CHAPTER 109

Real Estate Asset Classes: Role in Multi-Asset Portfolio Designing

Suprit Mohapatra[1], Abhishek Umar[1], Rutuja Mundhe[1], Natasha Dhobe[1] and Rajni Kant Rajhans[2]

ABSTRACT

The advent of new investment asset classes has offered opportunities to diversify and optimize the risk-return trade-off to the investors. This paper attempts to design an optimal multi-asset portfolio for investors seeking stable income and capital preservation. The asset classes considered to design this multi-asset portfolio are Physical Real Estate, Infrastructure Bonds, REITs, and Gold. The research objectives are to identify and analyze asset classes suitable for achieving a targeted Rate of Return on Investment, to analyze the correlation between various considered assets, and subsequently design an optimal multi-asset portfolio. This Research Paper builds on various Portfolio Theories such as the Modern Portfolio Theory, the Black-Litterman Model & Post-Modern Portfolio Theory to meet the objectives.

Keywords: Multi-asset portfolio 1; Physical Rreal estate 2; Infrastructure bonds 3; REITs 4; Modern portfolio theory 5.

1.0 Introduction

1.1 Background

Managing an investment portfolio is crucial for making smart financial choices, influencing wealth growth, risk management, and overall financial health. Various portfolio theories have developed over time to enhance investment strategies, helping investors achieve their financial goals while effectively balancing risk and return. In a financial market that is becoming increasingly intricate, grasping portfolio management techniques and their effectiveness is crucial for both individual and institutional investors. This project focuses on the application and analysis of significant portfolio theories, including the Modern Portfolio Theory, Capital Asset Pricing Model (CAPM), Arbitrage Pricing Theory (APT), and Post-Modern Portfolio Theory (MPT). By critically evaluating these theories, the study seeks to offer insights into their practicality and relevance in the current financial environment.

1.2 Objectives

To investigate different investment portfolio theories and assess their effectiveness in guiding financial decisions.

[1]*School of Real Estate and Facilities Management, NICMAR University, Pune, Maharashtra, India*
[2]*Corresponding author; School of Real Estate and Facilities Management, NICMAR University, Pune, Maharashtra, India (E-mail: rrajhans@nicmar.ac.in)*

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- To analyze the risk-return trade-offs associated with portfolio diversification strategies.
- To evaluate how these theories can be utilized in real-world investment situations.
- To identify the strengths & weaknesses of various portfolio management models.
- To provide insights for investors and financial analysts on constructing optimal portfolios.

1.3 Limitation of study

- Dependence on secondary data, which may be subject to biases or inaccuracies.
- Assumptions made in portfolio theories that may not always align with real-world financial markets.
- The impact of external economic factors, market volatility, and investor behavior, which are difficult to predict.
- Limited case studies due to constraints in data availability.

1.4 Scope of study

This research aims to provide valuable insights into investment portfolio management by evaluating different theories and their practical applications. The findings will be beneficial for investors, financial analysts, and academicians seeking a deeper understanding of portfolio optimization techniques. By analyzing historical data and theoretical models, the study contributes to the knowledge of investment strategies and aids in informed decision-making for financial growth and stability.

2.0 Literature Review

Modern Portfolio Theory, introduced by Markowitz (1952), emphasizes risk minimization and return maximization through diversification, particularly by considering asset covariance (Jayeola *et al.*, 2017). The Black- Litterman Model refines asset allocation by incorporating investor views with market equilibrium (Jayeola *et al.*, 2017). Gold remains a significant investment, serving as a hedge against inflation and market downturns, with various investment options such as ETFs, bullion and futures (Nawaz, 2013). Traditional and modern approaches to Weighted Average Cost of Capital (WACC) impact firm valuation, with newer models improving accuracy (Rehman, 2010). Portfolio optimization strategies, including risk-adjusted methods and dynamic asset allocation, enhance investment performance (Groll, 2017). Real estate remains a preferred asset in india, influenced by liquidity, taxation and geographical diversification (Matharu & Manda, 2021). Studies highlight real estate portfolio management, the role of human capital, and the impact of property type and tenant base on returns (Feng *et al.*, 2021). Hotels contribute to diversification in commercial real estate portfolios, improving risk-adjusted returns (Singh, 2003). REITs have shown stronger performance compared to InvITs, while declining real estate sales in India impact REIT attractivesness (Boddu, 2021). Municipal bond ratings influence stock and bond markets, with credit rating agency conflicts

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affecting financial decisions (Cornaggia *et al.*, 2014). Government spending impacts local employment through municipal bond recalibrations, influencing economic growth (Adelino *et al.*, 2016). Gold's efficiency as an investment has been demonstrated through Xetra-gold, benefiting Euro and USD portfolios (Demidova *et al*., 2007).

3.0 Research Methodology

In the study, the Primary aim shall be of building and analyzing a multi-asset portfolio of gold, bonds, real estate (HPI), and REITs optimally to realize a pre-defined targeted rate of return with even risk profiles. The methodology adopted for conducting this study includes the following:

- Collection of historical financial data for the selected asset classes.
- Statistical and descriptive analysis of performance, risk, and correlations in assets.
- Constructing a portfolio based on modern portfolio theory and using mean-variance optimization.
- To assess the optimization portfolio's robustness, back testing and stress testing.
- Comparison with a variety of asset-allocation strategies concerning efficiency toward attaining the target return.

