequately explored in the context of Pakistani banks. CAPM is preferred over other asset pricing models by practitioners to predict expected returns of various asset classes. CAPM is the first model of asset pricing and is relatively easy to apply for calculating expected returns as compared to other models. Moreover, the Fama-French three-factor model and the five-factor model have evolved from the CAPM. This section presents a review of the influential literature on the Fama-French models.

2.1. Fama-French Three-Factor Model

A number of studies have empirically analyzed the Fama-French three-factor model in various stock markets from developed and developing economies (Shaharuddin et al., 2018). For instance, Rahman et al. (2006) examined the Fama-French three-factor model in the context of Bangladesh. The empirical results strongly supported the Fama-French three-factor model. The study also found that time variability caused high fluctuations in stock returns over the sample period. Further, Rahman (2010) analyzed the Fama-French model using data from Islamic and conventional banks after incorporating several exposures including market risk, interest rates, and exchange rates. The study reported several interesting findings. First, different types of risk exposures have different determinants. Second, the market risk exposure of Islamic banks was lower than the conventional banks. Third, bank mergers caused a significant reduction in exposure towards interest rate risk, total risk, and unsystematic risk. Hamid et al. (2012) evaluated the efficacy of the Fama-French three-factor model on 20 banks listed on the Karachi Stock Exchange using monthly data from January 2006 to December 2010. The study found that the Fama-French three-factor model adequately explained the variations in bank returns.

Fidanza and Morresi (2015) tested the Fama-French three-factor model on the European financial firms over several time periods. The study found that size and book-to-market ratio contribute towards non-diversifiable risk and should be included for estimating the expected returns of financial firms. Moreover, the study argued that banks with high book-to-market ratios are considered riskier while small banks could not benefit from government protection. It was also contended that size, value, and market risk premium explain changes in expected stock returns. This study reports different results as compared to studies analyzing returns of non-financial firms.

Chandra (2015) compared the Fama-French three-factor model with the CAPM using a dataset of 29 Indonesian banks for the period 2010 to 2013. The results suggested that in the Indonesian context, CAPM has greater predictive power as compared to the Fama-French three-factor model. Moreover, it was argued that market returns and firm size influence changes in stock returns, while the book to market ratio does not have a statistically significant influence on stock returns. Dash (2019) examined the applicability of the Fama-French three-factor model on a sample of 9 large-capitalization stocks from the banking industry of India. The study used data for the period 2008 to 2016 and found a significant negative impact of the book-to-market ratio on mean returns. However, the influence of beta coefficient and size was insignificant. The results are substantially different from many previous studies, which suggest that stocks with high book-to-market ratios tend to have higher returns as compared to their counterparts.

2.2. Fama-French Five-Factor Model

A number of studies have empirically analyzed the Fama-French five-factor model in various stock markets from developed and developing economies. For instance, Schuermann and Stiroh (2006) compared several asset pricing models using a dataset from the US for the period 1997 to 2005. The study argued that market-related factors dominate the variation in bank returns. Adrian et al. (2015) proposed a novel five-factor asset pricing model after including return on equity and spread (i.e. the difference between financial sector returns and market returns). The study found that aggregate expected returns are negatively associated with the return on equity of financial firms. Similarly, Gharaibeh and Al-Qudah (2020) also investigated the Fama-French five-factor model using Jordanian banks data for the period 2006 to 2018. The study reported that market value and firm profitability are crucial for explaining the expected returns of Jordanian banks. The study argues that there is a high correlation between market value and investment factors which implies that banks with a high book-to-market value ratio have a conservative investment strategy. Thus, the authors suggested that market value and firm profitability may be included in the asset pricing model for predicting expected returns.

