Assessing the Performance of Pension Funds: A Study on the State Government Scheme of NPS in India

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Abstract

Individuals or employees invest in the National Pension System (NPS) intending to grow their money and receive a pension at the time of retirement. The pension system is directly related to stock market fluctuations and as a result, returns from NPS account to the investors cannot be possible to predict easily. However, due to the impact on investors' savings, any NPS investor, new or old, must assess the performance of the pension schemes. This study has taken into account the performance of all three funds under the State Government Scheme of NPS. The study makes use of NAV data of the funds under consideration for ten years. Descriptive statistics, correlation, One Way ANOVA, weighted average return, straight line equation, return per unit of risk, Sharpe and Treynor ratios were used for analysis. According to the study, the weighted average return of the State Government Scheme in NPS is 9.23%. Furthermore, the study discovers that the returns of the funds have a strong and positive correlation between them.

Keywords: Risk, Return, Sharpe, Treynor, ANOVA

Introduction

India has been in a disadvantagedposition for the lack of an old-age income guarantee scheme for its people. It is observed in the literature thatfewcompulsory schemes are available for government employees, banks, and businesses.Whereas, recently India's insurance sector has begun to provide pension plans to all the citizens of the country (Gupta et. al., 2017). Individuals'retirement income plans are always funded under the Government pension scheme while the payment of pension is made at retirement based on a defined contributory procedure. It indicates that an individual will geta pension based on his/her fund's assets. The pensioner bears the risk of fund underperformance in any defined contribution pension scheme(Das & Das, 2021). The primary goal of the research is to evaluate the performance of State Government Schemes under the NPS in India based on the performance of their pension funds. In addition, the significant relationship between the performance of pension funds under the scheme has been investigated.

National Pension System (NPS) of India

The government both central and state has been finding it difficult to meet the growing pension liability every year due to India's growing population, the rise of nuclear families, the rise in the cost of living, increased longevity and the rising number of retirees. As a result, the Indian Government announced a new pension system in 2004 called National Pension System for the central govt. employees (except armed forces) with a motive to reduce the pension liability on the government's part (Sadhak, 2013). It allows a person or employee to plan for retirement while still working or before retiring. NPS facilitates the accumulation of a pension corpus during their working lives through systematic savings and investments. The system is designed to provide a long-term solution for retirement income to retired people after superannuation. State governments have already adopted the new pension system for their employees gradually and it has now been made available to all citizens since 2009. Any person (non-resident or resident) between the ages of 18 and 70 may voluntarily join the NPS (PFRDA, 2020).

Pension funds are managed by both government and private pension fund managers, with the Pension Fund Regulatory and Development Authority monitoring and controlling their activities. Pension plans were always non-contributory and funded through budgetary allocations in the past (Fapohunda, 2013). As a result of the government's complete reliance on administration, regulation, and funding, several issues arose, including the diversion of remitted or allocated funds, the existence of ghost pensioners on the pension's payroll, the non-availability of records, unskilled administration, insufficient funding, and the delay or lack of payment after retirement (Sule & Ezugwu, 2009). To address these issues, the Pension Reform Act of 2004 established the contributory pension system, which is funded by monthly payroll deductions and employer contributions.

Review of Literature

According to Jariwala (2019), most of the money had invested in equities by aggressive investors which were followed by bonds of the corporate sector and Govt.

