Analysis of Attrition Rate and Impact on Actuarial Valuation

Assumptions are an integral part of performing actuarial valuations. Setting up actuarial assumptions involves reasonableness and acceptability is of prime importance. The Actuary's responsibility does not end with assisting company management and auditors in setting up of assumptions but also revolves around performing regular review of the appropriateness of the said assumptions by conducting a detailed analysis of Actuarial Gains and Losses.

As is true of some of the other assumptions, such as death, disability, and salary increases, the level of attrition experienced in the past is not known unless a study is made. Attrition experienced in the past can be affected for the future by many influences, so the study results should be altered as the result of other knowledge about factors expected to influence the employee group.

This study is based on a large body of company statistics and specific investigations have been deployed to derive such standard attrition rates.

Types of Significant Assumptions

While performing actuarial valuations of employee benefits, various financial and demographic assumptions are used. Some of the significant assumptions that impact the benefit costs are:

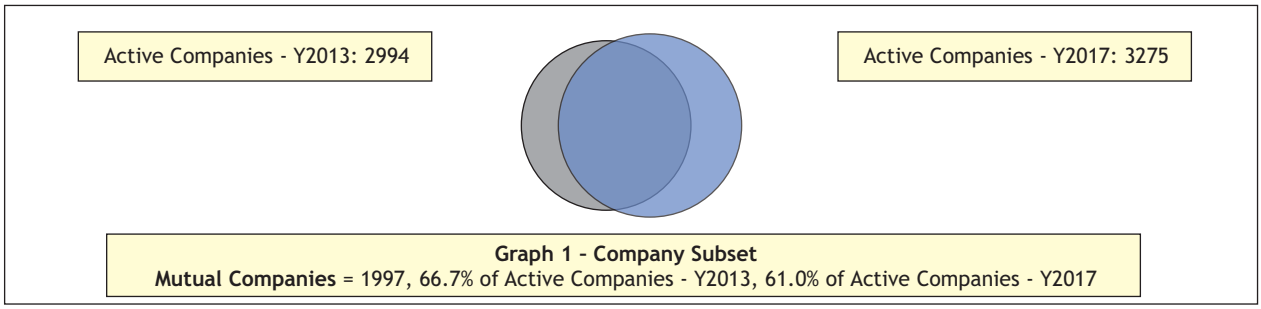
- **Salary escalation rate:** Salary escalation rate is the rate at which the salary increases. As most post-employment benefits are paid based on (Basic + DA) salary, the escalation rate should be considered on (Basic + DA) salary.
- **Mortality:** Mortality rate is the death rate during a particular period of time. It is dependent on the age of an employee. At present Indian Assured Lives Mortality (2006-08) Ultimate tables are used for the purpose of actuarial valuations in India.
- **Discount rate:** Discount rate is the rate used to determine the present value of future payouts. The discount rate should be determined with reference to market yields on government bonds or high quality corporate bonds as on the balance sheet date for relevant term and currency, as required as per the accounting standard on employee benefits as applicable.
- **Attrition rate:** Attrition rate represents the employee withdrawal other than on account of retirement and death. Usually entities provide a flat rate of attrition but it has been observed that attrition rate is dependent on the service or age of the employee. For example, the entity can use x% for service below 5 years, and y% for above 5 years instead of a flat rate of z%.

Why would we conduct an analysis for Attrition rates?

The purpose of this paper is to describe the basic level of attrition rate using the industry, size of a company, age and service classification as a guide. Although attrition rate is only one of the several actuarial assumptions that must be selected, it is an important one in terms of the effect it has on employee benefit costs. Attrition rate is significant in deciding the future expected cash flows and has a direct impact on obligation. Attrition assumption is the most difficult assumption as it dependent upon the age and service slab, sex, geography, industry and the pay scale of a particular employee. Thus the choice of the appropriate level of overall attrition is of decisive importance.

Data Collation:

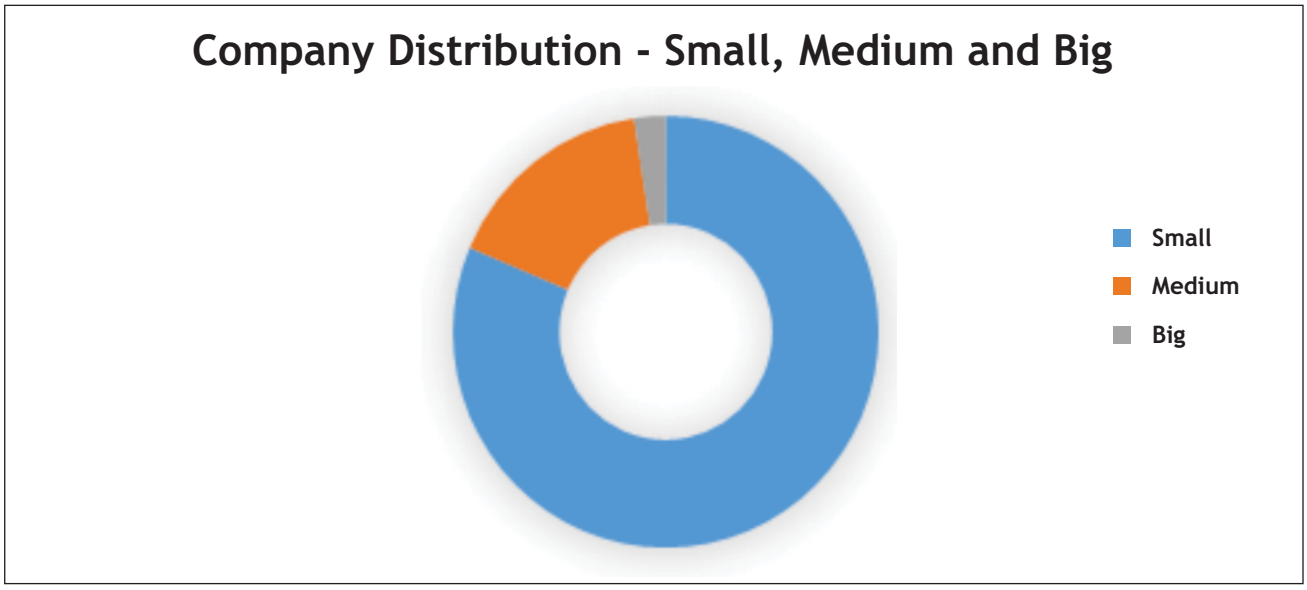
For trend analysis of attrition rate, employee data investigation was performed over the last 4 years. The data was gathered from March 2013 to March 2017. The companies active as on F.Y. 2013 were 2994 which subsequently increased to 3275 companies in F.Y. 2017. For the purpose of this investigation, we have used the data of 1997 common companies (i.e. Companies active from F.Y. 2013-17).