Acaravci and Karaomer (2017) analyzed the CAPM, Fama-French three, and five-factor models using data from 414 firms listed on Borsa Istanbul Exchange for the period 2005 to 2016. The study used the adjusted R-Squared, GRS test, and p-values for comparing the predictive power of these asset pricing models. The results suggest that the Fama-French five-factor model performed superior to the other models in explaining portfolio returns. Moreover, Elsayed (2018) evaluated the CAPM, Fama-French three, and five-factor models on Egyptian stocks for the period 2003 to 2017. The results suggested that the Fama-French five-factor model outperforms the others based on the GRS test when size and profitability factors were included. Contrarily, the Fama-French three-factor model outperforms other models when the book-to-market ratio was included. Moreover, it is argued that investment factors were redundant in explaining the average returns of stocks listed on the Egyptian stock market. Dirkx and Peter (2020) incorporated the momentum factor in the Fama-French five-factor model using data for German stocks for the period 2002 to 2019. The results suggest that the model with the momentum factor did not significantly enhance the explanatory power of the model as compared to the three-factor model. Ragab et al. (2020) compared the Fama-French three and five-factor models on Egyptian stocks using time series techniques. The results imply that both models are useful for explaining the variation in stock returns. Moreover, the study argues that there is no substantial difference in the predictive power of both these models based on adjusted R-Squared and GRS tests.

3. Methodology

3.1. Data

This study has used daily stock price data of 20 domestic commercial banks listed on the Pakistan Stock Exchange. The data spans a 10 year time period from 2011 to 2020. The list of twenty banks selected for the study is provided in Table 1. The prior literature has primarily used data from non-financial firms to compare the performance of Fama-French models from several developed and developing countries. However, we compare the performance of the Fama-French three-factor and five-factor models in the context of Pakistani banks for two reasons. First, Pakistan is a developing country in South East Asia that has not been adequately explored for analyzing the performance of asset pricing models. Second, the existing literature provides

Table 1: Commercial Banks Listed on the Pakistan Stock Exchange

No	Symbol	Name of Bank	Official Website
1	ABL	Allied Bank Limited	www.abl.com.pk
2	AKBL	Askari Bank Limited	www.askaribank.com.pk
3	BAFL	Bank Al-Falah Limited	www.bankalfalah.com
4	BAHL	Bank Al-Habib Limited	www.bankalhabib.com
5	BOK	Bank of Khyber Limited	www.bok.com.pk
6	BOP	Bank of Punjab Limited	www.bop.com.pk
7	BIPL	Bankislami Pakistan Limited	www.bankislami.com.pk
8	FABL	Faysal Bank Limited	www.faysalbank.com.pk
9	HBL	Habib Bank Limited	www.habibbankltd.com
10	HMB	Habib Metropolitan Bank Limited	www.hmb.com.pk
11	JSBL	JS Bank Limited	www.jsbl.com
12	MCB	MCB Bank Limited	www.mcb.com.pk
13	MEBL	Meezan Bank Limited	www.meezanbank.com
14	NBP	National Bank Of Pakistan	www.nbp.com.pk
15	SBL	Samba Bank Limited	www.samba.com.pk
16	SILK	Silkbank Limited	www.silkbank.com.pk
17	SNBL	Soneri Bank Limited	www.soneri.com
18	SCBPL	Standard Chartered Bank Limited	www.standardchartered.com.pk
19	SMBL	Summit Bank Limited	www.summitbank.com.pk
20	UBL	United Bank Limited	www.ubl.com.pk

very limited evidence in the context of banks in developing countries such as Pakistan.

The data of daily stock prices was extracted from the official website of the Pakistan Stock Exchange. Moreover, the financial data such as book value of equity and profitability was extracted from the publicly available annual reports of the listed banks.

3.2. Description and Measurement of Variables

We have used publicly available financial data for measuring several variables, such as size, book equity, book-to-market ratio, and several profitability indicators. These variables are the basis for constructing Fama-French factors. The proxy for size is market capitalization which is calculated by multiplying the number of outstanding shares by the year-end closing price of the respective banks. The book value of equity figure represents the value of equity capital reported in a bank's balance sheet. The book-to-market value ratio was calculated by dividing the book value of equity by the market value of equity. Similarly, operating profit was represented by EBIT which is reported in the published financial statements. Return on equity was calculated by dividing net income by the total book value of equity. The investment in total assets was calculated by measuring the change in total assets over the financial year.