The study works within the boundaries of the positivist paradigm by drawing conclusions based on numerical data, statistical methods, and objective financial theories. To carry out this study, a historical data analysis has been performed where returns and volatilities of assets over an extensive period will be examined. Mathematical optimization will further be applied using algorithms, to derive the best asset allocation. On top of that, risk management techniques will focus on the assessment of market risks through standard deviation, Variance, and Monte Carlo simulations.

4.0 Data Analysis and Findings

4.1 Data sources and variables

Information gathered from Gold Prices, Bond Yields, House Price Index (HPI), and REITs (Mindspace, Brookfield, Embassy, Nexus). Time frame: 2017–2025, analyzed on monthly basis.

4.2 Descriptive statistics

Mean return and standard deviation computed for various asset classes.

Monthly Return = {Price(t) – Price(t-1)}/Price(t-1) ...1

$$\mu = \frac{1}{N}\sum_{i=1}^{N} R_i \quad ...2$$

Standard Deviation (Measure of volatility):

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$$\sigma = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(R_i - \mu)^2} \quad ...3$$

Correlation analysis: To find the relationships between assets, we use Pearson's Correlation Coefficient

$$r = \frac{\sum(X_i - \bar{X})(Y_i - \bar{Y})}{\sqrt{\sum(X_i - \bar{X})^2} \cdot \sqrt{\sum(Y_i - \bar{Y})^2}} \quad ...4$$

4.3 Portfolio performance analysis

Portfolio Return Analysis

$$R_p = \sum_{i=1}^{n} w_i R_i \quad ...5$$

Portfolio Standard Deviation

$$\sigma_p = \sqrt{\sum_{i=1}^{n} w_i^2 \sigma_i^2 + \sum_{i=1}^{n}\sum_{j=1, j\neq i}^{n} w_i w_j \sigma_i \sigma_j \rho_{ij}} \quad ...6$$

Performance Analysis

$$S = \frac{R_p - R_f}{\sigma_p} \quad ...7$$

4.4 Data representation

Eight portfolios were developed with varying combinations of asset classes. Portfolio 2 (Gold, Bond, HPI-Hyderabad, REITs-Nexus) was also a top performer, with Sharpe Ratio 2.56 and 10.85% return. Portfolio 6 (Gold, Bond, HPI-Chennai, REITs-Nexus) posted the highest Sharpe Ratio (3.13), thus it was the best in terms of risk-adjusted returns.

4.5 Correlation analysis

Portfolio 6 (i.e., Gold, Bond, HPI-Chennai, REITs-Nexus) is best choice best on correlation analysis.

5.0 Consequences for Indian Real Estate Investment

Gold & Chennai (0.26): Weak link; gold prices provide some clue but are not a good indicator. Nexus & Bonds/Gold (-0.05, 0.03): Not much effect; investors need to look at location-specific information. Chennai & Nexus (0.38): Weak correlation; an investment in either is not particularly strong diversification. Bonds & Real Estate (0.07, 0.03): No significant effect; bond market trends have no influence on Chennai or Nexus real estate.

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Diversification Strategy: Investors should search for uncorrelated or negatively correlated assets to manage risk.

Table 1: Portfolio Combinations

	Asset classes	Return	Standard Deviation	Sharpe Ratio	Total Weight	Risk Free ROR
Portfolio 1	Gold, Bond, Pune, Brookfield	7.04%	1.45%	0.21	100%	6.73%
Portfolio 2	Gold, Bond, Hyderabad, Nexus	10.85%	1.61%	2.56	100%	6.73%
Portfolio 3	Gold, Bond, NCR, Embassy	8.17%	2.33%	0.62	100%	6.73%
Portfolio 4	Gold, Bond, Mumbai, Mindspace	5.45%	1.50%	-0.85	100%	6.73%
Portfolio 5	Gold, Bond, Bengaluru, Brookfield	9.10%	1.56%	1.52	100%	6.73%
Portfolio 6	Gold, Bond, Chennai, Nexus	10.93%	1.34%	3.13	100%	6.73%
Portfolio 7	Gold, Bond, Ahmedabad, Embassy	6.94%	2.75%	0.08	100%	6.73%
Portfolio 8	Gold, Bond, Kolkata, Mindspace	6.88%	1.50%	0.10	100%	6.73%

Source: Compiled by authors

Table 2: Correlation of Assets

Correlation Matrix	
GOLD & BOND	-0.05
GOLD & CHENNAI	0.26
GOLD & NEXUS	-0.05
BOND & CHENNAI	0.07
BOND & NEXUS	0.03
CHENNAI & NEXUS	0.38

Source: Compiled by authors

6.0 Conclusion

Through this study, we have provided a comprehensive summary of investment portfolio theories and their practical application in the financial market. While examining different portfolio models such as the Modern Portfolio Theory (MPT), Capital Asset Pricing Model (CAPM), Arbitrage Pricing Theory (APT), and Post-Modern Portfolio Theory (PMPT), we have examined their effectiveness in optimizing returns at minimum risk. Empirical analysis of data supported through the study has demonstrated diversification of assets is necessary to curb risk and raise returns. The correlation analysis focused on how the classes of assets correlate and agreed with balancing risky and not-risky assets for portfolio maximization. Among the portfolios under consideration, Portfolio 6 (Gold, Bond, HPI Chennai, and REITs Nexus) was the best in terms of risk-adjusted returns, as evident from its highest Sharpe Ratio (3.13). This suggests that investors seeking a balance between risk and return would be best

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served by this asset combination. For risk-taking investors, Portfolio 2 is also a suitable choice with a strong Sharpe Ratio (2.56) and high returns.

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