A study on select Pension Funds in India

Abstract

During the first two decades of the 21st century, India has undergone remarkable demographic transformations. Among these changes, a noteworthy development is the projection that India will ascend to become the world's most populous country by the year 2026 (Nelson, 2010). Another significant shift is the rapid growth of individuals over the age of 60 within the population. According to the United Nations (2008), the number of elderly individuals is escalating at an unprecedented rate, anticipated to surpass 500 million by the close of this century. Consequently, India is poised to become an aging society at a rapid pace even before achieving the status of a high-income economy. Population aging brings about significant and far-reaching consequences for a country, encompassing social, economic, and political realms. The rising population of elderly individuals places considerable strain on both the healthcare and social care systems of the nation. Addressing this challenge requires the formulation of effective social and economic policies aimed at alleviating the financial insecurity associated with old age. An effective way of alleviating the fear of financial insecurity is to invest in various financial products offered by the Government and private organizations, one of them being pension funds. The research paper aims to critically appraise/evaluate the select schemes of Aditya Birla Sunlife Pension Management Ltd.

Keywords – Financial insecurity, Pension fund, Schemes

I. Introduction

The demographic changes in India over the first two decades of the 21st century have been significant. One of the most important changes is the projection that India will become the most populous country by 2026. (Nelson 2010). And significantly the number of persons over the age of 60 is growing fastest among the population and will cross 500 million by the end of this century (Figure 1) (UN 2008). Hence, India will become a rapidly aging country before it becomes a high-income economy (Figure 2) (Asher, Bali 2010: 68).

The figure below is an indication of how the share of the population over the age of 60 is projected to increase from 8 percent in 2015 to 19 percent in 2050. By the end of the century, the elderly will constitute nearly 34 percent of the total population in the country.

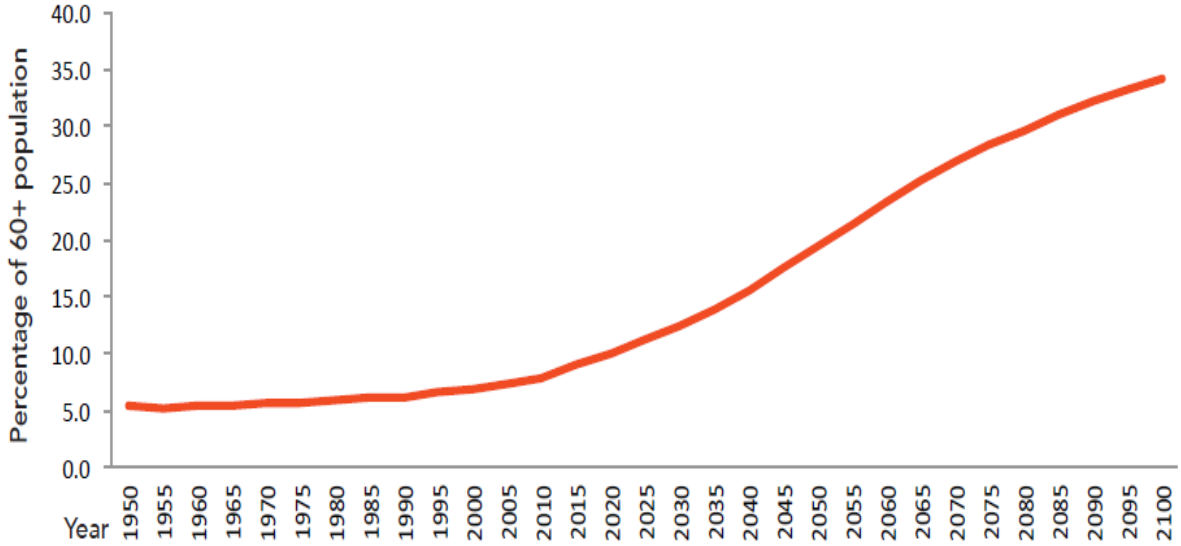

Figure 1: **Percentage of 60 plus population persons in total population, India, 1950-2100**

Source: United Nations (2015), World Population Prospects, 2015 Revision, Department of Economic and Social Affairs, United Nations

The figure below further shows the annual growth rate of the elderly population will outpace the annual growth rate by the middle of this century and thus indicate a faster pace of growth than other age categories.

