



ADVANCE SOCIAL SCIENCE ARCHIVE JOURNAL

Available Online: <https://assajournal.com>

Vol. 05 No. 01. Jan-March 2026. Page#. 6430-6450

Print ISSN: [3006-2497](#) Online ISSN: [3006-2500](#)Platform & Workflow by: [Open Journal Systems](#)

Bank Profitability, Shariah Status and Regime-Switching Strategies: Evidence from Pakistan Stock Exchange-Listed Banks

Muhammad Mohsin Bhatti

PhD Scholar

Institute of Business Management & Administrative Sciences,
The Islamia University of Bahawalpur

Hassan Mujtaba Nawaz Saleem

Associate Professor

Institute of Business Management & Administrative Sciences,
The Islamia University of Bahawalpur

Muhammad Farooq

Assistant Professor

Institute of Business Management & Administrative Sciences,
The Islamia University of Bahawalpur

ABSTRACT

Purpose: This study investigates the impact of Pakistan Stock Exchange-listed banks profitability and Shariah compliance status on superior investors wealth, who are differentiated based on their risk profile such as Risk Averse, Risk Neutral, Risk Taker (RA, RN, RT) and further investigating which strategy from Regime-Switching and non-Regime Switching is better to amplify these associations.

Methodology: By adopting quantitative approach, this study focuses on 20 commercial banks listed on the Pakistan Stock Exchange (PSX). Secondary data comprising of daily closing balances of banks' stocks is taken from a reliable source Business Recorder, the one-month KIBOR rates from the State Bank of Pakistan (SBP), and KSE_ALL benchmark from the official website of PSX. The period spans November 18, 2015, to December 31, 2025, selected to align with Shariah segregation stated by PSX. Three data streams were developed, the Whole-Sample (November 18, 2015, to December 31, 2025), the In-Sample (November 18, 2015, to February 12, 2017), and the Out-Sample (February 13, 2017, to December 31, 2025). The data streams are processed by using statistical analysis like 'Descriptive Analysis' and 'OLS Regression' by using MS-EXCEL. Descriptive statistics and OLS regression were performed using MS-EXCEL while forecasting of Out-Sample data was executed through 'Filtered Probability' using MATLAB version R2018a.

Findings: Across the whole-sampled data, top profitable banks segment has higher mean value (0.0454%) with standard deviation (1.218%) than bottom profitable banks segment (0.218%) than the

bottom-profitability portfolio (0.0347% and 1.425%). Moreover, Shariah compliance banks segment performed better with mean value (0.0600%) but with a high standard deviation (1.837%) than conventional banks segment (0.0379% and 1.169%). In forecasts of out-sampled data with initial investment of Rs. 1, the growth in observes in top profitable banks segment are RA=Rs. 2.246, RN=2.050 and RT=2.418 under regime-switching model and bottom banks Rs. 2.081, Rs. 1.893, and Rs. 2.291 respectively. The results reveal that all investors (RA, RN, and RT) generate superior wealth in top profitable banks as compared to bottom profitable banks. Furthermore, results confirm that the Islamic banks outperform conventional banks across all risk profiles of investors. These results substantiate that both profitability and Shariah compliance positively impact on wealth maximization for all investors by risk profile.

Practical Implications: The qualified results and hypotheses of the research will be helpful for investors in portfolio management strategies and the regulators in developing regulations to save the interest of stakeholders.

Originality: This is a unique work done on wealth maximization of investors by risk profile having investment in the Banking sector of PSX. This type of study is never conducted early. So, it is unique work done.

Keywords: Risk Averse, Risk Neutral, Risk Taker, Wealth Maximization, Top Profitable Banks and Bottom Profitable Banks, Islamic Banks, Conventional Banks, Regime Switching Model, Non-Regime Model, Ending Wealth, Sharpe Ratios, Random Matrix Theory, MATLAB.

1. Introduction

Investors wealth maximization is not a simple criterion of selecting asset with higher returns. The recent research on portfolio management reveals that dynamic portfolio return distributions, uncertain estimation, risk considerations, and changing market conditions; consequently, following elements are become integral parts of portfolio evaluation: risk, return, investors' behavior towards risk, and forecasts of investment performance (Lassance & Vrins, 2023; Salo et al., 2024; Grant et al., 2024). The importance of portfolio management for emerging markets is very high and relevant, where static analysis rules are less reliable because of micro and macro-economic conditions.

Banking sector plays an important role in economic activities for emerging economies such as Pakistan. While banking sector is one of the largest and active trading participants of the Pakistan Stock Exchange, yet commercial banks are different based on their, profitability, risk tolerance, business models, and Shariah Compliance status. Recent evidence confirms that Shariah-Compliant portfolios can better resilience against market risk than conventional equities. Although the literature in general confirms that Islamic equities better perform in all market conditions (Shear & Ashraf, 2022; Abu-Alkheil et al., 2024; Ghaemi Asl et al., 2024).

The second concern is whether market trend information can maximize investors wealth. The investment decision based on market conditions (bearish and bullish) can enhance portfolios performance. The recent developments in portfolio optimization techniques such as regime-switching strategies, online allocation, and market knowledge can support in identification of optimal asset

allocation (Ciciretti & Bucci, 2023; Guo et al., 2023; Tian et al., 2023). Yet complex models are not guarantee of superior wealth. A noisy regime classification can cause inverse impact.

This study addresses these concerns by using daily returns data of 20 PSX-listed banks for the period 18 November 2015 to 31 December 2025. This study compares two dimensions, first which set of banks better for wealth maximization from top profitable banks and bottom profitable, second Islamic banks or conventional banks are better for investors in term of wealth maximization. For each dimension, all investors by risk profile processed through MATLAB furcating for both paths' regimes-switching and non-switching strategies.

This study contribution us fourfold. First, it examines the regime-aware Pakistani banking sector portfolio. Second, is examine bank level comparison of Islamic vs conventional instead of relying of indices. Third, it evaluates wealth maximization together with market sensitivity. Fourth, derived conclusion based on empirical data.

1.1 Research Questions

RQ1: Does profitability of PSX-listed banks impact on the wealth maximization of investors by risk profile?

RQ2: Does Shariah Compliance Status impact on the wealth maximization of investors by risk profile?

RQ3: Does regime-switching strategy better than non-regime-switching strategy for the wealth maximization of investors by risk profile?

RQ4: Does investors risk profile impact on the wealth maximization of investors by risk profile?

1.2 Hypothesis

H1: Top profitable banks are better for the wealth maximization of investors by risk profile than bottom profitable banks.

H2: Islamic banks are better for the wealth maximization of investors by risk profile than conventional banks.

H3: Regime-Switching strategy is better for the wealth maximization of investors by risk profile than non-Regime-switching.

2. Literature Review

The pinning theory of this study is Modern Portfolio Theory (MPT), introduced by Markowitz (1952), provided foundation to asset allocation is about maximizing returns by minimizing risk. According to this theory, investors allocate assets on optimal portfolio to enhance expected returns by lowering risks associated with each asset type. Fama and French (1992) further improved this framework demonstrating that expected returns depend on market beta, size and value. But the risk and return trade off remains integral part of financial management, the main challenge of increasing expected return by mitigating risk (Fama & French, 1992).

While the supporting theories are behavioral finance and Capital Asset Pricing Model (CAPM). Behavioral finance theories challenge the traditional financial theories by inducing the psychological factors and claimed that investment decisions are affected by behavioral factors. Shefrin and Statman (2000) developed behavioral portfolio theory by introducing psychological factors into investment decision making, while **Wong (2020)** contributed a detailed working on behavioral economics and finance. The

second supporting theory is Capital Asset Pricing (CAPM) which deals on the association of expected return and systematic risk.

The investors always seek wealth maximization which is the core objective of their investment activities. There are many theories and practices developed in support of investors' wealth maximization, one of them is the Modern Portfolio Theory (Markowitz, 1952) which proposes that the allocation of assets is of top importance to get the maximum benefit that comes from minimizing construable risk and leads to enhance the returns. In financial management, one of the key important topics is the trade of 'Risk & Return', it is all about the game of increasing expected return by decreasing avoidable risk (Fama & French, 1992). To increase expected return, one strategy proposed by Li and Mulvey (2021), considering economic conditions and minimizing the transactional cost, will boost expected return, it is called neural network-based portfolio optimization.

No doubt, the wealth maximization topic of interest for investors. The central point of the stock market is 'Investors'. The investors are important as they invest money to make money, the decisions and patterns of investment are also depending on the behavior of investors. That is why the investors' behavior has been becoming important as per the latest study by Baker et al. (2019) which also highlights that investors' behavior of taking risks in portfolio selection is based on cognitive biases. The behavior of investors towards risk can be categorized as risk averse, risk neutral, and risk taker.

