Institute of Actuaries of India

Evidence on funding, fund mandates and investment risks of Indian DB schemes

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13th Current Issues in Retirement Benefits

August 11, 2017

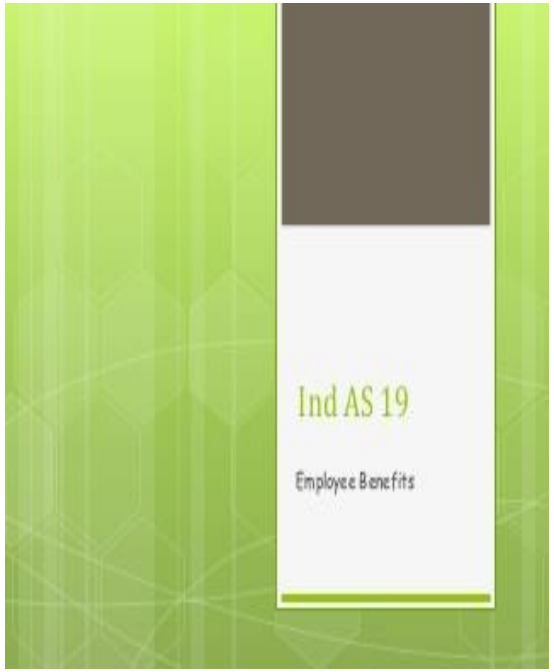
Indian Actuarial Profession

Serving the Cause of Public Interest

Presentation Flow

1. Motivation
2. Approach
3. Ind AS 19 and investment philosophy
4. Data structure
5. Hypothesis testing
6. Trends
7. Summary and conclusion
8. Further research

Motivation



1. Ind AS 19 transition
2. Greater forbearance to the volatility of asset returns
3. Investment risks commensurate to liabilities?
4. Effect of investment risks on
   a. Funding level?
   b. Fund manager?
5. Can lead a further ground for longitudinal research on funding, fund managers and risks taken by Indian DB funds

Approach

Data set

- Gratuity funds
- NSE 50 companies (March 2014, 2015, 2016)
- Consolidated for Indian subsidiaries, else standalone

Funding level, Fund Manager

- Funding level (% assets to liabilities)
- Funding level classified by value of assets
- Fund manager: self-managed, insurer-managed, part-self and part-insurer.

In a nutshell

Asset-side risk acceptance

- Experience gain/ loss on assets
- As % of expected return on assets
- Stands out only when interest rates oscillate significantly between two FYs.

Analyses

- Does funding level affect fund manager choice?
- Does funding level affect asset side risks?
- Does fund manager choice affect asset side risks?

Questions

To conduct the following evidence-based analyses on the current level of investment risks assumed by Indian post-employment defined benefit plans:

1. Are commensurate investment risks accepted?
2. Are assets managed in-house or outsourced?
3. Is the attitude to investment risk-taking affected by the plan's funding levels?
4. How does regulation affect the investment risks taken?
5. What are the options for greater risk-taking?

Effect of change, Ind AS 19

*Approach toward investment risk and ALM **could dramatically change** in Indian Defined Benefit Plans.*

Breaking down of income between

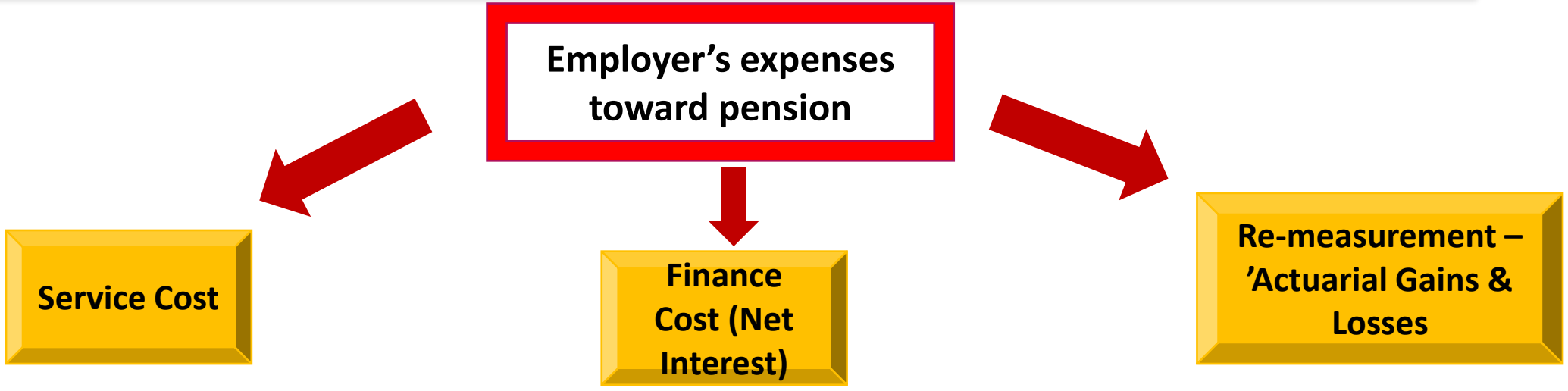
a) **Statement of Comprehensive Income (i.e., P&L Account), and**

b) **Statement of OCI (i.e., in Shareholders' Equity)**

Proponents of the breaking down of income argue that this treatment improves the predictive power of financial statements.

Will the reduced risk to P&L spur higher investment risk?

