AN APPROPRIATE INVESTMENT PORTFOLIO FOR STOCK MARKET INVESTORS: EVIDENCE FROM PAKISTAN

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Abstract. *The study aims to identify the most appropriate investment portfolio (AIP) for investors, and to identify the characteristics of the*

portfolio which forms AIP. For this purpose, sixteen time series portfolios has been formed, using Fama and French five factor model (2015). Besides, marker factor, four risk factors have been constructed which include SMB, HML, RMW, and CMA. The results show that five portfolios which are BHRA, BLRA, BLRC, BHRC, and SHRA are appropriate investment portfolios for investors in Pakistan. Amongst these portfolios, BHRA earns highest monthly average returns of 1.17% having standard deviation of 9.13%, followed by BLRA with average monthly returns of 1.05% with standard deviation of 7.59%. The average return of BHRA is 11.4% higher than BLRA, whereas standard deviation of BHRA is almost 20% larger than the standard deviation of BLRA. Both, the average per month return and risk of BHRA are highest amongst all higher returns portfolios. Contrarily, the excess return of BLRA is not considerably low from BHRA but the incremental risk per unit return of BHRA is almost double of BLRA. Therefore, amongst all five appropriate portfolios, BLRA is justifiably the most appropriate investment portfolio which has the highest adjusted R-square of 77.106 %, the highest average returns of 1.053 % per month, and minimum risk of 7.5%. The results, therefore, suggests all investors to include big, low book/market, robust profitable, and aggressive investment stocks in their portfolios to earn above average returns with minimum risk.

Keywords: Appropriate Investment Portfolio (AIP), Fama & French Five-Factor Model, portfolio characteristics.

Introduction

When it comes to investments, one of the main questions for investors is where to invest capital given the two objectives of increasing the return and reducing the risk in mind. Modern portfolio theory of Markowitz (1952) has thrown light on this question and explained it in a general way, which says that investors should invest in the form of portfolio to diversify unsystematic risk. To get maximum benefits of diversification, the choice of securities that are to be included in the portfolio should follow a simple criterion that there should be negative correlation amongst securities and they should have higher return on a calculated risk or offer minimum risk at given level of returns.

Sharpe (1964) further added to this question by leading the discussion in the context of systematic risk by developing the capital asset pricing model (CAPM). CAPM calculates systematic risk adjusted expected returns of equities. Now when it comes to formation of portfolio of securities what matters is only the pricing of systematic risk.

Ross (1973) provided arbitrage pricing theory, which says that CAPM is a single factor (i.e. market factor) model. However, expected returns can be a function of more than one factor. He did not identify the factors but provided a starting point to search for other factors. Later on, large number of CAPM anomalies arise which is comprised of; price earnings ratio of Basu (1977), size anomaly of Benz (1981), earnings price anomaly of Basu (1983), Leverage anomaly of Bhandari (1988), book to market ratio of Rosenberg, Reid, and Lanstein (1985), and momentum anomaly of Jegadeesh and Titman (1993).

These anomalies gave birth to multifactor asset pricing models. Some of the prominent multifactor models are three factor model of Fama and French (1993), four factor model of Carhart (1997), Alternative three factor model of Chen, Marx, and Zhang (2013), and Fama and French five factor model (2015). Multitude of literature has been written throughout the world on the validity of said models.

But despite the contributions of various researchers and huge amount of literature in the area of investment and portfolio management the two questions, i.e. which portfolio of securities is the most appropriate investment portfolio for investment, and what are its characteristics remain unanswered.

The objective of this study was to find answers these two questions in the context of a developing country--Pakistan. First is to identify that which portfolio of securities is the most appropriate investment portfolio for investors of Pakistan. Second objective is to answer that what type of characteristics form the most appropriate investment portfolio (AIP) in the context of Pakistan?

The finding of the study is that BLRA is the most appropriate investment portfolio (AIP) for investors of Pakistan. BLRA is a portfolio of stocks which is comparatively bigger (B), with low book to market ratio (L), with robust net operating profitability (R), and having aggressive investment (A).