Graph 1 - Company Subset
Mutual Companies = 1997, 66.7% of Active Companies - Y2013, 61.0% of Active Companies - Y2017

*Mutual companies refers to the companies which were active from F.Y. 2013-17.

Mutual companies are further grouped into three categories based on employee strength, viz. "Small Company", "Medium Company", and "Big Company".

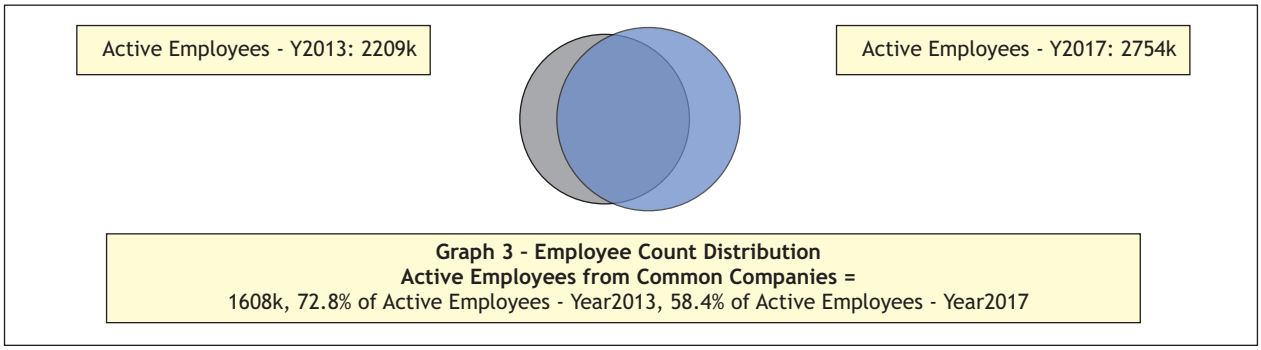


Graph 2 - Sample Distribution - Company Size
Category based on Employee Count as at 31-03-2013
Small Companies: [0,500] **Medium Size Companies:** [501, 5000] **Big Size Companies:** 5001 and above

Methodology:

For the analysis of employee attrition rate, we have made use of employee data set compiled for the purpose of gratuity valuations over the analysis period. From 2010 onwards we started our own SQL based software for employee benefit valuations with the primary objective to perform qualitative and quantitative work while honing our ability to handle a large set of employee specific data. Valuation software is available to store/reuse uploaded data which is kept in a highly secure dedicated server for each of the valuation date.

As at 31-03-2013, active employee data available for gratuity valuation was approximately 2.2 million for 2994 companies. Out of 2994 there were 1997 companies which stayed over end-to-end valuation period with employee count of 1.6 million.



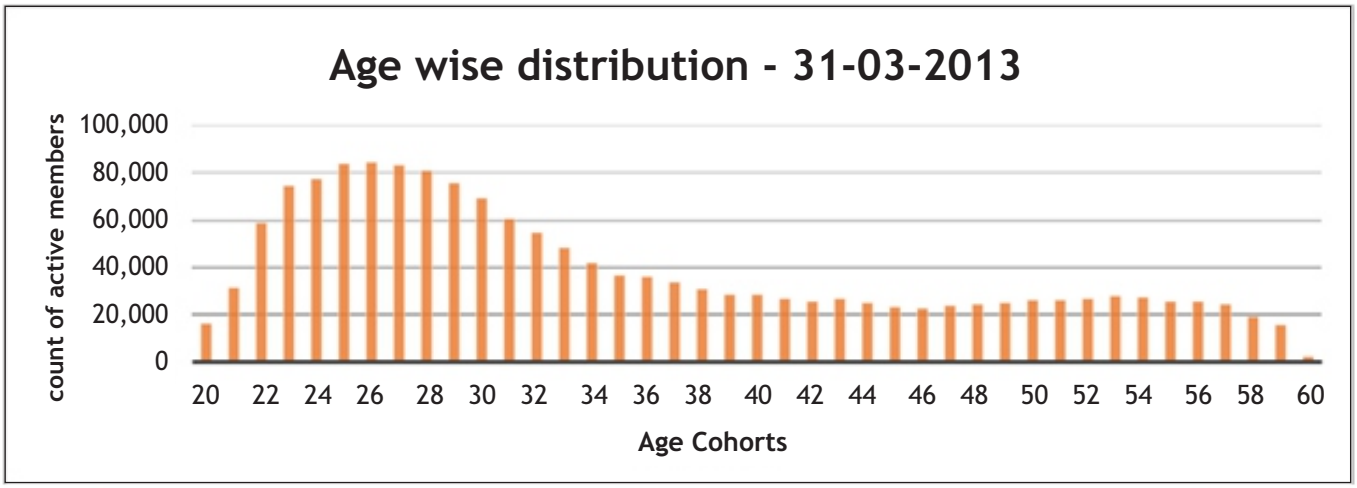
Graph 3 - Employee Count Distribution
Active Employees from Common Companies =
1608k, 72.8% of Active Employees - Year2013, 58.4% of Active Employees - Year2017

For the purpose of analysis, we extracted the employee ID, date of birth, date of joining and normal retirement age for each company/employee at each valuation date of 31-03-2013, 31-03-2014, 31-03-2015, 31-03-2016 and 31-03-2017. However for the analysis of employee withdrawal a select period of [4] years from March 2013 is used to arrive p.a. attrition rate.