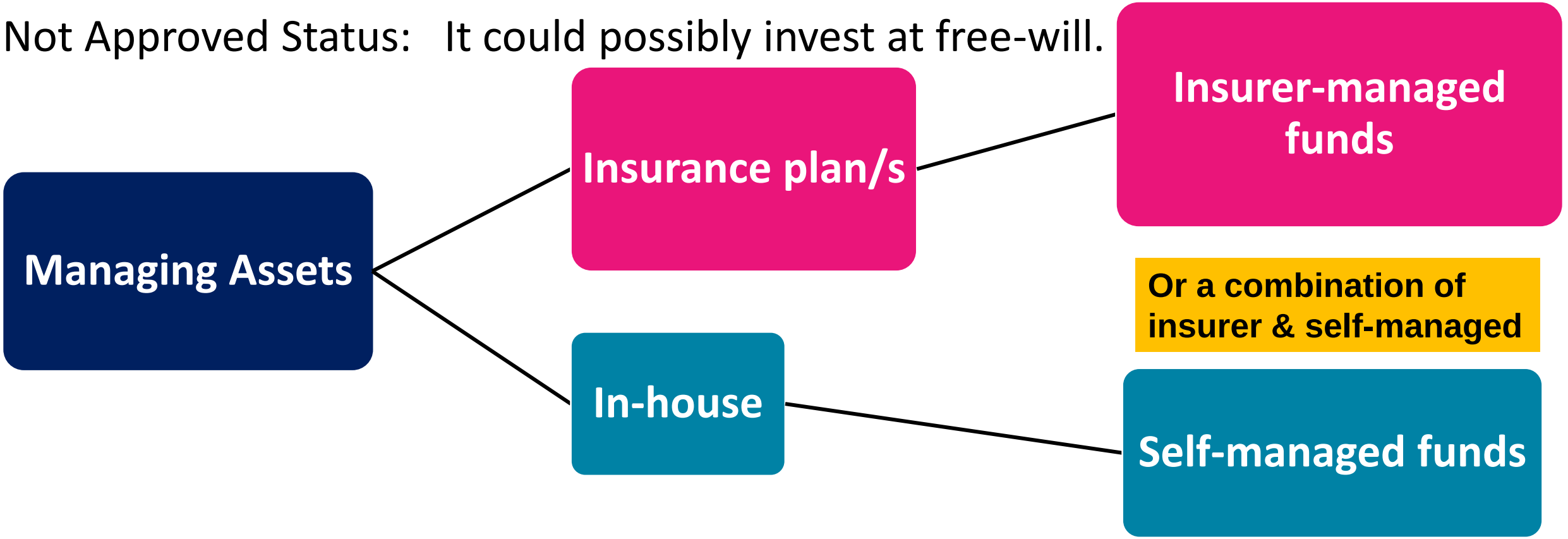
What is the current level of risk-taking?