Now, the question arises regarding the sources of risk, which are many and different but one of the major sources of risk is market fluctuations. To assess variations of the financial market in different economic conditions, Markov-Regime Models were developed by Andrey Markov in 1956 after that it was modernized by Hamilton in 1989. These models are mainly used in pricing financial assets, managing risk, and allocating portfolios (Hamilton, 1989). These Regime Switching Models are better for return as compared to Non-Regime Switching Models (Campani et al., 2022). Markov-Regime Models are being used in the mortgage segment and found to be effective (Zhou et al., 2022). Non-switching regime models are static and unable to capture dynamic market tests in his research, they work in static market conditions (Iftimie et al., 2023).

Market trends affect all the businesses of the economy but big companies less effect by them. Moreover, Shariah Compliant stocks are gaining popularity not only in developing countries as well as in developed countries like Japan. In a study, it is proved that Sharia-compliant stocks outperform as compared to Non-Shariah-compliant stocks (Saleem & Ahmad-Zaluki, 2021).

One of the key players in the money market is the banks, many studies are there that link banks' performance with portfolio optimization (Xiong et al., 2020). The behavior of the investors also has an impact on portfolio performance (Sharma & Mitra, 2020).

Despite of extensive research work on wealth maximization, investors behavior and portfolio optimization but limited empirical evidence on the association of banks' profitability and investors wealth maximization, Shariah status and investors wealth maximization. Specifically, no prior research has conducted on: (a) comparison of top vs. bottom profitable banks in Pakistani banking sector, (b) comparison of wealth maximization by Islamic vs. conventional banks and application of regime-switching vs. non-regime switching models. So, this study fills this gap by providing comprehensive comparison

of impact of profitability, Shariah Status and regime strategy on wealth accumulation by investors differentiated based on their risk appetite.

Based on theory and literature review, the conceptual framework for this study positions independent variables are banks profitability and Shariah compliance status, the dependent variable is investors wealth maximization/ ending wealth. The investors behavior towards risk such as Risk Averse, Risk Neutral and Risk Taker are moderating variables. While the regime-switching dynamics are market conditions.

3 . Methodology

This study adopts quantitative research design based on secondary data of banks and market benchmark (KSE_All). for this research is being adopted. The sample consists of 20 commercial banks listed on Pakistan Stock Exchange (PSX). The daily closing balances of stocks and KSE_All are retrieved from PSX, while one-month KIBOR values used as risk-free are sourced from the State Bank of Pakistan (SBP). The sample starts from 18 November 2015 because from this date PSX developed Shariah Compliance framework. For analysis purpose the data was divided into three data streams named whole-sample period is reported as 18 November 2015 to 31 December 2025 in-sample 18 November 2015 to 12 February 2017 and out-sample from 13 February 2017 to 31 December 2025. The classifications of top and bottom profitable banks are based on profit after tax for the year ended 31 December 2025, this methodology adopted by **Saleem & Ahmad-Zaluki (2021)** for Automobile sector. The detail of sample composition is:

Portfolio/category	Banks	N
Top-profitability segment	ABL, BAFL, BAHL, HBL, HMB, MCB, MEBL, NBP, SCBPL, UBL	10
Bottom-profitability segment	AKBL, BIPL, BML, BOK, BOP, FABL, JSBL, SBL, SILK, SNBL	10
Islamic throughout study	MEBL, BIPL	2
Conventional	Remaining sampled banks	18
Total	PSX-listed banks in study	20

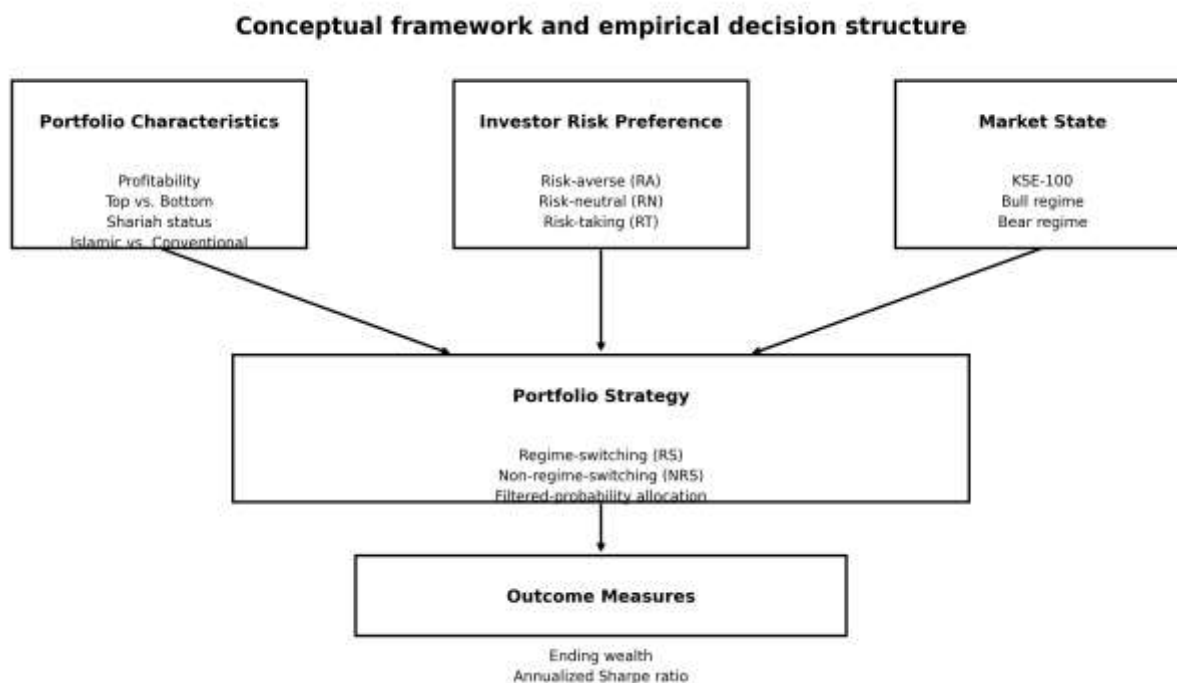
For market-sensitivity and return analysis, the all three data streams undergone through statistical techniques such as descriptive analysis and CAPM-based OLS. The descriptive statistics cover mean, variance, standard deviation, and skewness. The Ordinary Least Squares (OLS) regression covers beta and R-square of all banks' stocks and their benchmarks. Through disruptive analysis, the characteristics of the data is analyzed while OLS regression used to assess the market sensitivity.

For forecasting wealth maximization by the investors differentiated based on their risk profile, Rs. 1 invests into out-sample data and compares both asset allocation strategies Markov Regime-Switching and Non-Regime switching models. The out-sample data undergone software MATLAB R2018a, by using filtered probabilities for the regime-based forecasts. Based on results, all three investors risk averse (RA), risk neutral (RN) and risk taker (RT) are compared and evaluated. The resulting series are interpreted using ending wealth and, separately, Sharpe ratios.

The key outcome is ending wealth of investors rather than a causal regression coefficient. Therefore, H1 and H2 are evaluated based ending reported wealth, values of corresponding portfolio categories. While the H3 is evaluated based on all risk profiles rather than regime-switching.

Figure 1 presents the conceptual framework of this empirical study. Profitability (Top vs. Bottom), Shariah Status (Islamic vs. Conventional) are portfolio categories, investors risk profile (Risk Averse, Risk Neutral and Risk Taker) and KSE-100 Index Bullish/ Bearish market conditions while the Regime-Switching and Non-Regime-Switching are investment strategies. Portfolio outcomes are ending wealth.

Figure 1. Conceptual Framework



4. Analysis and Results:

Econometric model: CAPM market-sensitivity test

To quantify market sensitivity, the study estimates a CAPM-style regression separately for each bank and for the principal portfolio groups:

$$(R_{it} - R_{ft}) = \alpha_i + \beta_i (R_{mt} - R_{ft}) + \varepsilon_{it}$$

where R_{it} is the bank or portfolio return, R_{ft} is the daily risk-free rate derived from KIBOR, R_{mt} is the KSE-All benchmark return, α_i is abnormal average excess return, β_i is market sensitivity, and ε_{it} is the idiosyncratic disturbance. OLS is estimated for the whole sample, in-sample period, and out-of-sample period. The main purpose is descriptive market-sensitivity assessment rather than causal identification.

