

Determining the Break-Even Point for Operating in the Pension Fund of Banks

Donya Haji Shahvardi¹ & Mehdi Tajodini²

¹ Master of Accountancy Banking

² Master of Accounting Banking, MA in Economics

Correspondence: Donya Haji Shahvardi, Master of Accountancy Banking.

Received: December 10, 2015

Accepted: January 10, 2016

Online Published: January 13, 2016

doi:10.5539/mas.v10n3p23

URL: <http://dx.doi.org/10.5539/mas.v10n3p23>

Abstract

This study is an attempt to investigate the development of actuarial science through a review on the concepts, theories and models related to actuary and its relation to pension funds and the break-even point for operating in the pension fund of banks during the financial period from 2013-2041. Furthermore, this study provides a strategy to exit the mentioned fund from the balance deficit. It is noteworthy that results indicated the resources deficit for the mentioned fund in the next three years.

Keywords: operational break-even point, actuarial, pension plans, pension funds of banks

1. Introduction

The problem of the pension fund is rooted in the fact that although pension plans is a long-term commitment, but it has some special features that are absent in other types of commitments. On the one hand their value are not certain, on the other hand, in many cases, companies do not know how many years they have to pay pensions to retirees. However, the payments are not ambiguous for them (Shabahang, 2008). In addition, an increase in the number of elderly people, prolongation of retirement, demographic trends, labor market recession and early retirement enhance the commitments. For this reason, long-term and medium-term effects of commitments for pension funds should be examined from the actuarial point of view. The design of a pension system in which the balance between resources and expenditure is established in the long term requires complex calculations about how to set parameters for receiving (premium rate, wages and benefits, premium payment term, etc.) and payments (age at retirement, life expectancy, pension formula and etc.) due to economic and social factors (Behzadi, 2008). According to the notification and the adoption of Accounting Standard No. 27 (pension benefits schemes) in pension plans for trustee funds, the funds have been required to evaluate the capability to pay future commitments and insert the results in the balance sheet for users by actuarial calculations.

2. Literature Review

For the first time in 1775, the actuarial term was ascribed to the English mathematician called Patterson who provided the life table for British society. In 1850, actuarial practices were used in the areas of life insurance and pension plans. In the early years of the present century, actuarial practices have been extended in new areas such as non-life insurance, medical care, social security, the financial condition of banks, and financial engineering (Roghanizadeh, 2007).

Stoner et al. (1999) conducted a study to determine the role and responsibilities of actuaries in England. In this study, according to an overview on actuary in the UK, defined contributions plans (DC) and defined benefit plans (DB) were compared, and similarities and contradictions in both plans and their advantages and disadvantages in the UK were investigated.

Gold (2003) reviewed the existing theory (transparent model) in which managers and investors consider the defined benefit plans similar to the operation of a subsidiary company and measure its value in terms of the value of the market portfolio. In addition, Gold proposed another alternative model (opaque model) in which investors and managers calculate the value of pension levels based on actuarial methods and economic assumptions and according to income.

Anantharaman (2001) conducted a study to investigate the actuarial role and economic incentives that are faced

in the choice of actuarial assumptions and pension plans with defined benefits. The results of this study showed that similar to situations the auditors are faced with, the risk of losing revenue from actuarial practices can affect the choice of assumptions and distort actuarial results on the status of pension plans.

3. Pension Plans and Its Use in Actuarial Calculations

Pension plans are programs whereby members after termination of service receive benefits in the form of pension.

3.1 Layers of Pension Plans

In general, pension plans are discussed in the following three layers:

First layer: the purpose of this layer is to provide a guarantee for the minimum supports of social security for the majority or all members of society, including health care, pension, disability and survivors.

Second layer: it considers to some extent the last wage at the time of employment and pensions in the first layer.

Third layer: this method is often used by people who have more financial power at the time of employment, including individual insurance such as life insurance and savings.