3.3. Statistical Techniques

Past studies have used three main statistical techniques for analyzing asset pricing models i.e. cross-sectional, time series, and panel data analyses (Cochrane, 2009). This study has applied the Ordinary Least Squares (OLS) regression to compare the predictive power of Fama-French three-factor and five-factor models. To address some violations of statistical assumptions, we have used robust standard errors. To compare the performance of the asset pricing models, we will focus primarily on the intercept coefficient, coefficient of the risk factors, and the model selection criteria such as adjusted R-squared. The following general equation was estimated to compare the asset pricing models.

$$R_{it} - R_{ft} = \alpha + \sum \beta_{it} \times F + e_{it} \quad (1)$$

Where R_{it} is the stock return of bank i at time t, R_{ft} is the risk-free rate at time t, α represents the intercept,

β_{it} represents the coefficient, F represents the risk factors from the Fama-French three-factor and five-factor models. This study has used the sample mean of each factor for estimating the risk premium. To calculate the market risk premium, we have subtracted the risk-free rate from the return on the market as per the existing literature (Cochrane, 2009).

Furthermore, we also perform the GRS test to assess and compare the mean-variance efficiency of the Fama-French three-factor model with the Fama-French five-factor model. The GRS test, developed by Gibbons et al. (1989) is a test of mean-variance efficiency and serves as a benchmark for evaluating asset pricing models. The GRS test enables us to assess if the particular asset pricing model can explain the expected returns of an asset or a portfolio. In addition, the test is also used to rank various asset pricing models based on their performance. The GRS test can be applied using the following formula.

$$\text{GRS Statistics} = \frac{T}{N} \times \frac{T-N-L}{T-l-1} \times \frac{\hat{\alpha} \times \sum'^{-1} \times \hat{\alpha}}{1+\mu' \times \Omega'^{\wedge} - 1 \times \mu'} \sim \text{FN}, T-N-L \quad (2)$$

Where $\hat{\alpha}$ represents the estimated intercepts, $\sum$ represents the residual covariance matrix, T represents the number of observations, N is the number of portfolios, L is the number of factors, and Ω represents the covariance matrix of the portfolio factors.

3.4. Portfolio Construction

In this study, we have used the data for constructing twelve portfolios, i.e. Small Value Stocks Portfolio (SVSP), Big Value Stocks Portfolio (BVSP), Small Growth Stocks Portfolio (SGSP), Big Growth Stocks Portfolio (BGSP), Small and High Operating Profitability Stocks Portfolio (SHPSP), Big and High Operating Profitability Stocks Portfolio (BHPSP), Small and Low Operating Profitability Stocks Portfolio (SLPSP), Big and Low Operating Profitability Stocks Portfolio (BLPSP), Small and Conservative Growth Stocks Portfolio (SCGSP), Big and Conservative Growth Stocks Portfolio (BCGSP), Small and Aggressive Growth Stocks Portfolio (SAGSP) and Big and Aggressive Growth Stocks Portfolio (BAGSP).

The first set of portfolios (i.e. SVSP, SGSP, BVSP, and BGSP) were constructed after considering the size and growth aspects of stocks. The first portfolio SVSP was formed by including small and value stocks. Stocks have been classified as small stocks if their market capitalization is below the median level of market capitalization. Further, stocks have been classified as value stocks if the book equity-to-market equity ratio is greater than the median value of book equity-to-market equity ratio of all banks. The second portfolio BVSP was formed by including big and value stocks. Stocks have been classified as big stocks if their market capitalization is above the median level of market capitalization. The third portfolio SGSP was formed by including small and growth stocks. Stocks have been classified as growth stocks if the book equity-to-market equity ratio is lesser than the median value of the book equity-to-market equity ratio of all banks. The fourth portfolio BGSP was formed by including big and growth stocks.