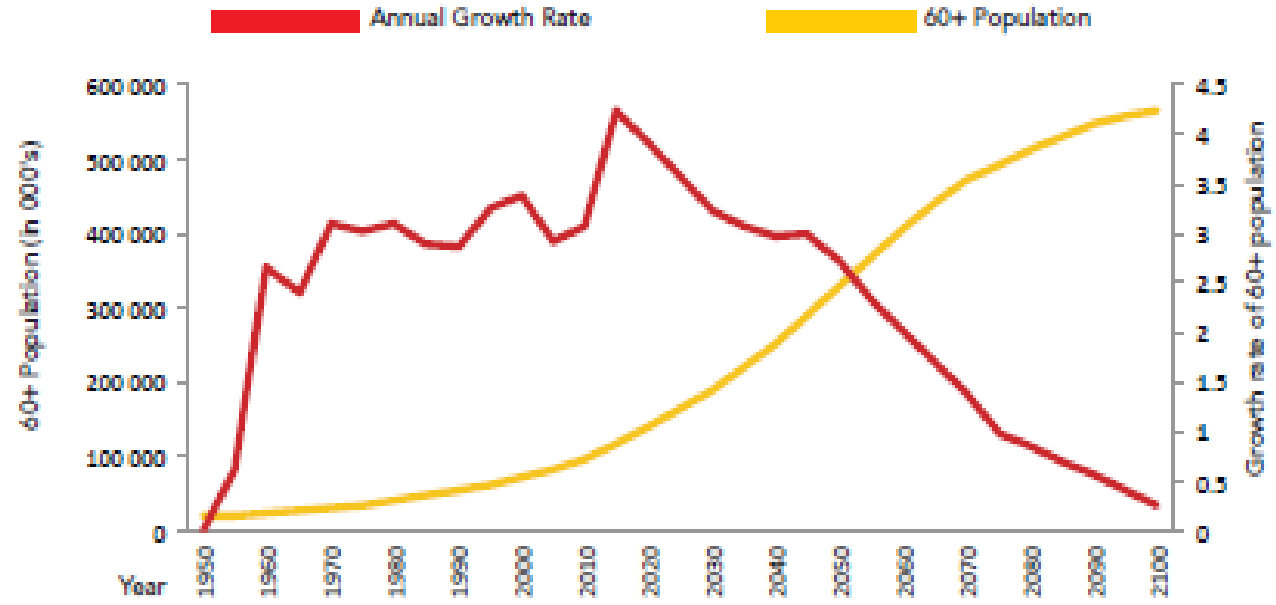

Figure 2: Size and growth rate of the elderly population in India, 1950-2100

Source: United Nations (2015), World Population Prospects, 2015 Revision, Department of Economic and Social Affairs, United Nations

This trend indicates that India will experience a significant shift towards being an aging country even before it achieves a high-income status in its economy.

Population aging is a dynamic demographic trend all over the world. The pace of aging in developed and developing countries is different. It took 110 years and 80 years to double the share of the older population from 7% to 14% in France and Sweden, respectively, while it is projected to take only 25 years and 20 years for China and India, respectively, to double their share of the older population (Economic and Political Weekly, Vol. 54, Issue No. 39, 28 Sep, 2019).

Population aging is accompanied by profound social, economic, and political implications for a country. The increasing number of older persons put a strain on the health care as well as the social care systems of a country. The challenge is to devise appropriate social and economic policies to mitigate the vulnerability of old age.

An effective way of alleviating the fear of financial insecurity is to invest in various financial products offered by the Government and private organizations. Broadly the following investment options are available:

1) Shares
2) Debentures and Bonds
3) Public Deposits
4) Bank Deposits
5) Post Office Savings
6) Public Provident Fund (PPF)
7) Money Market Instruments
8) Mutual Fund Schemes
9) Life Insurance Schemes
10) Real Estates
11) Gold-Silver
12) Derivative Instruments
13) Commodity market (commodities)
14) Pension system

The research paper deals with the pension system available in this country. A brief description of the same is worth mentioning here.

II. Indian Pension System:

Current Pension Products and Schemes

The Indian pension scenario includes non-contributory social pension schemes financed by the Government to provide a minimum level of protection like the National Social Assistance Programme (NSAP), mandatory defined benefit pension scheme on pay-as-you-go basis like Civil Service Pension for employees who joined service before 2004, Employees' Provident Fund (EPF) and Employees' Pension Scheme (EPS) under the EPFO, other Statutory Provident Funds like Coal Mines, Seamen's Assam Tea Plantations etc.