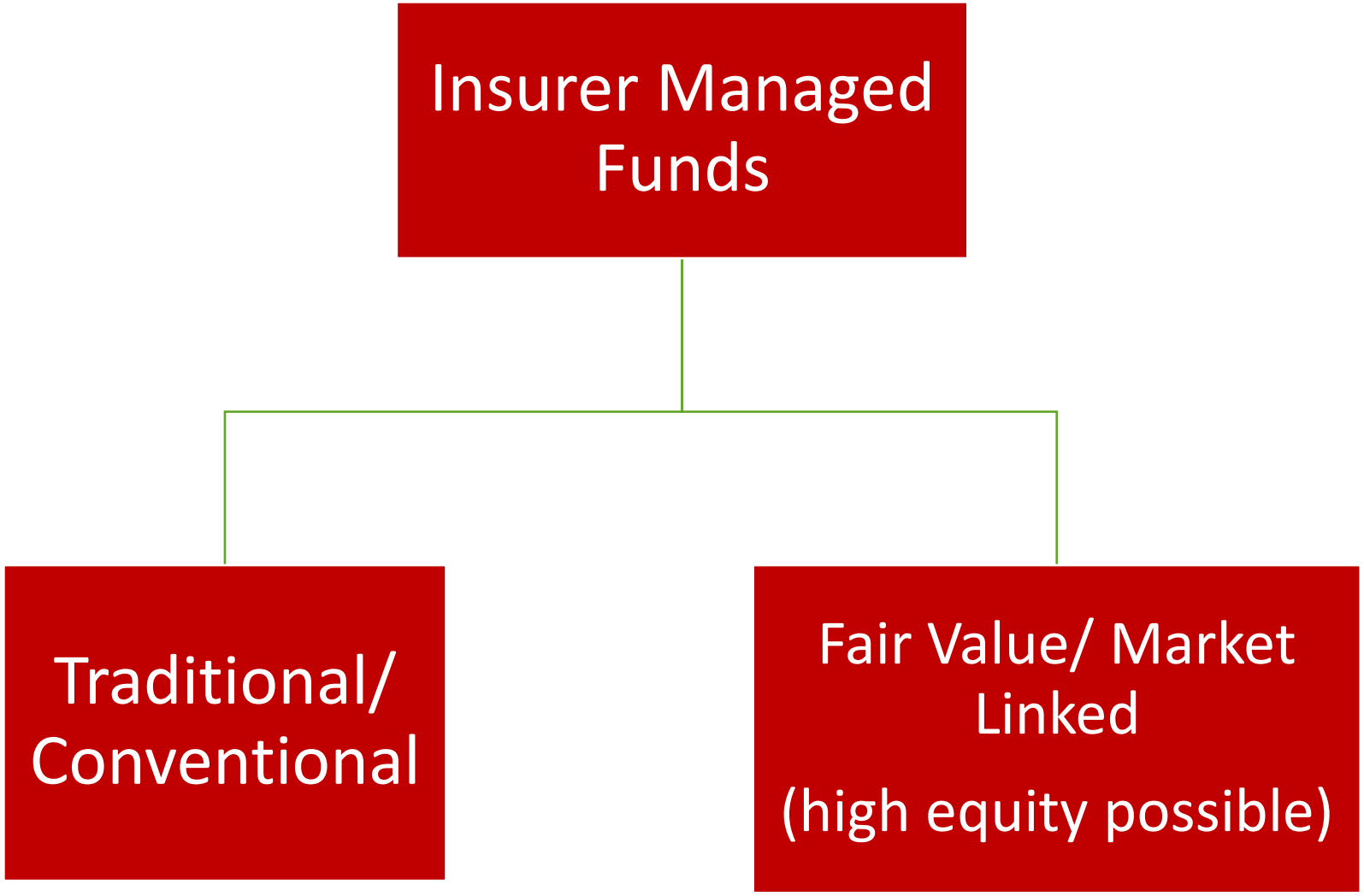
Investment Regulation

Approved Status: Fully exempts the fund's income from tax (E-E-E). Obligates the fund to invest as per the investment regulations.

Not Approved Status: It could possibly invest at free-will.



Current regulation around Insurer-Managed funds



Important assumption & coordinates

Consistency in the actuarial valuation methodologies, classification of assets, calculation of expected return on plan assets (EROA), and evaluation of asset-side actuarial gains and losses.

Who Manages?

- Is the plan A) insurer-managed, or B) self-managed or C) part self-/part insurer-managed?
- Does the fund size affect trustees' approach toward the fund manager?

How Much Risk Is Assumed?

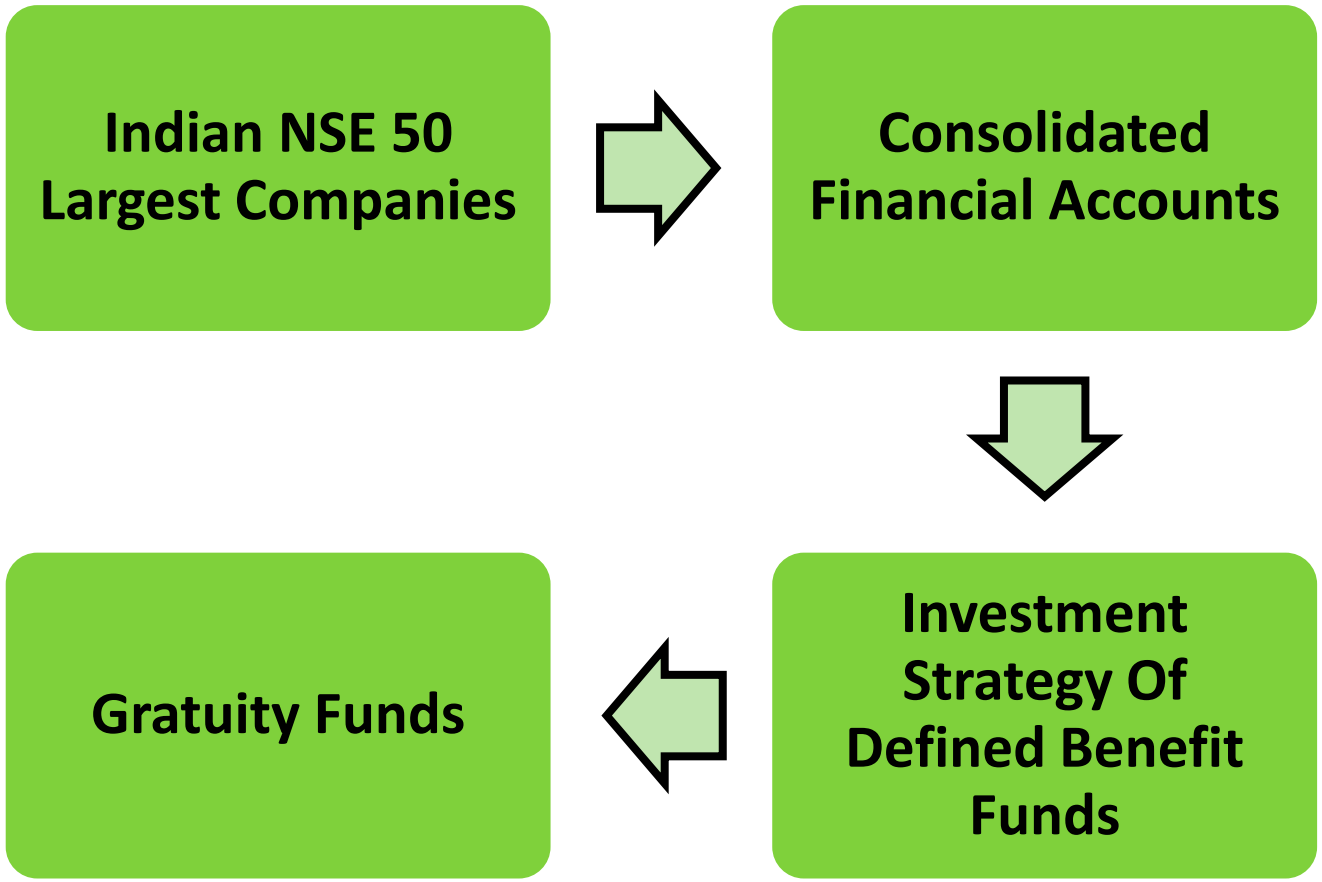
- Based on the volatility of actual asset returns as compared with the expected returns.

