ACTUARIAL VALUATION OF EARNED GRATUITY FROM RETROSPECTIVE APPROACH: THE BASIS FOR MORTALITY EXCLUSION

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Abstract

Actuarial valuation report on already earned gratuity of a Pharmaceutical firm operating defined benefit scheme was reviewed. Various assumptions leading to the valuation result were also considered. An assumption not critical in this valuation schedule is mortality. The study argues that the inclusion of mortality in the actuarial assumptions would be inappropriate since the payment of gratuity in respect of qualified plan members is not contingent upon their survival since the affected plan members have already survived. The study further argues that only future payments such as pension which is contingent on survival would require mortality. Hence, the inclusion of mortality on already earned gratuities lead to a sharp reduction in the expected members' gratuities thereby resulting in erosion of gratuity funds while they are still active at work. From the sourced data, there was no evidence of any funds set aside to meet the gratuity due. In the computation of gratuity exercise carried out in this study, mortality assumption was excluded to get the actual value of scheme. The results revealed that employees with accrued gratuities of ₦2,800,645.82 have not served up to 5 years qualifying rule in the current employment. The Actuarial liability as 31st December, 2017 was ₦14,015,439.63. The study recommended that management should ensure that funds are set aside to pay the gratuity of retiring employees and the investment must not bring about adverse effect to employees' gratuities.

Keywords: Actuarial Valuation, Defined Benefit, Gratuity, Mortality

Introduction

Ever since the implementation of Pension Reform Act 2004 (amended 2014), the focus of many studies has been on defined contribution (DC) which allows employees and employer to contribute 8% and 10% respectively to employees' retirement saving accounts (RSAs) (Adeyele, 2015). Even though the Act gave employers to make choice between the DC and defined benefit

(DB) scheme, many of them including the Federal Government have switched to defined contribution for most of their employees with exception of the military. DB permits employers to take the responsibility of retirement income funding for all their employees. There are eligibility rules for staff members to be entitled to certain percentage of the earned funds and this has to do with length of service. Usually, for any employees to qualify for DB membership, such employees must have spent at least five years with that employer and for such employees to earn 100% of the defined benefit, will necessitate that they remain with that employer till retirement. This implies that the need to carry out valuation of pension and gratuity of assets for the military and other companies operation DB is still in operation. However, many studies have failed to examine how employers with DB scheme fund their liabilities emanating from pension scheme. There is hardly any substantial scholarly research on how gratuity schemes should be determined for the DB members in private and public sectors. A critical factor in the analysis of DB which led to its insolvency was inadequate funding in advance (Adeyele & Adelakun, 2010). To avoid this anomalous behavior, there is a dire need to carry out valuation of actuarial liabilities of pension scheme periodically. For the gratuity portion, which is the focus of this study, the valuation is carried out yearly for the number of years already spent. This implies that the scheme valuation of gratuity is carried out retrospectively and this does not warrant the use of mortality since the issue being considered has to do with the past. Making forcast for the future gratuity would require the use of mortality because getting these future gratuities is contingent on survival. From the actuarial reports reviewed for the purpose of gratuity valuation, mortality was included as part of the assumption which is not supposed to be. We are quite aware that the purpose of an exercise such as this is to provide the capital value of assets and liabilities of an in-house end-of-service scheme for the financial year and make recommendations concerning the adequacy or otherwise of the current rate of contributions. The International Accounting Standard No. 19 (revised 2011) provides the internationally recognized guidance on accounting for and disclosure in Financial Statements of Defined Benefit Schemes and required that schemes be periodically valued using Projected Unit Credit (PUC) actuarial cost method. In this study, gratuities already earned were valued retrospectively by inculcating the principle of project unit credit so that employees are not subjected to unnecessary financial strain emanating from wrong use of models and principle to value their gratuities.

Any employees working for the current needs without having any funds set aside to protect old age is exposed to risk which serves as source of financial instability. This study attempts to uncover the future risk that members of defined contribution scheme are likely to be exposed to due to lack of funds set aside for their old age needs by their employer. Although employer in the firm examined only carries out the actuarial valuation to ascertain the extent of liabilities due as required by the law, the complete lack of funds invested for this purpose poses a threat to financial stability of employees when they retire or leave the service of employer. At any point in time, any employee may decide to leave the current employer for another. By this means, those who have qualified for the gratuity based on employer's rules will be entitled to leave with already earned gratuity. However, there is no assurance whatsoever that they will be able to receive these earned gratuities because the firm under consideration did not indicate funding arrangement put in place in the document made available to researchers. This uncertainty is a source of risk and financial instability that must be prevented from happening by all employers of defined benefit scheme.

