Available online at https://journal.rescollacomm.com/index.php/ijqrm/index

International Journal of Quantitative Research and Modeling

e-ISSN 2721-477X
p-ISSN 2722-5046

Vol. 5, No. 3, pp. 256-261, 2024

Actuarial Pension Fund Using the Projected Unit Credit (PUC) Method: Case Study at PT Taspen Cirebon Branch Office

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Abstract

The pension fund program is a program held by the government to ensure the welfare of Civil Servants (PNS) in retirement as old-age security. The pension program for civil servants is managed by a pension fund, PT Taspen (Persero). Actuarial calculations of pension funds need to be carried out to determine the amount of normal contributions and actuarial liabilities that must be paid by pension plan participants and companies. The actuarial calculation of pension funds used by PT Taspen in managing civil servant pension funds is the Accrued Benefit Cost which determines in advance the benefits that will be obtained by participants. The Projected Unit Credit (PUC) method is one part of the Accrued Benefit Cost. This study aims to determine normal contributions and actuarial liabilities using the Projected Unit Credit (PUC) method for civil servant pension program participants of PT Taspen (Persero) Cirebon Branch Office. The calculation results show that the PUC method provides a more accurate calculation of the estimated normal contributions and actuarial liabilities of the company. This study is expected to be a reference for other companies in managing employee pension funds using an actuarial approach.

Keywords: pension funding, Projected Unit Credit (PUC), normal cost, actuarial liability

1. Introduction

Welfare in old age is something that is coveted for a worker. Islam et al (2016) said that as a form of government concern in creating workers' welfare in old age, a pension program was created. According to Law Number 11 of 1992 concerning Pension Funds, a pension program is a program that seeks retirement benefits for participants. The pension program is managed and run by a pension fund institution. Based on Law Number 11 of 1992, a pension fund is a legal entity that manages and runs a pension program that promises benefits to participants at retirement. Pension funds are an important component in long-term financial planning, both for employees and companies. As a form of financial protection in retirement, pension funds are designed to ensure the welfare of employees after they are no longer actively working. One of the pension funds in Indonesia is PT Dana Tabungan dan Asuransi Pegawai Negara or commonly called PT Taspen (Persero) which is assigned by the government to manage and run pension programs for Civil Servants (PNS). Pension fund management companies or institutions, such as PT Taspen, are responsible for ensuring that sufficient funds are provided to meet future pension obligations.

One actuarial method that is widely used to calculate pension fund liabilities is Projected Unit Credit (PUC). The PUC method takes into account employees' pension rights based on projected future salary increases, as well as years of service. This approach allows companies to calculate pension obligations more accurately and realistically, given the dynamics of salary increases and employee career development. Thus, this method provides a clearer picture of the costs that companies must prepare to meet future pension obligations.

This case study aims to examine how the PUC method is applied in the calculation of actuarial liabilities at PT Taspen Cirebon Branch, as well as evaluate the extent to which this method is able to provide an appropriate calculation related to the company's pension obligations.

Through this study, it is expected to gain a deeper understanding of the mechanism of calculating pension funds using the PUC method, as well as its contribution in facilitating corporate financial planning related to pension funds.The findings of this study are also expected to provide insights for other institutions or companies that face similar challenges in managing employee pension funds.

2. Materials and Methods

2.1. Materials

The object used in this research is secondary data, namely data on Civil Servants (PNS) participating in the pension program at PT Taspen Cirebon Branch Office in 2022 which contains the gender of the participant, the age of the participant when appointed as a civil servant, retirement age, length of service, and last basic salary. In this study, pension benefits, present value of pension benefits, normal contributions, and actuarial liabilities will be determined using the Projected Unit Credit (PUC) method with the help of Microsoft Excel applications.

Table 1: PT Taspen pension program participant data

No	Gender	Participants Entry Age	Participant Retirement Age	Length of Service	Last Base Salary (IDR)
1	Female	27	60	33	55.399.200
2	Female	29	60	30	48.429.600
3	Female	24	60	35	42.280.800
4	Female	20	60	39	56.188.800
5	Male	27	58	31	46.464.000
6	Male	21	60	38	65.182.800
7	Male	22	60	38	62.538.000
8	Female	21	60	38	60.000.000
9	Male	29	58	28	49.297.200
10	Male	25	60	35	56.391.600
11	Female	28	58	30	30.621.600
12	Male	23	58	34	51.528.000
13	Female	23	58	34	52.068.000
14	Male	22	60	37	65.182.800
15	Male	30	58	27	56.982.000
16	Male	22	58	36	43.658.400
17	Female	28	60	31	48.300.000
18	Male	22	60	37	62.538.000
19	Female	20	60	39	60.000.000
20	Male	23	60	36	60.627.600

The retirement age limit of different employees is adjusted to Government Regulation No. 17 of 2020 concerning Amendments to Government Regulation No. 11 of 2017 concerning Civil Servant Management. And the final basic salary of employees is adjusted to the latest regulation, namely Government Regulation No. 5 of 2024 concerning the Nineteenth Amendment to Government Regulation No. 7 of 1997 concerning Civil Servant Salary Regulations. The interest rate assumption used in this study is taken from the company's internal assumptions used by PT Taspen, which is 9.7% (i = 9.7%), and the proportion of civil servant salaries according to government regulations is 2.5% (k = 2.5%).

