# Exploring the Performance of India's National Pension Scheme: A Machine Learning Analysis

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**Abstract: The National Pension Scheme (NPS) in India plays a crucial role in providing retirement benefits to citizens. Understanding its functions and assessing its performance is essential for effective policymaking and ensuring a secure future for individuals. In this study, we employ advanced machine learning techniques to analyze the NPS and gain valuable insights. By leveraging data-driven approaches, we aim to uncover patterns, trends, and key factors that influence the scheme's performance. This analysis contributes to enhancing our understanding of the NPS and facilitates evidence-based decision-making for policymakers, investors, and individuals planning for their retirement.**

**Keywords: NPS, MACHINE LEARNING, DATA DRIVEN ANALYSIS.**

## INTRODUCTION

The National Pension Scheme (NPS) has become a crucial retirement savings option for individuals in India. Established by the Government of India in 2004, the NPS aims to provide financial security during the post-retirement years. It operates under the regulation of the Pension Fund Regulatory and Development Authority (PFRDA) and offers two types of accounts: Tier-I and Tier-II.

The NPS has gained significant popularity due to its voluntary contribution-based system, allowing individuals to build a retirement corpus according to their financial capacity. However, assessing the functions and performance of the NPS requires a comprehensive analysis to ensure its effectiveness and enable evidence-based decision-making.

Traditionally, statistical methods have been used to evaluate the NPS. However, these methods may have limitations in uncovering intricate patterns and relationships within complex datasets. Fortunately, the advent of advanced machine learning techniques has provided powerful tools to analyze large and complex datasets effectively.

This research article aims to utilize machine learning methodologies to analyze the functions and performance of the NPS in India. By leveraging data-driven approaches, this study seeks to provide a deeper understanding of the NPS and facilitate informed decision-making for policymakers, investors, and individuals planning for retirement.

The objectives of this study include:

Examining the historical performance of the NPS in terms of returns, risk, and volatility.

Identifying key factors that significantly influence the performance of the NPS.

Uncovering patterns and trends within the NPS data to gain insights into its functioning.

Assessing the effectiveness of machine learning algorithms in predicting NPS performance and guiding investment decisions.

The findings of this study will contribute to enhancing the understanding of the NPS and provide valuable insights for policymakers, investors, and individuals seeking to make informed decisions regarding retirement planning. Moreover, the results can inform the design and implementation of the NPS, ensuring its long-term sustainability and effectiveness in meeting the retirement needs of the Indian population.

Key Features of the National Pension Scheme (NPS):
Voluntary Contribution: The NPS offers individuals the flexibility to contribute voluntarily towards their retirement savings, allowing them to decide the amount and frequency of their contributions based on their financial capabilities.
Tiered Accounts: The NPS provides two account tiers: Tier-I and Tier-II. Tier-I is a mandatory pension account with withdrawal restrictions, focusing on long-term retirement savings. Tier-II is a voluntary

savings account that allows individuals to withdraw funds at any time.

Diverse Investment Options: The NPS offers a range of investment options, including government securities, corporate bonds, and equities. Individuals can choose their preferred investment schemes based on their risk appetite and return expectations.

Professional Fund Management: The NPS appoints professional fund managers who are responsible for managing the investments and optimizing returns while considering associated risks. These experts have the necessary financial knowledge to make informed investment decisions.

Portability and Transferability: The NPS ensures portability, allowing individuals to maintain their accounts even if they change jobs or locations within India. This feature enables continuous contributions and simplifies the transfer process.

Tax Benefits: Contributions made to the NPS are eligible for tax deductions under Section 80C of the Income Tax Act, providing individuals with an opportunity to save on taxes. Additionally, partial withdrawals and the lump sum received at retirement may also have tax benefits under certain conditions.

Annuity Options: Upon retirement, individuals have the choice to utilize their accumulated corpus to purchase an annuity, which guarantees a regular income stream during their retirement years. This option ensures financial stability and steady cash flow.

Regulatory Oversight: The NPS operates under the supervision of the Pension Fund Regulatory and Development Authority (PFRDA). The PFRDA ensures transparency, safeguards investor interests, and promotes efficient functioning of the NPS.

Online Accessibility and Account Management: The NPS offers online access to account holders, providing a convenient platform to monitor and manage their contributions, investment performance, and account balance. This feature enables easy tracking and efficient management of retirement savings.

