Varazdin Development and Entrepreneurship Agency
in cooperation with
John Naisbitt University
University North
Faculty of Management University of Warsaw

Economic and Social Development

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CONTENTS

ACTUARIAL METHODS AND ASSUMPTIONS IN THE RETIREMENT BENEFITS PLANS

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ABSTRACT
The main objective of any pension scheme is to fulfil target pension liabilities as they fall due. Attaining this objective requires planning, assumptions, funding and continuous monitoring. The need to recognize and make provision for benefit payments in advance, involves the actuary in placing a present value on the future commitment to pay benefits. The main calculations carried out by actuaries are to determine annual cost (required contributions) of providing the pension benefits and the level of liabilities that should be recognized at a specific point in time. Contributions inflow is occurring at a different time and in a different pattern, so that the time value of money is an important consideration. Actuarial methods and assumptions in determining both the cost and funded status of pension plans and institutions for retirement provision across the European countries are different. Project Unit Method is the most common method used for determining the required contribution rate. Also, other methods, such as: Attained Age, Entry Age and Aggregate Methods are also sometimes used. Actuarial assumptions required in the valuation of retirement are economic assumptions and demographic assumptions. The flexibility in assumption setting and the lack of standardised sensitivity analysis creating potential hazards within the pension scheme. The aim of this paper is to show the influence of various actuarial assumptions on pension benefits and provision, because pension liabilities are highly sensitive to changes in actuarial assumptions. Special attention is given to plans of defined payments after termination of employment, rendering of a service, i.e. Projected Unit Credit Method (PUCM) in accordance with IAS 19 requirements. Various simulations and sensitivity analyses are prepared in order to evaluate the parameters of the model, validation and verification of obtained results.
Keywords: *Actuarial assumptions, PUCM, Sensitivity analysis, Pension plans*

1. INTRODUCTION

Pension policy is extensively present in the policy of every country. Numerous reasons, such as systemic, demographic, economic and political ones, led to the crisis in functioning of the state pension system in almost all countries, and especially in countries in transition. Fundamental reasons behind the current financing system, which lacks adequate financial reserve, are generally within the conceptual inexistence of a functional relationship between paid contributions and the pension level, therefore, lack of equilibrium of the level of required reserves and liabilities is a general characteristic of this system. Systemic reasons for misbalance in functioning of the current financing system lie, first of all, in inexistence of a full financial relationship between paid contributions and the pension level, i.e. non-recognition of the actuarial equivalence principle in its full essence as the basic insurance principle. These features led to existence of a big discrepancy between pension contribution rates and rates that are demographically conditioned, highly planned replacement rates, inadequate formulae for pension calculation. Pension insurance and the institutional reform of the pension insurance system are main topics currently and take up a significant position in plans of the countries with developed market economies, and especially countries in transition. Modalities and parameters for realisation of a long-term and sustainable pension system are different and present one of the most important challenges in this area. Undoubtedly, there is a significant connection between the selected parameters and stability of a pension system. Numerous researches

indicate that sensitivity to changes in the basic parameters make the pension insurance, from the aspect of management of pension funds and pension schemes, a complex product.
Time and duration of defined retirement benefits are not fixed and certain and they depend on the beneficiary himself. There may be a considerable delay between the promise to pay benefits being given and the actual payment of benefits. Therefore, information on the benefits promised before they are actually paid are necessary, i.e. actuarial projections that use assumptions about future events. Also, continuous analysis of the demographic and economic experience of a pension scheme is necessary, as well as calculation of the retirement benefits payable (early retirement reduction factors, lump sum benefits etc.).

2. MAIN CHARACTERISTICS OF PENSION PLANS

Pension plan can be with a defined contribution or a plan with defined benefits. Regarding Defined Benefit (DB) plans, benefits to be paid are defined in advance. The absolute level of the benefits may be defined in fixed monetary terms, perhaps dependent upon the number of years of service that the employee has achieved. These fixed benefits can be harmonised after retirement according to a contracted criteria (e.g. retail prices index). Formulae are in function of earnings in the year preceding the retirement (final salary plan) or the average earnings in a longer period (career average pay), which provide a big difference at the amounts of annual pension, as can be seen in continuation. If an individual earnings in year t is PY_t, and the rate of allocation approved in the year t is b, then total annual pension, according to the plan of average length of service for an individual who started working at e age, and is retired at r age:

$$\text{Pension benefit p.a.} = \sum_{t=e}^{r-1} \cdot b_t PY_t$$

If percentage of allocation for every year is the same, i.e. $b_t = b$, we have:

$$\sum_{t=e}^{r-1} bPY_t = b\sum_{t=e}^{r-1} PY_t = b(r-e)\frac{\sum_{t=e}^{r-1} PY_t}{(r-e)}$$