In this section, the empirical analysis and its results are presented. For analysis purpose, descriptive analysis by using MS-Excel and results are given under table 4.1 and 4.2:

Table-4.1. Descriptive Analysis of Stock Returns and Excess Return of their Benchmarks

Bank	Panel A: Whole-Sample				Panel B: In-Sample				Panel C: Out-Sample			
	Mean	Variance	SD	Skewness	Mean	Variance	SD	Skewness	Mean	Variance	SD	Skewness
ABL	0.00030	0.00030	0.01650	0.49250	0.00040	0.00020	0.01290	0.53430	0.00020	0.00030	0.01690	0.48720
BAFL	0.00050	0.00040	0.01910	0.04160	0.00120	0.00020	0.01560	0.34330	0.00040	0.00040	0.01950	0.02520
BAHL	0.00060	0.00030	0.01810	(0.19330)	0.00100	0.00020	0.01350	(0.90930)	0.00050	0.00030	0.01860	(0.14890)
HBL	0.00020	0.00040	0.01930	0.39350	0.00080	0.00020	0.01560	0.48510	0.00010	0.00040	0.01980	0.38930
HMB	0.00050	0.00030	0.01840	(0.41570)	0.00050	0.00020	0.01420	(0.05420)	0.00050	0.00040	0.01890	(0.43320)
MCB	0.00020	0.00030	0.01620	0.06330	(0.00010)	0.00020	0.01530	0.22110	0.00020	0.00030	0.01630	0.04440
MEBL	0.00090	0.00040	0.01890	(0.10380)	0.00130	0.00030	0.01730	0.42610	0.00080	0.00040	0.01910	(0.15700)
NBP	0.00060	0.00050	0.02130	0.10380	0.00120	0.00020	0.01550	(1.54970)	0.00050	0.00050	0.02200	0.18980
SCBPL	0.00050	0.00060	0.02360	(0.27020)	0.00070	0.00050	0.02240	(0.02140)	0.00040	0.00060	0.02380	(0.29860)
UBL	0.00040	0.00050	0.02300	(10.88460)	0.00130	0.00020	0.01360	0.43960	0.00030	0.00060	0.02400	(10.88900)
AKBL	0.00060	0.00040	0.02010	(0.12970)	0.00070	0.00020	0.01400	0.43750	0.00060	0.00040	0.02080	(0.15060)
BIPL	0.00030	0.00080	0.02770	(2.16750)	0.00090	0.00050	0.02240	0.96050	0.00020	0.00080	0.02830	(2.36570)
MBL	0.00010	0.00200	0.04470	2.88530	0.00000	0.00090	0.03060	1.26850	0.00010	0.00210	0.04630	2.90270
BOK	0.00050	0.00070	0.02690	(0.10040)	0.00130	0.00050	0.02240	0.29020	0.00030	0.00080	0.02740	(0.12520)
BOP	0.00060	0.00070	0.02620	0.37440	0.00230	0.00060	0.02470	0.75740	0.00030	0.00070	0.02630	0.33420
FABL	0.00070	0.00050	0.02220	0.24050	0.00140	0.00040	0.01910	0.24000	0.00060	0.00050	0.02260	0.24370
JSBL	0.00030	0.00090	0.03080	0.49910	0.00100	0.00060	0.02470	1.06300	0.00020	0.00100	0.03150	0.46180
SBL	0.00030	0.00230	0.04780	0.18480	0.00070	0.00130	0.03620	0.35610	0.00030	0.00240	0.04920	0.17500
SILK	(0.00010)	0.00090	0.03010	1.00600	0.00010	0.00070	0.02690	1.32670	(0.00020)	0.00090	0.03050	0.97420
SNBL	0.00030	0.00050	0.02290	(0.60500)	0.00080	0.00030	0.01700	0.38370	0.00020	0.00060	0.02360	(0.64430)
KSE_All	0.00030	0.00010	0.01070	(0.37040)	0.00100	0.00000	0.00670	0.13230	0.00020	0.00010	0.01110	(0.36220)

Table-4.1 consists of a descriptive analysis of all twenty banks listed on Pakistan Stock Exchange (PSX) and their benchmark (KSE_All).

Panel A: is descriptive statistics of whole-sample reflecting means of daily returns which are close to zero with range -0.0001 to 0.0009 across individual banks, while mean value of their benchmark is 0.0003. The mean values of top profitable banks are higher and positive (0.0002 to 0.0009) in comparison of bottom profitable banks (-0.0001 to 0.0006). This indicates that average daily returns are better of top tier of banks which is also better from their benchmark KSE_All 0.0003. The variances of top banks ranging (0.0003 to 0.0006) while bottom banks with (0.0004 to 0.0023) indicate that top tier banks having low spread (less risky) in comparison of bottom banks (more risky) while benchmark value is 0.0001. The standard deviation indicates the consistency, the SD values of top banks is (0.0162 to 0.0236) and bottom banks (0.021 to 0.0478), indicating top tier banks returns are more consistent as compared to bottom group of banks and their benchmark value is 0.0107 near to top banks. The skewness of the

descriptive statistics indicates direction of data, top banks are with 50% negatively skewed while this ratio in bottom banks is 40% and benchmark/ market also with negative skewness value (0.3704). Overall, in whole-sample data stream, the top banks outperform but skewness is with more downside along with their benchmark which is risky.

Panel B: is descriptive statistics of in-sample reflecting means of daily returns which are close to zero with range -0.0001 to 0.0023 across individual banks, while mean value of their benchmark is 0.0010. The mean values of top profitable banks are higher (-0.0001 to 0.0013) in comparison of bottom profitable banks (0.000 to 0.0023) but only MCB is the bank with negative returns which is from top tier of banks. This indicates that average daily returns are better of top tier of banks which is also better from their benchmark KSE_All 0.0010. The variances of top banks ranging (0.0002 to 0.0005) while bottom banks with (0.0000 to 0.0007) indicate that top tier banks having low spread (less risky) in comparison of bottom banks (more risky) while benchmark value is 0.0000. The standard deviation indicates the consistency, the SD values of top banks is (0.0129 to 0.0224) and bottom banks (0.0140 to 0.0363), indicating top tier banks returns are more consistent as compared to bottom group of banks and their benchmark value is 0.0067 near to top banks. The skewness of the descriptive statistics indicates direction of data, top banks are with 40% negatively skewed while this ratio in bottom banks is 0% and benchmark/ market also with positive skewness value (0.1323). Overall, in whole-sample data stream, the top banks outperform but skewness is with more downside along with their benchmark which is risky.

Panel C: is descriptive statistics of out-sample reflecting means of daily returns which are close to zero with range -0.0002 to 0.0008 across individual banks, while mean value of their benchmark is 0.0010. The mean values of top profitable banks are higher (0.0001 to 0.0008) in comparison of bottom profitable banks (-0.0002 to 0.0006). This indicates that average daily returns are better of top tier of banks which is also better from their benchmark KSE_All 0.0002. The variances of top banks ranging (0.0003 to 0.0006) while bottom banks with (0.0004 to 0.0024) indicate that top tier banks having low spread (less risky) in comparison of bottom banks (more risky) while benchmark value is 0.0001. The standard deviation indicates the consistency, the SD values of top banks is (0.0163 to 0.0240) and bottom banks (0.0208 to 0.0492), indicating top tier banks returns are more consistent as compared to bottom group of banks and their benchmark value is 0.0111 near to top banks. The skewness of the descriptive statistics indicates direction of data, top banks are with 50% negatively skewed while this ratio in bottom banks is 40% and benchmark/ market also with positive skewness value (0.3622). Overall, in whole-sample data stream, the top banks outperform but skewness is with more downside along with their benchmark which is risky.