In Pakistan, investors can earn maximum possible returns with minimum possible risk by investing in this portfolio. The remainder of this work consists of sections such as Second Chapter consists of review of literature, Chapter three is research methodology of the study, Chapter four is finding of the study, and Chapter five concludes the study.

Literature review

The foundation of modern finance was laid down by Markowitz (1952) who put his entire emphasis on portfolio selection. In his seminal paper, he introduced the concepts of diversification, systematic and unsystematic risk, and formation of stocks portfolio. The major take away of his work was risk diversification-- do not invest in a single security, invest in a portfolio of securities. When more securities are added to a portfolio then risk of individual security become negligible and the only risk that still persist in portfolio that cannot be eliminated even due to diversification is called systematic risk.

Sharpe (1964), Linter (1965) and Mossin (1966) developed CAPM based on the initial work done by Markowitz. CAPM measures the systematic risk adjusted expected return of a security.

Efficient Market Hypothesis (EMH) was given by Fama (1970) that is based on Sharpe, Linter, and Mossin model. It states that semi strong form of efficiency prevails in stock markets. Because security prices incorporate all the information that is available in the stock market, hence bring the market to equilibrium.

Ross (1976) proposes Arbitrage Pricing Theory (APT),it states that expected return is not based on merely one factor that is market risk premium as provided by Sharpe, Lintner and Mossin. But expected returns of a security rely on large number of factors. This study does not identify and measure the factors but provide starting point to search for other factors, after that a large number of anomalies arise that has raised a question mark on the validity of CAPM and EMH.

Price earnings anomaly (P/E) of Basu (1977) explores the empirical bond between equity returns and price earnings ratio. EMH negates the possibilities of earning abnormal returns but P/E hypothesis states that it can be an indicator of earning abnormal returns due to overstated expectations of investors. Hence

price earnings ratios may deserve attention of investors at the time of formation of portfolio formation and portfolio revision.

Roll (1977) criticizes the validity of CAPM that it is not testable as calculation of CAPM requires calculation of average return of market portfolio and in reality formation of market folio is not possible so CAPM cannot be tested. Average rate of return of an efficient portfolio should not be dealt as a proxy of market portfolio.

Benz (1981) explored association of stocks return and size of NYSE (New York Stock Exchange) common stocks with effect from 1936 to 1975.It finds that larger firms had lesser returns than the smaller firms. This size effect has been existed for studied period. The existence of size effect for almost forty years provides that the CAPM is mis-specified. The size effect is linear for smaller size firms but it is not linear for medium and large size firms.

Bhandari (1988) investigated the relationship of leverage and expected common stock returns. It was found that stock with high debt to equity ratio have high risk adjusted returns than stocks with low debt to equity ratio. Therefore, debt to equity ratio should also be included as an independent factor to determine expected returns.

Rosenberg, Reid, and Lanstein (1985) argue that stocks with high book to market price ratio (B/M) outperform the stocks with low book to market price of stocks. They conclude that one of the reasons behind inefficiency of NYSE is buying stocks with high B/M ratio and selling stocks with low (B/M) ratio as it provides information to earn higher returns.

Fama and French (1993) studied market factor, Firm size, and book to market ratio these three factors explain variations in equity returns. Whereas, two risk factors that are maturity risk and default risk explain variations in bond returns. These five factors explain variations in average returns of stocks and bonds.

Jegadeesh and Titman (1993) observed trading strategies that abnormal returns can be earned through buying stocks that have earned significant returns in past (past winners) whereas, selling stocks that have performed poor in past (past loser). A winner minus loser (WML) portfolio of stocks that have performed well in the previous 6-months are bought and kept it for the next 6-months can earns positive returns for the next 12 months and half of the portfolio returns will start to dissipate in following two years. Transactions by investors who buy winner stocks and sell loser stock can move away the prices temporarily and cause overreaction.

Carhart (1997) developed four factors model by including momentum anomaly with FF3. Four factor model explain substantial time-series and cross-

sectional variations. The four factors model had also improved the pricing errors of CAPM and three factors model. Carhart provide very important insights for mutual funds investors for wealth maximization.