The second type of formulae for determination of pension benefits is use of the average of m years out of total n years of service, where $m < n$, and a_t is the rate of allocation according to the pension approved in year t. According to the plan of five-year average, the amount of the pension benefit would be calculated using the following formula:

$$\text{Pension benefit p.a.} = \sum_{t=e}^{r-1} a_t \cdot \frac{\sum_{t=r-5}^{r-1} PY_t}{5}$$

We will show an example of difference between amounts in annual pension by applying the stated calculations. Let entry age be 35, retirement age 65, contribution rate b_t=b=1% out of earnings every year, earnings growth is 3% every year, with earnings in the first year at the amount of 10,000. Annual pension benefit in this case is:

$$b(r-e)\cdot\frac{\sum_{t=e}^{r-1} PY_t}{r-e} = 4,658$$

if a_t = const., i.e. contribution for allocation for pension is the same in every year, we have:

$$\text{Pension benefit p.a.} = a \cdot (r - e) \cdot \frac{\sum_{t=y-5}^{y-1} PY_t}{5} = 6{,}870.$$

The benefits for service up to a given point in time, whether vested rights or not are accrued benefits. They may be calculated in relation to current earnings or projected earnings.
Where the pension formula defines benefits in terms of years of service, the accrued benefits are equal to the benefits defined by the formula but using only years of service up to the valuation date.
Let entry age be 20 and current age 35, as in previous example, retirement age 65 with retirement pension of 1% of salary per year of service.
Accrued benefits p.a. $=$ past service $\cdot 1\% \cdot$ salary

$= (35-20) \cdot\ 0.01\ \cdot\ 10{,}000 = 1{,}500$

The second method for calculation of accrued benefits is when total available benefits are multiplied by the ratio of number of years of service up to the valuation date to total years of service possible until benefits commence payment.

$$\text{Accrued benefit p.a.} = \frac{\text{past service}}{\max \text{service to age } 65} \text{ pension benefit at age } 65 \cdot \text{service to age } 65$$

$$= \frac{35-20}{65-20}\ 0.01\ \cdot 30\ \cdot 10{,}000 = 1{,}000$$

Defined Contribution **(**DC) plans provide an individual account for every participant and pension benefits are based exclusively on paid amount on the participant's account, on investment return and losses that are allocated to such account. Plans with determined contributions require that the amount or method for payment of contributions is contracted, and the contribution is paid to the account of every participant. If the amount of contribution is not defined, when contributions are paid it is mandatory in plans to allocate those contributions at participants' accounts according to the contracted criteria. The actuarial involvement in DC arrangements reflects to a large extent the actuarial involvement in normal life-assurance savings contracts. The majority of cases defined contribution plans may well be implemented using insurance contracts.
Actuarial involvement in occupational retirement provision differs more markedly from involvement in life assurance for DB plans and in particular "salary-dependent" plans. The level of actuarial involvement in occupational retirement benefits reflects the extent to which the occupational benefit system itself has been developed. This in turn reflects historical factors and specific conditions in the country.

3. ACTUARIAL METHODS

Each method may be characterised by security and stability of the method. The stability of a method would normally be considered in terms of the conditions required to ensure that the annual cost as defined by the method remains relatively stable. All the methods used can be considered prospective in that they refer to future liabilities and future contributions. The calculations are always based on the details of the current population of the pension scheme but in projecting the benefit payments to be made the population development is also projected. 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. Apart from this main objective, there are other objectives of actuarial methods. One of differentiation is to when the cost is met, where we have several methods.
Pay-as-you-go method introduces the concept of using the contributions made in respect of one generation (current employees) to pay the benefits accrued by another (current pensioners). An

advantage of the method is that on the introduction of the pension scheme, contributions in respect of active employees can be used immediately to pay pension benefits to retired people who would have been members of the scheme. This method is used in France, Serbia (public pension system), etc. One of the assumptions is that a system of public pension insurance can adequately function, among other things, in a situation when there are a great number of active insured relative to the number of insurance beneficiaries. It is estimated that this is a situation where pension remuneration (pension) for one beneficiary is financed from contributions of 3-3.5 (Rakonjac-Antic, 2012) or more active insured persons. In Serbia, dependency ratio is 1,1:1. With capitalisation or funded methods the cost of benefit provision is met when the employer is still active. The aim in respect of each individual is to have accrued an amount equal to the present value of all future benefit payments at the point in time that employee leaves the services of the employer. Capitalisation method can be further classified based on how the cost is met over the active service period. With fund-driven methods, the objective is to maintain a certain level of funding, which then defines the contribution required. This group of methods includes Current Unit method and Projected Unit method.