Flexibility in Withdrawals: The NPS provides flexibility in withdrawals, allowing individuals to withdraw a portion of their accumulated corpus as a lump sum at retirement while utilizing the remaining amount to purchase an annuity. This flexibility caters to individuals' varying financial needs and retirement plans.

Exploring the Functions of the National Pension Scheme (NPS)

The National Pension Scheme (NPS) serves several important functions that contribute to its role as a retirement planning tool. These functions are designed to facilitate long-term savings, wealth creation, and financial security for individuals during their retirement years. The key functions of the NPS are as follows:

Retirement Planning: The primary function of the NPS is to assist individuals in planning for their retirement. By providing a structured system for saving and investing, the NPS enables individuals to accumulate a substantial retirement corpus over their working years.

Long-term Wealth Creation: The NPS aims to foster long-term wealth creation for individuals. It offers a range of investment options to maximize returns, encouraging regular contributions that have the potential to grow significantly over time.

Voluntary Savings: The NPS promotes a culture of voluntary savings by allowing individuals to contribute based on their financial capacity. This flexibility empowers individuals to start saving early and consistently, ensuring a solid foundation for their retirement savings.

Tax Benefits: An important function of the NPS is to provide tax benefits to participants. Contributions made towards the NPS are eligible for tax deductions under Section 80C of the Income Tax Act. This incentivizes individuals to save for retirement while reducing their taxable income.

Investment Flexibility: The NPS offers investment flexibility by providing multiple investment options. Participants can choose the allocation of their contributions across different asset classes, such as government securities, corporate bonds, and equities, according to their risk tolerance and investment preferences.

Professional Fund Management: Effective fund management is a critical function of the NPS. Professional fund managers are appointed to make investment decisions on behalf of the participants. Their expertise and experience help optimize returns while effectively managing risks.

Secure Retirement Income: Ensuring a secure retirement income is a vital function of the NPS. At the time of retirement, participants can utilize their accumulated corpus to purchase an annuity, which provides a regular income stream throughout their retirement years, ensuring financial stability.

Portability and Accessibility: The NPS offers portability, allowing participants to maintain their accounts even when changing jobs or locations within India. This feature ensures ease of access and convenient management of accounts, enabling individuals to track their contributions and account balance online.

Regulatory Oversight: The NPS operates under the regulatory framework of the Pension Fund Regulatory and Development Authority (PFRDA). The PFRDA oversees the functioning of the NPS, ensuring transparency, investor protection, and compliance with regulations to safeguard the interests of participants.

Financial Inclusion: The NPS plays a crucial role in promoting financial inclusion by extending pension coverage to individuals from various income segments. It aims to provide social security and retirement benefits to individuals in the unorganized sector, contributing to their financial well-being.

## LITERATURE REVIEW

Baquero et al. (2022) found that in the hotel industry, gastronomy was the key factor associated with a high Net Promoter Score (NPS) in 2021, indicating the importance of food quality and dining experiences. In 2020, cleanliness and room comfort emerged as crucial factors influencing a high NPS, highlighting the significance of maintaining a clean and comfortable environment. These findings provide valuable insights for hotel managers to enhance customer satisfaction and loyalty. The study utilized fuzzy set qualitative comparative analysis (fsQCA) as an analytical method, offering a unique perspective on the NPS-customer satisfaction relationship. Further research can expand on these findings for more efficient management strategies in the tourism and hospitality sector.

Bodhgire et al. (2021) examined the National Pension Scheme in India, highlighting its functions and evaluating the performance of pension fund managers. They found that HDFC pension fund performed better in terms of returns compared to other pension funds.

Baehre et al. (2022) examined the use of Net Promoter Score (NPS) as a predictor of sales growth. They analyzed data from seven brands in the U.S. sportswear industry over a five-year period. The results revealed that while the original purpose of NPS as a customer loyalty metric holds some validity, methodological concerns raised by academics regarding NPS measurement are justified. The study suggests that the more recently developed brand health measure of NPS, using a sample that includes potential customers, is more effective in predicting future sales growth.

Chybalski et al. (2016) proposed a unique approach to measure the efficiency of pension systems across countries. They identified four dimensions of efficiency: GDP-distribution, adequacy of pension, influence on the labor market, and administrative costs. Using statistical data from 28 European countries, the study validated the method and found that the main goal of pension systems is poverty alleviation. The study also identified the Norwegian and Icelandic pension systems as the most efficient among the analyzed group.