Mirza and Shahid (2008) tested application of Fama and French three factors model in Pakistan. It was found that three factors model explain cross-sectional variations for most of the portfolios. They provided the evidence of size and value premium in Karachi stock exchange.

Hassan and Javed (2011) compared CAPM and FF3 using data of Karachi stock exchange. Both, CAPM and FF3 are found valid for Pakistani equity market. The explanatory power of FF3 is significantly higher than traditional CAPM due to inclusion of size and value factors.

Khan et all (2012) used market, size and leverage premium to test asset pricing. Conclusively, market and size premium significantly explicates cross sectional variation but leverage premium do not contribute toward cross sectional variations of stock returns.

Eraslana (2013) tested validity of FF3 on the Istanbul stock exchange. FF3 has explained variations in expected stock returns but the explanatory power was not strong during the tested period in comparison with other studies in Istanbul. The reason is that time period, number of portfolios, and indices of all studies were different. Economic crunches also affect the macroeconomic variables and stock prices.

Fama and French (2015) extended their 1993 model five factors with profitability and investment factor. The new model has performed better than the traditional three factors model by explaining average stock returns but value premium turn out to be redundant factor in FF5.

Chiah, Chai and Zhong (2015) compared FF3 and FF5. Profitability and investment factors have enhanced the explanatory power of FF5 in comparison with FF3. FF5 do not completely explain all variations in expected returns although it explains more asset pricing anomalies.

Hassan et al. (2017) compare CAPM, FF3, and FF5 for explaining expected returns in context of an emerging country…Pakistan. All of the three models were found valid for explaining portfolio returns but FF5 model is found to be the most appropriate model in context of Pakistan.

Rashid et al. (2018) test validity of CAPM and FF3. Study established that both CAPM, and three factor model is valid in the context of Pakistan.

Hassan et al. (2018) used Fama and Macbeth (1973) two pass regression to tests the applicability of FF5 in the context of Pakistan. It is found empirically that FF5 is a valid asset pricing model as investment and profitability has significantly explained portfolio returns.

Lohano and Kashif (2018) perused the efficacy of CAPM, three factors, and five factor models in context of Pakistan. The outcomes have concluded that by using time series approach three factors model have did well in comparison to CAPM. Whereas, five factor model found better in cross sectional approach.

All of the above studies in the domain of asset pricing are focusing on either testing the applicability of asset pricing models or it compares various asset pricing model in the context of different countries. It is therefore utmost important to explore a portfolio of securities having specific characteristic by which investors can form a portfolio of securities which can earns maximum possible returns with minimum risk of the overall portfolio.

Research Methodology

This section explains the data, variable construction, formation of stock portfolios and specification of the model.

Data

For the purpose of portfolio sorting, data on risk factors have been taken for fourteen years for largest 120 companies. Whereas, monthly share price, risk free rate, and monthly index data have been taken from June 2000-2001 to June 2013-2014 for the purpose of excess portfolio returns and factors risk premium.

Portfolio Formation

So as to organize portfolio in accordance with size, market capitalization of each company for all years was calculated at the end of June for the year t-1 i.e. for the year July, 2000 to June 2001, market capitalization at the end of June, 2000 was calculated and then arranged it from small market to large market capitalization and divided it into two groups i.e. small and large.

Size portfolio was further sorted according to book to market value from low book to market value to high book to market value and divided it into two groups i.e. low book to market value and high book to market value.

Value sorted portfolios are once again arranged on the basis of operating profitability from low operating profitability to high operating profitability and separated into two groups i.e. weak profitability and robust profitability group.

Profitability sorted portfolio are then organized according to investment in assets from low investment companies to high investment companies and

alienated it into two groups i.e. conservative investment and aggressive investment.

Variable Development

Four factors are calculated as zero-investment portfolios. These factors are built from sixteen sub portfolios to separate the factor premiums from each other.