Employee Distribution as at 31-03-2013

At each valuation date, age and service of individual employee is calculated to lower absolute value integer. In respect of employees who were active for companies which are selected for analysis as at 31-03-2013, we summarized 1.6 million employee data as follows:

- Age
- Service
- Normal Retirement Age
- Industry Type



Graph 4
Employee Count Distribution - Age Specific (As at 31-03-2013)

The Table below summarises the common employees as at 31-03-2013 for companies which are selected for analysis. This was further used to check how attrition rate varies among various industries.

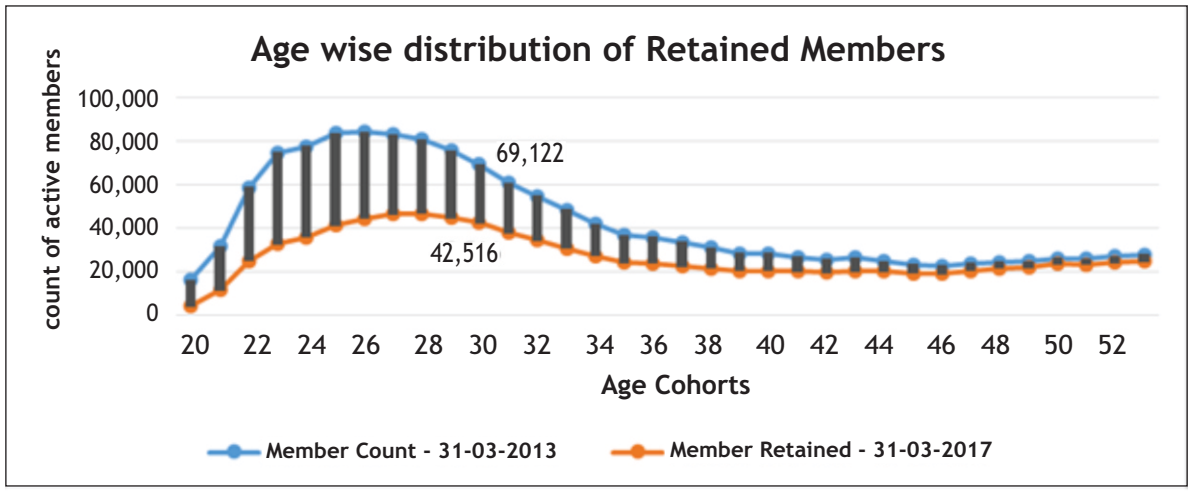
Table 1
Employee Count Distribution - Industry Specific (As at 31-03-2013)

Industry	Member Count
Banking	314,800
Hardware / Software & IT Consulting, Products & Services	253,937
Energy & Resources	117,336
Pharmaceutical / Healthcare / Skincare / Hygiene Products & Services	94,680
Manufacturing - Other	92,848
Outplacement Services / BPO / KPO	84,883
Financial Services	83,386
Services - Other	53,622
Supply Chain Management	36,711
Apparel / Accessories / Textiles	31,133
Manufacturing - Chemical Elements & Allied Products	29,293
Conglomerate	27,353
Insurance	27,159
Airlines, Aviation Services / Supplies	26,294
Hospitality	25,376
Safety & Security, Investigative Services & Products	22,447
Manufacturing - Automotive	19,339
Infrastructure	18,758
Manufacturing - Industrial	18,287
Steel	17,528
Food & Beverage Manufacturing / Distribution / Services	16,432
Architectural, Designing, Engineering & Technical	14,500
Printing & Publishing	12,705
Manufacturing - Electronics	10,984

Industry	Member Count
Hospitals	10,523
Property Development / Real Estate Services	10,320
Retail Consumer Products	9,834
Electronics	9,638
Education	9,312
Business Advisory, Solutions & Consultancy Services	8,653
Broadcasting / Media & Entertainment / News	8,032
Gems & Jewelleries	7,754
Sourcing, Dealing, Buying & Supplying	7,668
Manufacturing - Consumer	7,221
Advertising, Marketing & Public Relations	6,561
Testing & Inspection	5,580
Glass	5,388
Agriculture Products & Services	5,237
Construction & Building Systems / Materials / Fixtures	5,013
Packaging	4,732
Export / Import	4,476
Mining	4,171
Telecommunications	3,899
Research Analysis & Development	3,584
Transportation	2,832
Broadband / Cable Networks & Services	2,658
Online Services	2,420
Scientific & Medical Instruments	2,347
Environmental Products & Services	2,152
Farm & Industrial Equipment	1,986
Associations and Non-Profit Organizations	1,956
Government	1,455
Travel & Tourism	960
Biotechnology	872
Ship Management / Marine Services	599
Sports, Athletic, Recreational, and Social Activities	400
Animals & Animal Products	270
Arts / Handicrafts / Antiques / Curios	194
Grand Total	1,608,488

Collated information of employees which were active as at 31-03-2013 were compared with active employees as at 31-03-2017. This was done by making an Age - Service matrix, which is based on survival status and time-to-time information available for exits.

The graph below shows members beginning at as 31-03-2013 and members retained at 31-03-2017. The area between the two curves represent the employees who have left.