3.2 Actuarial Assumptions in Pension Plans

The following factors have a decisive role in the actuarial calculation and are considered as the actuarial assumptions:

- 1) The number of employees and pensioners
- 2) Salaries and benefits which are subject to superannuation payment
- 3) Salaries and benefits calculated for pension
- 4) Regular and timely payment of superannuation payment for employee and employer contributions
- 5) The age of pensioners and employees
- 6) An increase in salaries of employees and percentage of superannuation payment
- 7) The way to invest in the fund
- 8) Life expectancy
- 9) The level for cost of living
- 10) Mortality rate

In actuarial studies for pension plans, the most prominent factors include the death, retirement, and disability. When calculating the premium rate and the adjustment of costs and revenues, these factors must be considered.

3.3 Different Methods For the Actuarial Prediction of Pension Funds

In actuarial mathematics, there are different methods for predictions related to pension funds. These methods are mainly classified into three groups:

1. Absolute actuarial methods: These methods have many applications in the field of insurance.
2. Statistical and econometric models and methods: These methods include regression methods, time series analysis and statistical and econometric models.
3. Hybrid methods: Hybrid methods consider both internal and external factors.

3.4 Resources and Expenditures for Pension Plans

✓ Sources of income include:

- 1) Insurance premiums or superannuation payment
- 2) Benefits of investment in long-term projects
- 3) Government subsidies
- 4) Other income includes donations, gifts and penalties arising from failure to timely payment of insurance premiums

✓ expenditures or costs of pension plans are as follows:

- 5) Benefits costs (salaries and allowances)
- 6) Administrative costs

One method to assess the fulfillment of the obligations of the fund is the annual assessment method. In general, there would be a fundamental principle on plans for long-term benefits. This principle is expressed in the following equation:

"The present value of expected future revenue = present value of expected future costs"

The main question is that "when is the future in this system?" The premium rate is fixed but in comparison with the rate derived from the annual assessment system, it is higher in the first years. This extension is to provide resources to invest. The major problem in the system which makes its performance ambiguous is the validity of assumptions that lead to the determination of the premium rate by actuarial calculation. This means that when the balance period is prolonged, wages and pensions may be subject to major changes because of changing social and economic conditions, and factors such as mortality rates and interest rates.

5. Research Methodology

Actuarial calculations are used by three assumptions, including an increase in pension, an increase in salary at the time of employment, and the rate of return on investment as well as four different modes. The resources (assets) and expenditure (commitments) of the fund are separately calculated at four modes and by different assumptions in order to calculate the balance of resources and costs. It should be noted that the rate of increase in salaries of pensioners is 13% and 11%, the rate of increase in salaries at the time of employment is 15% and 13%, and the investment return rate is 17% and 15%.

6. Research Results

In order to generalize the experiences of other countries and achieve the purpose of the use of actuarial calculations in the country, the status of pension funds of banks in 2015 is evaluated using the actuarial calculation, evaluation method at the end of the year and the annual assessment method. In cases of possible future, we assess the status of the fund. Information extracted from the Bank Pension Fund has been summarized in Table 1.

Table 1. A summary information extracted from the Bank Pension Fund

Rate of return on investment of the fund is 17% and 15% on average.
An increase in the average life of female members to the average life of male members is 3 years
An increase in the age of male employee to the age of his wife is estimated 7 years on average
Retirement date is based on 30 years of experiences or 55 years for the age of men and 50 years for women.
A deceased retired person's pension includes all pension at the time of death.
The basis for calculating salaries of the heirs (deceased at the time of employment) is similar to the calculation of pensions considering a minimum wage.

The main assumptions of the actuarial calculations in this study are:

- the exemption of investment income from income tax
- Paying the personnel costs from the surplus investment of the Fund
- Service deduction on the basis of 30 years of experience for current employees (55 years old for men and 50 years old for women)

To determine the long-term survival of the fund (break-even), its financial status is considered by "annual assessment". In this method, the pension deductions are not included in calculations. According to data from the Bank Pension Fund, the output of every year (retirement or death) is determined based on mortality table and membership background. In other words, employees having 30 years of experiences or men at the age of 55 years old and women at the age of 50 years old as well as the deceased employees, pension is determined for them or their survivors. It is noteworthy that disabled, resigned and upcoming fired employees are negligible and not included in the calculations due to the low probability of their leaving. Based on the following four modes, the break-even point for the pension fund of banks is predicted. The results are shown in Tables 2 to 5.