Size Premium (SMB) = 1/8 *[(SLWC-BLWC) + (SLWA-BLWA) + (SLRC-BLRC) + (SLRA-BLRA) + (SHWC-BHWC) + (SHWA-BHWA) + (SHRC-BHRC) + (SHRA-BHRA)]

Value Premium (HML) = 1/8 *[(SHWC-SLWC) + (SHWA-SLWA) + (SHRC-SLRC) + (SHRA-SLRA) + (BHWC-BLWC) + (BHWA-BLWA) + (BHRC-BLRC) + (BHRA-BLRA)]

Operating Profitability Premium (RMW) = 1/8 *[(SLRC-SLWC) + (SLRA-SLWA) + (SHRC-SHWC) + (SHRA-SHWA) + (BLRC-BLWC) + (BLRA-BLWA) + (BHRC-BHWC) + (BHRA-BHWA)]

Investment Premium (CMA) = 1/8 *[(SLWC-SLWA) + (SLRC-SLRA) + (SHWC-SHWA) + (SHRC-SHRA) + (BLWC-BLWA) + (BLRC-BLRA) + (BHWC-BHWA) + (BHRC-BHRA)]

Market Premium (MKT) = $(R_{mt} - R_{ft})$

Where $Rm = Ln (KSE/KSE_{t-1})$

R_{ft} = risk free rate of return

SMB can be taken to mean as to returns of a portfolio i.e. high on small companies and low on big companies, controlling for market, value, profitability and investment effects.

HML can be taken to mean as to returns of a portfolio that is high for companies that have high book to market ratio and low for companies that have low book to market ratio, controlling for market, size, profitability and investment effects.

RMW can be taken to mean as to returns of a portfolio that is high for companies that have high operating profit and low for companies that have low operating profit, controlling for market, value, size and investment effects.

CMA can be taken to mean as to returns of a portfolio that is high for companies that have low investment in total assets and high for companies that

have aggressive investment in total assets, controlling for market, value, profitability and size effects.

MKT can be taken to mean as excess returns of market portfolio over risk free rate of returns, controlling for market, value, profitability and investment effects.

Model specification

$R_{it} - R_{Ft} = a + b_i (R_{Mt} - R_{Ft}) + s_i (SMB_t) + h_i (HML_t) + r_i (RMW_t) + c_i (CMA_t) + e_{it}$…………………………………………………………………………….(3)

Where as

$R_{it} - R_{Ft}$= excess returns of "i" portfolio for the period "t"

a= intercept

$(R_{Mt} - R_{Ft})$ = Market premium at time 't'; (SMB_t)= Size Premiumat time 't'; (HML_t) = Value Premiumat time 't'; (RMW_t) = Premium for profitability at time 't'; (CMA_t) = Investment Premiumat time 't

Empirical Results

This section of the study explains the empirical results.

Descriptive statistics of stock portfolios

Table 1 displays descriptive statistics of portfolios arranged by Size, B/M, EBIT, and Investment. BHRA has the maximum mean returns of 1.17% per month whereas, SLWA has the minimum mean returns of -.37% per month. BHRC has the highest risk of 9.36% per month as measured by standard deviation while, SLWA has the minimum risk of 6.70% per month.

Table 1 *Descriptive Statistics of Size-B/M-EBIT-Investment Sorted Portfolios.*

Portfolio	Mean	Max	Min	Std. Dev.
BHRA	0.012	0.248	-0.408	0.091
BHRC	0.008	0.303	-0.312	0.094
BHWC	0.004	0.336	-0.386	0.089
BHWA	0.005	0.253	-0.506	0.090
BLRA	0.011	0.211	-0.405	0.076
BLRC	0.008	0.204	-0.270	0.070
BLWC	-0.000	0.156	-0.178	0.067
BLWA	0.007	0.231	-0.291	0.074
SHRA	0.010	0.196	-0.247	0.087
SHRC	0.007	0.228	-0.234	0.083

SHWA	0.007	0.234	-0.306	0.089
SLRC	0.006	0.234	-0.294	0.077
SHWC	-0.000	0.201	-0.314	0.082
SLRA	0.007	0.223	-0.361	0.080
SLWA	-0.004	0.214	-0.318	0.067
SLWC	0.002	0.234	-0.204	0.071