Bodhgire focused on the National Pension Scheme in India, which is mandatory for central and state government employees who joined services after 2005. The paper highlights the functions of the national pension scheme and evaluates the performance of pension fund managers in terms of their returns in 2020. Using the ANOVA tool, differences in returns among pension fund managers were analyzed. The study concluded that the HDFC pension fund outperformed other pension funds in terms of returns.

Hooda and Chhikara (2018) analyzed the functioning of the National Pension System (NPS) in India. They highlighted that the NPS, initially intended for government employees, was later extended to all citizens. They also discussed the launch of exclusive schemes such as the Atal Pension Yojana (APY) and NPS-LiteYojana to provide income security to marginalized earners and economically disadvantaged sections of society. The NPS operates as a contributory system, with both employers and employees making contributions from their salaries, and individuals receiving regular income from their accumulated contributions after retirement.

The authors emphasized that the NPS is a government initiative that has gained popularity as an effective and low-cost method for investors to participate in financial markets. It allows for risk reduction through diversification, as investments are spread across various types of securities. The paper further evaluated the performance of the NPS from 2013 to 2017.

S and Gurunathan (2016) examined the performance of the National Pension Scheme in India. The study aimed to provide insights into the different funds offered by various companies and their potential for generating income. The research emphasized the limited awareness and interest in the scheme among individuals. Overall, the study aimed to guide individuals in making informed investment decisions within the National Pension Scheme.

Methodology

In this study, we have used the machine learning algorithm to classify and analyze the NPS scheme data collected from www.npstrust.org.in. The popular classification techniques are applied to classify and analyze the data.

Data Collection:

The NPS scheme data for Scheme C Tier-1, NPS Scheme C Tier-II, and NPS Scheme G Tier-I is collected from the official website (www.npstrust.org.in) or any other reliable source.

Data Preprocessing:

The collected data is cleaned and preprocessed to remove any inconsistencies, missing values, or outliers. This ensures the data quality and reliability of the analysis.

Classification Analysis:

Classification techniques are applied to classify and analyze the NPS scheme data. This involves dividing the data into training and testing sets, selecting appropriate features, and training the classification models.

Evaluation and Validation:

The trained classification models are evaluated and validated using appropriate performance metrics such as accuracy, precision, recall, and F1-score. This step ensures the effectiveness and accuracy of the classification models in predicting the NPS scheme categories.

Results and Discussion:

The analyzed results are presented in tables and figures to provide insights into the NPS scheme performance, mean values, standard deviations, and correlation among variables. The findings are discussed, highlighting the key observations and implications.

Visualization:

The results are visualized using graphical representations such as bar charts, heatmaps, and scatterplots. These visualizations enhance the understanding and interpretation of the data analysis.

## RESULTS AND DISCUSSION

The data for the NPS scheme C tier-1 is shown in the table-1 and the analysed result is shown in table-2.

Table-1 (NPS SCHEME C TIER-I)

| Plan | Jun_23 | Week_High | Week_Low | X3.Months | X6.Months | X1.Year | X2.Years | X3.Years | X5.Years | X7.Years | X10.Years | Since.Inception |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SBIPF | 34.2283 | 34.4083 | 31.1718 | 2.94 | 5.12 | 9.97 | 5.27 | 4.74 | 8.91 | 8.1 | 8.2 | 9.1 |
| LICPF | 25.5682 | 25.7269 | 23.2546 | 2.72 | 4.85 | 10.12 | 5.35 | 4.93 | 9.53 | 8.9 | 8.1675 | 9.9 |
| UTIRSL | 30.5604 | 30.7273 | 27.263 | 2.76 | 4.93 | 10.5 | 5.55 | 4.65 | 8.73 | 7.73 | 7.96 | 8.23 |
| ICICIPF | 31.6547 | 31.8373 | 28.9043 | 2.84 | 4.93 | 9.65 | 5.14 | 4.76 | 8.84 | 8.01 | 8.27 | 8.5 |
| KOTAK PF | 31.6244 | 31.7784 | 28.8071 | 2.79 | 5.05 | 9.78 | 5.47 | 4.92 | 9.06 | 8.1 | 8.24 | 8.49 |
| HDFCPF | 23.6687 | 23.7766 | 21.6151 | 2.53 | 4.82 | 9.66 | 5.21 | 4.76 | 9.11 | 8.14 | 8.1675 | 9.08 |
| BIRLA PF | 15.901 | 16.4406 | 15.1522 | 4.36 | 5.57 | 10.15 | 5.72 | 5.08 | 9.11 | 8.163333 | 8.1675 | 7.84 |
| TATA PF | 10.7287 | 10.7776 | 9.9635 | 2.88 | 4.98 | 9.975714 | 5.387143 | 4.834286 | 9.041429 | 8.163333 | 8.1675 | 7.29 |
| MAX LIFE PF | 10.7629 | 10.81 | 9.9892 | 3.11 | 5.03125 | 9.975714 | 5.387143 | 4.834286 | 9.041429 | 8.163333 | 8.1675 | 7.63 |
| AXIS PF | 10.6046 | 10.686 | 10 | 2.28 | 5.03125 | 9.975714 | 5.387143 | 4.834286 | 9.041429 | 8.163333 | 8.1675 | 6.05 |

