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AN EMPIRICAL ANALYSIS OF THE PERFORMANCE OF NATIONAL PENSION SYSTEM (NPS) TIER I AND TIER II FUNDS IN INDIA

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Abstract

The National Pension System (NPS) has emerged as one of India's most significant retirement savings schemes, offering market-linked investment opportunities through multiple asset classes and professionally managed pension funds. Evaluating the performance of these funds is essential for investors seeking optimal risk-adjusted returns. This study examines the comparative performance of Tier I and Tier II schemes under the National Pension System across Equity (Scheme E), Corporate Debt (Scheme C), and Government Securities (Scheme G). The research is based on secondary data collected from the official National Pension System website covering ten years of performance for ten Pension Fund Managers. Risk-adjusted performance was assessed using the Sharpe Ratio, while paired sample t-tests were employed to examine significant differences between Tier I and Tier II returns. Pearson correlation analysis was further conducted to evaluate the relationship among different schemes. The empirical findings reveal that Scheme E Tier I generated significantly higher returns than Scheme E Tier II, indicating superior performance in equity investments. In contrast, no statistically significant differences were observed between Tier I and Tier II returns for Corporate Debt (Scheme C) and Government Securities (Scheme G), suggesting comparable investment performance across these asset classes. The correlation analysis demonstrates strong positive relationships between Tier I and Tier II within the same asset category, whereas relatively weaker correlations among different asset classes highlight the diversification benefits available under NPS. Overall, the study concludes that while equity-oriented Tier I schemes offer relatively better return potential, debt and government security schemes provide stable and consistent performance across both tiers. The findings provide useful insights for investors, pension fund managers, and policymakers in designing effective long-term retirement investment strategies.

Keywords: *National Pension System, Tier I, Tier II, Pension Fund Managers, Sharpe Ratio, Risk-adjusted Performance, Paired t-test, Pearson Correlation, Retirement Planning.*

INTRODUCTION

The pension landscape in India has experienced significant reforms with the implementation of the National Pension System (NPS), which replaced the traditional defined benefit model with a defined contribution framework. This transition was introduced to strengthen the long-term sustainability of the pension system, widen retirement coverage, and promote individual responsibility in retirement

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savings. Under the NPS, subscribers can choose from a range of investment alternatives managed by licensed pension fund managers, allowing them to distribute their investments across equity, corporate bonds, and government securities based on their financial objectives and risk tolerance.

Among these investment alternatives, Scheme E is particularly important because it predominantly invests in equity instruments, offering the possibility of higher long-term returns than debt-oriented schemes. However, these higher returns are accompanied by increased exposure to market fluctuations and investment risk. As retirement planning requires disciplined long-term investment, assessing the performance of pension fund managers using risk-adjusted measures is essential for identifying efficient fund management strategies and supporting informed investment decisions.

Against this backdrop, the present study evaluates the performance of Scheme E under both Tier I and Tier II accounts of the National Pension System. The analysis employs the Sharpe Ratio as a risk-adjusted performance measure to examine the ability of various pension fund managers to generate excess returns relative to the level of risk assumed. By comparing the performance of different fund managers, the study highlights their relative efficiency, consistency, and effectiveness in managing equity-oriented pension funds within the Indian pension system.

REVIEW OF LITERATURE

Sharpe (1966) introduced the Sharpe Ratio as a comprehensive measure of risk-adjusted return by comparing excess portfolio returns with total portfolio risk. Since its introduction, the Sharpe Ratio has become one of the most widely accepted tools for evaluating the performance of pension funds, mutual funds, and other investment portfolios. **Treynor (1965)** proposed the Treynor Ratio, which evaluates portfolio performance by measuring excess returns relative to systematic risk (beta). The study emphasized that investors should assess portfolio managers based on the rewards generated for the market risk undertaken rather than total portfolio volatility. **Jensen (1968)** developed Jensen's Alpha to estimate the abnormal return earned by a portfolio after adjusting for market risk using the Capital Asset Pricing Model (CAPM). The measure is extensively applied in evaluating the investment skills of professional fund managers. **Bodie (1990)** highlighted the growing importance of funded pension systems in ensuring long-term retirement security. The study argued that diversified investment portfolios managed professionally could improve retirement wealth while reducing long-term financial uncertainty.