2.2. Methods

This paper will determine the amount of normal contributions and actuarial liabilities using the Projected Unit Credit (PUC) method. This paper is conducted through the following steps:

(a) Compile the data obtained in the excel calculation table based on the Indonesian Mortalita Table IV 2019 with the assumption of the interest rate used by PT Taspen, which is 9.7% (i = 9.7%),
(b) Calculating the amount of pension benefits (B_r) based on the last salary assumption, with the known age of entry into work, the retirement age of the participant, the last basic salary (s_{r-1}) and the proportion of salary in accordance with government regulations which is 2.5% (k = 2.5%).
(c) Calculate the present value of pension benefits (PVFB) based on the amount of pension benefits that have been obtained previously, the initial lifetime annuity, the discount factor, and the chances of someone living today (age x years) until retirement age r years.

(d) Calculating normal contributions and actuarial liabilities using the Projected Unit Credit (PUC) method based on the present value of pension benefits (PVFB), total service period, and remaining service period of participants.
(e) Analyze and evaluate the calculation results, and draw conclusions.

3. Results and Discussion

3.1. Example of Actuarial Calculation of Pension Fund

An example of an actuarial calculation of a pension fund that will be carried out by taking a random sample of data that has been obtained. The sample used is participant number 9 with male gender, which is assumed when the calculation is carried out to be 32 years old (x = 32), appointed as a civil servant at the age of 29 years (y = 29), retirement age of 58 years (r = 58) with the basic salary for the last year is IDR 49,297,200.00 (s_{r-1} =49,297,200.00). Next, we will find the normal contribution and actuarial liability of the participant.

3.1.1. Calculation of Pension Benefits

An example of calculating the amount of pension benefits based on the final salary assumption for r = 58 is presented below.

$B_r = k(r-y)s_{r-1}$,
$B_{58} = 2.5\%\ (58-29)\ s_{57}$,
$B_{58} = 2.5\%\ (29)\ 49{,}297{,}200 = 35{,}740{,}470.$

So, the amount of pension benefits received by participants when they retire at the age of 58 is IDR 35,740,470. Furthermore, the amount of pension benefits is used to calculate the present value of pension benefits.

3.1.2. Calculation of Present Value of Future Benefits (PVFB)

Example of calculating the present value of future benefits for participants at the age of entry and the age at which the calculation is made.

a. Present value of future benefits at entry age (y = 29)

$$^{r}(PVFB)_y = B_r\ v^{r-y}\ {}_{(r-y)}p_y\ \ddot{a}_r$$
$$^{58}(PVFB)_{29} = 35{,}740{,}470\left(\frac{1}{1+0.097}\right)^{29}\left(\frac{l_{29+39}}{l_{29}}\right)\left(\frac{N_{58}}{D_{58}}\right)$$
$$^{58}(PVFB)_{29} = 21{,}272{,}839.61$$

The present value of pension benefits that participants will get at the entry age (y = 29 years) is IDR 21,272,839.61.

b. Present value of pension benefits at calculation age (x = 32)

$$^{r}(PVFB)_x = B_r\ v^{r-x}\ {}_{(r-x)}p_x\ \ddot{a}_r$$
$$^{58}(PVFB)_{32} = 35.740.470\left(\frac{1}{1+0{,}097}\right)^{26}\left(\frac{l_{32+26}}{l_{32}}\right)\left(\frac{N_{58}}{D_{58}}\right),$$
$$^{58}(PVFB)_{32} = 28.146.683{,}21.$$

The present value of pension benefits that participants will get at the calculation age of 32 years is IDR 28,146,683.21.

The results of the calculation of the present value of subsequent pension benefits until the participant reaches pension age (r = 58) with B_r = 35,740,470 using the excel application are shown in Table below. Then the present value of pension benefits that have been obtained will be used to calculate normal contributions and actuarial liabilities.