What Is The Extent Of Plan Funding?

- Ratio of plan Assets to Plan Liabilities.

When the proportion of funds managed by the insurer or by the company exceeded 15% of the total funds, the fund was classified as part self-/part insurer-managed.

Data Sources And Period



Although both life pension and gratuity constitute defined benefits that could be offered to employees, most Indian private sector companies do not offer life pension benefits.

47 of the NSE 50 are funded with average funding ratio of 92%.

Longitudinal data on funding level and fund mandates NSE50 companies

Funding Level	FY 2013-14	FY 2014-15	FY 2015-16
Assets (Rs million)	308,925	458,157	450,919
Liabilities (Rs million)	343,661	513,126	491,172
Aggregate funding level	**89.89%**	**89.29%**	**91.80%**

Longitudinal data on funding level and fund mandates

Fund mandates	FY 2013-14	FY 2014-15	FY 2015-16
Insurer managed	55,933	178,865	192,318
Part self/part insurer	191,961	214,113	222,285
Self managed	61,032	65,178	36,317
Total	**308,925**	**458,157**	**450,919**

Fund mandates	FY 2013-14	FY 2014-15	FY 2015-16
Insurer managed	18.1%	39.0%	42.7%
Part self/part insurer	62.1%	46.7%	49.3%
Self managed	19.8%	14.2%	8.1%
Total	**100%**	**100%**	**100%**

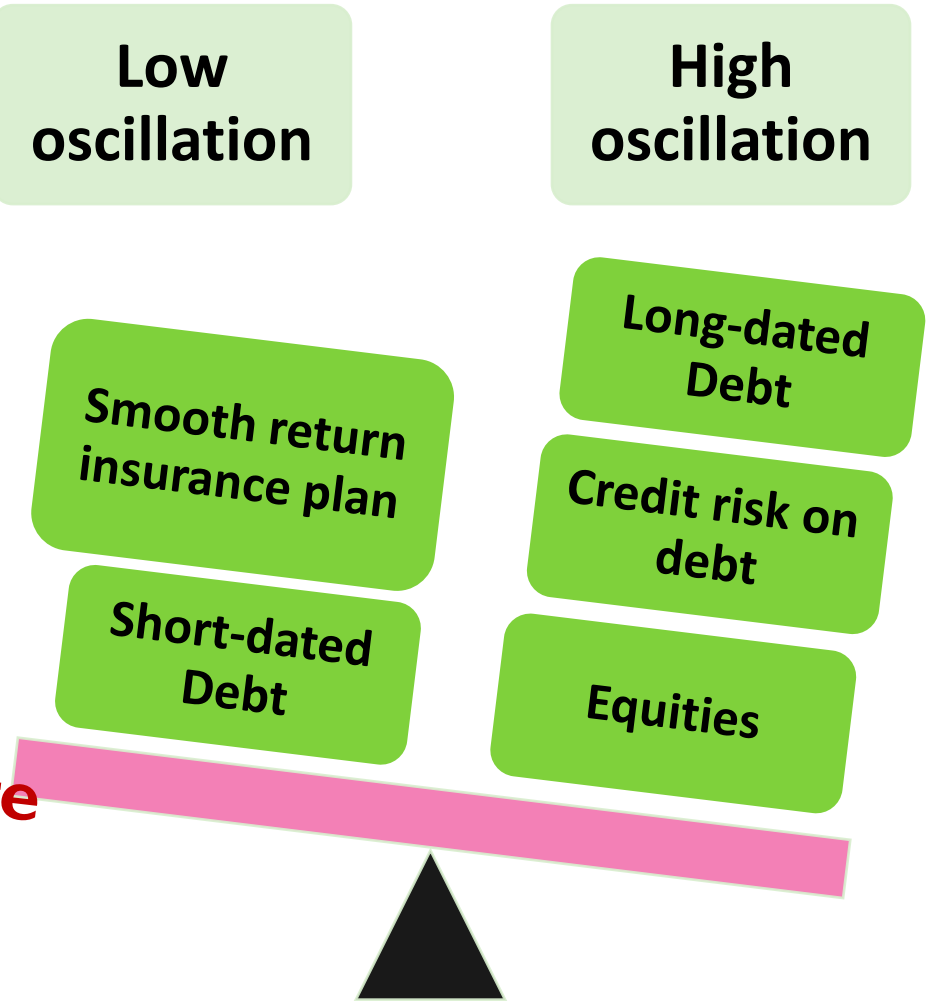
Summarized NSE 50 asset information FY 2015-16

Funding Level	Insurer Managed	Part insurer/ Part self	Self-Managed	Unfunded	Total (all Rs Million)
Less than 10%	66	15	-	-	81
10% - 25%	426	-	-	-	426
25% - 50%	-	-	-	-	-
50% - 75%	15,335	3,917	5,729	-	24,981
75% - 90%	10,242	20,701	-	-	30,943
90% - 100%	155,454	151,419	23,205	-	330,078
100%+	10,795	46,233	7,382	-	64,410
Total Assets	**192,318**	**222,285**	**36,317**	**-**	**450,919**

Summarized NSE 50 asset information FY 2015-16

Asset Size (Rs million)	Insurer Managed	Part insurer/ Part self	Self-Managed	Unfunded	Total
> 20,000	1	3	0	0	4
5,000 - 20,000	6	6	3	0	15
2,500 - 5,000	4	2	2	0	8
500 - 2,500	10	3	2	0	15
< 500	3	1	1	3	8
Total	24	15	8	3	50