Table-4.2. OLS-Regression Calculations Stock Returns and Excess Return of their Benchmarks

Bank	Panel A: Whole Sample				Panel B: In-Sample				Panel C: Out-Sample			
	Intercept	Slope	SE	R-Squared	Intercept	Slope	SE	R-Squared	Intercept	Slope	SE	R-Squared
ABL	0.0001	0.588	0.588	0.1449	-0.0005	0.9041	0.9041	0.2219	0.0001	0.572	0.572	0.141
BAFL	0.0003	0.8569	0.8569	0.229	0.0001	1.1121	1.1121	0.2305	0.0003	0.8436	0.8436	0.2299
BAHL	0.0004	0.6908	0.6908	0.1664	0.0003	0.6394	0.6394	0.1018	0.0004	0.6935	0.6935	0.1712
HBL	-0.0001	0.9547	0.9547	0.2777	-0.0005	1.3417	1.3417	0.335	-0.0001	0.9349	0.9349	0.2752
HMB	0.0003	0.6235	0.6235	0.1311	-0.0001	0.679	0.679	0.1037	0.0004	0.621	0.621	0.1335
MCB	0	0.7492	0.7492	0.2425	-0.0013	1.2709	1.2709	0.3126	0.0001	0.723	0.723	0.241
MEBL	0.0007	0.7675	0.7675	0.1874	0.0004	0.9146	0.9146	0.1266	0.0007	0.76	0.76	0.1947
NBP	0.0003	0.9482	0.9482	0.2255	0.0004	0.8595	0.8595	0.139	0.0003	0.9528	0.9528	0.2315
SCBPL	0.0003	0.5198	0.5198	0.0551	0.0003	0.4513	0.4513	0.0184	0.0003	0.5234	0.5234	0.0597
UBL	0.0001	0.9717	0.9717	0.2029	0.0002	1.1644	1.1644	0.3349	0.0001	0.9616	0.9616	0.1973
AKBL	0.0004	0.8365	0.8365	0.1973	-0.0001	0.9213	0.9213	0.1954	0.0004	0.8325	0.8325	0.1976
BIPL	0.0001	0.7134	0.7134	0.0756	0.0002	0.7723	0.7723	0.054	0.0001	0.7102	0.7102	0.0775
MBL	-0.0001	0.6218	0.6218	0.022	-0.0008	0.8755	0.8755	0.0372	0	0.6092	0.6092	0.0213
BOK	0.0004	0.2357	0.2357	0.0087	0.0013	0.0493	0.0493	0.0002	0.0003	0.2446	0.2446	0.0098
BOP	0.0003	1.1364	1.1364	0.2146	0.0009	1.4728	1.4728	0.1617	0.0001	1.1183	1.1183	0.2218
FABL	0.0005	0.8874	0.8874	0.1814	0.0005	1.0305	1.0305	0.1328	0.0004	0.8799	0.8799	0.1864
JSBL	0	0.9371	0.9371	0.1054	-0.0004	1.4787	1.4787	0.1628	0	0.9091	0.9091	0.1023
SBL	0.0002	0.5345	0.5345	0.0142	-0.0002	0.9514	0.9514	0.0314	0.0002	0.513	0.513	0.0134
SILK	-0.0003	0.7041	0.7041	0.0624	-0.0007	0.8412	0.8412	0.0444	-0.0003	0.6972	0.6972	0.0645
SNBL	0.0001	0.5306	0.5306	0.0609	0.0004	0.4056	0.4056	0.026	0.0001	0.5369	0.5369	0.0636
KSE_All	0	1	1	1	0	1	1	1	0	1	1	1

4.2 Table-4.2

Table-4.2 consisting of three panel results of descriptive analysis:

Panel-A: The results of the whole-sample OLS estimates indicate that top profitable banks are strongly aligned with their benchmark KSE_All. The average beta of top banks is 0.78 which reflects co-movement with market. The bottom tier of banks with marginal lower average of 0.73 with ranging 0.31 for SNBL to 1.13 for BOP. R-Squared, the explanatory power of top tier banks better with aver R-squared 0.202 compared to bottom tier of banks with R-squared value 0.091, reflecting that 20% of returns variation of profitable banks due to systematic factors. The intercepts of both groups are negligible significant.

Panel-B: The results of the in-sample OLS estimates indicate that top profitable banks are strongly aligned with their benchmark KSE_All. The average beta of top banks is 0.99, with HBL at 1.34 and MCB at 1.27 which reflects co-movement with market. The bottom tier of banks with marginal lower average of 0.95 with BOP at 1.47 and FABL at 1.03. R-Squared, the explanatory power of top tier banks better with aver R-squared 0.212 compared to bottom tier of banks with R-squared value 0.099, reflecting that 21% of returns variation of profitable banks due to systematic factors. The intercepts of both groups are negligible significant.

Panel-C: The results of the out-sample OLS estimates indicate that top profitable banks are strongly aligned with their benchmark KSE_All. The average beta of top banks is 0.76, which reflects co-movement with market. The bottom tier of banks with marginal lower average of 0.70. R-Squared, the explanatory power of top tier banks better with aver R-squared 0.198 compared to bottom tier of banks with R-squared value 0.089, reflecting that 20% of returns variation of profitable banks due to systematic factors. The intercepts of both groups are negligible significant. These results suggest that single-factor models are adequate for top tier of banks for capturing risk-return trade-off better compared to bottom tier of banks.

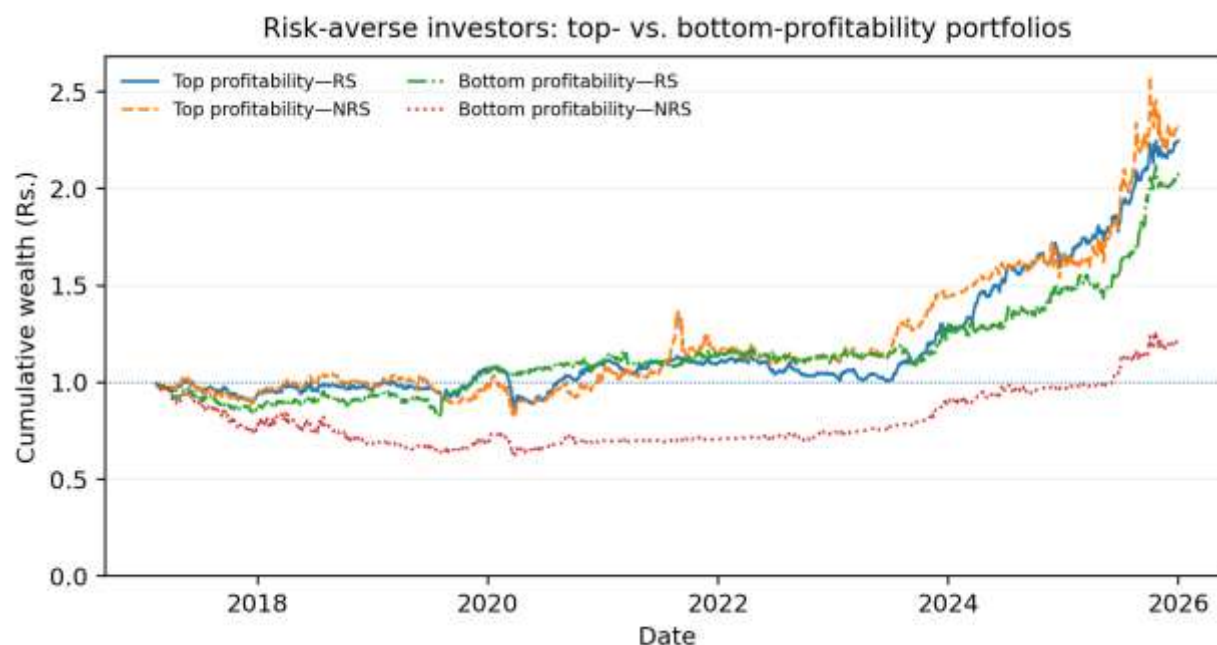
4.2 Forecasting of Out-Sample Data:

Now, for forecasting purpose data is split into two data sets, first part is called In-Sample data from 18-Nov-2015 to 12-Jan-2017 where returns of portfolio are at their maximum level, from 13-Jan-2017 to 06-Dec-2025 data is being labeled as Out-Sample data. Forecasting purpose, the out-sample data is undergone filtered probability by investing Rs.1 for all investors (RA, RN, RT) and the results obtained in form of wealth accumulated by all said investors during out-sample tenure. The results are comprised of performance of investors by using Markov Regime Switching and Static Models for 1. Top Profitable Banks Vs. Bottom Profitable Banks, 2. Islamic Vs. Conventional Banks. Total 20 banks are listed on PSX which are divided into two lists one is top profitable banks and second bottom profitable banks on the basis of profit after tax for the year 2024 published in their annual reports and reputed newspapers in Pakistan. The software which is applied on data forecasted ending wealth of investors is called MATLAB R2018a. For better and quick understanding, the results are presented in pictorial form given below:

4.2.1: Risk Averse Investors: (Top Profitable Vs. Bottom Profitable Banks)

Risk averse investors avoid taking risk, the comparison of these types of investors is given below:

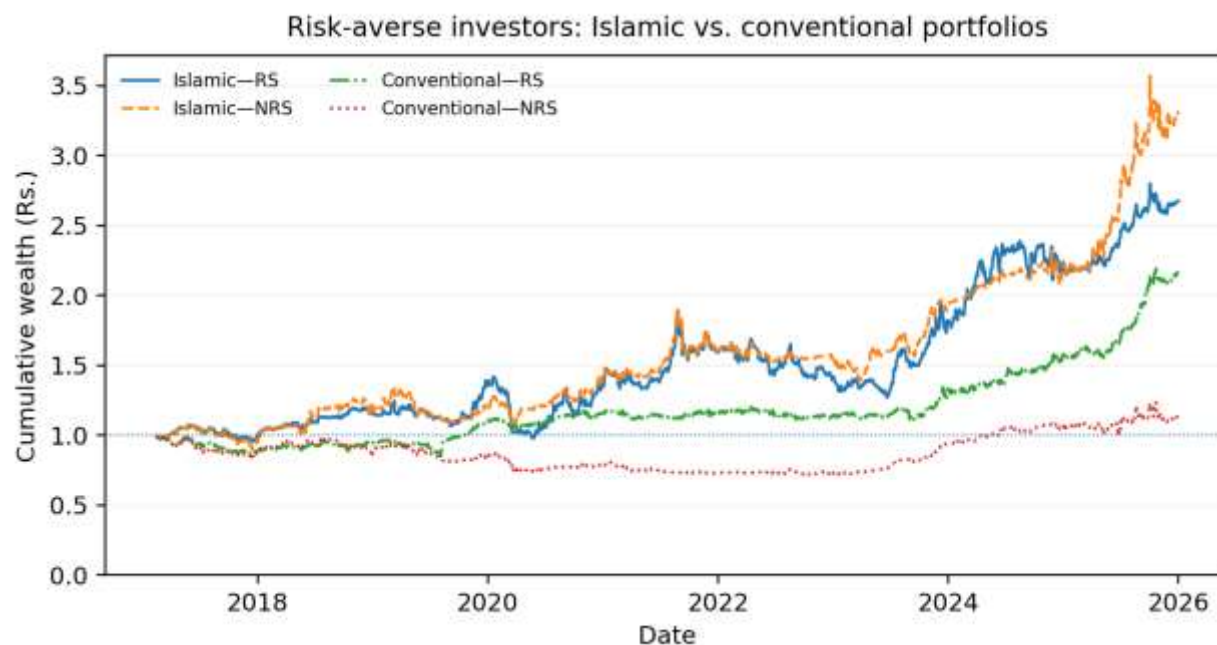
Figure 2. Cumulative out-of-sample wealth path



According to figure-2, RA investors are accumulating more wealth by investing in top profitable banks through non-regime-switching model-based approach as compared to Markov Regime-Model based approach. The accumulated wealth pattern of RA investors is NRS Top Profitable Banks>RS Top Profitable Banks>RS Bottom Profitable Banks> NRS Bottom Banks.

4.2.2: Risk Averse Investors (Islamic Vs. Conventional Banks):

Figure 3. Cumulative out-of-sample wealth path

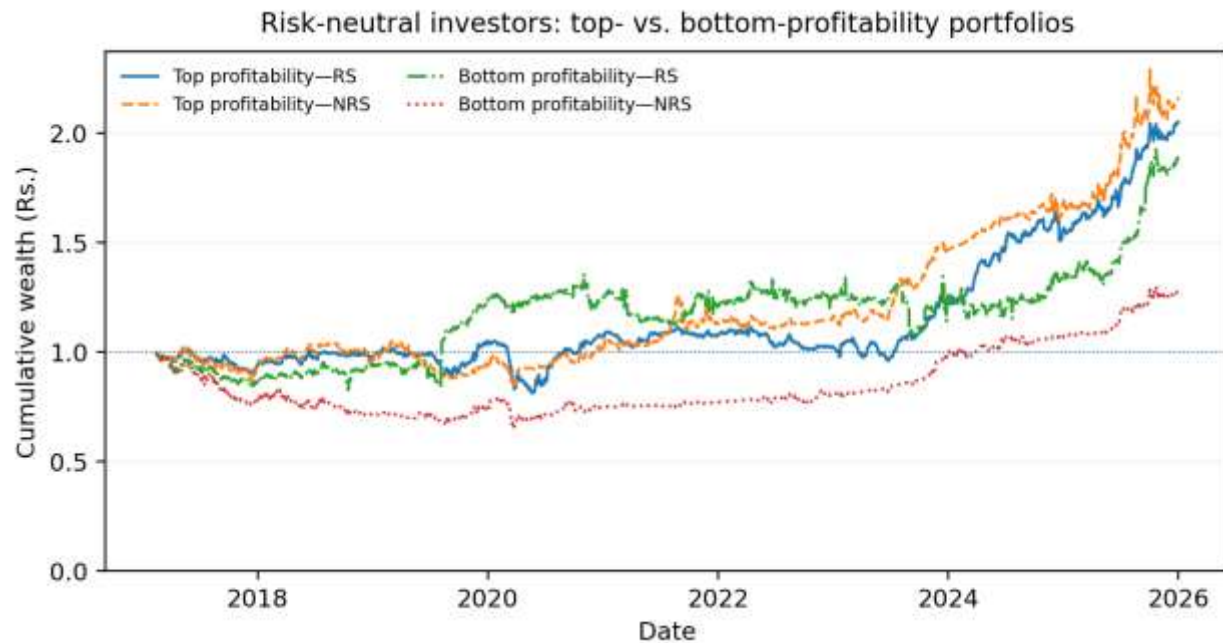


According to figure 3, RA investors are accumulating more wealth by investing in Islamic banks through Non-Regime-Switching Model based approach as compared to Regime-Switching Model based approach. But in conventional banking RA investors accumulating more wealth by using Regime-Switching Models. The accumulated wealth pattern of RA investors is NRS Islamic Banks>RS Islamic Banks>RS Conventional Banks> NRS Conventional Banks.

4.2.3: Risk Neutral Investors (Top Profitable Vs. Bottom Profitable Banks):

Risk neutral investors remain indifferent for risk and return trade off, they consider only return while making investment decisions, the comparison of their wealth accumulation between Top Profitable and Bottom Profitable Banks is given below:

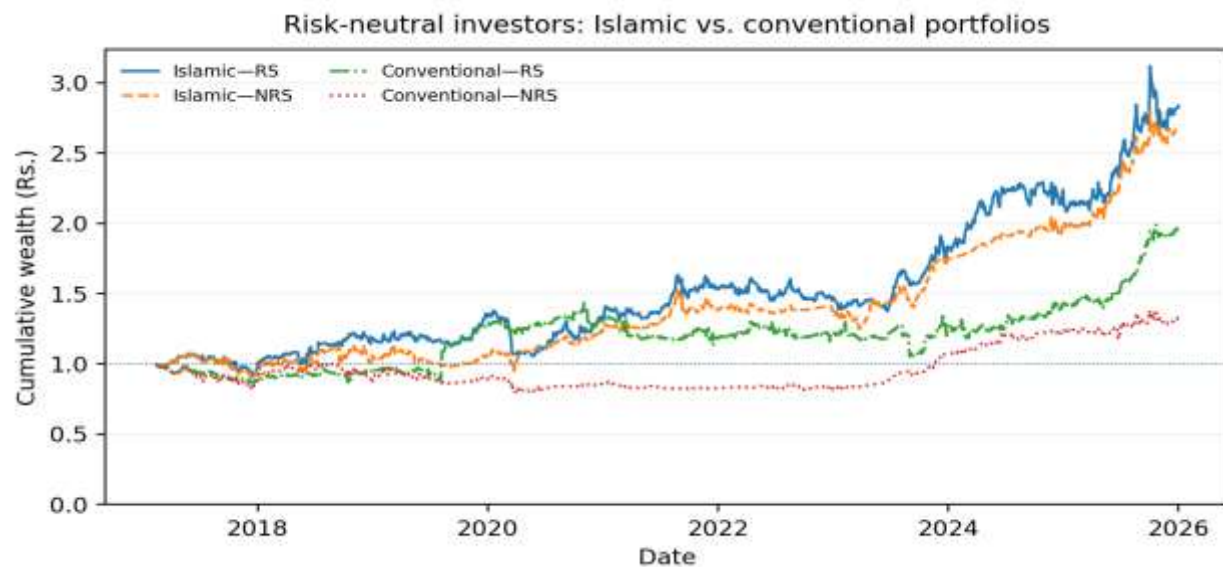
Figure 4. Cumulative out-of-sample wealth path



According to figure 4, RN investors are accumulating more wealth by investing in top profitable banks through Non-Regime-Switching Model based approach as compared to Regime-Switching Model based approach. But in bottom group of banks, RN accumulating more wealth by using Regime-Switching Model compared to Non-Regime Switching Model. The accumulated wealth pattern of RN investors is NRS Top Profitable Banks>RS Top Profitable Banks>RS Bottom Profitable Banks> NRS Bottom Banks.