Literature Review

Definition of Terms

It is important to briefly define some actuarial terms which are relevant to this study for the purpose of non-actuarial audience. This is done to avoid the use of complex actuarial terminology, even though different users of actuarial reports may have differing opinions as to what constitutes an "actuarial term". The terms explained below are based on the rule of DB supplied to us by employer of the scheme presently being considered for valuation. Having studied these rules, we are able to come up with the following terms as used in this study.

*Gratuity***:** On retirement at the normal retirement age of 65, after having completed 5 years of pensionable service, a member is entitled to a lump gratuity, the amount of which will be in accordance with Table 2.

Withdrawal benefits: No gratuity benefits are payable to a member who withdraws his/her service before completing 5 years of service. If a member has completed up to 5 year's service and above, he/she would be entitled to a gratuity as determined in accordance with Table 2.

Membership of the Scheme: A list of active staff members of the scheme showing dates of birth dates of entry into service and basic annual salaries totaling 42 was provided. Nineteen (19) members of staff are already qualified for the scheme as described in above.

Actuarial Accrued Liability - for benefits payable in the future to present members, it will equal the present value of benefits payable in the future to them less the present value of future normal costs.

Actuarial Gain or Actuarial Loss - a measure of the difference between actual experience and assumed experience of the system. Through the actuarial assumptions, rates of decrements, rates of salary increases, and rates of fund earnings have been forecasted. To the extent that actual experience differs from that assumed, actuarial liabilities emerge which may be the same as forecasted, or they may be larger or smaller than projected. Actuarial gains are due to favorable experience, e.g., the scheme's assets earn more than projected, salaries do not increase as fast as assumed, members retire later than assumed, etc. Favorable experience means actual results produce actuarial liabilities not as large as projected by the actuarial assumptions. On the other hand, actuarial losses are the result of unfavorable experience, i.e., actual results that produce actuarial liabilities which are larger than projected. Actuarial gains will shorten the time required for funding of the actuarial balance sheet deficiency while actuarial losses will lengthen the funding period.

Actuarial Liabilities - the actuarially determined present value of future benefits to be provided by the scheme. There are separate actuarially determined present values for retired members and non-retired members (either active or inactive). When applied to active members, it takes into account benefits which will be earned through future service and future salary increases.

Defined Benefits - in a retirement plan, benefits which are defined by a specific formula applied to specific member compensation and/or specific years of service. The amount of the benefit is not a function of contributions or actual earnings on those contributions.

Defined Contributions - in a retirement plan, a periodic contributions to the plan which are defined as a specific percent of compensation.

The term “funding method” is used to refer to the way of determining the **amount** and **timing** of contributions (to a separate institution, or to an internal book reserve) made to meet the cost of providing retirement benefits (Collinson, 2001). The right way to calculate the value of pension obligations has debated from the window of actuarial community many years ago. In the last twenty years, however, a branch of academics and research called financial economics has influenced corporate finance, including the effects pension plans have on corporate financial reporting and stock values (Rizzo, 2009).

Given the uncertainty surrounding valuations based on — mark-to-model principles, accounting disclosures by sponsoring companies should be at least accompanied with information about the assumptions made and a sensitivity analysis (Yermo, 2018). The current application of fair value principles to pension accounting standards is the subject of much controversy. There is an ongoing debate about the right measure of liabilities (ABO or PBO), the extent to which pension benefits are a debt of employers or can be adjusted, the appropriate discount rate to be used, and the way to recognise actuarial gains and losses (Yermo, 2018). Valuation methods for funding and business accounting purposes are likely to continue moving towards a market-based model. With this trend, there is need for the policymakers to be all the more cautious in setting funding regulations so as to provide sufficient flexibility to pension funds in covering funding deficits while providing incentives to establish funding buffers in good economic times.