Asset side risks



Fluctuation due to change in interest rates

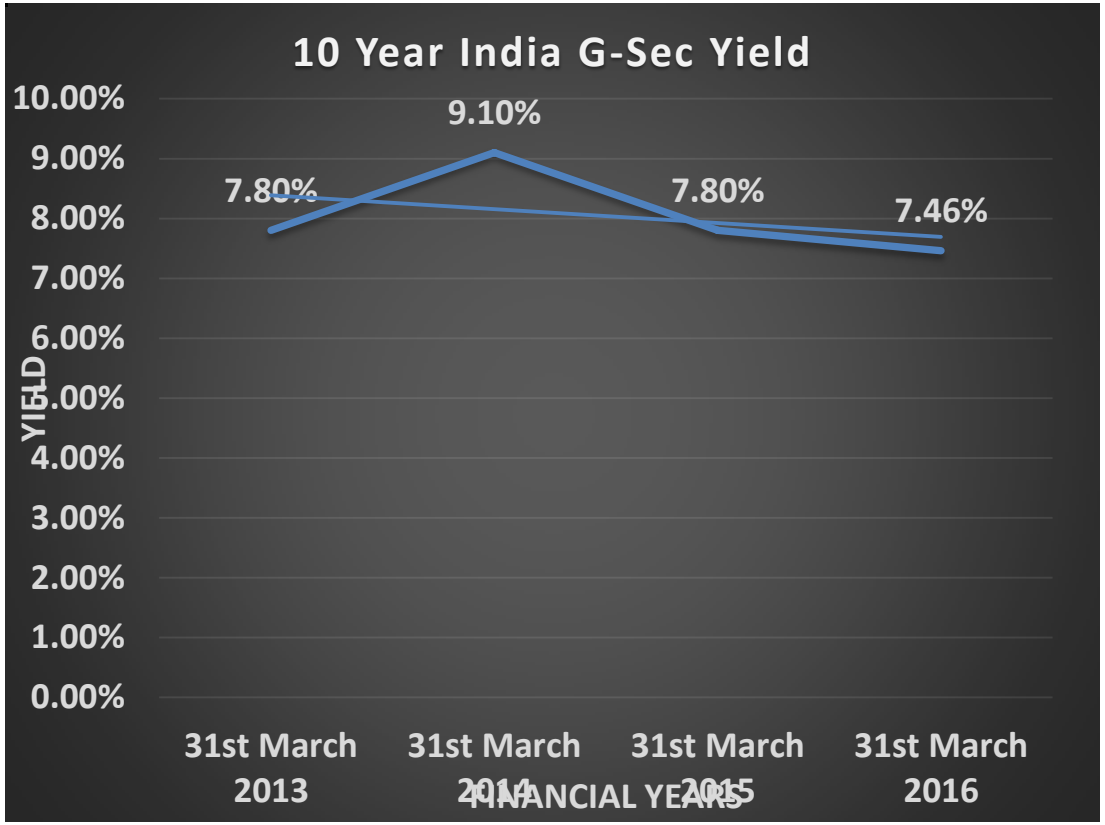
Measuring investment risks from financial statement disclosures

Company	FY	ACTGL (Rs million)	Asset Allocation
Tata Motors	2013-14	-233.7	Debt sec-71%, Insurer managed-28%, Bank -1%
	2014-15	259.7	Debt sec-73%, Insurer managed-21%, Bank -6%
	2015-16	198.1	Debt sec-79%, Insurer managed-19%, Bank-2%
Larsen & Toubro	2013-14	-101.7	Gsec-30%, State Gsec-11%, Corp bonds-29%, Equity-2%, Insurer Managed-1%, PSU bonds-20%, Others-7%
	2014-15	329.9	Gsec-31%, State Gsec-11%, Corp bonds-30%, Equity-2%, Insurer Managed-1%, PSU bonds-17%, Others-8%
	2015-16	123.6	Gsec-23%, State Gsec-18%, Corp bonds-34%, Equity-2%, PSU bonds-14%, Others-9%

Funds invested in MTM long-dated debt will report

a. **actuarial losses in FY 2013-14**, and

b. **actuarial gains in FY 2014-15**.



How much RISK is assumed??

High risk if the ratio lies beyond ±40% (i.e. for Δ100 bps, over 3.2% experience gain/ loss at base interest of 8%. Asset duration ≥ 3.2 yr commensurate risk)

Risk Ratio=

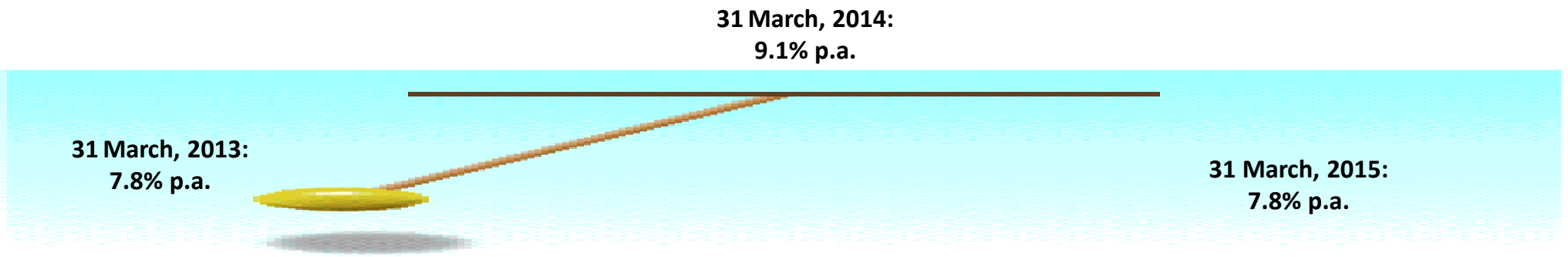
$$\frac{\textit{Actuarial Gain/Loss On Plan Assets OR Experience Adjustments On Plan Assets}}{\textit{Expected Return On Plan Assets}}$$

Actuarial Gains/Losses arise from either:

1. Change in assumptions between the previous year and the current year
2. Experience in the current year being different from the assumptions.