Graph 5
Employee Count Distribution for retained employees - Age Specific

It can be perceived from the above data point on the graph that the population size was 69,122 for employees aged 30 as at 31-03-2013 which reduced to 42,516 as at 31-03-2017. This observation shows that around 26,606 employees have

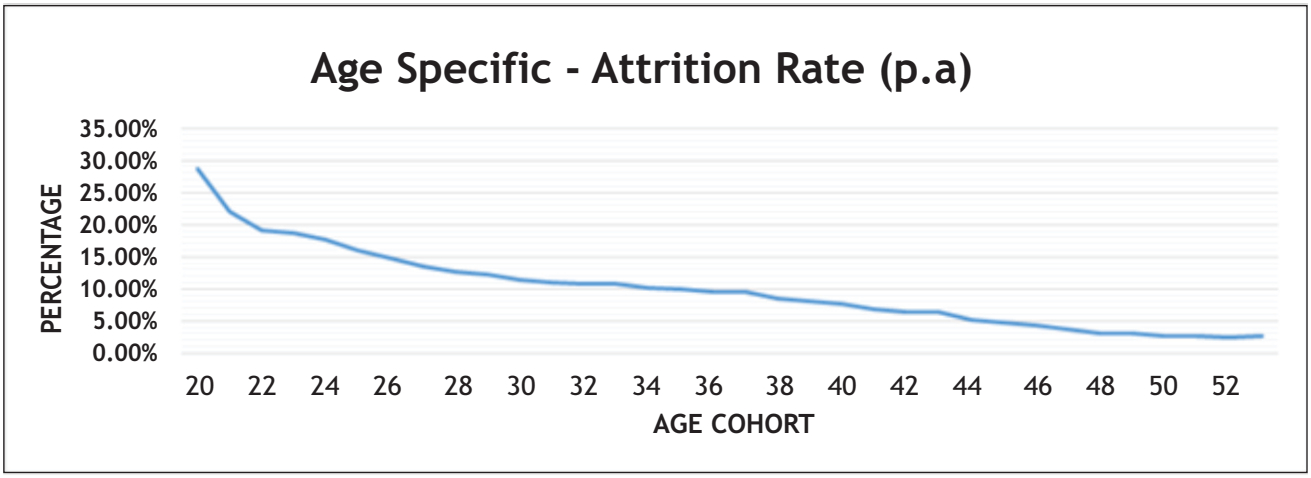
left during the 4 year time period. Hence, the attrition rate for age 30 is 38.49% over 4 years, which comes to 11.44% p.a.

As the select period for the analysis of attrition trend is 4 years, we have restricted the sample for retained employees as at 31-03-2013 at age 53.

Results:-

Results for per annum attrition rate were analyzed as follows:

a) Attrition Rate - Age Specific



Graph 6
Attrition Rate - Age Specific

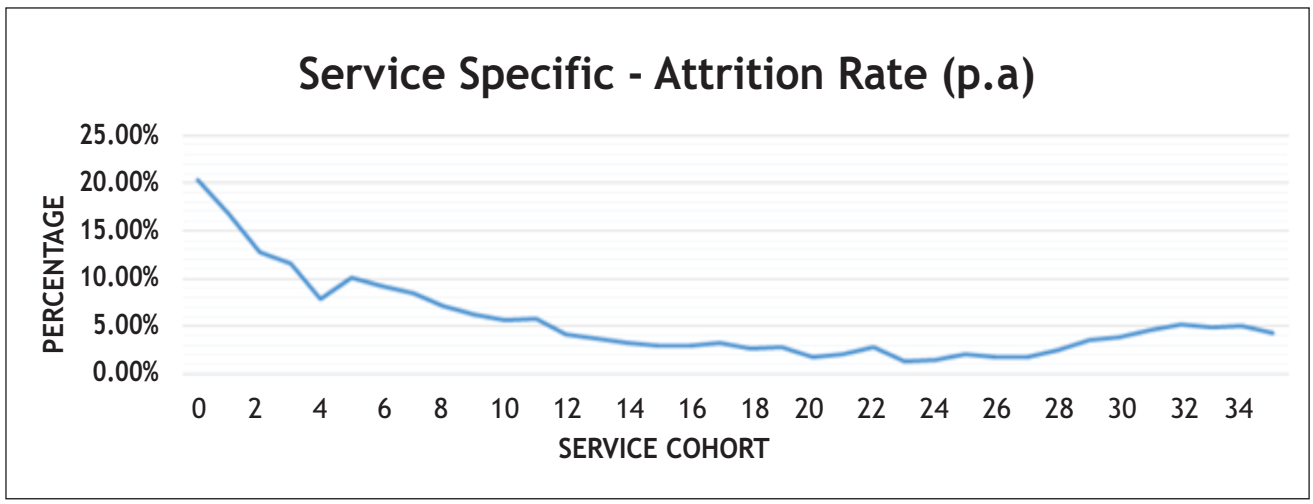
Table 2
Attrition Rate (p.a.) - Age Specific

Age (years)	Attrition Rate (p.a.)
20	28.69%
21	22.11%
22	19.21%
23	18.65%
24	17.59%
25	16.06%
26	14.77%
27	13.56%
28	12.77%
29	12.32%
30	11.44%
31	11.05%
32	10.81%
33	10.75%
34	10.15%
35	9.88%
36	9.47%

Age (years)	Attrition Rate (p.a.)
37	9.54%
38	8.54%
39	8.09%
40	7.68%
41	6.79%
42	6.44%
43	6.43%
44	5.16%
45	4.68%
46	4.37%
47	3.74%
48	3.14%
49	3.00%
50	2.63%
51	2.63%
52	2.43%
53	2.77%

We can observe a trend that the younger employees are now working for the same company for a shorter duration than in the past. Attrition assumption tends to be higher at the younger ages and falls as the employee gets older. The graph reflects a small up-turn at the older ages as some employees opt for early retirement.