The second set of portfolios (i.e. SHPSP, BHPSP, SLPSP, and BLPSP) were constructed after considering the size and operating profitability aspects of stocks. The fifth portfolio SHPSP was formed by including small and high operating profitability stocks. Stocks have been classified as high operating profitability stocks if the EBIT is greater than the median value of EBIT of all banks. The sixth portfolio BHPSP was formed by including big and high operating profitability stocks. The seventh portfolio SLPSP was formed by including small and low operating profitability stocks. Stocks have been classified as high operating profitability stocks if the EBIT is greater than the median value of EBIT of all banks. The eighth portfolio BLPSP was formed by including big and low operating profitability stocks.

The third set of portfolios (i.e. SCISP, BCISP, SAISP, and BAISP) were constructed after considering the size and investment pattern/strategy of stocks. The ninth portfolio SCISP consists of stocks that are classified as small and follow a conservative investment strategy. The tenth portfolio BCISP consists of stocks that are classified as big and follow a conservative investment strategy. The eleventh portfolio SAISP consists of stocks that are classified as small and follow an aggressive investment strategy. The tenth portfolio BCISP consists of stocks that are classified as big and follow an aggressive investment strategy.

3.5. Factors in Fama-French Models

We now discuss the factors used in the Fama-French models, i.e. R_M, SMB, HML, RMW, and CMA. R_M is based on the KSE-100 Index returns. The KSE-100 index is the most prominent index of the Pakistan Stock Exchange consisting of the 100 largest and influential firms. The KSE-100 index is regularly used by financial analysts and academicians as a benchmark of stock market performance. R_M was calculated by subtracting the risk-free rate (proxied by the three-month Treasury bill rate) from the expected return on the market i.e. KSE-100 index.

$$R_M = E(R) - R_{\text{RF}} \quad (3)$$

The Small Minus Big (SMB) factor was formed in three steps. First, we take the average of two portfolios (comprising small-value stocks and small-growth stocks).

Second, we take the average of two portfolios (comprising big-value stocks and big-growth stocks). Third, we take the difference between the two averages.

$$\begin{aligned} SMB &= (SVSP + SGSP)/2 - (BVSP + BGSP)/2 \\ &= \tfrac{1}{2}(SVSP + SGSP - BVSP - BGSP) \end{aligned} \quad (4)$$

Moreover, the High Minus Low (HML) factor was also formed in three steps. First, we take the average of two portfolios (comprising small-value stocks and big-value stocks). Second, we take the average of two portfolios (comprising small-growth stocks and big-growth stocks). Third, we take the difference between the two averages.

$$\begin{aligned} HML &= (SVSP + BVSP)/2 - (SGSP + BGSP)/2 \\ &= \tfrac{1}{2}(SVSP + BVSP - SGSP - BGSP) \end{aligned} \quad (5)$$

Furthermore, the Robust Minus Weak (RMW) factor was formed in three steps. First, we take the average of two portfolios (comprising small-high profitability stocks and big-high profitability stocks). Second, we take the average of two portfolios (comprising of small-low profitability stocks and big-low profitability stocks). Third, we take the difference between the two averages.

$$\begin{aligned} RMW &= (SHPSP + BHPSP)/2 - (SLPSP + BLPSP)/2 \\ &= \tfrac{1}{2}(SHPSP + BHPSP - SLPSP - BLPSP) \end{aligned} \quad (6)$$

Last, the Conservative Minus Aggressive (CMA) factor was formed in three steps. First, we take the average of two portfolios (comprising of small-conservative investment stocks and big-conservative investment stocks). Second, we take the average of two portfolios (comprising small-aggressive investment stocks and big-aggressive investment profitability stocks). Third, we take the difference between the two averages.

$$\begin{aligned} CMA &= (SCISP + BCISP)/2 - (SAISP + BAISP)/2 \\ &= \tfrac{1}{2}(SCISP + BCISP - SAISP - BAISP) \end{aligned} \quad (7)$$