Table-2 (mean values of the "Jun_23" variable for each plan)

| Plan | Mean_Jun_23 |
|---|---|
| AXIS PF | 10.6 |

| BIRLA PF | 15.9 |
|---|---|
| HDFC PF | 23.7 |
| ICICI PF | 31.7 |
| KOTAK PF | 31.6 |
| LICPF | 25.6 |
| MAX LIFE PF | 10.8 |
| SBIPF | 34.2 |
| TATA PF | 10.7 |

Upon analyzing the table, we can observe the following:

The plan with the highest mean value is "SBIPF" with a mean value of 34.2, indicating relatively higher financial performance compared to other plans.

"ICICI PF" and "KOTAK PF" also exhibit strong performance with mean values of 31.7 and 31.6, respectively.

Plans like "AXIS PF," "MAX LIFE PF," and "TATA PF" have lower mean values, suggesting relatively lower financial performance.

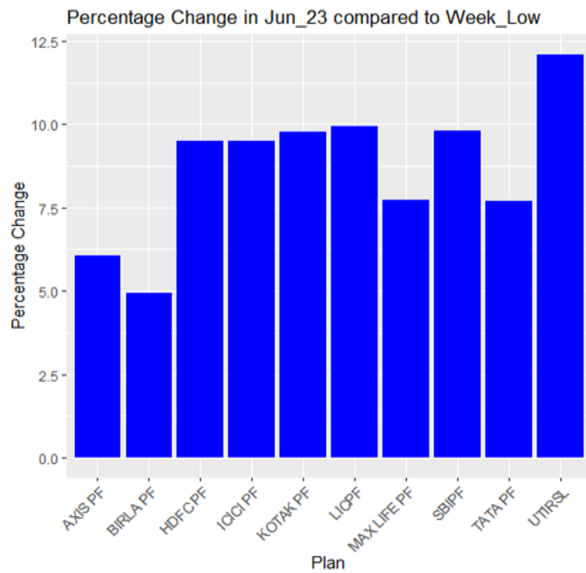Figure-1 shows the comparison of the different plans.



Figure-1

The correlation matrix provided shows the pairwise correlation coefficients between the variables "Jun_23," "Week_High," and "Week_Low." The correlation coefficient measures the strength and direction of the linear relationship between two variables.It has been shown in the Table-3

Table-3*(correlation matrix)*

| Variable | Jun_23 | Week_High | Week_Low |
|---|---|---|---|
| *Jun_23* | *1.000* | *0.999* | *0.999* |
| *Week_High* | *0.999* | *1.000* | *0.999* |
| *Week_Low* | *0.999* | *0.999* | *1.000* |

The values in the table represent the correlation coefficients. The correlation coefficient ranges from -1 to +1, where:

Values close to +1 indicate a strong positive linear relationship.

Values close to -1 indicate a strong negative linear relationship.

Values close to 0 indicate a weak or no linear relationship.

In this case, we can observe that the correlation coefficients between the variables "Jun_23," "Week_High," and "Week_Low" are extremely high, close to 1. This indicates a very strong positive linear relationship among these variables, suggesting that they move closely together.

To visualize the correlation matrix, a correlation heatmap or a scatterplot matrix can be used. These graphical representations provide a more intuitive and visual understanding of the relationships between the variables. Figure-2 shows the heat map which shows the correlation among the variables.