6.1 First Mode: Predicting the Financial Status of the Fund at the End of Each Period by the Annual Assessment Method with Three Assumptions, including an Increase in Salaries at the Time of Employment by 15%, an Increase in Pensions by 13%, and Return on Investment by 17% without Considering the Beginning Inventory of the Fund

Table 2. Predicting surplus (deficit) of pension fund of banks in the first mode (Figures in Million Rials)

Surplus (deficit) at beginning of the period without considering the beginning inventory of the Fund	Value of pension deductions	Value Income of Pension Fund with considering investment income	Value for the received deduction at the beginning of the period	Financial period
-381,033	973,452	592,419	506,341	1392
-422,529	1,109,735	687,206	587,356	1393
-467,939	1,265,098	797,159	681,332	1394
-517,508	1,442,212	924,704	790,346	1395
-571,465	1,644,122	1,072,657	916,801	1396
-630,016	1,874,299	1,244,282	1,063,489	1397
-693,333	2,136,700	1,443,367	1,233,647	1398
-761,532	2,435,839	1,674,306	1,431,031	1399
-834,661	2,776,856	1,942,195	1,659,996	1400
-912,669	3,165,616	2,252,946	1,925,595	1401
-995,384	3,608,802	2,613,418	2,233,690	1402
-1,082,470	4,114,034	3,031,565	2,591,081	1403
-1,173,384	4,689,999	3,516,615	3,005,654	1404
-1,267,326	5,346,599	4,079,273	3,486,558	1405
-1,363,166	6,095,123	4,731,957	4,044,408	1406
-1,459,370	6,948,440	5,489,070	4,691,513	1407
-1,553,900	7,921,222	6,367,322	5,442,155	1408
-1,644,100	9,030,193	7,386,093	6,312,900	1409
-1,726,552	10,294,420	8,567,868	7,322,964	1410
-1,796,912	11,735,638	9,938,727	8,494,638	1411
-1,849,705	13,378,628	11,528,923	9,853,780	1412
-1,878,085	15,251,636	13,373,551	11,430,385	1413
-1,873,546	17,386,865	15,513,319	13,259,247	1414
-1,825,576	19,821,026	17,995,450	15,380,726	1415
-1,721,247	22,595,969	20,874,722	17,841,643	1416
-1,544,727	25,759,405	24,214,677	20,696,305	1417
-1,276,696	29,365,722	28,089,026	24,007,714	1418
-893,653	33,476,923	32,583,270	27,848,949	1419
-5,858,911	38,163,692	32,304,780	32,304,780	1420

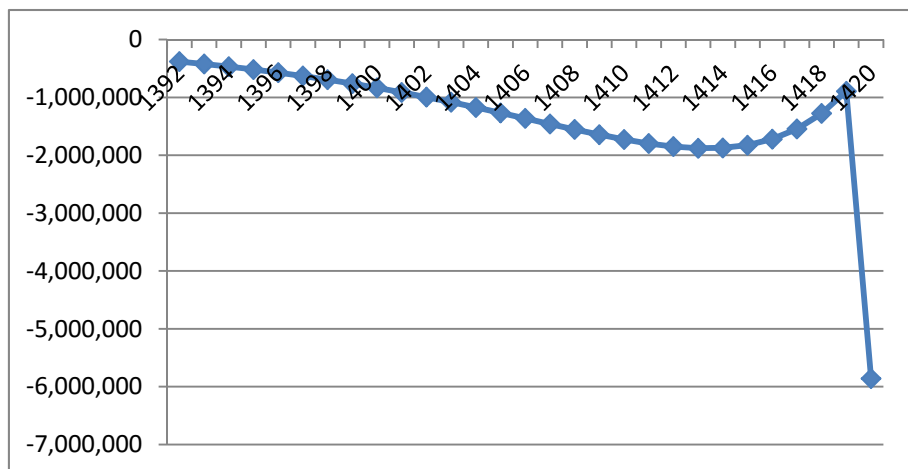


Figure 1. Predicting surplus (deficit) of pension fund of banks in the first mode