The paradigm shift in the Indian Pension system came with the introduction of the National Pension Scheme (NPS). Its origin is based on the report of the Old Age Social and Income Security (OASIS) Committee (GOI, 2000), the Working Group's report (GOI, 2001), and the Expert Group's report (GOI, 2002). These reports recommended forming a Pension Fund Regulatory and Development Authority (PFRDA) and the PFRDA bill was introduced in Parliament in 2005. National Pension Scheme which was earlier named as New Pension Scheme was introduced by the Government through the notification No. 5/7/2003-ECB & PR dated 22nd December 2003 and it was made mandatory for Central Government employees (except armed forces) who joined service w.e.f. 1-1-2004. The monthly contribution is 10% of the salary and Dearness Allowance to be paid by the employee and matched by the Government. Initially, this scheme was for government employees but later in the year 2009, it was opened for all citizens.

III. Literature review

The researcher while working on the present project had to delve deep into the available literature to gather an insight into the subject. Some of them are given below.

According to Grace et. al. (2010), planning for superannuation is examined with reference to individual choice of life course, cumulative advantage perspectives, and studying investors' behaviour theories. Retirement planning is dealt with by both men and women. The behavioural aspect of an investor is examined with his/her perception of retirement. In-depth information was gathered by adopting a qualitative research design in the context of real life in order to form a theory. 21 semi-structured exploratory interviews were conducted in order to identify and describe the various feelings and thoughts that both male and female customers have regarding financial planning regarding retirement. The 21 in-depth interview findings show that the perspectives of males and females differ regarding retirement planning. Males are driven towards the perspective of individual choice wherein it is assumed that retirement is the next stage in an individual's life where lifestyle is contributing to the present standards of living. Women basically go on the life course viewpoint where life is not dependent on assumptions about the future stages of life. To enhance the value of research, the methodology of perceptual mapping was used while analysing thus giving the knowledge about the behaviour and attitude of investors towards financial retirement planning.

Goli and Pandey (2010) emphasised that there is an increasing emphasis in academic literature and popular media on productively utilising India's millennials for economic growth. But the forecasts of future growth often ignore the unhealthy and early initiation of aging symptoms in Indian adults. Unless we ensure active and healthy ageing in one of the fastest-ageing societies in the world, realising a demographic dividend would be a remote possibility. The age-wise population projections suggest that by the time India will have its young-age dependency below 30, its old-age dependency is likely to be above 15. This means that the advantage accrued from India's age composition will depend on ensuring healthy and active aging where the elderly population can contribute to the economy (Goli and Pandey 2010; James and Goli 2016).

Imam (2011), in his paper, explored the potential and actual role played by the government in pension fund management. Pension funds embrace low proportions of equity in their portfolios which affects the growth of pension funds and moreover, low equity proportions mean more safety for the pension funds. To some extent "home bias" occurs because it is not necessary for regulators to lay strict limits on the proportion of equities. Another issue that requires attention is the tax treatment for making the new pension scheme viable.

According to Goswami (2013), Kudrna- Tran- Woodland (2015), and Sinha (2008), restructuring the institutional framework was the key to the reform being carried out in the Indian pension system. It has been further explained that the cause behind the requirement for re-arranging the institutional framework is the failure of pension schemes like no-pay-no-go, pay-as-you-go, NOAP, IGNOAPS, IGNDPS, EPF, EPS(as most of the pension schemes are beneficial to the public sector employees).

Chopra and Puduserry (2014) present primary data to show that pension amounts were used by the elderly primarily to meet expenditures on food and health. Hence there is a definite need for social pensions to address the increasing old-age dependency and declining support system (Subaiya and Bansod).

According to Golandaj et al 2013, there has hardly been any change in the preferred living arrangements among older adults in India. In 2014, the proportion of the elderly population living alone and living with their spouse was only 2.2% and 10%, respectively. However, close to 87.8% of the elderly population were living with children and others. Old-age dependency on children is not new in India, but with the emergence of concepts like "second demographic transition" and "third civilisation wave", reorientation of the family system with further nucleation is being witnessed (Lesthaeghe and van da Kaa 1986; Mladek 2012; Roy et al 2017).
A recent study by Evans and Palacios (2015) covering more than half of the world's elderly population finds that the elderly and adults are generally the least poverty-stricken group, while children are the poorest group.