Time series regression for five factor model

Results of time series regression for five factor model are reflected from Table 2. It is concluded that market premium is positive and significant at 5% level of significance for all of the sixteen portfolios. The size premium (SMB) is significantly and positively related to portfolio of small stock, though; it is not steady for big stock portfolios. Whereas for value premium (HML) the risk adjusted return of portfolio of stocks with high book to market ratio outdid low book to market ratio. For profitability premium (RMW) the portfolio returns is high for robust profitable stocks and low for weak profitable stocks. While for investment premium (CMA), average returns of the portfolio are high for conservative investment and low for aggressive investment stocks. Consequently, it delivers indication that in Pakistan portfolio of small stock outdoes portfolio of big stock, value stock outpaces growth stocks, robust profitable firms outdo weak profitable stocks, and conservative investment outdoes aggressive stocks on the basis of risk adjusted returns. These outcomes in line Hassan et al. (2017), Lohano and Kashif (2018), Hassan et al. (2018).

Range of adjusted R-square is from 46.02% to 77.10%. It means that from 46.02% to 77.10% variation in portfolio returns is clarified by variations in market premium, size premium, value premium, operating profit premium and investment premium. Probability value of F-statistics is also established statistically significant at 5% level of significance for all of the sixteen portfolios. This means that market premium, size premium, value premium, operating profit premium and investment premium has significant linear relationship with portfolio returns for all portfolios and it is steady with Fama and French five factors model. Therefore, Fama and French five factors model is found effective as it is considerably explaining portfolio returns in equity market of Pakistan.

Table 2 *Five Factor Time Series Regression*

Portfolio	Inter-cept	MKT	SMB	HML	RMW	CMA	Adj. R2	F-Stat	Sig
SLWC	-0.01	0.85	1.07	-0.42	-0.57	0.38			
t-Stat	-1.71	13.6	8.83	-3.16	-3.85	2.77	0.56	46.27	0.00
SLWA	-0.01	0.75	0.96	-0.37	-0.65	-0.22			
t-Stat	-3.33	11.67	7.77	-2.66	-4.28	-1.54	0.5	33.92	0.00
SLRC	-0.01	0.77	1.05	-0.24	0.67	0.65			
t-Stat	-1.97	10.7	7.61	-1.54	3.93	4.11	0.52	37.06	0.00
SLRA	-0.01	0.74	1.09	-0.5	0.41	-1.11			
t-Stat	-2.26	10.15	7.7	-3.17	2.34	-6.89	0.54	39.64	0.00
SHWC	-0.01	0.765	0.9	0.62	-0.8	0.38			
t-Stat	-2.48	12.26	7.51	4.64	-5.45	2.78	0.68	71.24	0.00
SHWA	-0.01	0.77	1.03	0.89	-0.74	-0.83			
t-Stat	-1.45	12.36	8.63	6.68	-5.04	-6.09	0.73	91.76	0.00
SHRC	-0.01	0.76	1.33	0.65	0.18	0.51			
t-Stat	-1.51	11.4	10.43	4.58	1.12	3.48	0.65	62.88	0.00
SHRA	-0.01	0.76	1.23	0.74	0.34	-0.35			
t-Stat	-1.62	11.12	9.31	5	2.12	-2.29	0.66	65.33	0.00
BLWC	-0.01	0.69	0.33	-0.3	-0.7	0.41			
t-Stat	-2.06	10.31	2.6	-2.12	-4.44	2.79	0.46	29.48	0.00
BLWA	0	0.78	0.33	-0.28	-0.78	-0.61			
t-Stat	-0.96	11.44	2.51	-1.9	-4.82	-4.04	0.53	38.26	0.00
BLRC	-0.01	0.7	-0.08	-0.11	0.3	0.22			
t-Stat	-2.59	13.19	-0.81	-0.95	2.39	1.83	0.68	72.46	0.00
BLRA	-0.01	0.88	-0.08	-0.42	0.15	-0.31			
t-Stat	-2.35	17.94	-0.89	-3.99	1.32	-2.85	0.77	113.5	0.00
BHWC	-0.01	0.77	-0.01	0.61	-0.55	0.45			
t-Stat	-2.16	12.31	-0.15	4.61	-3.71	3.22	0.73	88.96	0.00
BHWA	-0.01	0.79	0.06	0.61	-0.39	-0.55			
t-Stat	-2.85	12.5	0.47	4.52	-2.59	-3.95	0.73	91.02	0.00
BHRC	-0.01	0.86	0.08	0.55	0.31	0.42			
t-Stat	-2.76	13.99	0.63	4.2	2.15	3.13	0.76	109.1	0.00
BHRA	-0.01	0.69	0.05	0.69	0.48	-0.62			
t-Stat	-2.24	10.88	0.42	5.075	3.19	-4.37	0.73	91.28	0.00