b) Attrition Rate - Service Specific



Graph 7
Attrition Rate - Service Specific

Table 3
Attrition Rate (p.a.) - Service Specific

Service (years)	Attrition Rate (p.a.)
0	20.37%
1	16.82%
2	12.81%
3	11.62%
4	7.90%
5	10.12%
6	9.13%
7	8.42%
8	7.16%
9	6.29%
10	5.66%
11	5.73%
12	4.19%
13	3.66%
14	3.23%
15	2.90%
16	2.98%
17	3.31%

Service (years)	Attrition Rate (p.a.)
18	2.71%
19	2.73%
20	1.70%
21	2.10%
22	2.77%
23	1.31%
24	1.41%
25	2.05%
26	1.83%
27	1.76%
28	2.56%
29	3.48%
30	3.83%
31	4.58%
32	5.14%
33	4.88%
34	5.01%
35	4.25%

Graph 7 shows the correlation between attrition rates and years rendered in service. The graph reflects higher attrition for employees with lower service and conversely the attrition decreases as the service of an employee increases. Appreciation at work, job security, opportunity for advancement are few of the main reason why a lower attrition rate is reflected at the higher service range. However, a steady increase in attrition is reflected after 28 years of service as an employee tends to leave the organizations on account of retirement.

c) Attrition Rate - Industry Specific

Table 4
Attrition Rate (p.a.) - Industry Specific

Industry	Attrition Rate (p.a.)
Outplacement Services / BPO / KPO	34.24%
Safety & Security, Investigative Services & Products	33.95%
Online Services	22.84%
Telecommunications	22.45%
Property Development / Real Estate Services	22.26%
Insurance	21.00%
Hospitality	20.82%
Apparel / Accessories / Textiles	20.38%
Environmental Products & Services	19.84%
Infrastructure	19.10%
Manufacturing - Electronics	18.50%
Advertising, Marketing & Public Relations	17.57%
Export / Import	17.48%
Scientific & Medical Instruments	17.27%
Business Advisory, Solutions & Consultancy Services	17.21%
Gems & Jewelleries	17.21%
Biotechnology	16.78%
Retail Consumer Products	16.64%
Broadcasting / Media & Entertainment / News	16.27%
Financial Services	15.91%
Manufacturing - Other	15.58%
Travel & Tourism	15.25%
Broadband / Cable Networks & Services	15.21%
Education	15.20%
Construction & Building Systems / Materials / Fixtures	15.19%
Sourcing, Dealing, Buying & Supplying	15.15%
Electronics	14.82%
Architectural, Designing, Engineering & Technical	14.43%
Pharmaceutical / Healthcare / Skincare / Hygiene Products & Services	14.02%
Testing & Inspection	13.44%
Farm & Industrial Equipment	12.34%
Supply Chain Management	12.27%
Hospitals	12.20%
Packaging	12.16%
Manufacturing - Industrial	11.05%
Services - Other	10.87%
Transportation	10.34%
Hardware / Software & IT Consulting, Products & Services	10.30%
Conglomerate	10.15%
Food & Beverage Manufacturing / Distribution / Services	9.96%
Ship Management / Marine Services	8.77%
Steel	8.18%
Associations and Non-Profit Organizations	7.77%
Agriculture Products & Services	7.76%
Printing & Publishing	7.67%
Glass	7.40%
Manufacturing - Automotive	7.37%
Research Analysis & Development	7.15%
Manufacturing - Chemical Elements & Allied Products	7.04%
Sports, Athletic, Recreational, and Social Activities	6.33%
Manufacturing - Consumer	4.59%
Mining	3.58%
Government	3.52%
Energy & Resources	3.31%
Animals & Animal Products	3.27%
Airlines, Aviation Services / Supplies	2.86%
Arts / Handicrafts / Antiques / Curios	2.79%
Banking	2.65%

Table 4 gives industry specific bifurcation of attrition rate. The highest attrition rate is observed in Outplacement Services / BPO / KPO whereas the lowest attrition rate was in Banking of 2.65% p.a.

Table 5
Attrition Rate (p.a.)

Range	Table 3 (a) Attrition Rate (p.a.)
Age Range 1 - [20,30]	15.46%
Age Range 2 - [31,40]	9.85%
Age Range 3 - [41,50]	4.63%
Age Range 4 - [51, and above]	2.61%

Range	Table 3 (b) Attrition Rate (p.a.)
Service Range 1 - [0,1]	18.84%
Service Range 2 - [2,4]	11.16%
Service Range 3 - [5,10]	8.68%
Service Range 4 - [11,20]	3.24%
Service Range 5 - [21, and above]	2.37%

The Attrition rates tabulated above are further analysed for various sectors, which are tabulated as below:

Table 5 (a)
Sector - Steel & Manufacturing

Range	Attrition Rate (p.a.)
Age Range 1 - [20,30]	17.04%
Age Range 2 - [31,40]	10.38%
Age Range 3 - [41,50]	6.99%
Age Range 4 - [51, and above]	7.97%

Range	Attrition Rate (p.a.)
Service Range 1 - [0,1]	20.04%
Service Range 2 - [2,4]	12.63%
Service Range 3 - [5,10]	8.94%
Service Range 4 - [11,20]	4.22%
Service Range 5 - [21, and above]	4.37%

Table 5 (b)
Sector - Pharmaceutical

Range	Attrition Rate (p.a.)
Age Range 1 - [20,30]	19.00%
Age Range 2 - [31,40]	10.44%
Age Range 3 - [41,50]	5.88%
Age Range 4 - [51, and above]	5.33%

Range	Attrition Rate (p.a.)
Service Range 1 - [0,1]	21.23%
Service Range 2 - [2,4]	13.92%
Service Range 3 - [5,10]	7.87%
Service Range 4 - [11,20]	4.61%
Service Range 5 - [21, and above]	3.29%

Table 5 (c)
Sector - BPO/KPO/SCM

Range	Attrition Rate (p.a.)
Age Range 1 - [20,30]	30.49%
Age Range 2 - [31,40]	18.01%
Age Range 3 - [41,50]	13.03%
Age Range 4 - [51, and above]	11.88%