Experience gain (loss): Indicator Of Risk

Stock of investment risk assumed



	Exp gain (loss) to EROA > |40%|	Smooth asset returns
FY 2013-14	11 companies	36 companies
FY 2014-15	15 companies	32 companies

During the two valuation dates (31.3.2014 & 31.3.2015), the risk free interest rate oscillated by over 100 basis points.

Changes in asset returns are expected in self managed funds and Unit-linked insurance plans (long duration debt).

During the intra year interest rate fluctuation (over 100 bps)

	FY 2014-15			FY 2013-14		
Funding Level	Number of Companies	Average Funding Level (%)	Risk Ratio (%)	Number of Companies	Average Funding Level (%)	Risk Ratio (%)
< 10%	4	2	150	5	3	-29
10%-25%	2	20	26	2	25	20
25%-50%	3	45	6	1	42	23
50%-75%	4	59	35	9	61	-9
75%-90%	9	80	48	6	85	-6
90%-100%	17	95	19	15	95	2
100%+	11	108	-1	12	102	-2
Total	**50**	**89**	**18**	**50**	**90**	**-1**

High risk ratio increasingly points to market-linked insurance plans

FY 2013-14		
Company	Risk Ratio	Fund Manager
IndusInd Bank	-69%	Insurer Managed
Yes Bank	-62%	Insurer Managed
Hindustan Unilever	44%	Insurer Managed
Kotak Mahindra Bank	60%	Insurer Managed

FY 2014-15		
Company	Risk Ratio	Fund Manager
Grasim	41%	Insurer Managed
Dr. Reddy's	54%	Insurer Managed
HDFC Bank	125%	Insurer Managed
Kotak Mahindra Bank	272%	Insurer Managed

FY 2015-16		
Company	Risk Ratio	Fund Manager
Cipla	-70%	Insurer Managed
ICICI Bank	-67%	Part Self/Part Insurer
HDFC Bank	-63%	Insurer Managed
Yes Bank	-46%	Insurer Managed
Idea Cellular	47%	Insurer Managed

10% drop in Nifty between end of FY 2014-15 to FY 2015-16

Equity proportion of UL plans is **sometimes disclosed**

All figs in Rs million	Proportion in equity	ACTGL	Exp gain (loss)	EROA	Exp/EROA
ACC (insurer managed)	9%	18	18	148	**12%**
HDFC (insurer managed)	12%	-14	9	140	**6%**
HDFC Bank (insurer managed)	37%	-136	-136	217	**-63%**
ICICI Bank (self managed)	11%	-398	-398	597	**-67%**
Kotak Mahindra Bank (insurer managed)	20%	-77	-81	228	**-36%**