Deepak Mohanty (2022) in his working paper Perspectives on the Pension-Sector in India opined that the future expansion in NPS is expected to emanate from the private sector – both the salaried and self-employed. He feels that steps at enhanced pension literacy, both of the subscribers and the intermediaries, coupled with a nudge from the regulator and the Government along with encouragement to young adults to join a pension scheme early would accelerate the movement towards a pension society.

IV. Objectives:

The research paper aims to critically appraise/evaluate the selected schemes of Pension funds. The following are the detailed objectives to be fulfilled in the proposed research work:

a) To do a performance analysis of select Pension Funds Schemes in India since inception.
b) To study the growth pattern of select Pension Funds Schemes in India since inception.
c) To make a comparative analysis of the performance of select Pension Funds Schemes in India with their benchmark.

V. Research Methodology:

Data selection and its sources:

The present study is about select Schemes under NPS regulated/administered by PFRDA. There are professional fund managers appointed exclusively for the purpose of managing the assets of the schemes. The Pension Funds for Public Sector NPS Schemes are:

At present the following schemes under NPS managed by the respective Public and Private sector funds are operative.

(i) Scheme applicable to Central Government Employees and employees of Central Autonomous Bodies - called the CG scheme wherein the maximum permitted exposure to Asset class E (Equity) is 15%, to Asset class C (Corporate Bond) is 45%, and to Asset class G (Government Securities) is 50%. The individual subscribers do not have the choice of asset allocation or pension funds.

(ii) Scheme applicable to State Govt. employees and employees of State Autonomous bodies – called the SG scheme- This follows the same investment pattern as the CG scheme. The individual subscribers do not have the choice of asset allocation or pension funds.

(iii) Schemes applicable to Individuals and Corporates:-
The following schemes are applicable to individual and corporate subscribers:-
   (a) NPS- Lite Scheme - This follows the same asset allocation pattern as the CG scheme. However, the aggregators can choose any one pension fund from the eight pension funds.
   (b) APY Scheme: This follows the same asset allocation pattern as the CG scheme.
   (c) Corporate CG Scheme- This follows the same asset allocation as the CG scheme.
   (d) E-C-G-A pattern for Tier I & Tier II – The assets are invested in Equity, Corporate Bonds, Government Securities, and SEBI Regulated 'Alternative Investment Funds' AIF (Category I and Category II only). SEBI (Alternative Investment Fund) regulations 2012 contains guidelines with respect to the above.

The scheme chosen for the purpose of the study is Equity (Tier I) of Aditya Birla Sunlife Pension Management Ltd. The reason being the growth in Asset Under Management of the said organisation is the highest among all the Pension Fund Management Companies.

Fund manager	FY21	FY22
SBI Pension Funds Private Limited	39%	27%
LIC Pension Fund Limited	35%	28%
UTI Retirement Solution Limited	36%	21%
HDFC Pension Management Company Limited	98%	73%
ICICI Prudential Pension Funds Management Company Limited	74%	54%
Kotak Mahindra Pension Fund Limited	59%	42%
Aditya Birla Sun Life Pension Management Limited	98%	87%

Figure 3: Fund manager-wise growth in AUM

Source: Annual report and Audited Accounts of NPS for the financial year 2021-22

The data used in the study are the published weekly NAV of the selected schemes which are basically secondary in nature. Appropriate adjustments whenever required, have been made for enhancing the comparability of data over time. The data were obtained from the Data Bank of PFRDA. The time period of data is from the date of inception till 31st March 2022 of the chosen scheme.
The secondary data related to the daily NAV, on the other hand, has been collected from the website of PFRDA.
Tools for analysis of data:

(i) The performance of the fund has been evaluated by the following ratios.

(a) Treynor Ratio

Proposed by Jack L. Treynor in 1965, Treynor Ratio was first such measure that evaluates the risk-adjusted return performance of a portfolio. Treynor Ratio or the Reward to Volatility evaluates the excess return generated by a portfolio from the risk-free rate per unit of systematic risk taken. Treynor can be calculated as follows:

Treynor Ratio = $\frac{R_p - R_f}{\beta_p}$

R_p = Return of the Portfolio

R_f = Risk-free rate of Return

β_p = Beta of Portfolio Return

The higher the value of this ratio, the better the performance. However, careful interpretation is required if the calculated value of the ratio is negative, as such a negative value may not be necessarily due to poor performance of funds or due to negative beta. Again, Treynor Ratio will not give meaningful results if considered as a performance evaluation measure for Sector Funds or funds that are not completely diversified. This ratio operates with the underlying assumption that the funds, whose performance is being evaluated, are well-diversified. Lastly, the ratio is not suitable for asymmetric data due to its mean-variance assumption.