6.2 *Second Mode: Predicting the Financial Status of the Fund at the End of Each Period by the Annual Assessment Method with Three Assumptions, including an Increase in Salaries at the Time of Employment by 15%, an Increase in Pensions by 13%, and Return on Investment by 17% with Considering the Beginning Inventory of the Fund*

Table 3. Predicting surplus (deficit) of pension fund of banks in the second mode (Figures in Million Rials)

Surplus (deficit) at beginning of the period with considering the beginning inventory of the Fund	Value of pension deductions	Value Income of Pension Fund with considering investment income	Value for the received deduction at the beginning of the period	inventory of fund in the first period	Financial period
2,346,636	973,452	3,320,088	506,341	2,727,669	1392
2,323,035	1,109,735	3,432,770	587,356	2,745,564	1393
2,250,011	1,265,098	3,515,110	681,332	2,717,951	1394
2,115,006	1,442,212	3,557,218	790,346	2,632,513	1395
1,903,092	1,644,122	3,547,214	916,801	2,474,557	1396
1,596,602	1,874,299	3,470,900	1,063,489	2,226,618	1397
1,174,691	2,136,700	3,311,391	1,233,647	1,868,024	1398
612,856	2,435,839	3,048,694	1,431,031	1,374,388	1399
-117,620	2,776,856	2,659,236	1,659,996	717,041	1400
-1,050,284	3,165,616	2,115,331	1,925,595	-137,615	1401
-2,045,669	3,608,802	1,563,133	2,233,690	-1,050,284	1402
-3,128,138	4,114,034	985,896	2,591,081	-2,045,669	1403
-4,301,522	4,689,999	388,477	3,005,654	-3,128,138	1404
-5,568,848	5,346,599	-222,249	3,486,558	-4,301,522	1405
-6,932,013	6,095,123	-836,891	4,044,408	-5,568,848	1406
-8,391,383	6,948,440	-1,442,943	4,691,513	-6,932,013	1407
-9,945,283	7,921,222	-2,024,061	5,442,155	-8,391,383	1408
-11,589,383	9,030,193	-2,559,190	6,312,900	-9,945,283	1409
-13,315,934	10,294,420	-3,021,515	7,322,964	-11,589,383	1410
-15,112,846	11,735,638	-3,377,208	8,494,638	-13,315,934	1411
-16,962,550	13,378,628	-3,583,923	9,853,780	-15,112,846	1412
-18,840,635	15,251,636	-3,589,000	11,430,385	-16,962,550	1413
-20,714,181	17,386,865	-3,327,316	13,259,247	-18,840,635	1414
-22,539,757	19,821,026	-2,718,731	15,380,726	-20,714,181	1415
-24,261,004	22,595,969	-1,665,035	17,841,643	-22,539,757	1416

-25,805,731	25,759,405	-46,327	20,696,305	-24,261,004	1417
-27,082,427	29,365,722	2,283,294	24,007,714	-25,805,731	1418
-27,976,080	33,476,923	5,500,843	27,848,949	-27,082,427	1419
-28,343,179	38,163,692	9,820,513	32,304,780	-27,976,080	1420