Definition of a certain level of contribution is the objective of Contribution-driven methods and further defines the level of fund to be accrued by a specific point in time. These methods include Entry Age method (EAN), Attained Age method and Aggregate method (Aitken, 2000; Anderson, 1992; Greenan, 2002). The Current Unit method is the most common way of funding for Dutch, Finnish, Norwegian and Swiss self-administered pension funds. The Projected Unit method is the most common choice in the United Kingdom, Ireland and Belgium, but this method is however also used by Spanish, Portuguese and Dutch pension funds and where IAS 19 (FRS 17 (UK) and RJ 271 (NL)) is applied for commercial accounting purposes (Collinson, 2001). Where insurance funding is popular, the Level Annual Premium method is commonly used.

The different methods do not only represent the different philosophies of actuaries regarding the "funding" of pension schemes and the recognition of pension cost. Method selection depends on historical development of retirement provision, but also on the freedom of choice available to the actuary and the restrictions of regulatory authorities.

The need to recognize and make provision for benefit payments in advance involves the actuary in placing a present value on the future commitment to pay benefits. That means finding the amount that needs to be held now in order to meet an uncertain commitment in the future. Actuaries reduce the future net cash flow of payments of benefits to employees by discounting to its real present value. On the other hand, the full present value of the total future benefits is not normally held at the time when the pension promise is first granted, but is recognised gradually over the period. Actuaries will select the method for this purpose. However, actuarial involvement in retirement benefits does not end with calculation and projection of the overall annual cost and accrued liabilities, there are numerous additional actuarial calculations.

4. DEFINED BENEFIT PLANS AFTER TERMINATION OF EMPLOYMENT, I.E. RENDERING OF A SERVICE

Benefit plans after termination of employment, i.e. rendering of a service related to the benefit, are formal and informal agreements stating that a company provides benefits after termination of employment. Actuarial techniques are mandatory to use in order 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. Both categories of actuarial assumptions are used, economic and demographic ones. IAS19 stipulates that PUCM is used and the paragraph 57 encourages involvement of a qualified actuary in the measurement of all obligations.

Present value of defined benefit is the present value of expected future benefits arising from employment in the current and prior periods.

Present value of the future benefit of an employee j of x age in the moment t is

$$PV_t\left(\text{future benefits}\right) = B^j(y)v^{y-x}\,{}_{y-x}p_x$$

where:

y - age when the benefit is paid or pension payment began,

v - a discounting factor involving the annual rate of interest or rate of return on bonds,

${}_{y-x}p_x$ - probability that a person of x age lives until y-x age, i.e. gains the right to benefit,

$B^j(y)$ - the amount of a lump sum payment or present value of a pension in the moment y

According to PUCM, current service cost is calculated by taking the present value of the future benefit (lump-sum payment or pension) and attributing that value to all years of employment. Current service cost in the moment t is defined as:

$$CSC_t^j = B^j(y)v^{y-x}\,{}_{y-x}p_x\,\frac{1}{y-e}$$

where e = age of joining the plan.

Obligation in the moment t is defined as present value in the moment t of future benefits reduced by future contributions:

$$\text{pucm}PVO_t^j = PV_t\left(\text{future benefits}\right) - PV_t\left(\text{costs of future employment}\right),$$

where $PV_t(\text{costs of future employment}) = CSC_t^j(y-x)$.

That leads to

$$\text{pucm}PVO_t^j = B^j(y)v^{y-x}\,{}_{y-x}p_x - CSC_t^j(y-x) = B^j(y)v^{y-x}\,{}_{y-x}p_x\,\frac{x-e}{y-e}$$

This alternative formula is also called the "pro-rata" approach to calculation of the final obligation since the present value of a future obligation is determined as a ratio from total service until the calculation date and expected total service that relates to the right to the benefit. Previous formula can be presented as the sum of obligations arising from income from the current employment year and previous years of employment as follows:

$$\text{pucm}PVO_t^j = B^j(y)v^{y-x}\,{}_{y-x}p_x\,\frac{1}{y-e} + B^j(y)v^{y-x}\,{}_{y-x}p_x\,\frac{x-1-e}{y-e},$$