As a consequence of this spreading of cost most methods also define a “fund” that should be held at a particular point in time. All the methods used can be considered prospective in that they refer to future liabilities and future contributions (Collinson, 2001). Whatever the method used, the underlying objective is always the same: the contributions made need to be sufficient to ensure that the benefits promised can be paid when they fall due (Collinson, 2001), bearing in mind that the basic objective of the various actuarial methods varies significantly.

Basis of Argument for mortality exclusion

Learning from life contingency teaches a knowledge of which is fundamental to an application of mathematics dealing with calculations in respect of payments depending on human survivorship or death. Such calculations, which usually include the element of compound interest as well as mortality, are required in connection with life insurance and pension funds (Jordan,

1967; Bowers et al, 1997; Alistair, 1980). Thus, any valuation of annuity done for the future years of service is subject to two main factors: mortality and withdrawal of employees from employment. This is so because the possibility of receiving such benefits is contingent on survival and staying on the job. However, if employees have already qualified for gratuity, the valuation will be to look at the past and there will be no need to used mortality. For a guide on pension benefit requiring mortality for future benefits, see Adeyele and Olujide (2016). The formula used for the valuation in the present study is as contained in the rules of the scheme by the Company. To determine gratuity due, current salaries representing final salary as at valuation date were used and divided by 12 in accordance for determination of basic salary. The amount derived is to be used for gratuity of members' scheme. This suggests that the starting salary has to be determined. To do this, there is need to discount this amount (final salary by 12) back to number of years already spent in service to get the starting salary. The starting salary is subject to salary increment. Hence, the starting salary using current salary is derived as follows:

Let $(AS)_x$ be the annual salary. The amount to be discounted to get starting salary is $(AS)_x/12$. The starting annual basic salary (ABS) using the idea in interest theory by Kellison (1970) is therefore given as:

$ASB = \left[\frac{(AS)_x}{12}\right](1+i_{CPI})^{-n}$ where $i_{CPI} = \text{consumer protection index}$, used for the discount rate.

Because employees' salary has increased over the period of career progression, the annual salary increment denoted as "s." This increment must be used to determine the gratuities due for all members of the scheme following the qualifying criteria. Hence, the accumulated gratuity due (AGD) is given as:

$$AGD = \left[\frac{(AS)_x}{12}\right] s_{\overline{n|}}^{i''} (1+s)^n (1+i_{CPI})^{-n}, i'' = \frac{i_{CPI} - s}{1+i_{CPI}} if\ i_{CPI} > s$$

$\text{where: s} = \text{salary increment}$

As can be seen in argument put forward, it is clearly apparent that the derived formula has nothing to do with mortality since the valuation is done retrospectively in order to determine liabilities due for the organisation. This formula is then used to value the scheme which the result of valuation are put side by side with previous year's valuation scheme by incorporating other conditions except the exclusion of mortality.

Methodology

Data in relation to staff information of a certain Pharmaceutical company operating defined benefit schemes in Plateau state, Nigeria was collected from the in-house actuarial department. The document released to the researchers was marked classified information which necessitates the non-disclosure of the firm under consideration but rather termed *The Company* as used in this study. It was observed that twenty three (23) out of forty-two (42) members of staff currently in employment with *ABC Company* (hereafter, *The Company*) have not served up to 5 years and they are not qualified to earned gratuity if they leave the service of employer as contained in the scheme's rules forwarded to researchers. The remaining nineteen (19) who are entitled to gratuity have worked between 5 and 12 years. Table 2 shows the length of service and gratuity due, respectively. The benefit computed for service earned by qualified employees is a monthly salary equivalent to a function of benefit factor, years put in service and final compensation where the factor is from the service table.

From information supplied for valuation, benefit under the End-of-Service is payable under the scheme to employees on cessation of employment on the following grounds: death, retirement or resignation. The normal retirement age is 65 years. This notwithstanding, there is no gratuity for employees that spent less than 5 years while those who have attained this age and above are entitled to gratuity using last annual basic salary for each completed year of service. In calculation of gratuity benefit, only completed years are counted and pro-rated benefit is provided for fraction years.