securities. It was also identified that the selected NPS schemes covering Equity, Corporate Bonds and Government Securities of Tier-I A/c had no significant variation in their mean returns.Based on the mean score, Aygoren et al. (2017) discovered that the pension funds AVIVA and VAKIF outperformed the market's other pension fund managers. Chander (2017) found that the ICICI pension fund outperformed the benchmark, followed by the pension funds of SBI, Kotak, Reliance, UTI, and RSL. The study also observed that LICPF, Reliance PF, ICICI and KOTAK PF performed poorly under the NPS scheme studied, according to Kumar and Kumar (2017). Barik (2015) discovered that the returns from national pension funds and mutual funds were more or less similar over the study period. According to Ananth and Gurunathan (2016), the UTI pension fund and ICICI pension fund had the highest return while the Reliance pension fund had the lowest. Ezugwu (2014) discovered a positive and significant association between the size of a portfolio's assets and its return. According to Imam (2011), the Government of India played an important role in terms of risk and return of pension funds as well as in properly positioning the pension funds to take advantage of the benefits. Further, it was identified that the pension funds had low equity proportions in their portfolios, which had affected the growth of pension funds and low proportions in equity resulted in the higher safety of funds. According to Gort (2009), the success of Swiss pension plans fell short of expectations because the performance of the pension plans in international equities and domestic equities was underperformed and below the market indices. Antolin (2008) discovered that the pension funds which are privately managed received a risk-premium over the short-term asset substitutes. Further, the study also observed that pension funds had underperformed the portfolio based on the maximum mean return for an assumed level of risk.

Many academics in India and abroad have researched how to measure the performance of pension funds/pension schemes using various statistical tools and risk-return measurement approaches. Assessing the performance of pension funds is critical because it includes an individual's savings, which will also benefit him/her when he/she retires from service. The Indian government also requires all

government employees to invest in NPS to receive a monthly pension after retirement. In this study, the researcher attempts to assess the performance of three funds under the State Government Scheme of NPS. It should be noted that no study has been conducted to assess the performance of the State Government Scheme of NPS for 10 years making the present study a unique one.

Objectives of the study

1. To evaluate the performance of the State Government Scheme under the National Pension System (NPS) in India based on the performance of their pension funds.

2. To assess the association of performances of pension funds under the State Government Scheme of NPS in India.

Hypotheses of the study

- H0: There is no significant relationship between the returns of pension funds under the State Government Scheme of NPS in India.

- H0: There is no significant difference across the returns of pension funds under the State Government Scheme of NPS in India.

Data Source & Methodology

Based on the annual return and risk of the State Government Scheme's three pension funds, viz., LIC Pension Fund Ltd., SBI Pension Fund Pvt. Ltd. and UTI Retirement Solutions Ltd., the performance of the scheme have been assessed. The returns of the funds are evaluated using the Sharpe and Treynor ratios to calculate risk-adjusted return. To evaluate the scheme's performance, the weighted average return and weighted variance have been measured, where the the weight of the pension funds has been considered as the proportion of the total investment of the funds made during the study period.

The fund's return and risk have been calculated over ten years from 2009-10 to 2018-19. Net Asset Values (NAVs) have been gathered for this purpose from the National Securities Depository Limited - NSDLwebsite(Pension Fund Managers, 2020). The performance of the scheme and three funds havebeen contrasted with that of the market. To do so, the study has also used market index data from the

S&P BSE Sensex for the same time frame considered in the study. The risk-free rate of returnhas been calculated as 7.70% by taking into account the average term deposit rates offered by commercial banks in India for ten years with maturities of more than one year and the relevant rates have been obtained from the RBI's official website (https://www.rbi.org.in/). Moreover, a limited number of statistical tools, including descriptive statistics, correlation, the t-test, the Kolmogorov-Smirnov & Shapiro-Wilk normality test, one-way ANOVA and the straight line trend equation concerning time have been used to analyse the data. The necessary calculations and hypotheses testing have all been completed using SPSS 21 and MSExcel 2013.

The formulae which have been exercised in the present study are mentioned below-

- Annual Return:Annual return measures the performance of the pension funds by using the following formula (Kabasinskas et. al. (2017); Njeru et. al. (2015))

$$\textbf{\textit{Yearly return of pension fund }} (R_i) = \frac{NAV_t - NAV_{t-1}}{NAV_{t-1}} \times \textbf{100}$$

*Where, Ri = Return of the ith Pension fund for the year, NAV_t = NAV per unit at the close of the year & NAV_{t-1} = NAV for the beginning of the financial yea*r.

- **Standard Deviation:**The risk of pension funds is measured through standard deviation and calculated by using the following formula (Gangwar & Singh (2017); Christopher & Edomwonyi (2016))-

$$\textbf{\textit{Standard deviation }} (\sigma) = \sqrt{\frac{N\Sigma X_i^2 - (\Sigma X_i)^2}{N^2}}$$

Where, σ = Standard deviation of the ithPension fund, Xi = Return of the ithPension fund, and N = Number of observations.