Benefits belonging to previous years of employment for $p_{x-1} > 0$ can be expressed in the form

$$PB_t^j = \frac{{}_{y-(x-1)}p_{x-1}}{p_{x-1}}B^j(y)v^{y-(x-1)}\,\frac{x-1-e}{y-e} + i\,{}_{y-x}p_xB^j(y)v^{y-(x-1)}\,\frac{x-1-e}{y-e}.$$

If we assume that we observe an obligation arising from benefits belonging to previous years of the employee's service who remained in the company from year t-1 to year t, i.e. p_{x-1} of that employee is no longer important to us, i.e. we can assume that for him $p_{x-1}=1$, then we have the following:

$${}_{y-(x-1)}p_{x-1}B^j(y)v^{y-(x-1)}\,\frac{x-1-e}{y-e} + i\,{}_{y-x}p_xB^j(y)v^{y-(x-1)}\,\frac{x-1-e}{y-e}$$

The first addend is an obligation for an employee for year t-1, and the second addend is additional cost for year t, i.e. interest cost, which presents increase of the present value of defined obligations during period that occurs, because benefits from one period are closer to settlement.

Actuarial gains and losses comprise the difference between the pension payments actually made by an employer and the expected amount. A gain occurs if the amount paid is less than expected.

A loss occurs if the amount paid is higher than expected. Gains and losses can also arise from adjustments in actuarial assumptions.
Past service cost is the change in the present value of the obligation according to defined benefits, which results from the change or significant reductions of the plan. Past service cost may be either positive (where benefits are introduced or changed so that the present value of the defined benefit obligation increases) or negative (where existing benefits are changed so that the present value of the defined benefit obligation decreases).

5. PUCM AND CHANGES IN ACTUARIAL ASSUMPTIONS

Actuarial assumptions shall be unbiased and mutually compatible. Actuarial assumptions are unbiased if they are neither imprudent nor excessively conservative. Two main categories of actuarial assumptions are economic and demographic assumptions. Economic assumptions are required to project the amount of benefits that will be payable. Some of economic assumptions made by actuaries in valuing retirement benefits are discount rate, inflation, rates of salary increase and pensions in payment, rate of increase in pension benefits for deferred pensioners, state pension benefits increase, and rate of increase in dividends. Actuarial assumptions are mutually compatible if they reflect the economic relationships between those factors.
Inclusion of an assumption in the calculation and its level depends on specific features of a country, regulatory authorities or an employer, and other indicators taken into account by actuaries. The assumptions represent a best estimate of the long term development of interest earnings, salary and prices inflation. Discount rate may be chosen by reference to market bond yields on high quality corporate bonds. In countries where there is no deep market in such bonds, government bonds are used. In event of a sufficiently long maturity to match the estimated maturity of all the benefit payments (as in Serbia) actuaries use current market rates of the appropriate term to discount shorter term payments, and estimates the discount rate for longer maturities by extrapolating current market rates along the yield curve. Discounted series of payments can be invested and additional income can be achieved.
The second category of assumptions are demographic assumptions functioning as projection of development of current and former employees who are eligible for benefits. The study by Sithole et al. (2011) reveals that mortality assumptions vary systematically across countries. In some countries, different mortality tables are used; in other countries only one table is accepted. While differing life expectancies of men and women are mostly taken into account. In European countries, mortality tables usually contain projections of expected future improvements in life expectancy, although tables with past mortality data are in use. Rates of turnover, disability and early retirement are mainly included in calculations.
Influence of changes in actuarial assumptions to pension liabilities we will show in a company X from Serbia that has 1202 employees as of 31.12.2016. Various simulations and sensitivity analyses are prepared in order to evaluate the parameters of the model. For this purpose, the main assumptions were stated and provisions were calculated based on PUCM, and then model parameters were changed and the achieved influence was observed.
1. Condition for a regular retirement in Serbia for men is 45 years of service or at least 15 years of service and 65 years of age. Condition for early retirement is a combination of the condition for the old-age pension and required years of service according to the table of the regulatory authority. Required years of service are 40 years, while old-age condition increases, every year until 2024, until 60 years of age. In 2017, condition was 40 years of service and 56 years and 4 months of age.
Condition for regular retirement for women is 45 years of service or at least 15 years of service and age according to the table of the regulatory authority. In 2017, condition for old-age for women was 61 years and 6 months and 15 years of service. Condition for early retirement was 55 years and 8 months of age and 37 years and 6 months of service. Conditions increase every

year until 2024, i.e. 60 years of age and 40 years of service. Pension is permanently reduced by 0.34% for each month before coming of the years of age stipulated for acquiring the right to old-age pension.