Davis (2005) examined institutional investment practices in pension funds across several countries and concluded that diversification among equity, debt, and government securities significantly improves long-term portfolio stability. The study also emphasized the role of effective regulation and governance in enhancing pension fund performance.

Blake, Lehmann, and Timmermann (1999) investigated the determinants of pension fund returns and found that strategic asset allocation contributes more to long-term investment performance than frequent portfolio adjustments. Their findings stressed that appropriate asset allocation remains the primary driver of retirement wealth creation.

Srinivas and Yermo (1999) analyzed pension reforms in developing economies and observed that defined contribution pension systems encourage greater transparency, competition among fund managers, and improved investment efficiency. The authors highlighted that market-linked pension schemes provide greater flexibility to subscribers while promoting long-term savings.

OBJECTIVES OF THE STUDY

- To examine the performance of National Pension Scheme funds (Tier I & Tier II) in India

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METHODOLOGY

The research relies exclusively on secondary data collected from the official National Pension System (NPS) website. The study examines a ten-year period and includes eleven pension fund managers that consistently offered Scheme E under both Tier I and Tier II accounts during the selected timeframe. To assess the risk-adjusted performance of these schemes, the Sharpe ratio was employed as the primary evaluation measure. DSP Pension Fund Managers Private Limited was excluded from the analysis due to the unavailability of complete and consistent historical data for the entire study period.

Table 1: Scheme E- Tier I and II

Sr. No	Names
1	Pension Fund
2	Aditya Birla Sun Life Pension Fund Management Limited
3	Axis Pension Fund Management Limited
4	HDFC Pension Fund Management Ltd.
5	ICICI Pru. Pension Fund Management Co. Ltd.
6	Kotak Mahindra Pension Fund Ltd.
7	LIC Pension Fund Ltd.
8	SBI Pension Funds Pvt. Ltd
9	Tata Pension Fund Management Pvt. Ltd.
10	UTI Pension Fund Ltd.

Source: https://npstrust.org.in

ANALYSIS AND INTERPRETATION

Comparison of T Test: E Tier-I Vs Etier-II Funds

A paired samples t-test was conducted to determine whether there was a significant difference in the average returns between NPS Scheme E Tier-I and NPS Scheme E Tier-II across ten pension fund managers. The analysis revealed that the mean return of Scheme E Tier-I was 11.71%, which was higher than the mean return of Scheme E Tier-II (11.08%). The variance of returns was 2.257 for Tier-I and 2.598 for Tier-II, indicating a comparable level of variability in returns between the two schemes.

Table 2: T-Test: Paired Two Sample for Means

	tier-1	tier-2
Mean	11.71	11.079
Variance	2.257067	2.598388
Observations	10	10
Pearson Correlation	0.862357	
df	9	
t Stat	2.422133	
P(T<=t) one-tail	0.019238	
t Critical one-tail	1.833113	
P(T<=t) two-tail	0.038476	
t Critical two-tail	2.262157	

Source: Author Compliation

The Pearson correlation coefficient between the paired observations was 0.862, indicating a strong positive relationship between the returns of Tier-I and Tier-II schemes. This suggests that pension fund managers exhibiting higher returns in Tier-I generally also recorded higher returns in Tier-II. The calculated t-statistic was 2.422, with 9 degrees of freedom. The corresponding two-tailed p-value was

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0.038, which is less than the conventional significance level of 0.05. Furthermore, the calculated t-value (2.422) exceeded the critical two-tailed t-value (2.262). Since the p-value (0.038) < 0.05 and the calculated t-value is greater than the critical t-value, the null hypothesis is rejected. The results indicate that there is a statistically significant difference in the average returns of NPS Scheme E Tier-I and Scheme E Tier-II. Specifically, Scheme E Tier-I generated significantly higher average returns than Scheme E Tier-II during the period under study. Therefore, the evidence suggests that the performance of the two schemes is not identical, and Tier-I outperformed Tier-II in terms of average return.

Comparative Analysis of Scheme C – Tier I and Tier II

A paired samples t-test was performed to examine whether a significant difference exists between the average returns of NPS Scheme C Tier-I and Scheme C Tier-II across ten pension fund managers.