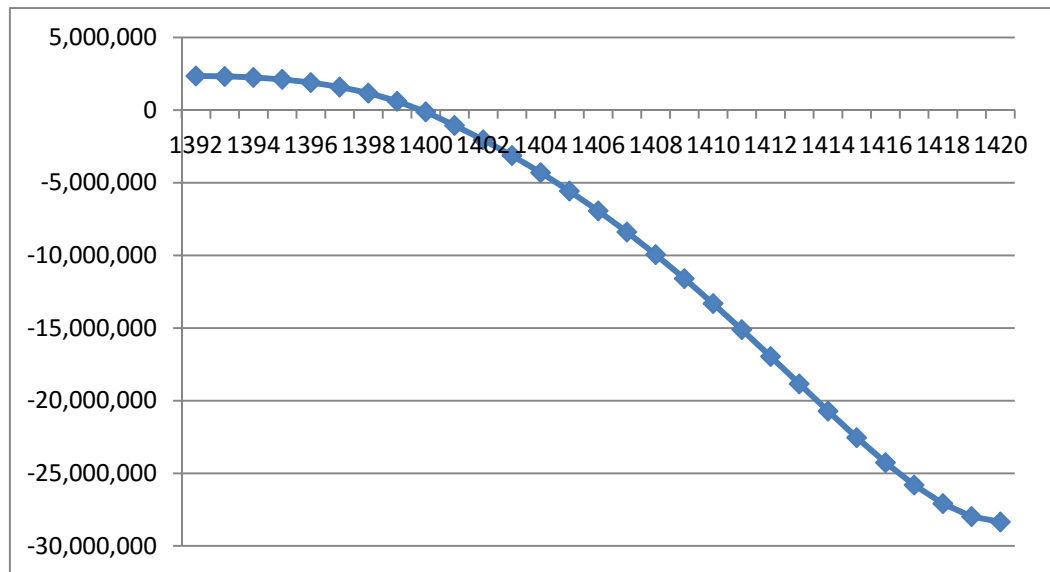


Figure 2. Predicting surplus (deficit) of pension fund of banks in the second mode

6.3 Third Mode: Predicting the Financial Status of the Fund at the End of Each Period by the Annual Assessment Method with Three Assumptions, including an Increase in Salaries at the Time of Employment by 13%, an Increase in Pensions by 11%, and Return on Investment by 15% without Considering the Beginning Inventory of the Fund

Table 4. Predicting surplus (deficit) of pension fund of banks in the third mode (Figures in Million Rials)

Surplus (deficit) at beginning of the period without considering the beginning inventory of the Fund	Value of pension deductions	Value Income of Pension Fund with considering investment income	Value for the received deduction at the beginning of the period	Financial period
-391,160	973,452	582,292	506,341	1392
-426,453	1,090,266	663,813	577,229	1393
-464,351	1,221,098	756,747	658,041	1394
-504,939	1,367,630	862,691	750,166	1395
-548,277	1,531,746	983,468	855,190	1396
-594,401	1,715,555	1,121,154	974,916	1397
-643,306	1,921,422	1,278,115	1,111,405	1398
-694,941	2,151,992	1,457,051	1,267,001	1399
-749,193	2,410,231	1,661,039	1,444,381	1400
-805,875	2,699,459	1,893,584	1,646,595	1401
-864,708	3,023,394	2,158,686	1,877,118	1402
-925,300	3,386,201	2,460,902	2,139,915	1403
-987,117	3,792,546	2,805,428	2,439,503	1404
-1,049,463	4,247,651	3,198,188	2,781,033	1405
-1,111,435	4,757,369	3,645,934	3,170,378	1406
-1,171,888	5,328,254	4,156,365	3,614,231	1407
-1,229,388	5,967,644	4,738,256	4,120,223	1408
-1,282,149	6,683,761	5,401,612	4,697,054	1409
-1,327,975	7,485,813	6,157,838	5,354,642	1410

-1,364,175	8,384,110	7,019,935	6,104,292	1411
-1,387,477	9,390,203	8,002,726	6,958,892	1412
-1,393,920	10,517,028	9,123,108	7,933,137	1413
-1,378,728	11,779,071	10,400,343	9,043,777	1414
-1,336,168	13,192,560	11,856,391	10,309,905	1415
-1,259,381	14,775,667	13,516,286	11,753,292	1416
-1,140,181	16,548,747	15,408,566	13,398,753	1417
-968,831	18,534,596	17,565,765	15,274,578	1418
-733,776	20,758,748	20,024,972	17,413,019	1419
-421,329	23,249,798	22,828,468	19,850,842	1420