When calculating provisions for termination benefits the first condition for retirement is taken (although it is not so common in practice), and termination benefits are not reduced in case of early retirement. In Serbia, the Labour Law stipulates that the minimum base for termination benefits when retiring is 2 average gross earnings in the Republic. The company X stipulated by an internal act 12 average gross earnings in the company.

2. In Serbia actuaries have freedom to estimate all of the parameters used in the calculations with some minimum requirements. Actuarial assumptions:

Regular discount rate is 3-5%. In undeveloped capital market, i.e. with minimum presence of debt securities in Serbia, it is difficult to define the benchmark for discount rate trends, which would reduce the future net cash flow of employees' benefits to its real present value. Previously, rate of return to frozen foreign exchange savings bonds was used, i.e. average weighted rate of return that can be expected in future from long-term government bonds with a corrective criterion, extrapolation based on macroeconomic modelling of applicable rates of return from short-term government bonds. In 2017 government bonds were issued in Euros with maturity of 10 years and return of 4%. Discount rate, stipulated by the regulatory authority (National Bank of Serbia-NBS) for technical provisions, is a one-year-five-year average of the rate of return or 5%, while for the mathematical provision it is 3% (from August 2017 it will be 2.25%). The key policy rate of the NBS decreased, since the beginning of 2015, from 8% to 4%. Rate of price inflation is 1.6% and rate of decrease in social security benefits is about 2.2% for 2015 (there are no new data, although slight increase of social security benefits is expected). Growth rate of earnings is defined either based on growth of earnings for the industry sector and the territory (average salary in Belgrade is by 126% higher compared to some cities in the south of the country) in the Republic (approximately 2%), or based on company management plans and specific features of the company itself. In certain companies of foreign ownership, earnings are connected to EUR (1 EUR=123.46 RSD on 31 December 2016).

Fluctuation rate of employees is long-term or set according to periods (number of periods and number of years in periods used in calculations is different and reflects specificity of a certain company). Long-term fluctuation rate used is from -2% to 2%, depending on the company.

Many companies in Serbia reduced number of employees in previous period due to restructuring process. Within the observed sample of 20 companies, the number of employees was in average reduced by 6% compared to the previous year, and percentage is far higher if we observe the period from 2013. If it is not possible to determine the rate based on past experience, then management plans or their combination is used.

Most often applied annuity tables are mortality tables RS2010-2012 (the regulatory authority stipulates use of the latest tables, separately for men and women). In some cases, mortality rates are derived by combining past experience of insurance companies and mortality of Serbian population. For disability, actuaries either directly implement foreign tables (from reinsurers, mostly German tables) or combine them with available data of Serbian population. A single rate of about 0.15% is often used.

Government bonds represent the bulk of portfolio investments. Currently, the longest maturity for government bonds of the Republic of Serbia in dinars is 7 years with maximum return of 5.6%[1], while for government bonds in it is 10 years and return is from 4% and they are exempted from tax payment.

[1] Issue in 2014 to 10 years with weighted average interest rate on the Republic of Serbia dinar government securities of 12.99%, and issue in 2016 with weighted average interest rate on the Republic of Serbia government securities in euro of 4.2%. http://www.javnidug.gov.rs

As can been noticed from the above stated, actuarial assumptions vary. Also, considering a large number of problems in application of IAS 19 in Serbia, a relevant experience in the national market is necessary. In our calculation, mortality tables RS 2010-2012 and disability rate 0.15% remain unchanged. Table 1 shows a comparative overview of provisions depending on the change in the main actuarial assumptions.

Table 1: Set of Assumptions-change in discount rate, salary growth and fluctuation rate (Author's calculations)

Assumptions	Basic	A1	A2	A3	A4	A5	A6
Discount rate	4%	**5%**	**3%**	4%	4%	4%	4%
Salary growth	2%	2%	2%	**3%**	**1%**	2%	2%
Fluctuation rate	0%	0%	0%	0%	0%	**1%**	**-1%**
Provisions (EUR)	2,619,198	2,310,715	2,996,074	3,000,127	2,302,437	3,008,499	2,296,669