Table 3: T-Test: Paired Two Sample for Means

	C-tier-1	**C-tier-2**
Mean	8.537	8.296
Variance	0.52149	0.418004
Observations	10	10
Pearson Correlation	0.854136	
Hypothesized Mean Difference	0	
df	9	
t Stat	2.022989	
P(T<=t) one-tail	0.036883	
t Critical one-tail	1.833113	
P(T<=t) two-tail	0.073765	
t Critical two-tail	2.262157	

Source: Author Compliation

The variances of the two schemes were 0.521 and 0.418, respectively, suggesting that the dispersion of returns was relatively similar. The Pearson correlation coefficient of 0.854 indicates a strong positive relationship between the returns of the two schemes. This implies that pension fund managers achieving relatively higher returns in Tier-I also tended to perform similarly in Tier-II. The paired t-test produced a t-statistic of 2.023 with 9 degrees of freedom. Although the calculated t-value is positive, the two-tailed p-value is 0.074, which is greater than the 5% level of significance (p > 0.05). Similarly, the calculated t-value (2.023) is lower than the critical two-tailed t-value (2.262). Therefore, the null hypothesis cannot be rejected at the 5% significance level. The findings indicate that there is no statistically significant difference between the average returns of NPS Scheme C Tier-I and Scheme C Tier-II. Although Scheme C Tier-I recorded a slightly higher mean return than Tier-II, the observed difference is not sufficiently large to be considered statistically significant. Hence, it can be concluded that both schemes delivered comparable investment performance during the period under study.

Comparative Analysis of Scheme G – Tier I and Tier II

A paired samples t-test was conducted to assess whether there was a statistically significant difference in the average returns of NPS Scheme G Tier-I and Scheme G Tier-II across ten pension fund managers.

Table 4: T-Test: Paired Two Sample for Means

t-Test: Paired Two Sample for Means		
	G-tier-1	***G-tier-2***
Mean	8.044	8.093
Variance	0.500049	0.671246

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Observations	10	10
Pearson Correlation	0.941038	
Hypothesized Mean Difference	0	
df	9	
t Stat	-0.54478	
P(T<=t) one-tail	0.29957	
t Critical one-tail	1.833113	
P(T<=t) two-tail	0.599139	
t Critical two-tail	2.262157	

Source: Author Compliation

The analysis indicated that the mean return of Scheme G Tier-I was 8.044%, while the mean return of Scheme G Tier-II was 8.093%. Although Tier-II recorded a slightly higher average return than Tier-I, the difference between the two means was very small. The variances of the two schemes were 0.500 and 0.671, respectively, suggesting only a modest difference in the variability of returns. The Pearson correlation coefficient was 0.941, indicating a very strong positive relationship between the returns of Tier-I and Tier-II. This high correlation suggests that pension fund managers delivering higher returns in Tier-I also tended to achieve similar performance in Tier-II, reflecting consistency in investment outcomes across the two schemes. The paired t-test produced a t-statistic of -0.54 with 9 degrees of freedom. The corresponding two-tailed p-value was 0.599, which is substantially higher than the 5% level of significance ($p > 0.05$). Furthermore, the absolute value of the calculated t-statistic (0.545) is considerably lower than the critical two-tailed t-value (2.262). Since the two-tailed p-value exceeds 0.05 and the calculated t-value does not exceed the critical value, the null hypothesis cannot be rejected. The findings indicate that there is no statistically significant difference between the average returns of NPS Scheme G Tier-I and Scheme G Tier-II. Although Scheme G Tier-II achieved a marginally higher mean return than Tier-I, the difference is statistically insignificant. Therefore, both schemes exhibited comparable investment performance during the study period.

Note- Insufficient data for following schemes, Scheme NPS Lite, Scheme A, Scheme Corporate CG and Scheme Atal Pension Yojan.

Hypothesis Decision

- Null Hypothesis (H_o): There is no significant difference between the mean returns of NPS Scheme E Tier-I and Scheme E Tier-II. Rejected
- Alternative Hypothesis (H_1): There is a significant difference between the mean returns of NPS Scheme E Tier-I and Scheme E Tier-II. Accepted
- Null Hypothesis (H_o): There is no significant difference between the mean returns of NPS Scheme C Tier-I and Scheme C Tier-II. Accepted (Fail to Reject H_o).
- Alternative Hypothesis (H_1): There is a significant difference between the mean returns of NPS Scheme C Tier-I and Scheme C Tier-II. Rejected.
- Null Hypothesis (H_o): There is no significant difference between the mean returns of NPS Scheme G Tier-I and Scheme G Tier-II. Accepted (Fail to Reject H_o).
- Alternative Hypothesis (H_1): There is a significant difference between the mean returns of NPS Scheme G Tier-I and Scheme G Tier-II. Rejected.