4.2.4: Risk Neutral Investors (Islamic Vs. Conventional Banks):

Figure 5. Cumulative out-of-sample wealth path

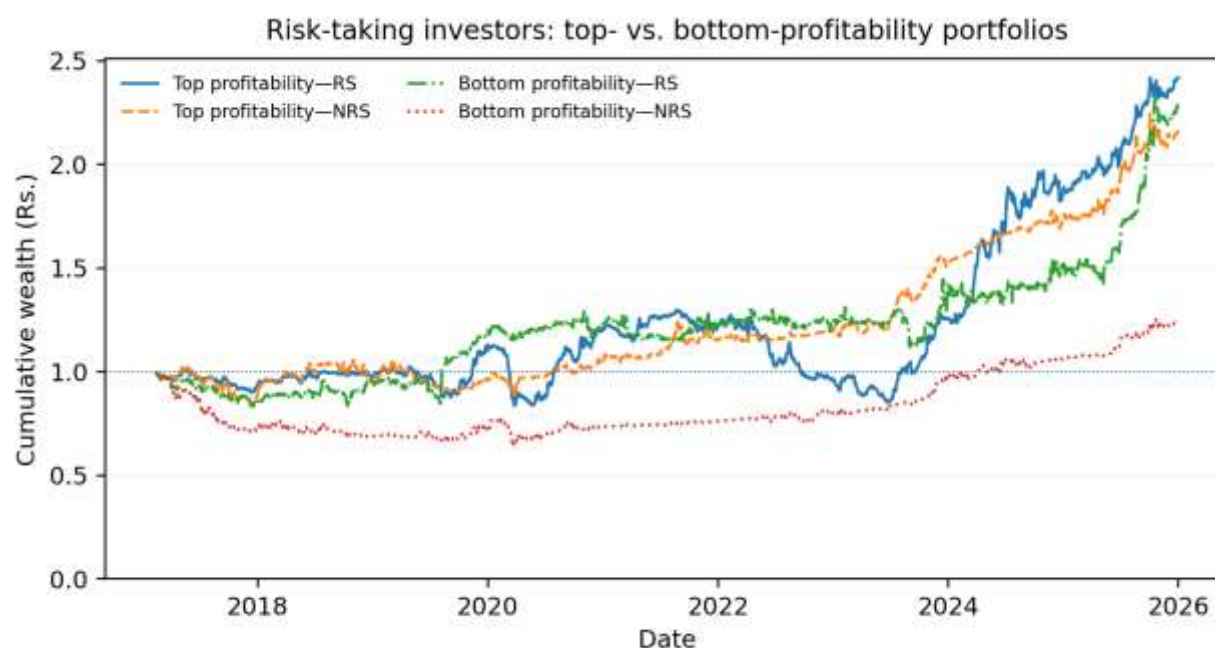


According to figure 5, RN investors are accumulating more wealth by investing in Islamic banks through Regime-Switching Model based approach compared to Non-Regime-Switching Model based approach. And RN investors are also accumulating more wealth by investing in Conventional through Regime-Switching Model based approach compared to Non-Regime-Switching Model based approach. The accumulated wealth pattern of RA investors is RS Islamic Banks>NRS Islamic Banks>RS Conventional Banks> NRS Conventional Banks.

4.2.5: Risk Taker Investors (Top Profitable Vs. Bottom Profitable Banks):

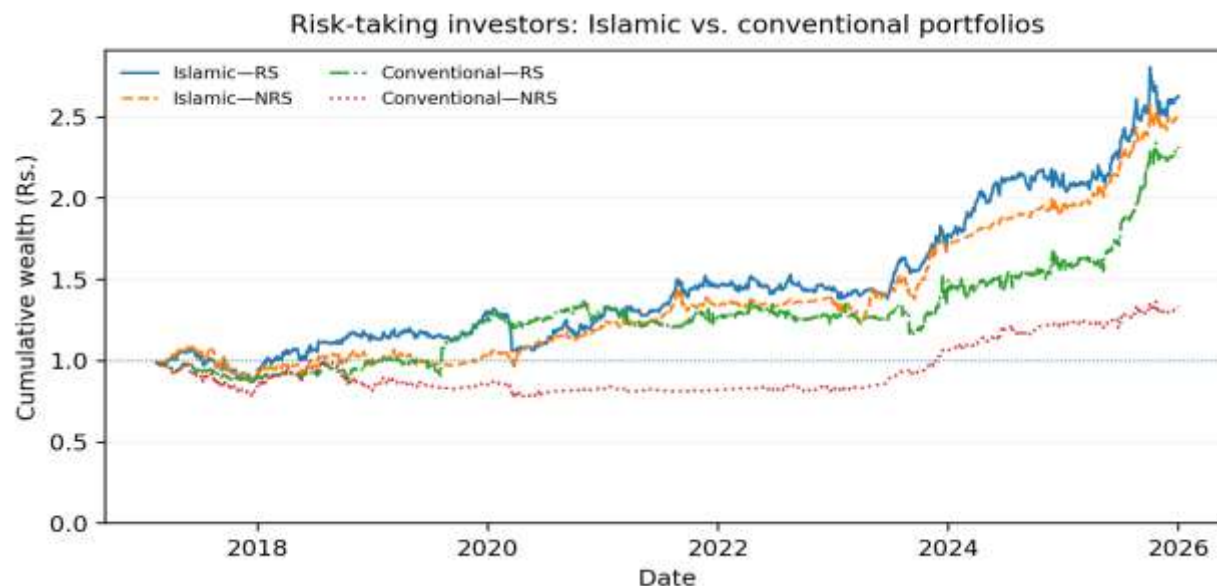
Risk taker investors like to bear risk for better returns, they consider only return while making investment decisions, the comparison of their wealth accumulation between Top Profitable and Bottom Profitable Banks is given below:

Figure 6. Cumulative out-of-sample wealth path



According to figure 6, RT investors are accumulating more wealth by investing in top profitable banks through Regime-Switching Model based approach compared to Non-Regime-Switching Model based approach. And this pattern also repeats in bottom profitable banks that RT accumulating more by using Regime-Switching model. The accumulated wealth pattern of RN investors is RS Top Profitable Banks> NRS Top Profitable Banks> RS Bottom Banks> NRS Bottom Banks.

4.2.6: Risk Taker Investors (Top Profitable Vs. Bottom Profitable Banks):

Figure 7. Cumulative out-of-sample wealth path

According to figure 7, RT investors are accumulating more wealth by investing in Islamic banks through Regime-Switching Model based approach compared to Non-Regime-Switching Model based approach. The accumulated wealth pattern of RA investors is RS Islamic Banks>NRS Islamic Banks>RS Conventional Banks> NRS Conventional Banks.

4.4 KSE-100 Market-Regime Analysis

For the identification of market conditions/ regimes, KSE-100 Index used for the period from 18 November 2015 to 31 December 2025. During these 10 years, the market regimes are 18 in numbers from which 13 are bearish market and 5 are bullish market. But in trading days the time period of bullish market prevails 1,359 days compared to bearish market 931 days.

4.3.1 Regime Episode Statistics

#	Regime	Period	Days	Mean (%)	SD (%)	Index Return (%)
1	Bear	30-Nov-2015–23-Mar-2016	77	0.0022	0.8419	2.09
2	Bull	27-Apr-2016–19-Jun-2017	284	0.1163	0.8678	35.96
3	Bear	03-Jul-2017–02-Aug-2017	22	0.0516	1.7151	5.11
4	Bear	04-Aug-2017–19-Jan-2018	113	-0.0497	1.1605	-5.76
5	Bull	15-Mar-2018–11-May-2018	39	0.0128	0.6025	0.23
6	Bear	28-Aug-2018–17-Jan-2019	95	-0.0822	1.2498	-7.76
7	Bear	07-Feb-2019–18-Apr-2019	50	-0.2361	0.8618	-10.94
8	Bear	23-Apr-2019–05-Nov-2019	126	-0.0254	1.3113	-2.87
9	Bull	13-Nov-2019–11-Mar-2020	79	0.0417	1.4813	1.36
10	Bear	18-Mar-2020–29-Apr-2020	29	0.1004	2.9846	9.02

11	Bear	06-May-2020–08-Jul-2020	41	0.1225	0.8126	5.83
12	Bull	25-Aug-2020–21-Sep-2021	258	0.0607	0.9490	14.19
13	Bear	23-Nov-2021–01-Feb-2022	51	0.0029	1.0917	1.62
14	Bear	10-Feb-2022–31-Mar-2022	35	-0.0831	1.0334	-2.20
15	Bear	28-Apr-2022–10-Nov-2022	130	-0.0409	0.9889	-5.19
16	Bear	16-Dec-2022–25-Jan-2023	29	-0.1104	1.3080	-3.67
17	Bear	22-Mar-2023–26-Apr-2023	21	0.0280	0.6873	1.79
18	Bull	26-Jun-2023–31-Dec-2025	623	0.2433	1.2132	320.04