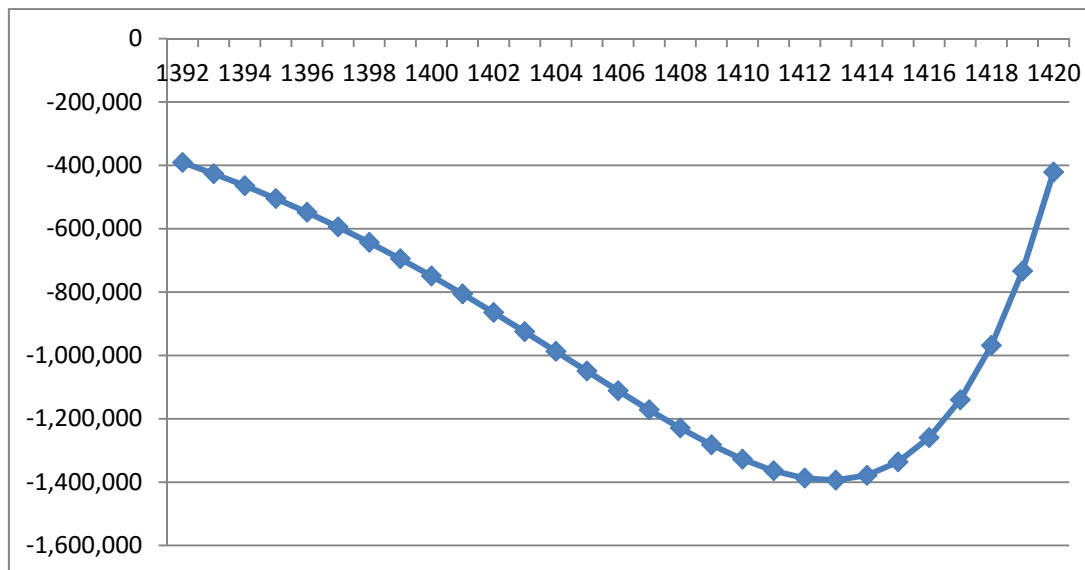


Figure 3. Predicting surplus (deficit) of pension fund of banks in the third mode

6.4 Fourth Mode: Predicting the Financial Status of the Fund at the End of Each Period by the Annual Assessment Method with Three Assumptions, including an Increase in Salaries at the Time of Employment by 13%, an Increase in Pensions by 11%, and Return on Investment by 15% with Considering the Beginning Inventory of the Fund

Table 5. Predicting surplus (deficit) of pension fund of banks in the fourth mode (Figures in Million Rials)

Surplus (deficit) at beginning of the period with considering the beginning inventory of the Fund	Value of pension deductions	Value Income of Pension Fund with considering investment income	Value for the received deduction at the beginning of the period	inventory of fund in the first period	Financial period
2,289,882	973,452	3,263,334	506,341	2,681,042	1392
2,206,911	1,090,266	3,297,178	577,229	2,633,365	1393
2,073,597	1,221,098	3,294,695	658,041	2,537,948	1394
1,879,698	1,367,630	3,247,328	750,166	2,384,636	1395
1,613,375	1,531,746	3,145,121	855,190	2,161,653	1396
1,260,980	1,715,555	2,976,535	974,916	1,855,381	1397
806,821	1,921,422	2,728,243	1,111,405	1,450,127	1398
232,903	2,151,992	2,384,896	1,267,001	927,844	1399
-481,354	2,410,231	1,928,878	1,444,381	267,839	1400
-1,287,229	2,699,459	1,412,230	1,646,595	-481,354	1401
-2,151,937	3,023,394	871,457	1,877,118	-1,287,229	1402

-3,077,237	3,386,201	308,965	2,139,915	-2,151,937	1403
-4,064,354	3,792,546	-271,808	2,439,503	-3,077,237	1404
-5,113,817	4,247,651	-866,166	2,781,033	-4,064,354	1405
-6,225,252	4,757,369	-1,467,883	3,170,378	-5,113,817	1406
-7,397,140	5,328,254	-2,068,887	3,614,231	-6,225,252	1407
-8,626,528	5,967,644	-2,658,884	4,120,223	-7,397,140	1408
-9,908,677	6,683,761	-3,224,915	4,697,054	-8,626,528	1409
-11,236,651	7,485,813	-3,750,839	5,354,642	-9,908,677	1410
-12,600,826	8,384,110	-4,216,716	6,104,292	-11,236,651	1411
-13,988,303	9,390,203	-4,598,100	6,958,892	-12,600,826	1412
-15,382,223	10,517,028	-4,865,195	7,933,137	-13,988,303	1413
-16,760,951	11,779,071	-4,981,880	9,043,777	-15,382,223	1414
-18,097,119	13,192,560	-4,904,560	10,309,905	-16,760,951	1415
-19,356,500	14,775,667	-4,580,833	11,753,292	-18,097,119	1416
-20,496,681	16,548,747	-3,947,934	13,398,753	-19,356,500	1417
-21,465,512	18,534,596	-2,930,916	15,274,578	-20,496,681	1418
-22,199,288	20,758,748	-1,440,540	17,413,019	-21,465,512	1419
-22,620,617	23,249,798	629,180	19,850,842	-22,199,288	1420