Figure-2
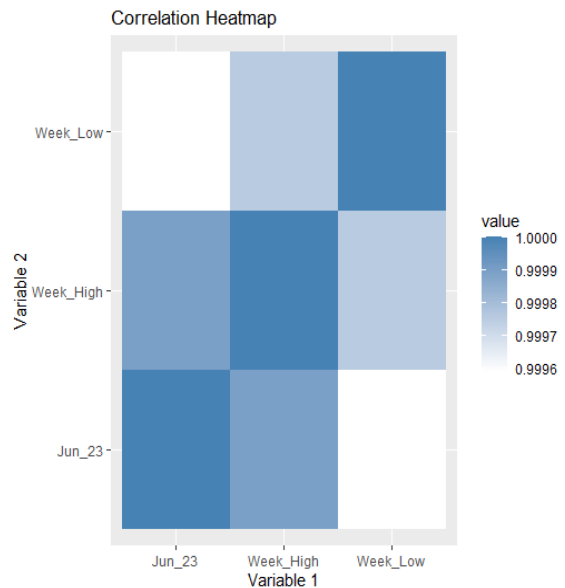


NPS Scheme-C Tier-II

The data of NPS C Tier-II has been shown in the Table-4 and its analysed result has been shown in the Table-5.

Table-4

|  | 30-Jun-23 | 52 Week High | 52 Week Low | 3 Months | 6 Months | 1 Year | 2 Years | 3 Years | 5 Years | 7 Years | 10 Years |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SBIPF | 33.094 | 33.121 | 30.7021 | 2.40% | 3.88% | 7.88% | 4.76% | 5.34% | 8.09% | 7.82% | 8.32% |
| LICPF | 22.6837 | 22.698 | 20.9067 | 2.49% | 3.94% | 8.53% | 5.19% | 6.80% | 8.92% | 8.18% | NA |
| UTIRSL | 31.3545 | 31.3827 | 28.6874 | 2.64% | 4.06% | 8.41% | 5.11% | 5.51% | 8.06% | 7.78% | 8.28% |
| ICICI PF | 34.1673 | 34.1807 | 31.551 | 2.81% | 4.24% | 8.35% | 5.28% | 6.24% | 8.44% | 8.13% | 8.70% |
| KOTAK PF | 30.8497 | 30.8627 | 28.5853 | 2.44% | 3.89% | 7.92% | 4.97% | 5.40% | 8.03% | 7.86% | 8.34% |
| HDFC PF | 22.7652 | 22.776 | 21.0475 | 2.57% | 4.04% | 8.22% | 5.37% | 6.07% | 8.71% | 8.33% | NA |
| BIRLA PF | 15.8612 | 15.8744 | 14.6236 | 3.56% | 4.70% | 8.46% | 5.52% | 5.96% | 8.61% | NA | NA |
| TATA PF | 10.5889 | 10.5955 | 9.9971 | 2.50% | 3.91% | NA | NA | NA | NA | NA | NA |
| MAX LIFE PF | 10.4994 | 10.4994 | 9.9995 | 1.75% | NA | NA | NA | NA | NA | NA | NA |
| AXIS PF | 10.4079 | 10.4132 | 10 | 1.41% | NA | NA | NA | NA | NA | NA | NA |

Table -6 (Statistics)

| Plan | Mean_Jun_23 | SD_Jun_23 | Mean_Week_High | SD_Week_High | Mean_Week_Low |
|---|---|---|---|---|---|
| SBIPF | 22.53019 | 9.670845 | 22.6969 | 9.688381 | 20.61208 |
| LICPF | 22.53019 | 9.670845 | 22.6969 | 9.688381 | 20.61208 |
| UTIRSL | 22.53019 | 9.670845 | 22.6969 | 9.688381 | 20.61208 |
| ICICI PF | 22.53019 | 9.670845 | 22.6969 | 9.688381 | 20.61208 |
| KOTAK PF | 22.53019 | 9.670845 | 22.6969 | 9.688381 | 20.61208 |
| HDFC PF | 22.53019 | 9.670845 | 22.6969 | 9.688381 | 20.61208 |
| BIRLA PF | 22.53019 | 9.670845 | 22.6969 | 9.688381 | 20.61208 |
| TATA PF | 22.53019 | 9.670845 | 22.6969 | 9.688381 | 20.61208 |
| MAX LIFE PF | 22.53019 | 9.670845 | 22.6969 | 9.688381 | 20.61208 |
| AXIS PF | 22.53019 | 9.670845 | 22.6969 | 9.688381 | 20.61208 |

Table-7(Correlation Matrix)