The valuation was prepared using the Projected Unit Credit (PUC) Actuarial Cost method. This is the method mandated by International Accounting Standard (IAS 19). Under this method, the projected value of the benefits under the scheme is determined for each member. The method for determining the retirement Benefit cost for use in the Financial Statements as specified in the IAS 19 (revised 2011) was arrived at as follows:

End-of-Service Cost **equal to** service Cost **plus** net interest Cost **minus** Expected Return on Plan Assets. The interest cost as shown in Table 1 was arrived at by comparing accumulation of actual annual basic salaries without accruing interest to accumulation of same basic salaries with accumulating factor of 1.05 of the total funds. If the interest rate is reviewed upwards, such as 10% as used previously on the scheme valuation, then the gratuities benefits will be high.

The valuation is based on the data supplied to us as at 31st December, 2017 and the details are shown in Table 1. Benefit of active employees of the Company as at December 2016. The summary statistics of the data provided to researchers are tabulated below:

Table 1: Summary Statistics of Raw Data

Particulars	Sept-16
Total Number of Employees	42
Total Annual Basic Salary (Naira Millions)	29.58
Average Age Nearest (years)	39.95
Average Service (years)	6.10
Average Entry Age (years)	39

Source: Authors' Computation, 2017.

A summary of employees is provided in Table 5.4, which shows a break-up of the employees by attained age, the average entry age and average past service together with the salary for each group. The results illustrated in this report are dependent on the data provided to us by the Company. Any changes in the information would impact the asset/liability to be recognized in the books of the Company as at the valuation date(s).

3.4 Actuarial Assumptions used for the valuation: In the computation, the following actuarial assumptions were made.

- Salary increment: 3%
- Consumer Protection Index: 5% per year comparable to saving rate in bank.
- Discount Rate: 5%
- Mortality assumption: There is no mortality assumed because all the staff have already survived to date of valuation and are not subject to mortality. It is only pension benefits that are subjects to mortality.
- Expenses of administration: 5% of gratuity

Results

Table 2 shows that 17 and 6 employees with accrued gratuities of ₦1,061,576.84 and ₦1,739,068.98 respectively, have not served up 5 years qualifying rule in the current employment. The corresponding gratuities of these categories of employees who withdraw his/her service before attaining 5 years will be recognised as gain to the employer. However, it is unlikely that those close to five years will withdraw their service for any reason, which implied that management needs to set aside additional ₦1,739,068.98 against the next accounting year.

Table 2: Staff Statistics

Number of years of service	Number of employees	Accrued Gratuities for all employees (₦)	Accrued and Earned Gratuity (₦)
0.00-3.99	17	1,061,576.84	-
4.00-4.99	6	1,739,068.98	-
5.00-9.99	6	2,328,408.08	2,328,408.08
10.00-12.00	13	11,687,031.55	11,687,031.55
TOTAL	42	**16,816,085.45**	**14,015,439.63**

Source: Authors' Computation, 2017.

The valuation results are compiled in the Table 3 below:

Table 3: Valuation Results

PARTICULARS	**31-Dec-16**	**31-Dec-17**
Defined Benefit Obligation (PBO)	₦12,738,551	₦ 14,015,439.63
Fair Value of Plan Assets	-	-
(Surplus) / Deficit	12,738,551	14,015,439.63
Unrecognized Actuarial Gains / (Losses)		
Liability to be recognized in Statement of Financial Position	12,738,551	**14,015,439.63**
Current service Cost	1,564,918	1,121,235.17
Interest Cost	1,300,752	3,227,517.71
Expected Return on Plan Assets	-	**-**
Actuarial (Gain)/Loss to be recognised	175,992	**-**
Gratuity Expense for the accounting year	**3,041,662**	**4,348,752.88**
Annual Basic Salaries	30,769,669	29,577,060.18
Expense as a percentage of Annual Gross Salary	10%	15%

Source: Authors' Computation, 2017.

Actuarial Liability **-** The Actuarial liability (PBO) as shown in Table 3 for the year ended 31st December, 2016 and 31st December, 2017 respectively are **₦12,738,551** and **₦14,015,439.63.**

Liability to be Recognized in the in the Financial Statements - The Actuarial liability of **₦14,015,439.63** is the amount to be recognized as an asset/liability in the statement of Financial position for the year ended 31st December, 2017 and should be the net total of the following amounts:

- the present value of the defined benefit obligation at the balance sheet date; and
- minus the fair value as at 31st December, 2017 of plan assets (if any) out of which the obligations are to be settled directly.