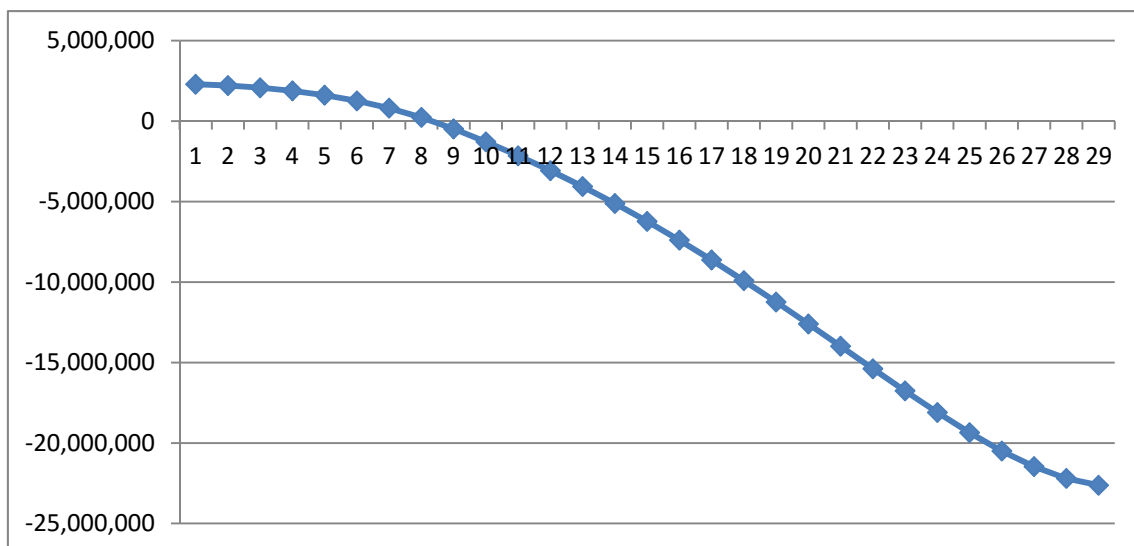


Figure 4. Predicting surplus (deficit) of pension fund of banks in the fourth mode

The results in each mode predict the deficit of the Pension Fund of banks during the studied period. Given the importance of the balance between resources and expenditures pension plans as well as the above results, some strategies are presented based on actuarial calculations for four modes.

7. Research Results

7.1 Findings

1. If the investment return rate is 17% per year, the annual growth of salaries at the time of employment is 15%, and annual growth of pensions is 13%, the fund will be faced with a deficit in 2021.
2. If the effective rate of return increases from 17% to 21%, the fund will have an appropriate status, the survival period for meeting obligations will be lifelong, and the fund will not be faced with a deficit.
3. If the investment return rate is not possible up to 21% for the Fund and the rate is less than 21%, the financial sustainability of the fund will be depleted and faced with a deficit.
4. If the investment return rate is 15% per year, the annual growth of salaries at the time of employment is 13%, and annual growth of pensions is 11%, the fund will be faced with a deficit in 2021.