- **Weighted average return:** the performance of the pension scheme is measured through a weighted average return by using the following formula (Bodie et. al. (2012); Kevin (2012))-

$$\textbf{\textit{Weighted Average Return }} (R_s)$$
$$= \sum_{i-1}^{n} r_i w_i = r_1 w_1 + r_2 w_2 + r_3 w_3$$

Where, RS = Weighted Average Return of the Scheme, r1, r2 and r3 = Indicates the returns of three pension funds respectively, whereas, w1, w2 and w3 = Indicates the weight i.e., an investment made by three pension funds respectively during the study period.

Beta: systematic or market risk is indicated by Beta and also used to calculate the risk-adjusted return (Chander (2017); Kumar & Kumar (2017)). The formula of Beta is -

$$\beta = \frac{r_{im}\, \sigma_i\, \sigma_m}{\sigma_m^2}$$

Where, β = Beta, rim = Coefficient of correlation between returns of ith pension fund & market return, σi = Standard deviation of the returns of ith Pension fund, σm = Standard deviation of the market return, σm2= Variance of Marker return

- **Return per unit of risk:** It has been utilised as a measure of the performance of the pension funds and calculated by using the following formula -

$$Return\ per\ unit\ of\ risk = \frac{r_i}{\sigma_j}$$

Where, ri = Realised return from the ith pension fund, σi = Standard deviation of the ith pension fund

- **Sharpe ratio:** It has been used as a measure of risk-adjusted return against per unit of total risk (Ananth & Gurunathan (2016); Kabasinskas et. al. (2017)) which is calculated by using the following formula -

$$Sharpe\ Ratio\ (SR) = \frac{r_i - r_f}{\sigma_i}$$

Where, ri = Realised return from ith pension fund, rf = Risk-free rate of return, σi = Standard deviation of the returns of ith Pension fund

- **Treynor ratio:** It has been utilised as a measure of risk-adjusted return against per unit of systematic risk which is measured by using the following formula (Kevin, 2012) -

$$Treynor\ Ratio\ (TR) = \frac{r_i - r_j}{\beta_i}$$

Where, ri = Realised return from ith pension fund, rf = Risk-free rate of return during the period, βi = Beta of ith pension fund.

Scope and Limitations of the study

- This study is confined to only the State Government Scheme of NPS in India.

- The study period spans ten financial years, from 2009-10 to 2018-19 and the accuracy of secondary data may not be possible as it has been collected from secondary sources.

Data Analysis and Discussion

This section of the research work includes the descriptive statistics of the three funds, the correlation coefficient of the funds, straight-line trend equations to determine whether the yearly returns of each fund are increasing or decreasing and finally, the return per unit of risk is calculated to determine the best pension fund that outperforms the other funds considered in the study along with Sharpe and Treynor ratios.

Table 1: Descriptive statistics related to the annual return of pension funds and S&P BSE Sensex for the period 2009-10 to 2018-19

Fund's Statistics	LIC Pension Fund Ltd.	SBI Pension Fund Pvt. Ltd.	UTI Retirement Solutions Ltd.	S&P BSE Sensex
Mean	8.96%	9.43%	9.56%	16.68%
SD	5.14%	4.72%	4.82%	24.99%
Min	2.16%	3.76%	4.56%	-10.58%
Max	19.89%	19.71%	19.35%	79.85%

Source: Compiled and computed by the researcher

Table 1 provides descriptive statistics for the S&P BSE Sensex and three pension fund's annual returns over ten years.Under the state government scheme of NPS in India, UTI Retirement Solutions Ltd. (9.56%) has the highest mean return during the study period, which is followed by SBI Pension Fund Pvt. Ltd. (9.43%) and LIC Pension Fund Ltd. (8.96%). In terms of yearly standard deviation, SBI Pension Fund Pvt. Ltd. (4.72%) has the lowest annual SD value during the study period, followed by UTI Retirement Solutions Ltd. (4.82%) and LIC Pension Fund Ltd. (5.14%).With a standard deviation of 24.99%, the market index's mean return stands at 16.68%. Additionally, the study has found that the fund's average annual return is lower thanthe annual average market return under study.