Range	Attrition Rate (p.a.)
Service Range 1 - [0,1]	33.65%
Service Range 2 - [2,4]	21.39%
Service Range 3 - [5,10]	11.55%
Service Range 4 - [11,20]	6.51%
Service Range 5 - [21, and above]	3.79%

Table 5 (d)
Sector - Hardware / Software & IT Consulting, Products & Services

Range	Attrition Rate (p.a.)
Age Range 1 - [20,30]	11.80%
Age Range 2 - [31,40]	6.95%
Age Range 3 - [41,50]	3.54%
Age Range 4 - [51, and above]	2.48%

Range	Attrition Rate (p.a.)
Service Range 1 - [0,1]	11.62%
Service Range 2 - [2,4]	11.18%
Service Range 3 - [5,10]	7.70%
Service Range 4 - [11,20]	4.82%
Service Range 5 - [21, and above]	2.51%

Table 5 (e)
Sector - Banking

Range	Attrition Rate (p.a.)
Age Range 1 - [20,30]	3.08%
Age Range 2 - [31,40]	1.91%
Age Range 3 - [41,50]	1.23%
Age Range 4 - [51, and above]	1.32%

Range	Attrition Rate (p.a.)
Service Range 1 - [0,1]	5.21%
Service Range 2 - [2,4]	1.81%
Service Range 3 - [5,10]	1.45%
Service Range 4 - [11,20]	1.44%
Service Range 5 - [21, and above]	1.27%

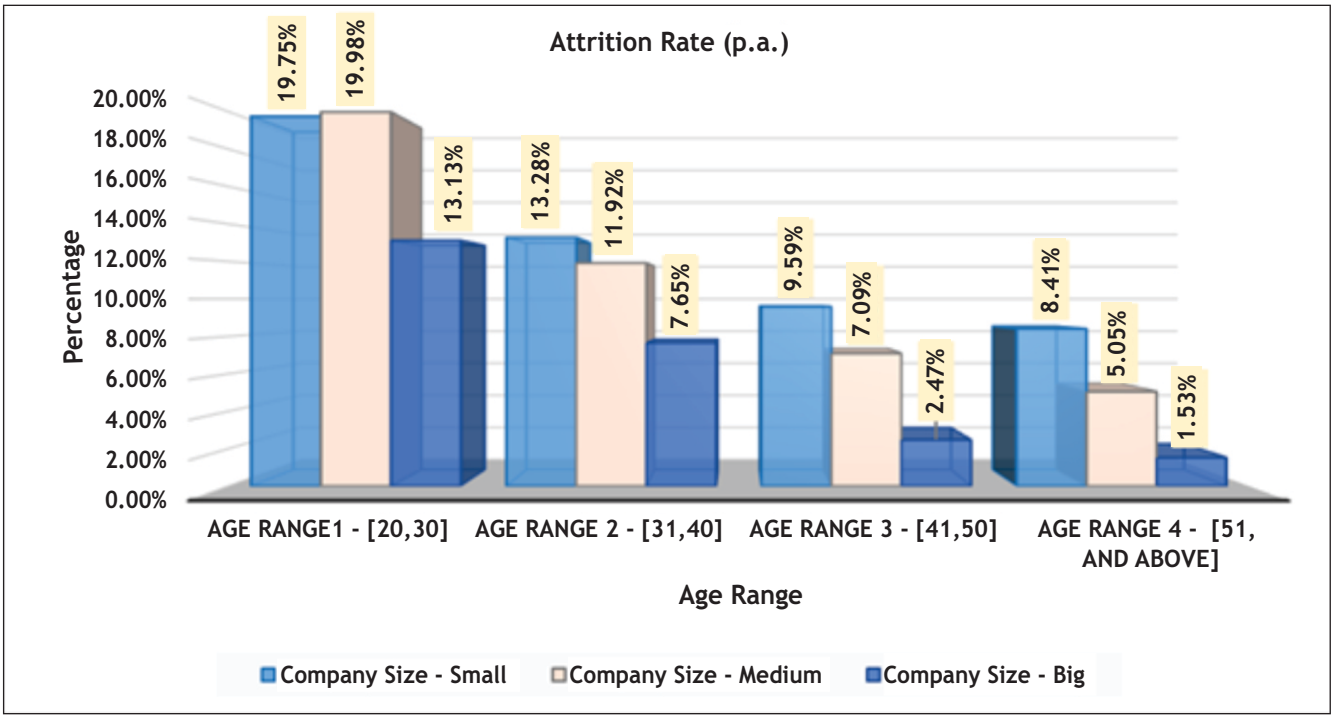
Table 5 (f)
Sector - Services

Range	Attrition Rate (p.a.)
Age Range 1 - [20,30]	19.96%
Age Range 2 - [31,40]	13.35%
Age Range 3 - [41,50]	5.95%
Age Range 4 - [51, and above]	2.40%