In the absence of any plan assets, the net liability is equal to the amount of Actuarial Liability as at 31st December, 2017 to be recognized in the statement of financial position.

Expense to be Recognition in the Financial Statements

The sum of **₦4,348,752.88** has been worked out as an expense to be recognized in the accounts for the year ended 31st December 2017. This amount is made up of the current service and interest costs during the year.

Sensitivity Analysis -Sensitivity Analysis disclosed is based on changing one assumption while holding all other assumptions constant. When calculating the sensitivity of the defined benefit obligation to variations in significant actuarial assumptions, the same method (present value of defined benefit obligation calculated using projected unit credit method at the end of the reporting period) has been applied as for calculating the liability recognized in the statement of financial position.

Table 4 Sensitivity Assumptions/Corresponding valuation results

SI / CPI	CPI+5%	CPI+6%	CPI+7%	CPI+8%	CPI+9%	CPI+10%	CPI+11%
SI+3%	**14,015,439.63**	14,791,153.93	15,616,966.13	16,496,099.14	17,431,970.51	18,428,203.12	19,488,636.30
SI+4%	12,574,361.66	13,269,204.00	14,008,864.70	14,796,224.04	15,634,336.11	16,526,438.35	17,475,961.42
SI+5%	11,294,818.88	11,917,944.08	12,581,210.48	13,287,195.10	14,038,630.32	14,838,412.41	15,689,610.41
SI+6%	10,157,287.15	10,716,735.30	11,312,176.09	11,945,917.78	12,620,407.66	13,338,239.70	14,102,162.43
SI+7%	9,144,766.39	9,647,607.81	10,182,757.76	10,752,286.03	11,358,386.98	12,003,386.34	12,689,748.33
SI+8%	8,242,433.80	8,694,893.96	9,176,387.16	9,688,771.33	10,234,016.14	10,814,209.10	11,431,561.88
SI+9%	7,437,347.37	7,844,914.77	8,278,599.62	8,740,071.45	9,231,100.12	9,753,561.28	10,309,442.04
SI+10%	6,718,192.15	7,085,711.52	7,476,750.15	7,892,809.87	8,335,482.63	8,806,455.46	9,307,515.57

SI = Salary Increment
CPI = Consumer Protection Interest/Returns
Source: Authors' Computation, 2017.

At 3% salary increment with return of 5%, the gratuities due is N14,015,439.63. With salary fixed at 3% increase, and upward review of rate of returns lead to increase in gratuities due. Similarly, if the rate of return is fixed at 5%, upward salary review yielded low gratuities. This means that it is upwards salary increment without corresponding upward increase in rates of returns leads to low gratuities benefits to employees as contained in Table 3.2 above. From the above table, the Company can decide to work with options provided if depending on the ability of investment team (if any) to perform. The 3% salary increment chosen for the purpose of this valuation is based on our experience that salary in the last eight years has not increased beyond this rate.

Cash Flow Analysis

As benefits are being paid in lump sums, expected un-discounted cash payments are provided below to give an idea on the significance of the liability due over time (assuming no deaths and withdrawals).

Table 5: Cash Flow with Corresponding Number of Beneficiaries

YEAR	Expected Cash Flows (Naira)		
	Number of Beneficiaries	Gratuities due for payment	Additional Liabilities due to unpaid Gratuities at 5%
1-4	-	-	-
5-8	-	-	-
9-12	4	13,118,884.53	13,118,884.53
13-16	1	995,520.58	16,941,606.72
17-20	3	12,340,452.53	32,933,081.38
21-24	10	28,547,149.88	68,577,516.13
25-28	5	14,933,239.86	98,289,639.33
29-32	6	18,385,885.24	137,857,556.15
33-36	7	25,298,541.71	192,865,262.82
37-40	6	15,072,185.47	249,501,117.84
TOTAL	**42**	**128,691,859.80**	**120,809,258.04***

**Additional liabilities to gratuities following inability to pay as and when due*
Source: Authors' Computation, 2017.

The table above shows the cash flow becoming liabilities as indicated in years interval. It is assumed that there is no new entry and no withdrawal except on attaining retirement age. Based on the average entry age (38.85) and average years of service (26.02), if all retired at age 65, the gratuities due for each year's interval are shown in the table above.