4. Results and Discussion

4.1. Descriptive Statistics

The descriptive statistics of the Fama-French factors are presented in Table 2. The mean value of R_M is 0.0273% and has a standard deviation of 1.04%. This return represents the overall excess market return over the risk-free rate. Contrarily, the mean value of all the other factors such as SMB, HML, RMW, and CMA are all negative, i.e. −0.0209%, −0.0268%, −0.0258%, and −0.0438% respectively. The negative mean value of SMB implies that the return of small-value and small-growth stock portfolios is less than the big-value and big-growth stock portfolios. Similarly, the negative mean value of HML suggests that small-growth and big-growth stock portfolios are outperforming their value counterparts. Further, RMW has a mean value of −0.0258% which implies that small and big stock portfolios with low operating profitability outperform small and big stocks portfolios with high operating profitability. Likewise, CMA also has a negative mean value which suggests that small and big conservative investment stock portfolio underperform their aggressive investment counterparts. The skewness and kurtosis coefficients along with the significant Jarque-Bera statistics are reported to analyze whether the Fama-French factors are normally distributed. Since all the skewness and kurtosis coefficients are considerably different from 0 and 3 respectively, it appears that the Fama-French factors are not normally distributed. Furthermore, the significant Jarque-Bera statistics also indicate that the factors do not follow the normal distribution.

4.2. Pearson Correlations

The Pearson correlations of the Fama-French factors are reported in Table 3. R_M has a negative correlation with HML ($r = -0.0684$) and SMB ($r = -0.0152$). Likewise, HML has a negative correlation with RMW ($r = -0.7389$)

Table 2: Descriptive Statistics

	Variables				
	R_M	**SMB**	**HML**	**RMW**	**CMA**
Mean	0.000273	−0.000209	−0.000268	−0.000258	−0.000438
Std. Dev.	0.010425	0.007556	0.005597	0.006651	0.006008
Skewness	−0.600784	2.001142	3.739542	−2.705723	−3.318435
Kurtosis	7.379094	27.94723	72.01684	42.01585	68.47818
Jarque-Bera statistic	2109.278***	65301.21***	492970.2***	158707.6***	443070.2***

Note: ***Denotes the statistical significance at the 1% level.

and CMA (r = −0.3346). Similarly, SMB also has a negative correlation with RMW (r = −0.9520) and CMA (r = −0.6398). Contrarily, R_M has a positive correlation with RMW (r = 0.0110) and CMA (r = 0.1855). Moreover, HML and SMB are positively correlated (r = 0.7521). Finally, RMW also has a positive correlation with CMA (r = 0.6169). Overall, the correlations indicate that the Fama-French factors are associated with one another.

4.3. Results of Fama-French Regressions

The regression results of the Fama-French three-factor and five-factor models are presented in Table 4 and 5 respectively. The F-statistics for all the regressions were statistically significant at the 1% level which suggests that all the models have sufficient explanatory power. However, to conserve space the F-statistics are not reported in Tables 4 and 5. The intercept values of most of the Fama-French regressions presented in Tables 4 and 5 are close to zero. The intercept values of most of the Fama-French three-factor regressions are statistically insignificant at the 10% level. Contrarily, several intercept coefficients of the Fama-French five-factor regressions are statistically significant at the 10% level.

Moreover, all partial slope coefficients of the Fama-French three-factor and five-factor regressions are statistically significant at the 1% level. This implies that the Fama-French factors (i.e. R_M, SMB, HML, RMW, and CMA) are important and contribute significantly in explaining excess portfolio returns. The significant Fama-French factors corroborate the viewpoint of Fama and French (1993, 2015) who argue that the variation in

Table 3: Pearson Correlations

	R_M	HML	RMW	CMA	SMB
R_M	1.000000				
HML	−0.068411	1.000000			
RMW	0.011075	−0.738930	1.000000		
CMA	0.185590	−0.334648	0.616978	1.000000	
SMB	−0.015249	0.752116	−0.952008	−0.639802	1.000000