(b) Sharpe Ratio

Sharpe Ratio or Reward to Variability, as propounded by William F. Sharpe in 1965 was the first composite metric that took into consideration total risk as the risk measure. It may be calculated as:

Sharpe Ratio = $\frac{R_p - R_f}{\sigma_p}$

R_p = Return of the Portfolio

R_f = Risk-free rate of Return

σ_p = Standard Deviation of the Portfolio Return

The higher the value of the Sharpe Ratio, the better the performance of the portfolio. It is one of the simplest and most straightforward risk-adjusted performance measures that take into account both systematic and unsystematic risk but is primarily suitable for normally distributed and positive portfolio return data. Also, this ratio does not differentiate between the downside and upside deviation and many extensions and modifications of the Sharpe Ratio evolved over the past years.

(c) Jensen's Alpha- It gives the excess return obtained when deviating from the benchmark. It is considered to be an absolute measure of performance and is given by the annualized return of the fund over the yield of an investment without risk, minus the return of the benchmark multiplied by the fund's beta (risk indicator) during the same period. The magnitude of Jensen's Alpha depends on two key variables viz. the return of the benchmark and the beta. This indicator represents the part of the mean return of the fund that cannot be explained by the systematic risk exposure to market variations.

It may be calculated as follows:

$\hat{\alpha} = \left[E_t \left(R_{p,t} \right) - R_f \right] - \hat{\beta}_p \left[E_t \left(R_{m,t} \right) - R_f \right]$

Where

$E_t \left(R_{p,t} \right)$ is the annualized mean return of the fund considered over the period;

$E_t \left(R_{m,t} \right)$ is the annualized mean return of the market portfolio considered over the period;

R_f is a proxy for the riskless rate;

$\hat{\beta}_p$ is the estimated sensitivity of the fund return to the benchmark variations.

(ii) In the last few decades Time series modeling is a dynamic research area that has attracted the attentions of researchers' communities all over the world. Time series modeling aims at carefully collecting and rigorously studying the past observations of a time series to develop an appropriate model which describes the inherent structure of the series. This model is then used to generate future values for the series, i.e. to make forecasts. The selection of a proper model is extremely important as it reflects the underlying structure of the series and this fitted model in turn is used for future forecasting. A time series model is said to be linear or non-linear depending on whether the current value of the series is a linear or non-linear function of past observations. Software STATA (Version 13) has been used to get the final output of ARIMA.

(iii) An appropriate Cointegration test was performed using the software STATA (Version 13) to track the long-term relationships between the schemes and the benchmark indices.

VI. Data analysis and presentation

The performance analysis of the scheme was done using the ratios mentioned above and the following conclusions were arrived at:

(i) Treynor Ratio measures the excess return generated by a portfolio from the risk-free rate per unit of systematic risk taken. A ratio of 23.61% implies that the investment or portfolio has generated a risk-adjusted return or a substantial risk-adjusted return relative to its systematic risk. It indicates that for every unit of systematic risk, the investment or portfolio has generated a return that exceeds the risk-free rate by 23.61%. It is worthwhile and not out of context to mention here that the CAGR of Nifty 50 around the same time was 15.43%.

(ii) Sharpe Ratio is one of the simplest and most straightforward risk-adjusted performance measures that take into account both systematic and unsystematic risks of the fund. A Sharpe ratio of 5% implies that the investment or portfolio has generated a positive risk-adjusted return relative to the risk-free rate of return. It suggests that for each unit of risk (as measured by the standard deviation of returns), the investment has produced a return that exceeds the risk-free rate by 5%. In other words, a higher Sharpe ratio indicates better risk-adjusted performance, as the investment has generated excess returns relative to the amount of risk taken. It also suggests that the investment has provided a higher return per unit of risk compared to the risk-free rate.

(iv) Jensen's Alpha gives the excess return obtained when deviating from the benchmark.