4.4 Aggregate Bull versus Bear Results

Regime	Trading days	Mean daily return (%)	SD daily return (%)
Bull	1,359	0.1597	1.0853
Bear	931	-0.0472	1.2058

Figure 8. KSE-100 market trend and Bull/Bear regimes

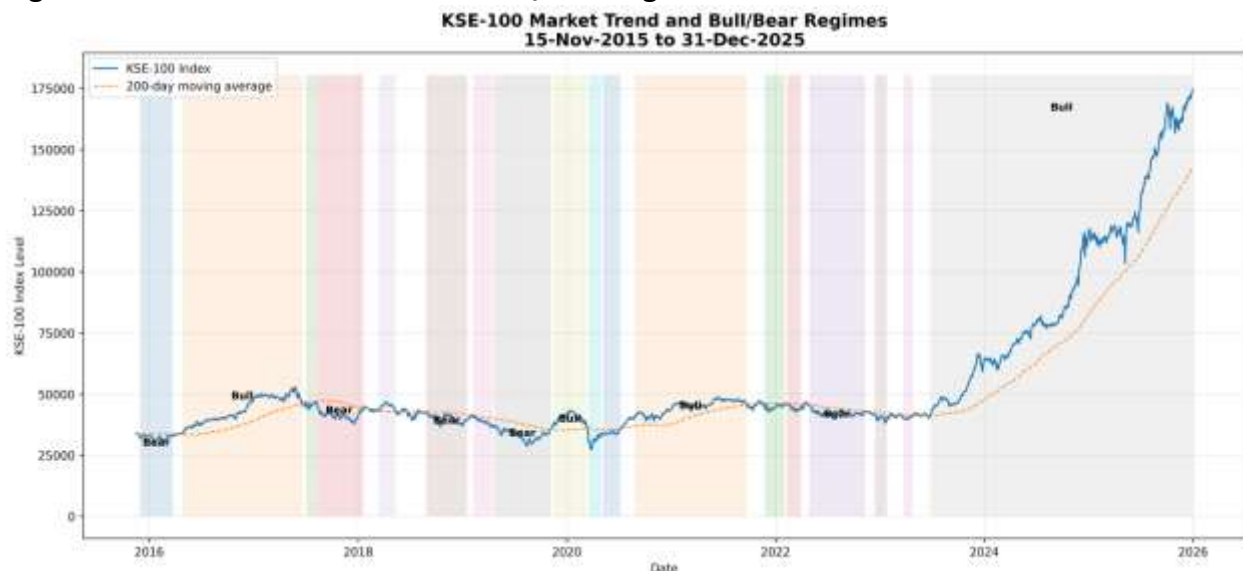


Figure 8 presents the market movement based on KSE-100 index. The market switches 18 time during the study period.

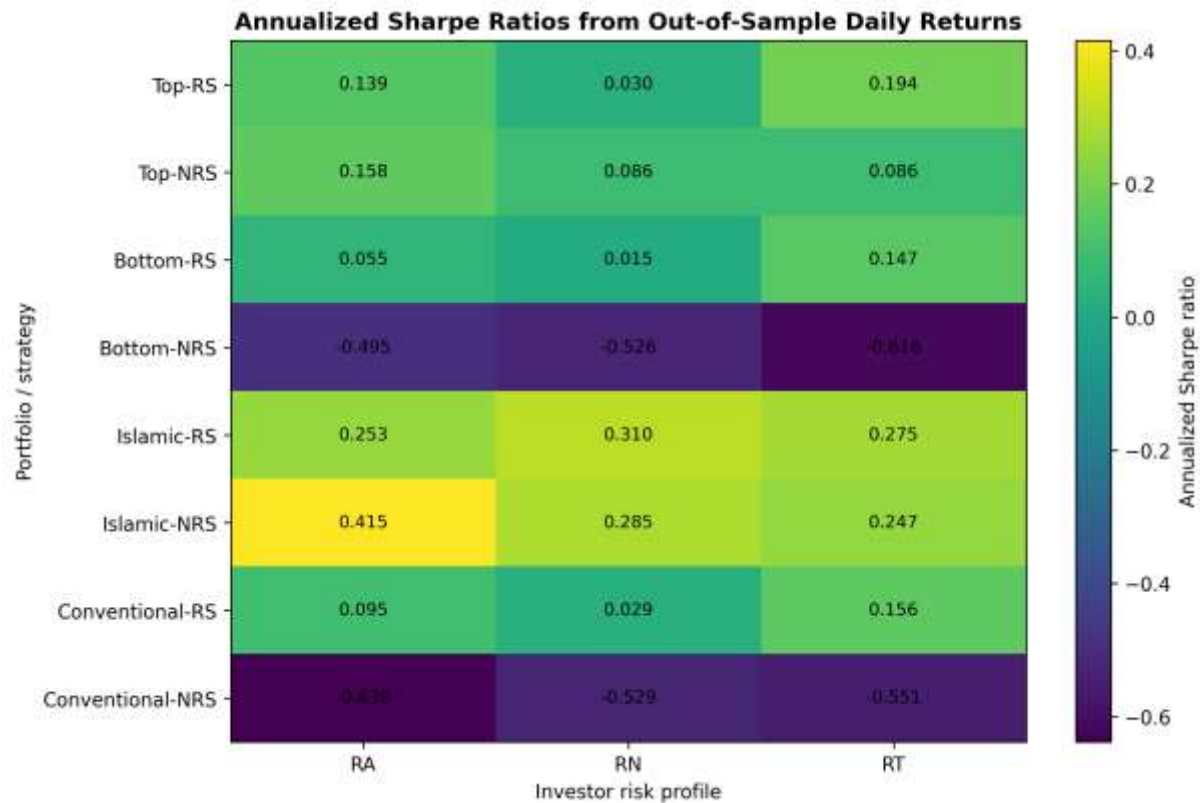
4.3 Comparison of All Investors' Ending Wealth & Sharpe Ratio

Portfolio	RA-RS	RA-NRS	RN-RS	RN-NRS	RT-RS	RT-NRS
-----------	-------	--------	-------	--------	-------	--------

Top profitability	2.246270	2.322100	2.050000	2.152302	2.418317	2.154750
Bottom profitability	2.081425	1.226169	1.893083	1.285141	2.291233	1.243861
Islamic	2.674772	3.296223	2.827495	2.678411	2.623053	2.503360
Conventional	2.170683	1.143091	1.973007	1.324468	2.319736	1.325010

Note. Initial investment = Rs. 1. Values are taken directly from Data.xlsx, sheet 'Sharpe_Ratio', Ending Wealth section.

Portfolio / strategy	RA	RN	RT
Top-RS	0.139	0.030	0.194
Top-NRS	0.158	0.086	0.086
Bottom-RS	0.055	0.015	0.147
Bottom-NRS	-0.495	-0.526	-0.616
Islamic-RS	0.253	0.310	0.275
Islamic-NRS	0.415	0.285	0.247
Conventional-RS	0.095	0.029	0.156
Conventional-NRS	-0.638	-0.529	-0.551



For such, analysis also confirmed from many studies like by **Jaffar, Dewandaru, & Masih (2017)** and **Iftimie et al. (2023)**.

4.4 Hypothesis assessment

Table 7. Hypothesis assessment

Hypothesis	Assessment	Evidence
H1: Top profitability > bottom profitability	Supported descriptively	Top-profitability ending wealth is higher in all six RS/NRS-by-risk comparisons.
H2: Islamic > conventional	Supported descriptively	Islamic ending wealth is higher in all six RS/NRS-by-risk comparisons.
H3: RS and NRS differ	Supported; universal RS superiority rejected	RS dominates in 9 of 12 comparisons, while NRS dominates in 3; the effect depends on category and risk profile.

5. Interpretations, Discussions and Conclusions:

The first major finding of this study is that profitability is a strong economical factor for investment decision making. The top profitable banks produce higher terminal wealth than bottom profitable banks for investors with different risk appetite and in both strategies (regime-switching and non-regime-

switching). This is consistent with existing literature on firms' profitability but should be interpreted as portfolio selection strategy not just evidence of cause and effect. The market-model (OLS Regression) also confirms that top profitable banks tier has more explanatory power of market sensitivity analysis. The second major finding is about Shariah status. Islamic banks tier outperforms conventional bankers in terminal wealth across risk profile and both strategies. These results are consistent with recent evidence that Shariah-Compliant stocks demonstrate better performance in terms of higher return with better risk management. The current study is only on comparison of Islamic and conventional banks. The third find is regarding choice of strategy between Regime-Switching and Non-Regime-Switching. None of these strategies is universally dominant. But in this study Regime-Switching outperform for all three types of investors decremented based on their risk profile. Risk Averse is the type of investors which reported that Non-Regime-Switching is better.