Table 2: Straight line trend equation for the returns of pension funds vis-à-vis time

Funds	Straight line trend equation	R^2	Trend direction	p-value
LIC Pension Fund Ltd.	y = 0.2593x + 7.5338	0.0233	Increasing	0.674
SBI Pension Fund Pvt. Ltd.	y = 0.1362x + 8.6761	0.0076	Increasing	0.811
UTI Retirement Solutions Ltd.	y = 0.1074x + 8.9668	0.0046	Increasing	0.853

Source: Compiled and computed by the Researcher

The results of the straight-line trend equation based on the annual return of the three funds included in the state government scheme of NPS in India are shown in Table 2. The annual return of the funds has been increasing over the study period and has maintained an increasing trend, according to the positive regression coefficients for all pension funds. The results of the p-values show that the three fund returns are not significantly increased over time.

Table 3: Return per unit of risk and risk-adjusted return of the funds under study

Funds	Return per unit of risk		Sharpe ratio		Treynor ratio	
	Ratio	Rank	Ratio	Rank	Ratio	Rank
LIC Pension Fund Ltd.	1.743	3	0.245	3	-0.052	3
SBI Pension Fund Pvt. Ltd.	1.998	1	0.367	2	14.667	1
UTI Retirement Solutions Ltd.	1.983	2	0.386	1	-7.721	2

Source: Compiled and computed by the Researcher

Table 3 displays the risk-adjusted returns and return per unit of risk for the three funds in the state government scheme. A person can compare the performance of a 'high-risk' and 'high-return' investment with 'less-risky' and 'lower-return' investments by measuring the value relating to the risk in the return of an investment.SBI Pension Fund Pvt. Ltd. (1.998) has attained the highest return per unit of risk, followed by UTI Retirement Solutions Ltd. (1.983) and LIC Pension Fund Ltd. (1.743) during the study period.

The reward-to-variability ratio or Sharpe ratio is a tool to measure the risk-adjusted return of a fund (Kevin, 2012). It is the ratio of the fund's effective/expected return to its standard deviation. According to the results of the Sharpe ratio, UTI Retirement Solutions Ltd. (0.386) has the better performance throughout the study period, followed by SBI Pension Fund Pvt. Ltd. (0.367) and LIC Pension Fund Ltd. (0.245) of the considered scheme.

The risk-adjusted measurement of return based on systematic risk is termed as Treynor ratio (Kevin, 2012). It shows how much money an investor can make from a pension fund investment for the amount of risk he/she is willing to take. The Treynor ratios of UTI Retirement Solutions Ltd. (-7.721) and LIC Pension Fund Ltd. (-0.052) are negative over the study period, but the same is positive in the case of SBI Pension Fund Pvt. Ltd. (14.667) fund of the considered scheme.

Table 4: Weighted average return of the state government scheme

Funds	Weight (Proportion of Investment)	Weighted Return
LIC Pension Fund Ltd.	0.32	2.87
SBI Pension Fund Pvt. Ltd.	0.34	3.16
UTI Retirement Solutions Ltd.	0.34	3.20
Weighted Average Return of the scheme		**9.23**
Weighted Variance of the scheme		**21.07**
Weighted Standard Deviation of the scheme		**4.45**

Source: Compiled and computed by the Researcher

Table 4 displays the portfolio of the State Government Scheme as a whole, as well as the three pension fund's weighted average returns. The study takes into account weights as a percentage of all three pension fund's annual investments.The study reveals that the pension funds with the highest weighted average return are UTI Retirement Solutions Ltd. (3.20%), followed by SBI Pension Fund Pvt. Ltd. (3.16%) and LIC Pension Fund Ltd. (2.87%). The weighted average return of the state government scheme of NPS over the ten-year study period is 9.23%. While the state government scheme's weighted standard deviation for the study period is 4.45 based on the value of the weighted variance.