Jensen's alpha of -1.72% implies that the investment or portfolio has underperformed relative to the expected return based on its beta and the market return. The negative alpha suggests that the investment has not generated excess returns beyond what could be attributed to its systematic risk. In other words, a negative Jensen's alpha indicates that the investment's actual return falls short of the expected return based on its systematic risk exposure. It suggests that the investment has not provided adequate compensation for the risk taken, relative to the market.

To study the trend/growth pattern of select Pension Funds Schemes since inception the researcher performed the following tests using Stata 16.

(i) Simple regression to establish whether there is a linear relationship between the dependent and independent variable

(ii) A Postestimation test (Durbin-Watson test) to test the null hypothesis that the residuals from an ordinary least-squares regression are not autocorrelated against the alternative and that the residuals follow an AR1 process. A Postestimation test (Durbin-Watson test) is performed to establish the significance of the linear regression. The Durbin-Watson test statistic tests the null hypothesis that the residuals from an ordinary least-squares regression are not autocorrelated against the alternative and that the residuals follow an AR1 process. The Durbin-Watson statistic ranges in value from 0 to 4. A value near 2 indicates non-autocorrelation; a value toward 0 indicates positive autocorrelation; a value toward 4 indicates negative autocorrelation.

(iii) Time series plot of dependent vs independent variable

(iv) Augmented Dickey Fuller test to check the stationarity of the data.

(v) Augmented Dickey Fuller test to check the validity of the model

Table 1: Aditya Birla Sunlife Pension Fund (E-I)

```
. regress loge1 date1
------------------------------------------------------------------------------
      Source |       SS       df       MS              Number of obs =    2089
-------------+----------------------------------------------F(  1,  2087) =  1329.67
       Model |  4.71816413     1  4.71816413            Prob > F      =  0.0000
    Residual |  7.40543179  2087  .003548362           R-squared     =  0.3892
-------------+----------------------------------------------Adj R-squared =  0.3889
       Total |  12.1235959  2088  .00580632            Root MSE      =  .05957
------------------------------------------------------------------------------
  log10navei |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       date1 |   .0000788   2.16e-06    36.46   0.000     .0000746    .000083
       _cons |   -.5991963   .0468969   -12.78   0.000    -.6911659   -.5072267
------------------------------------------------------------------------------
------------------------------------------------------------------------------
Durbin-Watson d-statistic(  2,  2089) =  .010006
------------------------------------------------------------------------------
```

The F statistic is significant and the Adj R-squared value is high enough to reject the null hypothesis. Further, the t statistic is significant to accept the alternative hypothesis that a correlation exists between the dependent and independent variable.
The Durbin-Watson d-statistic is low enough to conclude that a positive correlation exists between the dependent and independent variables.

The time series plot of the dependent and independent variable shows that there is an upward trend/growth of the fund Aditya Birla Sunlife Pension Fund, E-I.

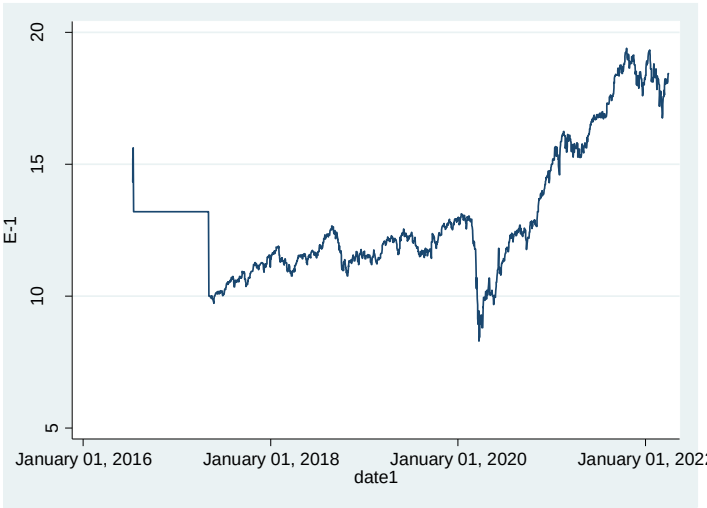

Figure 4: Time series plot of the NAV- Aditya Birla Sunlife Pension Fund (E-I) vs Time