Adjusted R-square for the Five-Factor model

Table 3 shows adjusted R-square for the Five-Factor model. All portfolios are sorted from lowest to highest r-square value. From table 1 and 2 it is observed that BHRA, BLRA, BLRC, BHRC and SHRA are the portfolios that have high adjusted R-square value and these portfolios have the highest average returns as well. All these portfolios are favorable investment portfolio for investors in Pakistan. Because these portfolios earn highest excess returns and the risk factors significantly explaining these returns.

Amongst these portfolios, BHRA earns highest average returns of 1.17% per month with a standard deviation of 9.13%. Next to it is BLRA that earns average returns of 1.05% per month with a standard deviation of 7.59%. The average per month returns of BHRA is 11.4% higher than average per month returns of BLRA whereas, standard deviation of BHRA is almost 20% larger than the standard deviation of BLRA. It is clear from table 1 that average per month returns of BHRA is the highest but risk of this portfolio is also the highest amongst all higher returns portfolios. While excess returns of BLRA is not very considerably low from BHRA but incremental risk per unit of returns of BHRA is almost double of BLRA. Therefore, it is justifiable that amongst these five favorable portfolios, BLRA is the most efficient portfolio that has the highest adjusted R-square of 77.106 %, highest average returns of 1.053 % per month and minimum risk of 7.5%. Therefore, it is strongly recommended investors of Pakistan should form a portfolio with characteristics of big size, low B/M, robust profitable and aggressive investments to earn maximum profit by having minimum possible risk.

Table 3 *Adjusted R-Square of portfolios*

Portfolios	5FM-FF
BLWC	0.460
SLWA	0.496
SLRC	0.519
BLWA	0.527
SLRA	0.536
SLWC	0.575
SHRC	0.649
SHRA	0.658
SHWC	0.678
BLRC	0.682
BHWC	0.725
BHWA	0.730
BHRA	0.730
SHWA	0.731
BHRC	0.764
BLRA	0.771

Conclusion and Recommendations

This study was carried out to test the applicability of Fama and French Five factors model for explaining time series variation in excess portfolio returns in Pakistani equity market for the purpose of finding out the appropriate portfolio of stocks.

It can be concluded from the results that in Pakistan portfolio of small stock outperform portfolio of big stock, portfolio of stocks with high book to market ratio outperform portfolio of stocks with low book to market ratio, portfolio of stock with robust operating profitability outperform portfolio of stock with low operating profitability and portfolio of stock with traditional investment outperform portfolio of stock with bellicose investment on the basis of risk adjusted returns. The same results and interpretation is also presented by Fama and French (2015).

BLRA is the most efficient portfolio that has the highest adjusted R-square of 77.106 %, second highest average returns of 1.053 % per month and minimum risk of 7.5%. It is worth noting that BLRA remains the most efficient portfolio for CAPM and three factors model as well along with five factors model .

The outcomes of this work warrant all type of investors, fund managers, and analysts to include profitability premium and investment premium along with market premium and size and value premium for valuation purpose, capital budgeting and project appraisal. Those investors who do not want to take huge risk and to earn above average returns should form their portfolio on the basis of big size stocks, low book to market value, robust profitability and aggressive investment.

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