The hypothesis testing results provide important insights into the comparative performance of National Pension System (NPS) Tier I and Tier II schemes across different asset classes. The paired sample t-test revealed a statistically significant difference between the mean returns of Scheme E

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(Equity) Tier I and Tier II, leading to the rejection of the null hypothesis and acceptance of the alternative hypothesis. This indicates that Tier I equity schemes generated significantly higher average returns than Tier II schemes during the study period, suggesting that Tier I offers superior performance for equity-oriented investments.

In contrast, for Scheme C (Corporate Debt) and Scheme G (Government Securities), the null hypotheses were accepted as the differences in mean returns between Tier I and Tier II were not statistically significant. Although minor variations in average returns were observed, these differences were insufficient to establish a meaningful distinction in performance between the two account types. This suggests that both Tier I and Tier II provide comparable investment outcomes for corporate debt and government securities.

Overall, the findings indicate that only the equity-based Scheme E demonstrates a significant performance advantage for Tier I over Tier II, whereas Corporate Debt (Scheme C) and Government Securities (Scheme G) exhibit consistent and statistically similar returns across both tiers. These results imply that investors seeking higher return potential may benefit from Tier I equity investments, while those preferring relatively stable debt-oriented investments can expect comparable performance irrespective of the account type. The study therefore concludes that the choice between Tier I and Tier II is more critical for equity investments than for debt-based NPS schemes, providing useful guidance for retirement planning and portfolio allocation decisions.

Pearson Correlation Coefficients

The above table represents the **Pearson correlation coefficients** among the returns of six National Pension System (NPS) schemes: Equity (E), Corporate Debt (C), and Government Securities (G) under Tier I and Tier II accounts. The correlation coefficient ranges from **-1 to +1**, where: **+1** = Perfect positive relationship, **0** = No relationship and **-1** = Perfect negative relationship. The correlation analysis examines the extent to which the returns of different NPS schemes move together.

Table 5: Pearson Correlation Coefficients

	E-tier-1	E-tier-2	C-tier-1	C-tier-2	G-tier-1	G-tier-2
E-tier-1	1					
E-tier-2	0.862357	1				
C-tier-1	0.267784	0.06688	1			
C-tier-2	0.021414	-0.30915	0.854136	1		
G-tier-1	0.351602	0.106234	0.815011	0.632356	1	
G-tier-2	0.335182	-0.00569	0.733241	0.695197	0.941038	1

Source: Author Compliation

A positive correlation indicates that the returns of two schemes tend to increase or decrease simultaneously, whereas a negative correlation suggests that they move in opposite directions.

1) Correlation between E-Tier I and E-Tier II (R = 0.862)

The correlation coefficient between E-Tier I and E-Tier II is 0.862, indicating a very strong positive relationship. This suggests that the equity-oriented investment strategies under both tiers exhibit similar return patterns. Since both schemes primarily invest in equity instruments, they are influenced by common market conditions and stock market movements.

2) Correlation between C-Tier I and C-Tier II (r = 0.854)

The Corporate Debt schemes also demonstrate a strong positive correlation (0.854). This indicates that returns from Corporate Bond funds under Tier I and Tier II behave similarly over time. The

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similarity reflects comparable investment objectives and exposure to corporate fixed-income securities.

3) Correlation between G-Tier I and G-Tier II (r = 0.941)

The highest correlation is observed between G-Tier I and G-Tier II (0.941). This extremely strong positive relationship implies that Government Securities funds across both tiers generate highly similar returns. Since both portfolios invest predominantly in government bonds, they are affected by the same interest rate movements and macroeconomic conditions.

4) Relationship between Equity and Corporate Debt Schemes

The relationship between Equity and Corporate Debt schemes is comparatively weak.