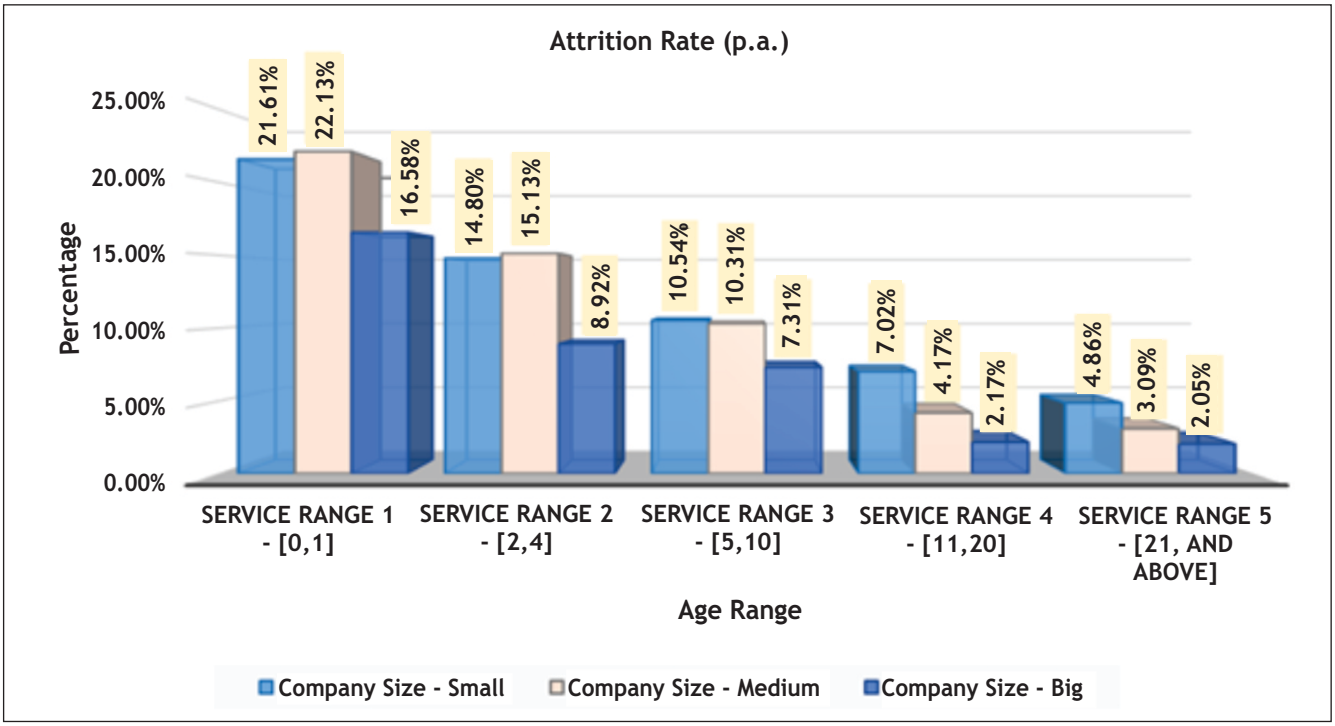
Range	Attrition Rate (p.a.)
Service Range 1 - [0,1]	23.36%
Service Range 2 - [2,4]	15.93%
Service Range 3 - [5,10]	10.59%
Service Range 4 - [11,20]	3.76%
Service Range 5 - [21, and above]	2.37%

It can be observed from the above age and service range that attrition rates are specifically higher when the service and age of an employee is below 5 and 30 years respectively. Hence, it is recommended to use a staggered attrition rate when required, would project the liability more appropriately.

d) Attrition Rate - Company Size



Graph 8
Attrition Rate - Age and Company size Specific



Graph 9
Attrition Rate - Service and Company size Specific

Impact of Attrition Rate on the Projected Benefit Obligation

Accounting by an enterprise for defined benefit plans involves:-
(a) Using of actuarial techniques to make a reliable estimate of the amount of benefit that employees have earned in return for their service in the current and prior periods. This requires an enterprise to determine how much benefit is attributable to the current and prior periods and to make estimates (actuarial assumptions) about demographic variables and financial variables that will influence the cost of the benefit

(b) Discounting that benefit using the Projected Unit Credit Method in order to determine the present value of the defined benefit obligation and the current service cost.

Consider an enterprise is offering a gratuity benefit to its employees. For provisioning of obligation, an enterprise will have to make a provision of gratuity, calculation of which is illustrated as below

Illustration 1

- Age : 32 years
- Service : 7 years
- Retirement Age : 58 years
- Monthly Salary : INR 30,000
- Vesting Period* : 5 years
- Benefit Scheme : Gratuity

15 days salary for each year of service with a limit of INR 2,000,000/-. Benefit is payable on death or on resignation or on retirement.

Accrued Amount
= 15/26*7*30,000
= INR 121,154

*Applicable on retirement or on resignation

Illustration 2

- Age : 44 years
- Service : 3 years
- Retirement Age : 58 years
- Monthly Salary : INR 78,000
- Vesting Period* : 5 years
- Benefit Scheme : Gratuity

20 days salary for each year of service. Benefit is payable on death or on resignation or on retirement.

Accrued Amount
= 20/26*3*78,000
= INR 180,000

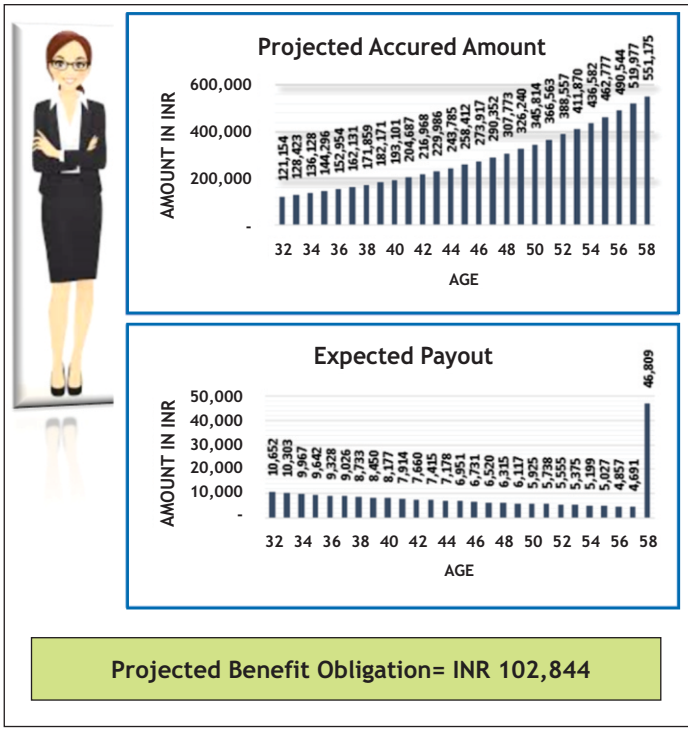
*Applicable on retirement or on resignation