Table 5:Correlation between pension funds and market index

Funds	LIC Pension Fund Ltd.	SBI Pension Fund Pvt. Ltd.	UTI Retirement Solutions Ltd.	S&P BSE Sensex
LIC Pension Fund Ltd.	1			
SBI Pension Fund Pvt. Ltd.	0.954 (8.971)*	1		
UTI Retirement Solutions Ltd.	0.965 (10.351)*	0.988 (17.787)*	1	
S&P BSE Sensex	-0.188 (-0.541)	0.001 (0.004)	-0.002 (-0.006)	1

Source: Compiled and computed by the researcher

t-value shown in the bracket with (n-2) i.e. 8 df at 5% level is 2.306 and at 1% level is 3.355

*Coefficients of correlation are statistically significant

Table 5 displays the correlation coefficient values between the market return and the three pension funds. The table above shows a strong and favourable association between the returns of the three funds that were the subject of the study.The coefficients of correlation for LIC Pension Fund Ltd & SBI Pension Fund Pvt. Ltd, LIC Pension Fund Ltd & UTI Retirement Solutions Ltd., SBI Pension Fund Pvt. Ltd & UTI Retirement Solutions Ltd, and SBI Pension Fund Pvt. Ltd & UTI Retirement Solutions Ltd are 0.954, 0.965 and 0.988 respectively. Additionally, the correlation coefficients for each pension fund are all significant t a1% level significance. The returns of the pension funds under investigation do not differ significantly from the market return; as a result, their association with the market return is purely coincidental.

Table 6: Normality for Pension Fund's Return

Pension Funds	Kolmogorov-Smirnov		Shapiro-Wilk	
	Statistic	Sig.	Statistic	Sig.
LIC Pension Fund Ltd.	0.177	0.200	0.200	0.922
SBI Pension Fund Pvt. Ltd.	0.189	0.200	0.200	0.900
UTI Retirement Solutions Ltd.	0.261	0.051	0.051	0.868

Source: Computed and compiled by the researcher

Table 6 shows that the Kolmogorov-Smirnov and Shapiro-Wilk tests have been used to examine the annual return of each of the State Government Scheme's three pension funds to determine whether it is normal. The results of the two tests mentioned above indicate that the relevant p-values are above 0.05 for all of the funds' understudies, indicating that the data are normally distributed.

Table 7: Result of ANOVA for Pension Funds Return of State Government Scheme

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	1.97	2	0.985	0.041	0.960	3.354
Within Groups	647.93	27	23.997			
Total	649.90	29				

Source: Compiled and computed by the researcher

The parametric test or One Way ANOVA has been used in table 7 to determine whether there is a discernible difference in return between the three pension funds mentioned above. The ANOVA test result shows that the corresponding p-value is above 0.05, which denotes an insignificant difference in return among the three funds under the State Government Scheme of NPS in India that were taken into consideration.

Conclusion

This study has taken into account the performance of all three funds under the State Government Scheme of NPS. The study makes use of NAV data of the three funds under consideration for ten years. The study reveals that UTI Retirement Solutions Ltd. has the highest annual average return (9.56%) which is followed by SBI Pension Fund Pvt. Ltd. (9.43%) and LIC Pension Fund Ltd. (8.96%). According to the study, the weighted average return of the State Government Scheme in NPS is 9.23% during the study period. Importantly, the study discovers that the returns of the funds have a strong and positive correlation between them.Moreover, the p-value for One Way ANOVA is higher than 0.05 which implies that the return of all three pension funds of the State Government Scheme of NPS is not statistically significant during the study period.

The pension of an employee is now based on the newly defined contributory and market-linked mechanism in India, which is popularly known as NPS. Pension funds evaluation is critical because it includes employees' lifelong savings for retirement. The savings in the pension system will deepen and stabilise the capital market as well as increase investments in government and corporate bonds. The NPS will have a positive impact on government finances and capital market liquidity. It can only help to promote inclusive growth for India's vast population if the government begins to promote it through nationwide awareness campaigns (Das & Das, 2022).

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