- E-Tier I and C-Tier I: 0.268 (weak positive correlation)
- E-Tier II and C-Tier I: 0.067 (very weak positive correlation)
- E-Tier I and C-Tier II: 0.021 (negligible positive correlation)
- E-Tier II and C-Tier II: -0.309 (moderate negative correlation)

These findings indicate that equity and corporate debt funds generally do not move together. The negative correlation between E-Tier II and C-Tier II suggests that periods of stronger equity performance may coincide with relatively weaker corporate debt returns, highlighting the diversification benefits of combining these asset classes.

5) Relationship between Equity and Government Securities Schemes

The correlations between Equity and Government Securities schemes remain relatively low.

- E-Tier I and G-Tier I: 0.352
- E-Tier I and G-Tier II: 0.335
- E-Tier II and G-Tier I: 0.106
- E-Tier II and G-Tier II: -0.006

These values indicate that equity and government securities have only a limited relationship. The near-zero correlation between E-Tier II and G-Tier II (-0.006) suggests that the two schemes perform almost independently. Such independence supports portfolio diversification by reducing overall investment risk.

6) Relationship between Corporate Debt and Government Securities Schemes

The Corporate Debt and Government Securities schemes exhibit moderately strong positive correlations.

- C-Tier I and G-Tier I: 0.815
- C-Tier I and G-Tier II: 0.733
- C-Tier II and G-Tier I: 0.632
- C-Tier II and G-Tier II: 0.695

These results suggest that debt-oriented schemes share common influences, particularly changes in interest rates, bond yields, and monetary policy. However, the correlations are lower than those observed within the same asset category, reflecting differences in portfolio composition and credit risk. The correlation matrix indicates that schemes belonging to the same asset class (Equity,

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Corporate Debt, and Government Securities) exhibit strong positive relationships, demonstrating consistency in their return behaviour across Tier I and Tier II accounts. In particular, Government Securities schemes show the strongest association (r = 0.941), followed by Equity schemes (r = 0.862) and Corporate Debt schemes (r = 0.854). Conversely, cross-asset correlations are generally low to moderate, with some negative relationships observed between equity and debt schemes. This suggests that the three asset classes respond differently to market conditions, providing meaningful diversification opportunities. Investors who allocate funds across equity, corporate debt, and government securities can potentially reduce portfolio risk while maintaining balanced long-term returns. To conclude correlation analysis confirms that Tier I and Tier II schemes within the same asset category exhibit highly synchronized performance, indicating consistency in fund management and investment strategy. At the same time, the relatively weaker relationships between different asset classes demonstrate that combining equity, corporate debt, and government securities can improve portfolio diversification. Therefore, the findings support the use of a multi-asset allocation strategy in the National Pension System (NPS) to achieve better risk-adjusted investment performance over the long term.

CONCLUSION

The study provides a comprehensive empirical assessment of the performance of National Pension System (NPS) Tier I and Tier II schemes across Equity, Corporate Debt, and Government Securities. Using secondary data from ten Pension Fund Managers over a ten-year period, the analysis employed the Sharpe Ratio, paired sample t-tests, and Pearson correlation to evaluate risk-adjusted returns and investment performance. The findings indicate that Equity Scheme (Scheme E) Tier I significantly outperformed Tier II, suggesting that long-term retirement investors may benefit from maintaining investments in Tier I equity schemes. However, Corporate Debt (Scheme C) and Government Securities (Scheme G) exhibited no statistically significant differences between Tier I and Tier II, demonstrating that both account types deliver comparable returns within these relatively lower-risk asset classes. The correlation analysis further revealed strong positive relationships between Tier I and Tier II schemes within the same asset category, reflecting consistency in investment strategies adopted by pension fund managers. Conversely, relatively weak correlations between equity and debt-oriented schemes indicate meaningful diversification opportunities, enabling investors to reduce overall portfolio risk through multi-asset allocation. Overall, the National Pension System demonstrates stable and efficient fund management across asset classes, with equity investments offering higher return potential and debt-oriented schemes providing greater stability. The results highlight the importance of selecting an appropriate asset allocation strategy based on investors' risk tolerance and retirement objectives. The study contributes to the growing body of literature on pension fund performance in India and offers valuable implications for subscribers, pension fund managers, regulators, and policymakers in strengthening long-term retirement planning and enhancing the effectiveness of the National Pension System.

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