Table 4: Fama-French Three-Factor Regression Results

Portfolio		Intercept	R_M	SMB	HML
SGSP	Coefficient	−0.00004	0.89048***	1.3306***	−0.5901***
	t-statistic	−0.2757	69.05033	50.972	−16.7122
	R^2	0.782493			
	Adjusted R^2	0.784029			
SVSP	Coefficient	0.0002	0.8385***	1.9997***	0.4598***
	t-statistic	1.4718	68.3426	48.3148	13.6671
	R^2	0.8356			
	Adjusted R^2	0.8354			
BGSP	Coefficient	−0.80003***	0.83821***	0.19996***	−0.53976***
	t-statistic	−2.668	68.30665	8.03386	−16.06105
	R^2	0.683984			
	Adjusted R^2	0.683597			
BVSP	Coefficient	−0.000037	0.890378***	0.33055***	0.409875***
	t-statistic	−0.275651	69.05029	12.06315	11.6055
	R^2	0.705504			
	Adjusted R^2	0.705144			

Note: ***Denotes statistical significance at the 1% level.

Table 5: Fama-French Five-Factor Regression Results

Portfolio		Intercept	R_M	SMB	HML	RMW	CMA
SGSP	Coefficient	−0.000189	0.92145***	0.982552***	0.61285***	−0.463105***	0.055627***
	t-statistic	−1.29478	65.37033	14.34019	−15.00434	−6.621057	1.675794
	R^2	0.758856					
	Adjusted R^2	0.758364					
SVSP	Coefficient	0.000006	0.860185***	0.851626***	0.367247***	−0.55341***	0.089984***
	t-statistic	0.47505	67.09617	13.66619	9.885996	−8.699491	2.980573
	R^2	0.832064					
	Adjusted R^2	0.831722					
BGSP	Coefficient	−0.000549	0.825225***	−0.209784***	−0.631489***	−0.619216***	0.143901***
	t-statistic	−4.274221	66.48554	−3.47713	−17.55805	−10.05399	4.92318
	R^2	0.697543					
	Adjusted R^2	0.696926					
BVSP	Coefficient	−0.000221	0.886779***	−0.83297	0.387742***	−0.53444***	0.109241***
	t-statistic	−1.60679	66.71444	−1.289218	10.06706	−8.102973	3.489936
	R^2	0.707251					
	Adjusted R^2	0.706653					
SLPSP	Coefficient	−0.000228	0.816991***	0.890412***	−0.144307***	−0.99969***	0.137589***
	t-statistic	−1.798499	66.56059	1,492,393	−4.057354	−16.41369	4.760038
	R^2	0.852381					
	Adjusted R^2	0.852079					
SHPSP	Coefficient	−0.0000065	0.837717***	0.814808***	−0.154964***	−0.074835	0.11921***
	t-statistic	−0.050005	66.34819	13.27637	−4.23563	−1.194474	4.009321
	R^2	0.731077					
	Adjusted R^2	0.730528					
BLPSP	Coefficient	−0.0000536	−847692***	−0.172966	−0.109278***	−1.097791***	0.114675***
	t-statistic	−4.123636	67.46696	−2.83209	−3.001508	−17.60815	3.875699
	R^2	0.736382					
	Adjusted R^2	0.735844					
BHPSP	Coefficient	−0.000235	0.827251***	−0.101801*	−0.099293***	−0.028175	0.132751***
	t-statistic	−1.870547	68.16416	−1.725688	−2.823533	−0.467864	4.645004
	R^2	0.690053					
	Adjusted R^2	0.68942					
SCISP	Coefficient	−0.000106	0.930885***	0.622966***	−0.105126***	−842021***	0.642383***
	t-statistic	−0.742333	67.14342	9.244438	−2.616914	−12.24018	19.67641
	R^2	0.778129					
	Adjusted R^2	0.777676					
SAISP	Coefficient	−0.000291	0.830497***	0.79189***	−0.109318***	−0.636223***	−0.358669***
	t-statistic	−2.271823	67.17332	13.17699	−3.051447	−10.37073	−12.31916
	R^2	0.832135					
	Adjusted R^2	0.831792					