The ultimate cost of a defined benefit plan may be influenced by many variables, such as final salaries, employee attrition rate and mortality. The ultimate cost of the plan is uncertain and this uncertainty is likely to persist over a long period of time. In order to measure the present value of the post-employment benefit obligations, it is necessary to:

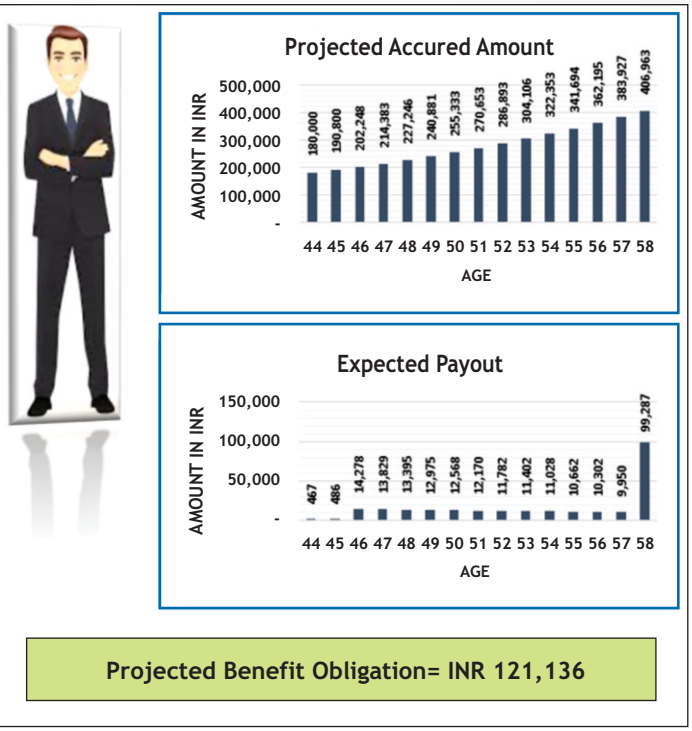
(a) apply an actuarial valuation method;
(b) attribute benefit to periods of service; and
(c) make actuarial assumptions

Financial Assumptions		Demographic Assumption	
Discount Rate	**: 8.00% p.a.**	**Mortality Rate**	**: IALM 2006-08**
Salary Escalation Rate	**: 6.00% p.a.**	**Attrition Rate**	**: Service Linked***
			**as mentioned in table 3 (b)*

An enterprise should use the Projected Unit Credit Method to determine the present value of its defined benefit obligations and the related current service cost and, where applicable, past service cost. The Projected Unit Credit Method (sometimes known as the accrued benefit method pro-rated on service or as the benefit/years of service method) considers each period of service as giving rise to an additional unit of benefit entitlement and measures each unit separately to build up the final obligation.



Projected Benefit Obligation= INR 102,844



Projected Benefit Obligation= INR 121,136

For calculation of **Projected Benefit Obligation**

a) **Accrued amount** calculated as at effective date is **projected** till last age of exit i.e. till normal retirement age, using 6.00% p.a. salary escalation rate.
b) Decrement adjusted **expected payout** at each age is calculated by multiplying mortality, attrition rate and/or survival chance with projected accrued amount.
c) **Projected benefit obligation** is then calculated by summing discounted value of each year expected payout using discount rate of 8.00% p.a.

For calculation of expected payout it is assumed that death or withdrawal of an employee will happen at the start of each year.

From Illustration 2, we can clearly see that the expected payout for the first two years is low as the member has not vested the benefit and so the expected payout is only due to the eventuality of death. Increase in expected payout from 3rd year onwards is predominately due to expected payout on account of attrition, as the member may vest the benefit by that age. Increase in attrition rate for non-vested beneficiaries will decrease projected benefit obligation due to less possibility of getting the benefit.

Delta in Projected Benefit Obligation (in %)	Illustration 1	Illustration 2
Discount Rate + 1.00% with rest all assumptions unchanged	-7.06%	-7.33%
Discount Rate - 1.00% with rest all assumptions unchanged	8.20%	8.18%
Salary Escalation Rate +1.00% with rest all assumptions unchanged	8.29%	8.26%
Salary Escalation Rate -1.00% with rest all assumptions unchanged	-7.25%	-7.53%
Attrition Rate + 1.00% with rest all assumptions unchanged	1.45%	-1.53%
Attrition Rate - 1.00% with rest all assumptions unchanged	-1.65%	1.47%

Table 6
Impact on Projected Obligation due to Change in valuation Assumptions

Conclusion

The selection of actuarial assumptions is critical for determining employee benefit liabilities as in turn it determines the company's expense. Choice of appropriate assumptions will help in minimizing volatility in the expenses and liability.

Accounting standard on employee benefits prescribes management's responsibility to set assumptions, but it is the onus of the auditor to express an opinion on annual accounts which should reflect a true and fair view. Therefore they also play a major role in setting assumptions. We therefore recommend that a discussion between the Company (Finance and HR representatives), the Actuary and the Auditor should occur at an early stage in the valuation process. This ensures all stakeholders are in agreement in this key area.

It should be remembered that since the assumptions are long term in nature (other than discount rate which is driven by market yields); we would not expect significant changes in the assumptions year on year. Change should only occur where previous assumptions are not reflecting experience or there has been a change in the management's perception for company's future plans.

In setting the assumption for attrition rate, one must take care that the past may not be always a guide to the future. Even if the past experience can be statistically analyzed to produce some meaningful rates, the future experience of withdrawals will depend on general economic conditions as also the particular conditions affecting the given employer's business. Furthermore, withdrawal rates differ significantly from scheme to scheme and within a scheme from year to year.

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