7.2 Suggestions to Cover the Deficit of Funds

7.2.1 Suggestions Related to the Investment of Pension Fund of Banks

1. In order to reduce the deficit of the fund assuming an increase in salaries, it is necessary to increase the rate of return on investment, the minimum rate of return on investment fund will be about 21% to reduce the deficit and change it into a surplus of actuarial calculations.
2. For an increase in the superannuation payment up to 17% for the balance between assets and liabilities (in equilibrium), rate of return on investment of the fund will be 19%.
3. Receiving the superannuation payment and pensions for the appropriate amount at the appropriate time in terms of work experience and leniency added to increase pensions.
4. The disabled and deceased members will receive pensions for 20 years. Therefore, it leads to a lack of investment and increases commitments of the fund.
5. Performing actuarial calculations to review and assess the financial ability of the fund for meeting future obligations for more than 5 years and review the actuarial calculations for long periods.
6. Modifying actuarial calculations in line with any change in the resources and obligations of the pension fund of banks.

Analyzing the results of the above assumptions, we find out that change the rate of return on investment is determinative for changing surplus or deficit of actuarial calculations. Perilous investment among different countries is different according to investment stage, investment areas, and geographic regions (Saleh Abad, 2007).

7.2.2 Factors Affecting the Deficit of the Pension Fund of Banks

1. Lack of attention to the Results and Suggestions actuarial reports in previous years and full disclosure of financial information related to the accounting and financial reporting prescribed in Accounting Standard 27. Therefore, it is suggested that the continuity of the pension systems is based on actuarial calculations.
2. Early retirement (less than 55 years) considering life expectancy creates additional and heavy commitments for the fund.
3. An unusual increase in superannuation payment of employees.

Considering that the pension is calculated on the basis of the last two years of service, a high percentage of the increase in the salary increases the salary of the last years of service, the salaries of pensioners, and future obligations of the fund.

4. Inadequate investment in relation to the increase in salaries.

Lack of investment related to an increase in the rate of salaries is in direct contact with the inflation rate will cause the fund to be faced with deficits in the future. Lack of investment by the size of the inflation rate and also an increase in salaries in line with the inflation rate more quickly increases the fund commitments in comparison with the fund assets. Therefore, it causes the fund to be faced with the deficit.

References

- Anantharaman, D. (2001). *Actuarial independence, client importance and pension assumptions*. Rutgers Business School. Retrieved from <http://andromeda.Rutgers.edu/divya>
- Bartel, A. L. (2007). *Audit of state of Washington pension pension funding*. Actuarial valuation report.
- Behzadi, H. (2008). *Actuarial principles and concepts for pension funds*. Qom, Sohfi Publication.
- Gerber, H. U., & Elias, S. W. Sh. (2000). Investing for retirement: optimal capital growth and dynamic asset allocation. *North American Journal*, 4, 42.
- Gold, J. (2003). Accounting Bias Enables Equity Investment by D.B.p plans. *Working Paper*, 8.
- Karen, E. L., & Anenson, T. L. (2007). Public pension liability: why reform is necessary to save the retirement of state employees. *Notre Dame journal of law, ethics & public policy*.
- McCrary, R. T., & Gregory M. S. (2007). California public employees retirement system parallel valuation and certification of the actuarial valuation of the judges retirement system parallel valuation and certification of the actuarial valuation of the judges retirement system as of June, 30, 1.
- Office of the Washington state actuary. (2006). *Securing to tomorrows pension today*. Actuarial valuation report.

- Roghanizadeh, M. (2005). *Mathematical analysis on the status of pension funds in Iran and the design of the optimized system for the mentioned funds*. Qom, Sohfi Publication.
- Roghanizadeh, M. (2007). *Understanding the retirement systems in the world, winter*. Retrieved from <http://www.isa.org.ir>
- Roghanizadeh, M. (2008). The challenges of the pension system. *Journal of Social Security*, 29(9).
- Saleh Abadi, A., & Haghghi, M. (2007). *Methods of financing and investment activities of Venture Capital funds with Islamic approach (with evidence from Germany, UK and Japan)*. Venture Capital industry seminar, University of Tehran.
- Shabahang, R. (2008). *Accounting theory, Fourth Edition*. Tehran: Auditing Organization Publication.

Copyrights

Copyright for this article is retained by the author(s), with first publication rights granted to the journal.

This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/3.0/>).