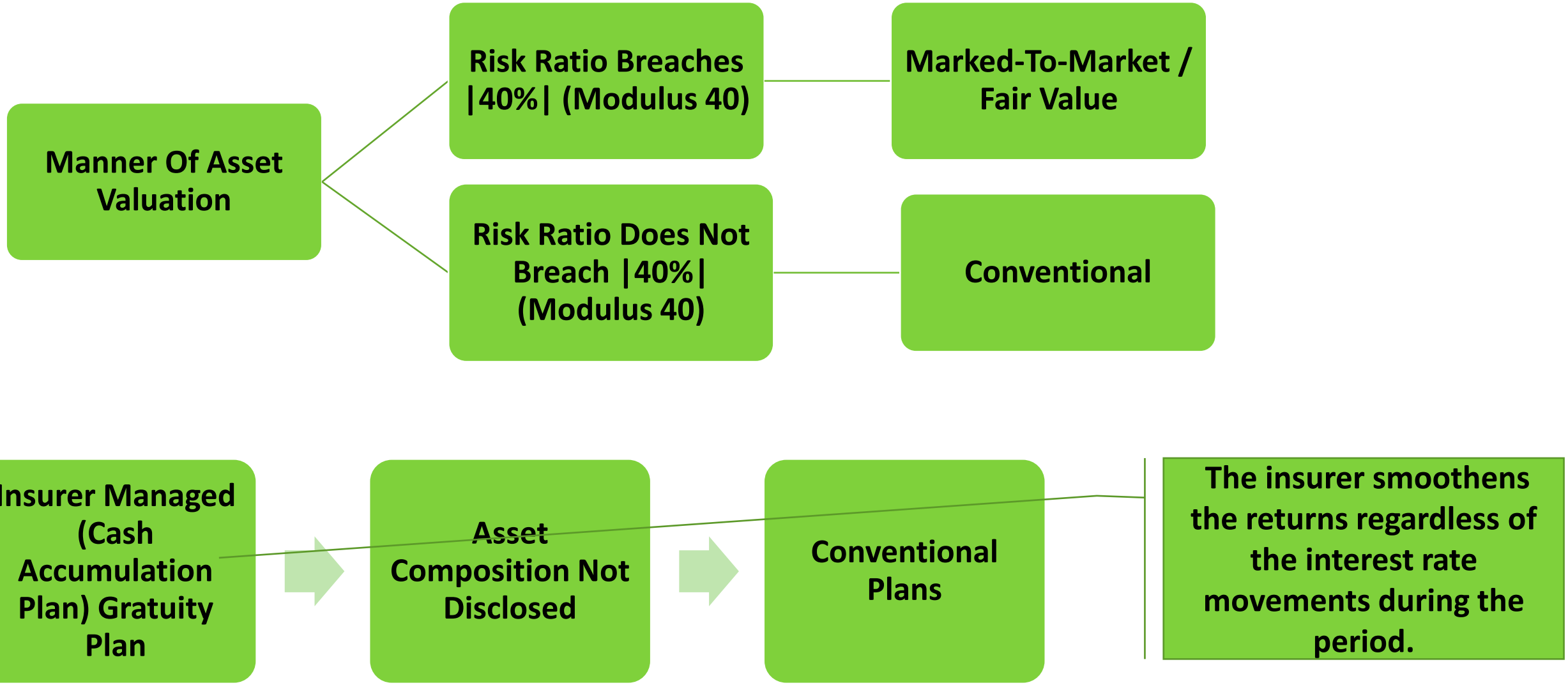
Source: Annual reports FY 2015-16

Professional guidance to disclose equity assets if UL plans are the pass through vehicle?

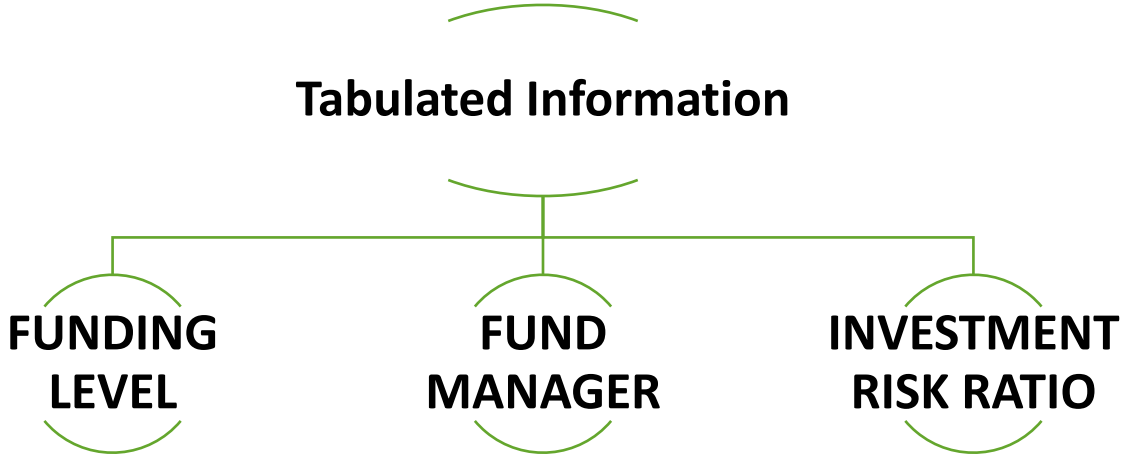
“Risk ratio” (Exp GL/ EROA) would not work in FY 2015-16!
G Sec yield steady between 31 Mar 2015 and 31 Mar 2016

Funding Level	Number of Companies	Liabilities (Rs Million)	Assets (Rs Milion)	Asset Experience gain/ (loss) (Rs Million)	EROA (Rs Million)	Asset Exp Gain/(Loss) : EROA
Less than 10%	5	8,866	81	-1	10	-10.00%
10% - 25%	1	1,968	426	9	20	46.87%
25% - 50%	0	-	-	-	-	0.00%
50% - 75%	9	36,410	24,981	-67	1,560	-4.26%
75% - 90%	9	35,802	30,943	-288	2,215	-13.02%
90% - 100%	18	346,595	330,078	1,245	26,313	4.73%
100%+	8	61,531	64,410	265	4,896	5.41%
Total	**50**	**491,172**	**450,919**	**1,163**	**35,014**	**3.32%**

Data For Statistical Analyses



Tests



Research questions:

1. Is the funding level affected by the choice of assets, that is, does having less volatile assets increase or decrease the funding level of the plan?
2. Is the investment risk-taking of the funds independent of the funding level?
3. Is the investment risk-taking of the funds independent of the fund manager?
4. Is the funding level independent of the fund manager?

Mann-Whitney U Test

1. **Examines if two samples belong to the same underlying population.**
2. **Non-parametric, can be applied to unknown probability distributions.**

Assumptions:

- The two investigated groups must be randomly drawn from the target population.
- Each measurement or observation must correspond to a different participant.
- Ordinal data measurement scale.

Limitations:

Same average but different variances would likely lead to erroneous results.

Mann-Whitney U Test: Funding Ratio v. Fund Manager

To test for a significant difference in the funding ratio based on fund classification

- H_0: There is no significant difference in the distribution of the funding ratio based on fund manager.
- H_1: There is a significant difference in the distribution of the funding ratio based on fund manager.

FY 2014-15	
no observations Group FV	19
no observations Group Trad	28
T	406
Obs U	216
E(U)	266
s.d.(U)	46.13
z value	-1.08
p-value	0.14

FY 2015-16	
no observations Group FV	19
no observations Group Trad	28
T	422
Obs U	232
E(U)	266
s.d.(U)	46.13
z value	-0.74
p-value	0.23

T= Sum Of Ranks Of Group "FV"

Obs U= T Minus "Sum Of Ranked Observations Of Group FV"

Since the p-value is sufficiently large for both years, the null hypothesis holds, i.e., there is no significant difference in the distribution of the funding ratio based on fund classification.