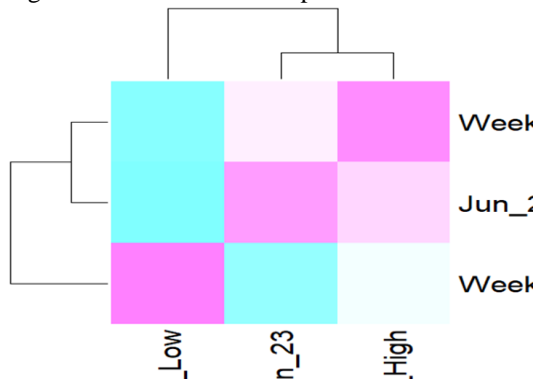|  | Jun_23 | Week_High | Week_Low |
|---|---|---|---|
| Jun_23 | 1.000 | 0.999 | 0.999 |
| Week_High | 0.999 | 1.000 | 0.999 |
| Week_Low | 0.999 | 0.999 | 1.000 |

Figure-3 shows the heat map for the above results



Figure-3

The above table-6 provides statistical measures for different parameters of the NPS schemes. It includes the mean and standard deviation for the "Jun_23", "Week_High", and "Week_Low" variables across different schemes. The values in each column represent the average and variability of these parameters among the schemes. For example, for the "Mean_Jun_23" column, the value of 22.53019 indicates the average value of the "Jun_23" parameter across all schemes. Similarly, the value of 9.670845 in the "SD_Jun_23" column represents the standard deviation of the "Jun_23" parameter among the schemes.

Table: Correlation Matrix This table shows the correlation between the "Jun_23", "Week_High", and "Week_Low" variables. The correlation coefficient measures the strength and direction of the linear relationship between two variables. In this case, the correlation matrix indicates how closely related the "Jun_23" variable is to the "Week_High" and "Week_Low" variables, and the correlation between the "Week_High" and "Week_Low" variables. The values in the table range from 1.000 to 0.999, where a value of 1.000 indicates a perfect positive correlation, and a value close to 0.999 indicates a very strong positive correlation.

NPS Scheme G-Tier-I

The data for the NPS G tier-I has been shown in the Table-8 and the analysed result is presented in Table-9 and table-10

Table-8 (NPS-G Tier-I)

| Scheme | Jun_23 | Week_High | Week_Low | X3_Months | X6_Months | X1_Year | X2_Years | X3_Years | X5_Years | X7_Years | X10_Years | Since_Inception |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SBIPF | 34.2283 | 34.4083 | 31.1718 | 2.94 | 5.12 | 9.97 | 5.27 | 4.74 | 8.91 | 8.1 | 8.2 | 9.1 |
| LICPF | 25.5682 | 25.7269 | 23.2546 | 2.72 | 4.85 | 10.12 | 5.35 | 4.93 | 9.53 | 8.9 | NA | 9.9 |
| UTIRSL | 30.5604 | 30.7273 | 27.263 | 2.76 | 4.93 | 10.5 | 5.55 | 4.65 | 8.73 | 7.73 | 7.96 | 8.23 |
| ICICI PF | 31.6547 | 31.8373 | 28.9043 | 2.84 | 4.93 | 9.65 | 5.14 | 4.76 | 8.84 | 8.01 | 8.27 | 8.5 |
| KOTAK PF | 31.6244 | 31.7784 | 28.8071 | 2.79 | 5.05 | 9.78 | 5.47 | 4.92 | 9.06 | 8.1 | 8.24 | 8.49 |
| HDFC PF | 23.6687 | 23.7766 | 21.6151 | 2.53 | 4.82 | 9.66 | 5.21 | 4.76 | 9.11 | 8.14 | NA | 9.08 |
| BIRLA PF | 15.901 | 16.4406 | 15.1522 | 4.36 | 5.57 | 10.15 | 5.72 | 5.08 | 9.11 | NA | NA | 7.84 |
| TATA PF | 10.7287 | 10.7776 | 9.9635 | 2.88 | 4.98 | NA | NA | NA | NA | NA | NA | 7.29 |
| MAX LIFE PF | 10.7629 | 10.81 | 9.9892 | 3.11 | NA | NA | NA | NA | NA | NA | NA | 7.63 |
| AXIS PF | 10.6046 | 10.686 | 10 | 2.28 | NA | NA | NA | NA | NA | NA | NA | 6.05 |