These results are source of portfolio decision making rather than unconditional source of superior performance. The practicality of findings is that portfolio manager should compare investment strategies to evaluate the investment options.

The development of three data streams for sake of analysis and forecasting is temporal robustness research design. This study provides a comparative assessment of wealth accumulation in Pakistan Stock Exchange listed banks' stock based on their profitability, Shariah status, investors risk profile and regime-switching strategy. The evidential based clear conclusions of the study are (i) better profitability of banks contribute better wealth maximization for the investors compared to bottom profitable banks, (ii) Islamic banks contribute better wealth maximization for the investors compared to conventional banks. The evidence on the portfolio selection strategy, nine instances out twelve are in favor of Regime-Switching Model. But this result is not generalizable. The study contributes to the existing literature on portfolio optimization, it broadens by adding Shariah status and investors risk profile. The investors can better understand importance of firm profitability, Shariah status and market dynamic for developing portfolio management tools and can better show resilience against risk. The regulators of money/ capital market can get benefits from this study in formulating regulation to keep health competition in the market with measures to rescue investors from unavoidable circummundane. For future research, dividend, transactional cost and other associated factors can be included.

References

- Alam, M., & Ansari, V. A. (2020). Are Islamic indices a viable investment avenue? An empirical study of Islamic and conventional indices in India. *International Journal of Islamic and Middle Eastern Finance and Management*, 13*(3), 503–518. <https://doi.org/10.1108/imefm-03-2019-0121>
- Allen, F., & Santomero, A. M. (2001). What do financial intermediaries do? *Journal of Banking & Finance*, 25*(2), 271–294.
- Ang, A., & Bekaert, G. (2002). International asset allocation with regime shifts. *The Review of Financial*

- Studies, 15*(4), 1137–1187. <https://doi.org/10.1093/rfs/15.4.1137>
- Ang, A., & Bekaert, G. (2004). How regimes affect asset allocation. *Financial Analysts Journal*, 60*(2), 86–99. <https://doi.org/10.2469/faj.v60.n2.2612>
- Antar, M., & Alahouel, F. (2019). Co-movements and diversification opportunities among Dow Jones Islamic indexes. *International Journal of Islamic and Middle Eastern Finance and Management*, 13*(1), 94–115. <https://doi.org/10.1108/imefm-04-2018-0137>
- Baker, M., Pan, X., & Wurgler, J. (2019). A behavioral approach to asset pricing: A review and synthesis. *Annual Review of Financial Economics*, 11*, 1–40.
- Barberis, N., & Thaler, R. (2003). A survey of behavioral finance. In G. M. Constantinides, M. Harris, & R. M. Stulz (Eds.), *Handbook of the economics of finance** (Vol. 1, pp. 1053–1128). Elsevier.
- Campani, C., et al. (2022). Constrained portfolio strategies in a regime switching economy. *Journal of Financial Economics**. Advance online publication.
- Chan, K.-S., Hansen, B. E., & Timmermann, A. (2017). Guest editors' introduction: Regime switching and threshold models. *Journal of Business & Economic Statistics*, 35*(2), 159–161. <https://doi.org/10.1080/07350015.2017.1236521>
- Chang, B. H., Meo, M. S., Syed, Q. R., & Abro, Z. (2019). Dynamic analysis of the relationship between stock prices and macroeconomic variables. *South Asian Journal of Business Studies*, 8*(3), 229–245. <https://doi.org/10.1108/sajbs-06-2018-0062>
- Daniel, K., Hirshleifer, D., & Subrahmanyam, A. (1998). Investor psychology and security market under- and overreactions. *Journal of Finance*, 53*(6), 1839–1886.
- Fama, E. F., & French, K. R. (1992). The cross-section of expected stock returns. *Journal of Finance*, 47*(2), 427–465.
- Government of Pakistan. (2021). *Economic Survey of Pakistan 2020–21**. https://www.finance.gov.pk/survey/chapters_21/PES_2020_21.pdf
- Hamilton, J. D. (1989). A new approach to the economic analysis of nonstationary time series and the business cycle. *Econometrica*, 57*(2), 357–384.
- He, Z., He, L., & Wen, F. (2019). Risk compensation and market returns: The role of investor sentiment in the stock market. *Emerging Markets Finance and Trade*, 55*(3), 704–718. <https://doi.org/10.1080/1540496x.2018.1460724>
- Iftimie, F., et al. (2023). A robust investment-consumption optimization problem in a switching regime interest rate setting. *Journal of Optimization Theory and Applications**. Advance online publication.
- Investopedia. (n.d.). *Technical analysis strategies for beginners**. Retrieved October 10, 2023, from <https://www.investopedia.com/articles/active-trading/102914/technical-analysis-strategies-beginners.asp>
- Iqbal, J., Ahmad, Z., Akhtar, S., & Ismail, H. (2020). Regime switching portfolio optimisation for international indices: Case of Indian subcontinent. *Journal of Financial Economics*, 206*, 1–15.
- Jaffar, Y., Dewandaru, G., & Masih, M. (2017). Exploring portfolio diversification opportunities through venture capital financing: Evidence from MGARCH-DCC, Markov switching, and wavelet approaches. *Emerging Markets Finance and Trade**. Advance online publication. <https://doi.org/10.1080/1540496X.2016.1277420>

- Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, 47*(2), 263–291.
- Li, X., & Mulvey, J. M. (2021). Portfolio optimization under regime switching and transaction costs. *INFORMS Journal on Optimization*, 3*(3), 1–25.
- Markowitz, H. (1952). Portfolio selection. *The Journal of Finance*, 7*(1), 77–91.
- Moeini Najafabadi, Z., Bijari, M., & Khashei, M. (2019). Making investment decisions in stock markets using a forecasting-Markowitz based decision-making approaches. *Journal of Modelling in Management*, 15*(2), 647–659. <https://doi.org/10.1108/jm2-12-2018-0217>
- Saba, I., Ariff, M., & Mohd Rasid, E. S. (2020). Performance of Shari’ah-compliant and non-Shari’ah-compliant listed firms: A case study of Malaysia. *International Journal of Islamic and Middle Eastern Finance and Management*, 14*(1), 128–150. <https://doi.org/10.1108/imefm-04-2019-0186>
- Saleem, H. M. N., & Ahmad-Zaluki, N. A. (2021). Using regime-switching models in Sharia-compliant stocks: Performance assessment of investors with discriminated risk-appetite. *Nankai Business Review International*, 12*(4), 599–617. <https://doi.org/10.1108/NBRI-04-2020-0018>
- Senarathne, C. W. (2019). Do Fama–French common risk-factor portfolio investors herd on a daily basis? Implications for common risk-factor regressions. *Journal of Capital Markets Studies*, 3*(2), 137–156. <https://doi.org/10.1108/jcms-06-2019-0034>
- Shaikh, S. A., Ismail, M. A., Ismail, A. G., Shahimi, S., & Mohd. Shafiai, M. H. (2019). Cross section of stock returns on Shari’ah-compliant stocks: Evidence from Pakistan. *International Journal of Islamic and Middle Eastern Finance and Management*, 12*(2), 282–302. <https://doi.org/10.1108/imefm-04-2017-0100>
- Sharma, A., & Mitra, D. (2020). Investor sentiment and bank profitability: An empirical analysis. *Journal of Banking & Finance*, 118*, 105860.
- Sharpe, W. F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk. *Journal of Finance*, 19*(3), 425–442.
- Shefrin, H., & Statman, M. (2000). Behavioral portfolio theory. *Journal of Financial and Quantitative Analysis*, 35*(2), 127–151.
- Su, X., et al. (2021). Robust portfolio selection with regime switching and asymmetric dependence. *Financial Review*, 56*(4), 789–815.
- Wong, W. K. (2020). Review on behavioral economics and behavioral finance. *Studies in Economics and Finance*, 37*(4), 625–672. <https://doi.org/10.1108/sef-10-2019-0393>
- Xiong, J., et al. (2020). Optimizing long-term bank financial products portfolio problems with a multiobjective evolutionary approach. *Journal of Banking & Finance*, 119*, 105909.
- Yousaf, I., & Ali, S. (2020). Integration between real estate and stock markets: New evidence from Pakistan. *International Journal of Housing Markets and Analysis*, 13*(5), 887–900. <https://doi.org/10.1108/ijhma-01-2020-0001>
- Zoicas-lenciu, A. (2017). *What drives trend-following profits?* SSRN. <https://ssrn.com/abstract=2944679>
- Zhou, C., et al. (2022). Optimal refinancing strategy for mortgage rate with regime switching. *Applied Stochastic Models in Business and Industry*, 38*(3), 450–467.