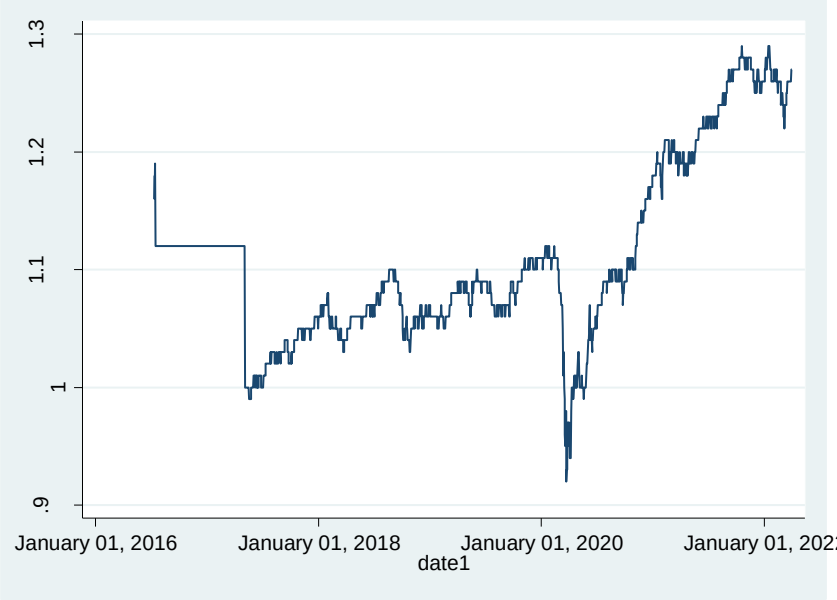

Figure 5: Time series plot of the Log-NAV- Aditya Birla Sunlife Pension Fund (E-I) vs Time vs Time

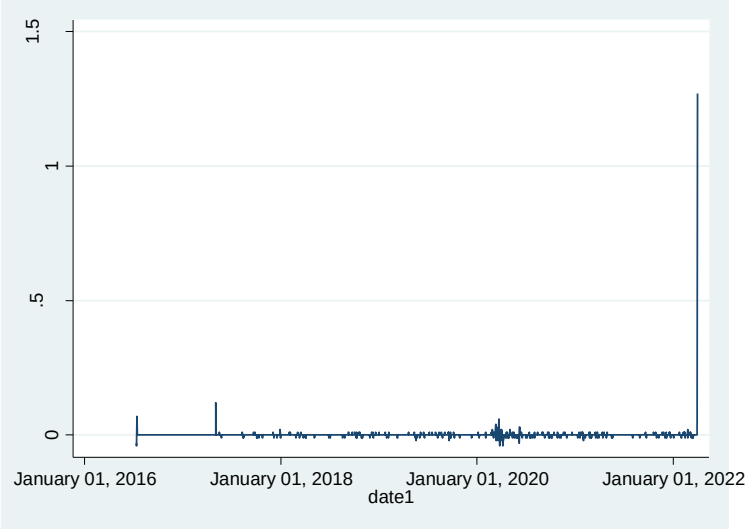

Figure 6: Time series plot of the first difference of Log-NAV- Aditya Birla Sunlife Pension Fund (E-I) vs Time

The graph shows stationarity at the first difference of the logarithmic value of NAV which further proves that there is growth/trend of the fund.

The ADF test tests the null hypothesis that a time series yt is I(1) against the alternative that it is I(0), assuming that the dynamics in the data have an ARMA structure. The Null and Alternative hypothesis are as follows:

H0: Variable is not stationary or variable has unit a root

H1: Variable is stationary or variable does not have a unit root

Table 2: dfuller log10navei, trend regress lags(1)

Augmented Dickey-Fuller test for unit root Number of obs = 2087

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
		---------- Interpolated Dickey-Fuller ---------		
Z(t)	-2.451	-3.960	-3.410	-3.120

MacKinnon approximate p-value for Z(t) = 0.3530

D.log10navei	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
log10navei						
L1.	-.0053232	.0021721	-2.45	0.014	-.0095829	-.0010635
LD.	-.1164885	.021683	-5.37	0.000	-.1590111	-.073966
_trend	7.46e-07	2.74e-07	2.72	0.007	2.08e-07	1.28e-06
_cons	.0051877	.0022473	2.31	0.021	.0007805	.0095949

The above table reveals that the absolute value of the Test Statistic is less than 1% Critical value. Thus it is safe to Accept H0 which means that the variable is not stationary or the variable has a unit root. Thus the fund has a trend/growth. Moreover, the negative value of the coefficient proves the validity of the model.