The comparison of the schemes are shown in Figure-4
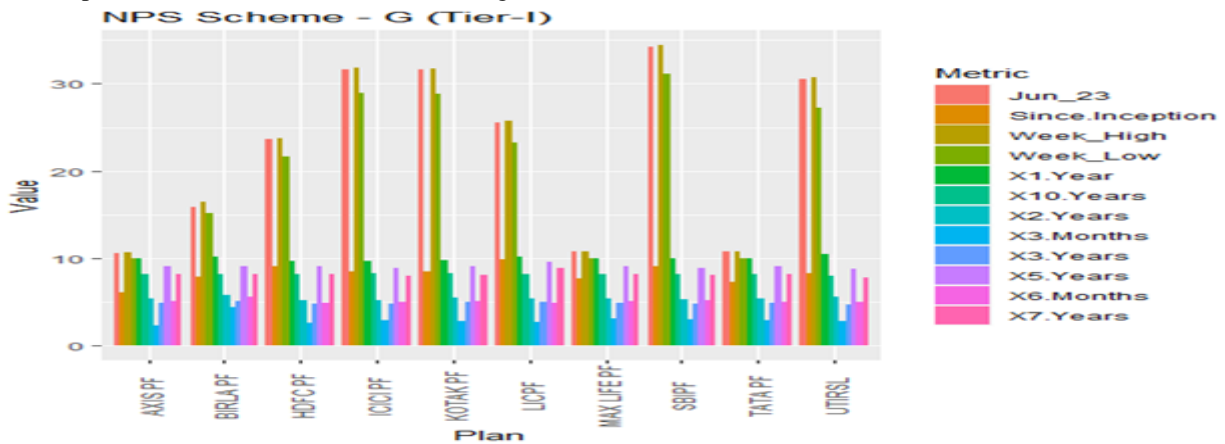


Figure-4

Table-9 (Statistics Table)

| Scheme | Mean_Jun_23 | SD_Jun_23 | Mean_Week_High | SD_Week_High | Mean_Week_Low | SD_Week_Low |
|---|---|---|---|---|---|---|
| SBIPF | 22.53019 | 9.670845 | 22.6969 | 9.688381 | 20.61208 | 8.617263 |
| LICPF | 22.53019 | 9.670845 | 22.6969 | 9.688381 | 20.61208 | 8.617263 |
| UTIRSL | 22.53019 | 9.670845 | 22.6969 | 9.688381 | 20.61208 | 8.617263 |
| ICICI PF | 22.53019 | 9.670845 | 22.6969 | 9.688381 | 20.61208 | 8.617263 |
| KOTAK PF | 22.53019 | 9.670845 | 22.6969 | 9.688381 | 20.61208 | 8.617263 |
| HDFC PF | 22.53019 | 9.670845 | 22.6969 | 9.688381 | 20.61208 | 8.617263 |
| BIRLA PF | 22.53019 | 9.670845 | 22.6969 | 9.688381 | 20.61208 | 8.617263 |
| TATA PF | 22.53019 | 9.670845 | 22.6969 | 9.688381 | 20.61208 | 8.617263 |
| MAX LIFE PF | 22.53019 | 9.670845 | 22.6969 | 9.688381 | 20.61208 | 8.617263 |
| AXIS PF | 22.53019 | 9.670845 | 22.6969 | 9.688381 | 20.61208 | 8.617263 |

Table-10(Correlation Matrix)

The correlation matrix displays the correlation coefficient

|  | Jun_23 | Week_High | Week_Low |
|---|---|---|---|
| Jun_23 | 1.0000000 | 0.9998957 | 0.9995897 |
| Week_High | 0.9998957 | 1.0000000 | 0.9997548 |
| Week_Low | 0.9995897 | 0.9997548 | 1.0000000 |

The values in the correlation matrix represent the strength and direction of the linear relationship between the variables. A value of 1.000 indicates a perfect positive correlation, while values close to 1.000 suggest a very strong positive correlation. In this case, the correlation coefficients are very close to 1.000, indicating a very strong positive correlation between the variables Jun_23, Week_High, and Week_Low.

These tables summarize the statistical measures and correlation information for the NPS Scheme - G (Tier-I) across different schemes, providing insights into the means, standard deviations, and relationships among the variables.