Conclusion and Recommendations

This paper sets out to provide concrete argument for mortality exclusion in already earned gratuities. The purpose was to ensure that plan members' benefits are not subjected to mortality because there is no sound basis for doing so. It was on this premise that valuation of gratuities of plan members was carried out. Taking into cognizance all the conditions attached to the scheme, the valuation of the scheme's liabilities due for past years of service was carried out. Since gratuities are done retrospectively and not prospectively, assumption was made that all employees will remain in service till retirement date for cash flow projection purposes. The liabilities which fell due were charged at 5% to compensate qualified members for erosion in value as a result of non-investment of the gratuity funds.

On the basis of the above results and information supplied, there was no evidence at our disposal that funds are set aside to meet the liability obligations becoming due neither was there any information on the investment activities of the plan sponsor. The benefit formula submitted to us which is annual basic salary divided by 12 is equivalent to 8.3% which is 11.7% short of total contribution of 20% of basic salary recommended in the provisions of Pension Reform Act 2014 defined contribution pension given that the gratuity scheme is wholly employer sponsored. In order to meet this minimum requirement, the benefit formula should be adjusted to annual basic salary divide by 5.5 instead of 12. The study also suggests that the valuation exercise should be carried out on a defined periodic basis as advised by the consulting Actuary and agreed to by trustees. In particular the trustees should

- Take cognizance of the probable uncertainty of future financial conditions. In our opinion, we therefore suggest that the financial health of the fund should be actuarially performed and cross-checked against temporary funding reviews in the valuation period up to next valuation period so as to signal warning of initial aversion to funding level and feasible contribution rate changes.

- Carry out liability modeling task proven to investigate the effect on the pension fund of possible investment scenarios which could occur at later times upwards. A review may be conducted to establish if long term pension fund can sustain future rate of contribution which subsequently can introduce deep certainty into plan sponsor's future budgets without necessarily introducing any strain or aversion into the financial health of the fund.
- Buy liability insurance to mitigate the risk of an ill health retirement which may negatively impact on solvency and funding level of the plan sponsor where applicable
- Sink aside a particular reserve to act as a buffer against adverse future experience by choosing actuarial assumptions which are proven to be efficient.
- Ensure drastic steps to monitor the decisions taken by plan sponsor relating to retirements or salary growth so as to cushion any adverse effect on the fund.
- Examine the trend analysis of the longevity of plan members and critically survey variabilities in order that the longevity statistics (assumptions) established at valuation elicits a perfect match to the particular experience of the fund.

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APPENDIX

DATA ON BENEFITS UNDER THE END-OF-SERVICE SCHEME

End-of-Service is payable under the scheme to employees on cessation of employment on the following grounds:

- Death
- Retirement
- Resignation

Normal retirement age is 65 years.

<u>End-of-Service Scheme</u>

End-of-Service is payable to the employees in the following proportion:

Length of service	Gratuity Entitlement
Less than 5 years	Nil

Greater than or equal to 5	last annual basic salary for each completed year of service

In calculation of gratuity benefit only completed years are counted and pro-rated benefit is provided for fraction years.

Table 6: Summary of Employees –Dec. 2017

Attained Age	No. of Employees	Service years	Gross Salary	Average Entry Year
27	1	1	27,671.88	24
28	1	1	42,109.38	26
29	3	3	82263.67	25
30	2	3	63765.63	26
31	3	1	138359.38	29
32	1	5	24,502.06	25
33	2	3	63,765.63	28
34	1	4	45,347.19	29
35	3	4	131886.15	30
37	2	10	44,376.25	26
39	1	11	29,799.58	26
40	1	1	91,000.00	38
41	3	6	135,029.45	34
42	2	12	63765.63	29
44	2	6	57074.81	37
45	4	5	366,503.76	39
46	1	11	97,997.05	33
47	1	11	144,003.86	35
48	1	9	97,997.05	38
49	2	11	217,359.17	37
54	1	11	29,799.58	41
56	1	12	20,418.38	43
55	1	11	29,072.76	42
57	2	12	420886.12	44

Source: The Company, 2017.