Table 3: dfuller log10navei, drift regress lags(1)

Augmented Dickey-Fuller test for unit root — Number of obs = 2087

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
	---------- Z(t) has t-distribution ----------			
Z(t)	-0.963	-2.328	-1.646	-1.282

p-value for Z(t) = 0.1678

D.log10navei	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
log10navei						
L1.	-.0016369	.0016999	-0.96	0.336	-.0049705	.0016967
LD.	-.1164323	.0217162	-5.36	0.000	-.1590201	-.0738446
_cons	.0018748	.0018914	0.99	0.322	-.0018344	.0055841

Further, when a trend term is added and the ADF test is repeated, the following result is obtained. The absolute value of the Test Statistic being lower than 5% Critical value gives the strength to reject the alternative hypothesis and conclude that the fund has a trend/growth. And the negative value of the co-efficient indicates the validity of the model.

Table 4: dfuller d1lognavei, trend regress lags(1)

Augmented Dickey-Fuller test for unit root — Number of obs = 2087

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
	---------- Interpolated Dickey-Fuller ---------			
Z(t)	-6.360	-3.960	-3.410	-3.120

MacKinnon approximate p-value for Z(t) = 0.0000

D.d1lognavei	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
d1lognavei						
L1.	-1.073453	.1687883	-6.36	0.000	-1.404464	-.7424416
LD.	.015377	.1164911	0.13	0.895	-.213074	.243828
_trend	1.44e-06	1.03e-06	1.40	0.161	-5.75e-07	3.46e-06
_cons	-.000879	.0012403	-0.71	0.479	-.0033114	.0015534

The above table reveals that the absolute value of the Test Statistic is less than 5% Critical value. Thus it is safe to Accept H0 which means that the variable is not stationary or the variable has a unit root. Thus the fund has a trend/growth. Moreover, the negative value of the coefficient proves the validity of the model.

Table 5: dfuller d1lognavei, drift regress lags(1)

Augmented Dickey-Fuller test for unit root — Number of obs = 2087

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
	---------- Z(t) has t-distribution ----------			
Z(t)	-6.412	-2.328	-1.646	-1.282

p-value for Z(t) = 0.0000

D.d1lognavei	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
d1lognavei						
L1.	-1.081791	.1687225	-6.41	0.000	-1.412673	-.750909
LD.	.019146	.116487	0.16	0.869	-.209297	.2475889
_cons	.0006274	.0006194	1.01	0.311	-.0005872	.0018421

Further, when a trend term is added and the ADF test is repeated, the following result is obtained. The absolute value of the Test Statistic being higher than the 5% Critical value gives the strength to reject the original hypothesis and accept the alternative hypothesis. And the negative value of the co-efficient indicates the validity of the model.

The third objective of the researcher was to test the long-run relationship between the NAV of Aditya Birla Sunlife Pension Fund (E-I) and the Nifty50 using Stat 13. This is called Co-integration analysis which is very significant to avoid the risk of spurious regression. Co-integration analysis is important because if a Co-integration relationship is identified, the model should include residuals from the vectors (lagged one period) in the dynamic VECM system. In this stage, Johansen's Co-integration test is used to identify the co-integrating relationship among the variables. The Johansen method applies the maximum likelihood procedure to determine the presence of co-integrated vectors in non-stationary time series.

Null hypothesis: No cointegration among the time series data.
Alternative hypothesis: There is cointegration among the variables.

Table 6: Johansen tests for Cointegration

Trend: constant — Number of obs = 2087
Sample: July 14, 2016 - March 31, 2022 — Lags = 2

maximum rank	parms	LL	eigenvalue	trace statistic	5% critical value
0	6	16440.955		11.0735*	15.41
1	9	16446.396	0.00520	0.1906	3.76
2	10	16446.492	0.00009		

maximum rank	parms	LL	eigenvalue	max statistic	5% critical value
0	6	16440.955		10.8829	14.07
1	9	16446.396	0.00520	0.1906	3.76
2	10	16446.492	0.00009		

As the trace statistic is less than 5% critical value we can safely reject the null hypothesis and conclude that there is at least one cointegrating equation and long-term association exists between Aditya Birla Sunlife Pension Fund (E-I) and Nifty fifty.

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