Table 5: (Continued)

Portfolio		Intercept	R_M	SMB	HML	RMW	CMA
BCISP	Coefficient	−0.000252	0.854913	−0.150049**	−0.154924***	−0.536403***	0.592554***
	t-statistic	−1.895885	66.54863	−2.402935	−4.16189	−8.414916	19.58725
	R^2	0.712105					
	Adjusted R^2	0.711517					
BAISP	Coefficient	−0.000591	954981***	−0.314535***	−0.150059***	−0.736673***	−0.406091***
	t-statistic	−3.987453	66.67309	−4.517693	−3.61555	−10.36506	−12.03946
	R^2	0.683434					
	Adjusted R^2	0.682788					

Note: *, ** and *** denotes statistical significance at the 10%, 5% and 1% levels respectively.

excess portfolio returns cannot be explained by the market risk premium alone while ignoring other important factors such as HML, SMB, RMW, and CMA. Thus, consistent with the recommendations of Fama and French (1993, 2015), we argue that financial analysts should supplement the market risk premium with unique Fama-French factors for forecasting portfolio returns and explaining the volatility in returns.

The performance of the Fama-French three-factor and five-factor models can be compared using the Adjusted *R*-squared criterion. The Adjusted *R*-squared is a measure of the predictive power of a regression model in explaining the variation in the dependent variable. The Adjusted *R*-squared of the Fama-French three-factor model lie between 0.68 and 0.83. These values imply that the three-factor model explains between 68% and 83% of the variation in excess portfolio returns. Moreover, the Adjusted *R*-squared of the Fama-French five-factor model lies between 0.68 and 0.85. These values imply that the five-factor model explains between 68% to 85% variation in excess portfolio returns. Overall, these results suggest that both the Fama-French three and five-factor models have reasonably good predictive power but the Fama-French five-factor model slightly outperforms its three-factor counterpart in certain scenarios. Thus, the Adjusted *R*-squared values also support the viewpoint that Fama-French factors are crucial in explaining excess portfolio returns in the context of Pakistani banks.

The GRS test was also applied to compare the mean-variance efficiency of the Fama-French three-factor model with the five-factor model. The GRS statistics for both the Fama-French models' specifications were very close to one another. This implies that the mean-variance efficiency of both models is not considerably different. Hence, we can conclude that both the Fama-French models perform reasonably well against one another in explaining the excess portfolio returns.

5. Conclusion

This study intends to compare the performance of the Fama-French three-factor and five-factor models in the context of Pakistani commercial banks. Therefore, we analyze data from 20 active commercial banks listed on the Pakistan Stock Exchange for the period 2011 to 2020. Consistent with the previous literature, we developed twelve portfolios based on size, market capitalization, investment strategy, and growth. We then construct five Fama-French factors namely, R_M, SMB, HML, RMW, and CMA. OLS regressions with robust standard errors were applied to analyze and compare the predictive power of both the Fama-French models. Further, we also compare the mean-variance efficiency of the Fama-French models through the GRS test. The results suggest that both the Fama-French three-factor and five-factor models perform relatively well in explaining the excess portfolio returns. We find some evidence that the Fama-French five-factor model has a slightly better predictive power than the three-factor model in some scenarios.

The study has some implications for practitioners and investors. First, the results imply that Fama-French three-factor and five-factor models have better predictive power as compared to conventional asset pricing models. Second, we recommend that financial analysts should prefer the Fama-French five-factor model over its three-factor counterpart for forecasting portfolio returns as it has slightly better predictive power. Third, investors should devise their investment strategies based on the Fama-French five-factor model rather than a single-factor model.

This study has several limitations. First, this study is restricted to Pakistani banks over a 10 year time period. Second, we only analyze two Fama-French models but do not compare them with the single-factor capital asset pricing model. Third, the study only focused on Fama-French models but did not consider other multi-factor models.

Therefore, we recommend that future researchers may compare the predictive power of multiple contemporary asset pricing models using a cross-country dataset from emerging economies.

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