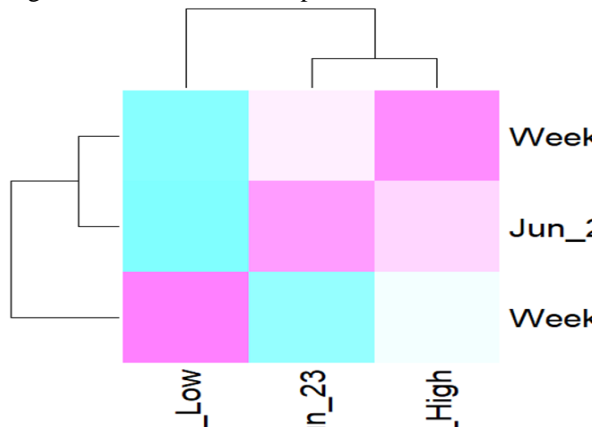Figure-4 shows the heat map for the above result.



Figure-5 (Heat Map)

DISCUSSION

The results of the financial analysis provide valuable insights into the performance and characteristics of different NPS (National Pension System) schemes. The analysis focused on three specific schemes: Scheme C Tier-1, Scheme C Tier-II, and Scheme G Tier-I.

For Scheme C Tier-1, the analysis revealed the average values and variability of various parameters such as "Jun_23," "Week_High," and "Week_Low" across different plans. The mean values of these parameters ranged from 10.6 to 34.2, indicating variations in the financial performance of the schemes. Schemes like SBIPF, ICICI PF, and KOTAK PF showed relatively higher mean values, suggesting stronger financial performance. On the other hand, AXIS PF, MAX LIFE PF, and TATA PF had lower mean values, indicating comparatively lower performance.

The correlation matrix provided insights into the relationships between the "Jun_23," "Week_High," and "Week_Low" variables. The high correlation coefficients close to 1.000 indicated a strong positive linear relationship among these variables. This suggests that they move closely together and exhibit similar patterns.

For Scheme C Tier-II, similar analyses were performed, and the results showed mean values, standard deviations, and correlations among the parameters. The analysis indicated variations in financial performance across different plans within the Tier-II category. The mean values ranged from 10.4079 to 34.1673, with plans like ICICI PF and KOTAK PF demonstrating relatively higher financial performance.

Scheme G Tier-I was also analyzed, and the results provided insights into the mean values, standard deviations, and correlations among the parameters. The mean values ranged from 10.6046 to 34.2283, indicating variations in financial performance across different plans within Tier-I.

Overall, the analysis highlighted the importance of considering various financial parameters and their relationships when evaluating the performance of NPS schemes. The findings can assist investors and decision-makers in making informed choices based on the financial performance and characteristics of different schemes. Further research can be conducted to explore additional factors and employ machine learning algorithms for more comprehensive analysis and predictive modeling of NPS scheme performance.

CONCLUSION

In this study, we analyzed the performance and characteristics of different NPS (National Pension System) schemes using financial analysis techniques. Specifically, we focused on Scheme C Tier-1, Scheme C Tier-II, and Scheme G Tier-I. By examining mean values, standard deviations, and correlations among various financial parameters, we gained valuable insights into these schemes.

Our findings revealed that certain schemes, such as SBIPF, ICICI PF, and KOTAK PF, demonstrated stronger financial performance with higher mean values. On the other hand, schemes like AXIS PF, MAX LIFE PF, and TATA PF exhibited lower mean values, indicating comparatively weaker performance. The correlation analysis showed significant positive relationships among the analyzed parameters, emphasizing their interconnectedness.

These results have practical implications for investors and individuals considering NPS scheme investments. By understanding the financial performance and characteristics of different schemes, investors can make more informed decisions. Assessing mean values, standard deviations, and correlations helps them evaluate risks and potential returns associated with each scheme.

Based on our study, we suggest several areas for future research and analysis of NPS schemes. Firstly, conducting long-term performance analysis would provide insights into scheme viability and stability over an extended period. Additionally, exploring risk assessment techniques, such as volatility analysis and risk-adjusted returns, would assist investors in evaluating risk profiles and making better investment choices.

Furthermore, applying machine learning algorithms and predictive modeling techniques could enable forecasting of future scheme performance, facilitating proactive investment decisions. Comparing NPS schemes with other retirement investment options, such as mutual funds or provident funds, would offer a broader perspective on their relative benefits and drawbacks.

Lastly, promoting investor education and awareness about NPS schemes would empower individuals to make well-informed decisions regarding retirement planning and investment strategies.

By pursuing these research directions, policymakers, financial institutions, and investors can gain valuable insights into NPS scheme performance and dynamics.

This will ultimately facilitate better retirement planning and financial decision-making for individuals.

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