Funding ratios are not reflective of the riskiness of the underlying investment strategy

Independence of funding v. risk taken and discretionary funding

The possibility of Type I error (rejecting H_0 when true) is higher when the Mann Whitney U test is applied in a situation of distinct variances.

It is believed that the population variances for funding ratios would not be different for “traditional” and “fair value” asset plans.

In India, DB plan funding is discretionary i.e., no minimum funding requirement. Employers neither maintain funding ratios that are similar nor link the choice of assets to the funding ratio.

Funding ratios are not reflective of the riskiness of the underlying investment strategies. This is held by the Mann-Whitney U test result.

Chi-squared Test:
Testing for the independence of attributes

1. The chi-squared statistic is arrived at by summing the ratio of all squared differences between observed and expected frequencies to the expected frequencies.
2. This is then compared with the critical value to evaluate independence or otherwise with a defined level of confidence.

Limitations:

1. It does not reveal the strength of the inter-relationship among the attributes of interest.
2. Sensitive to sample size.
3. Also sensitive to small expected frequencies in one or more cells.

Is the investment risk-taking of the funds independent of the funding level?

Is the investment risk-taking of the funds independent of the fund manager?

Is the funding level independent of the fund manager?

Chi-Squared Test: Funding level v. Risk taking

H_0: The funding ratio is independent of investment risk-taking

H_1: The funding ratio is not independent of the riskiness of the investment strategy

The hypothesis is tested by using the classification of data by funding ratio and risk ratio.

	Funding Ratio			
Risk Ratio (Act. Gain/loss: EROA)	Less than or equal to 50%	50% to 90%	Greater than 90%	Total
Exceeds |40%|	0	2	4	6
|40%| to 0%	3	14	24	41
Chi-Square Statistic				5.42
Critical Value at 5% level of significance (2 d.o.f.)				5.99

Since the calculated chi-squared statistic does not exceed the critical value, there is no reason to reject the null hypothesis

The funding ratio is independent of investment risk-taking.

Chi-Squared Test: Fund Manager v. Risk taking

H_0: Investment risk-taking is independent of the fund manager

H_1: Investment risk-taking is not independent of the fund manager

Data is tabulated by fund manager and risk ratio.

	Fund Manager			
Risk Ratio (ACTGL: EROA)	**Insurer Managed**	**Part self/part Insurer**	**Self Managed**	**Total**
Exceeds |40%|	3	2	1	**6**
|40%| to 0%	22	13	6	**41**
Chi-Square Statistic			**1.26**	
Critical Value at 5% level of significance (2 d.o.f.)			**5.99**	

As the observed chi-squared statistic does not exceed the critical value, there is no reason to reject the null hypothesis

The risk taken by a fund is not determined by fund manager choice.

Chi-Squared Test: Fund Manager v. Funding Level

H_0: The funding ratio is independent of the fund manager

H_1: The funding ratio is not independent of the fund manager

The hypothesis is tested by classifying data by fund manager and funding level

	Fund Manager			
Funding Ratio	Insurer Managed	Part self/ part Insurer	Self Managed	Total
≤50%	2	1	0	3
50% to 90%	9	5	2	16
Greater than 90%	15	9	4	28
Chi-Square Statistic				2.19
Critical Value at 5% level of significance (4 d.o.f.)				9.48

As the observed chi-squared statistic does not exceed the critical value, there is no reason to reject the null hypothesis.

The funding ratio is independent of the choice of fund manager

Regulation and asset profile

Regulation often drives the asset risk profile

While general risk management has become increasingly sophisticated, it is often driven more by regulatory and accounting issues than by the pension fund's specific risk profile.

[Source: Franzen, D. (2010). Managing investment risk in defined benefit pension funds. OECD Working Papers on Insurance and Private Pensions, No. 38, OECD Publishing.doi: 10.1787/5kmjnr3sr2f3-en]

An excerpt from
‘The case for the cult of the equity’

Reasons for the ability of pension funds to hold a much higher percentage of equities in their portfolios than life assurance funds:

1. Inflation Matching
2. Duration Matching
3. Lower Risk
4. Volatility Of Reported Profits
5. Market Depth
6. Liquidity

Source: Goobey, G.R. (1955). **Pension fund investments [LMA/4481/A/01/001]. Pension archives. Retrieved from** http://www.pensionsarchive.org.uk/58/

Summary and Conclusion

I. Greater movement to insurer-managed assets in the past two yrs,
II. 70% of NSE50 companies invest in low asset risks,
III. Independence observed between:
    a) *Funding level and fund manager choice*
    b) *Funding level and asset risks*
    c) *Fund manager choice and asset risks*
IV. Higher risk taking (e.g. equity proportion above 15%) only possible with insurer plans within the present regulatory framework,
V. NSE50 funding levels consistently in the 90% range,
VI. Disclosure of equity proportion in assets is not consistent,
VII. Education needed on investing in real asset classes to match the real nature of long-term liabilities (ACTGL in OCI helps).

Scope for further research

i. Longitudinal metrics on funding and fund managers could be developed.
ii. Risk metrics of DB funds could be developed.
iii. Both the number of companies and the coverage period in terms of the number of financial years can be increased to support the conclusions.
iv. Limited prior work on Indian organizational DB funds.

Paper citation

Ankolekar, M., Shenoy, R., Nadkarni, N., & Shah, R. (2016). Indian Defined Benefit Pension Plans: Evidence on Investment Risks, Fund Mandates and Funding Levels. Management and Labour Studies, 41(4), 355-383.