Comparison of changes in amounts of provisions is done in relation to the first set of assumptions (basic), discount rate is 4%, salary growth is 2% and long-term fluctuation rate is 0%. Change of the discount rate by 1% on average decrease or increase the value of the liability by 13,10% (comparison of basic assumptions, assumptions 1 and assumptions 2).
Change in the salary growth rate by 1% will on average decrease or increase the value of the liability by 13,32% (assumption 3 and 4).
When observing separately, the positive fluctuation rate leads to a higher level of provisions, while the negative rate reduces the level of provisions. Negative rate, under assumption that the number of new employees of younger age, and the number of employees who left the company are of older age, can lead to higher provisions. Moreover, change of the fluctuation rate by 1% change will on average decrease or increase the value of the liability by 13.59% (assumption 5 and 6). Changes in only one parameter for 1% leads to the increase/decrease of the provision for about 13%. Let's assume now two set of assumptions, "optimistic" and "pessimistic" sets. Optimistic scenario assuming that new employees are young and that the fluctuation rate is -1%, salary growth is 1% and discount rate is 5%.

Table 2. "Optimistic" and "Pessimistic" assumptions (Author's calculations)

Assumptions	Basic	Optimistic	Pessimistic
Discount rate	4%	5%	3%
Salary growth	2%	1%	3%
Fluctuation rate	0%	-1%	1%
State of provisions	2,619,198	1,822,923	4,044,404

All selected assumptions in optimistic set lead to decrease of provisions. In comparison with initial assumptions, this set of assumptions decreases provisions by 30.40% (Table 2). On the other hand, pessimistic simulation parameters increases provision by even 54.41%.
Using only mortality tables, without any additional adjustments for the disability rate 0.15%, the provisions level increases by approximately 2%. Furthermore, changing the assumption about life expectancy by one year, on average leads to a 3-4% change in the value of pension provision. IAS 19 stipulates disclosure of results of sensitivity analysis that indicates the influence of each significant actuarial assumptions on the outcome of pension valuation, as it is shown. In Serbian practice, however, the sensitivity analysis mostly includes only increase/decrease of the discount rate and salary growth rate.

6. CONCLUSION

Impact of actuarial assumptions on companies' balance sheet is economically significant. The actuarial method and assumptions that are used depend upon pension scheme and the purposes for which the calculations are being made. In the majority of European countries, different regulatory authorities interested in the results of the calculations restricting a free choice of the calculation method and assumptions. The restrictions can be rigorous or prescribe a minimum or maximum, either in the method and assumptions. On the other hand, company management enjoys a certain degree of discretion to set some parameters. On the other words, companies use the discretion available to them to manipulate the assumptions to their advantage. Changes in only one parameter for 1% leads to the increase/decrease of the provision for about 13%. The more "optimistic" assumptions (higher discount rate, lower salary growth and fluctuation rate) can lead to decrease of provision/obligations by even 30%. The assumptions need to represent the best estimate of the long term development of key parameters with all necessary explanation and continuous analysis of the demographic and economic experience.

It is necessary that the certified actuary is independent while performing his business activities and that he performs his business activities in accordance with the law and rules of actuarial profession, good business customs and business ethics. Actuarial assumptions should be unbiased and mutually compatible and reflect specificity of the company and the state.

LITERATURE:

1. Aitken, W. (2000). *A problem-solving approach to pension funding and valuation*. Winsted, Connecticut: ACTEX Publications.
2. Anderson, A. (1992). *Pension Mathematics for Actuaries*. Winsted, Connecticut: ACTEX Publications.
3. Collinson, D. (2001). Used in the valuation of Retirement benefits in the EU and other European countries. European actuarial consultative group. Retrived 22.2.2017 from www.gcactuaries.org
4. Greenan, J. (2002). *The Handbook of Canadian Pension and Benefit Plans*, 12th Edition, Toronto, Ontario: CCH Canadian Limited.
5. International Accounting Standards Board. (2014), *IAS 19, Accounting for Employee Benefits.* Retrived 10.05.2016 from www.ifrs.org.
6. McNally, B and O'Connor, T. (2013). *Actuarial Valuation of Pension Schemes- An Irish Perspective.* National University of Ireland Maynooth. Retrieved 14.02.2017 from http://eprints.maynoothuniversity.ie/4427/
7. Rakonjac-Antic, T. (2012). *Pension and Health insurance.* Belgrade: Faculty of Economics, University of Belgrade.
8. Sithole, T, Haberman, S and Verrall, R. J. (2011). Second international comparative study of mortality tables for pension fund retirees. *British Actuarial Journal*, 17(3), pp. 650-671.