Table 2: Calculation of Present Value of Future Benefits (PVFB) with $i = 9{,}7\%$

x	v^{r-x}	${}_{(r-x)}p_x$	$\ddot{a}_r$	${}^{r}(PVFB)_x$
29	0.068235095	0.906966844	12.94904938	**21,272,839.61**
30	0.074853899	0.907602165	12.91401314	23,352,651.91
31	0.082114727	0.908283378	12.87679179	25,637,086.96
32	0.090079856	0.909019684	12.83733337	**28,146,683.21**
33	0.098817602	0.90981122	12.79545208	30,903,797.79
34	0.108402909	0.910658132	12.75094663	33,933,023.88
35	0.118917992	0.911560577	12.70359892	37,261,416.00
36	0.130453037	0.912536991	12.653426	40,919,557.28
37	0.143106981	0.913596763	12.60031645	44,940,885.77
38	0.156988359	0.914758507	12.54427299	49,362,842.49
39	0.172216229	0.916031791	12.48516922	54,226,412.93
40	0.188921204	0.917453844	12.42323877	59,578,722.00
41	0.20724656	0.91904379	12.35847804	65,471,123.08
42	0.227349477	0.920820975	12.29087768	71,960,706.18
43	0.249402376	0.922814253	12.22054427	79,111,776.12
44	0.273594406	0.925043608	12.1474632	86,995,277.02
45	0.300133064	0.927547988	12.07185426	95,692,187.80
46	0.329245971	0.930357668	11.99382395	105,292,312.80
47	0.36118283	0.933512942	11.91359782	115,897,400.35
48	0.396217565	0.937045604	11.83128961	127,620,577.77
49	0.434650668	0.940978896	11.7468948	140,587,429.27
50	0.476811783	0.945336899	11.66040083	154,938,677.21
51	0.523062526	0.95016373	11.57201876	170,835,573.61
52	0.573799591	0.955476178	11.48161805	188,454,430.88
53	0.629458152	0.961330682	11.38950961	208,001,238.22
54	0.690515592	0.967785813	11.2960148	229,709,520.83
55	0.757495605	0.974873141	11.20112818	253,836,737.43
56	0.830972678	0.982626061	11.10483559	280,673,414.20
57	0.911577028	0.99102	11.00644704	310,528,915.29
58	1	1	10.90488871	343,736,978.14

3.1.3. Projected Unit Credit (PUC)

An example of calculating the normal contribution amount using the PUC method for participants when the calculation age is performed (x = 32), with the known ${}^{r}(PVFB)_x = 28.146.683{,}21$ is presented as follows.

$${}^{PUC\ r}(NC)_x = \frac{{}^{r}(PVFB)_x}{(r-y)},$$

$${}^{PUC\ 58}(NC)_{32} = \frac{{}^{58}(PVFB)_{32}}{(58-29)},$$

$${}^{PUC\ 58}(NC)_{32} = \frac{28{,}146{,}683.21}{29} = 827{,}843.62.$$

The results obtained show that the amount of normal contributions that must be paid by participants when they are 32 years old is IDR827,843.62. The results of the calculation of the next normal contribution using the PUC method until the participant reaches retirement age (r = 58) are shown in Table 3 below.

Table 3: Calculation of normal contributions using the PUC method

x	${}^{r}(PVFB)_x$	${}^{PUC\,r}(NC)_x$
29	21,272,839.61	625,671.75
30	23,352,651.91	686,842.70
31	25,637,086.96	754,031.97
32	28,146,683.21	**827,843.62**
33	30,903,797.79	908,935.23
34	33,933,023.88	998,030.11
35	37,261,416.00	1,095,924.00
36	40,919,557.28	1,203,516.39
37	44,940,885.77	1,321,790.76
38	49,362,842.49	1,451,848.31
39	54,226,412.93	1,594,894.50
40	59,578,722.00	1,752,315.35
41	65,471,123.08	1,925,621.27
42	71,960,706.18	2,116,491.36
43	79,111,776.12	2,326,816.94
44	86,995,277.02	2,558,684.62
45	95,692,187.80	2,814,476.11
46	105,292,312.80	3,096,832.73
47	115,897,400.35	3,408,747.07
48	127,620,577.77	3,753,546.40
49	140,587,429.27	4,134,924.39
50	154,938,677.21	4,557,019.92
51	170,835,573.61	5,024,575.69
52	188,454,430.88	5,542,777.38
53	208,001,238.22	6,117,683.48
54	229,709,520.83	6,756,162.38
55	253,836,737.43	7,465,786.40
56	280,673,414.20	8,255,100.42
57	310,528,915.29	9,133,203.39
58	343,736,978.14	10,109,911.12

4. Conclusion

Based on the calculation results and discussion from the previous chapter, the following conclusions are obtained:

(a) The total value of normal pension fund contributions calculated from the time the participant is appointed as a civil servant until the retirement age of 58 years using the Projected Unit Credit (PUC) method is IDR102,320,005.77.

(b) The actuarial liability value of pension funds that must be paid by PT Taspen when the participant is 57 years old using the Projected Unit Credit (PUC) method is IDR255,187,422.53.

(c) The Projected Unit Credit (PUC) method is more beneficial for pension plan participants and PT Taspen, because the total normal pension fund contributions that must be paid by participants using the Projected Unit Credit (PUC) method are smaller than the Attained Age Normal (AAN) method, and the value of actuarial liabilities that must be paid by PT Taspen using the Projected Unit Credit (PUC) method increases each year smaller than the Attained Age Normal (AAN) method.

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