Malaysian Journal of Economic Studies 49 (2): 111-119, 2012 ISSN 1511-4554

A Study on Longevity Factors for the New and Old Government Pension Policies in Malaysia

Rose Irnawaty Ibrahim[1]
Islamic Science University of Malaysia

Zailan Siri[2]
University of Malaya

Abstract: The objectives of this study are to compare and analyse the new and old government pension policies in Malaysia in terms of the longevity factor. Pensions are paid for the rest of the pensioner's life and in the form of derivative pensions to the spouse and child (if any) in the event of death. Hence, the longevity factor for a pensioner who survives and a pensioner who dies are formulated and estimated separately for both pension policies. In order to formulate these longevity factors, it is important to develop a family model for these two categories of pensioners separately. To formulate and estimate these factors, the theory of annuities and the Pension Law of Malaysia need to be studied. A comparison was conducted using empirical data sets of male pensioners in Malaysia from 1991 to 2000. It was found that the new government pension policy will result in more favourable financial implications for government employees or pensioners in the future.

Keywords: Derivative pension and annuities, longevity factor, pension
JEL classification: C82, D04, G38, H55, H75

1. Introduction

In recent years, pension has become an important element of cost to the government and private employers. A pension is a series of monetary payments paid to a retired employee and his/her survivors following retirement. Although many pensions are paid in a series of periodic payments of roughly equal amounts, it is also possible for pensions to be paid as a lump sum or as a combination of a large initial payment followed by smaller periodic payments. The payments usually continue for the rest of the natural life of the recipient, and sometimes to a spouse or other survivors.

Many studies show that life expectancy has increased in most countries. Since the life expectancy tends to increase over time for males and females, the mortality risk tends to be smaller. Therefore, pensioners are expected to live longer and thereby cause an increase in pension liabilities for the government. At the same time, the availability of better healthcare also contributes to higher life expectancy. Lindell (2003) suggested that the problem of increasing life expectancy in a pension scheme can be resolved by adjusting the accrued pension when granted according to the latest mortality rates and raising the set retirement

[1] Faculty of Science and Technology, Islamic Science University of Malaysia, 71800 Bandar Baru Nilai, Negeri Sembilan. Email: *rose.irnawaty@usim.edu.my*
[2] Institute of Mathematical Sciences, Faculty of Science, University of Malaya, 50603 Kuala Lumpur. Email: *zailansiri@um.edu.my*

age. Leibfritz (2003) stated that in order to reduce the burden on pension financing, employees should retire at a later age as people on average are living longer and consequently raising public pension payments. Moreover, healthy people may consider working longer rather than stop working and accepting low pensions. Rappaport (2002) concluded that increasing longevity, in the absence of other changes, affects a fundamental balance in society, between those who work to provide goods and services and those who have retired but continue to consume those goods and services. The individual, family, and also private and public sectors will be affected. It will also affect future governmental programmes for helping the elderly and the poor in general. Therefore, suggestions have been voiced to raise retirement age to maintain this balance as the population ages. In addition, the impact of higher life expectancy is common to all pension schemes around the world. To counteract this impact, Machnes (2000) suggested an increase in the contributions of the members who are still working, a raise in the retirement age or a decrease in the benefits given to pensioners. In view of this, it is important to conduct a study on the comparison of the longevity factors for the new and old government pension policies in Malaysia with the increase of the retirement age from 55 to 60.

The Malaysian Government Pension Scheme is offered by the Malaysian government to its employees in the public sector who are on pensionable status. The public sector employees include those employed directly by the government, statutory bodies and local authorities. The scheme was established in 1951, before the independence of Malaysia. The purpose of the scheme is to provide economic security to government employees and their survivors in the event of retirement, death and permanent disability. The benefits provided under the Malaysian Government Pension Scheme are retirement benefits in the form of monthly pensions and a gratuity; survivors' benefits (derivative pension) and disability pension.

Under the old Malaysian Government Pension policy, if the pensionable government employee dies after retirement within the period of 12½ years from the date of his retirement, the spouse and children will receive 100per cent of the monthly pension for a period not exceeding the difference between the period of 12½ years and the retirement period of the pensioner; and subsequently, the amount reduces to 70 per cent. However, if the pensionable government employee dies after the period of 12½ years from the date of his retirement, the spouse and children will receive 70 per cent of the monthly pension as stated in Pensions Laws of Malaysia (2001). This condition has resulted in financial burdens on pension recipients with young children after the death of the pensionable government employee or pensioner. To reduce this burden, with effect from 1 January 2009, the Malaysian Government has abolished this regulation, and 100 per cent of the derivative pension will be paid throughout the period of eligibility. The government has also agreed to compute the pension based on a formula that takes into account a period of up to a maximum of 30 years of service effective 1 January 2009. Prior to this, the pension was computed at a maximum service of up to 25 years (*http://www.jpapencen.gov.my/english/ new_policy.html*).

2. Review on Life Annuities

Pension is a stream of payments made in the form of an annuity for pensionable government employees and their survivors. Thus, we can say that pension is a special type of life annuity. To estimate the longevity factor, the theory of life annuities needs to be studied.

As discussed by Neill (1977), Jordon (1967) and Hooker (1957), life annuities are a regular series of payments which continue while the life assured is still alive, known as a single life annuity. Generally, an annuity ends with the death of the holder but can be designed to be paid during the lives of more than one person. This is known as a joint life annuity. A joint life annuity is an annuity which depends on more than one life. In practice, annuities may be paid more frequently such as quarterly, semi-annually, or annually. However, pensions are often paid monthly. For example, under the Malaysian Government Pension Scheme, the payment of pensions is usually made on a monthly basis and is payable at the end of the month.

As mentioned by Neill (1977), Jordon (1967) and Hooker (1957), if the payment is payable at the end of each year for the life of the participant and ceases upon the death of the participant, the present value of 1 payable at the end of each year is denoted by a_x. And the present value of 1 payable m times at the end of each year to a participant aged x is denoted by $a_x^{(m)}$, where it consists of payments, each of $\frac{1}{m}$, at age $x+\frac{1}{m}, x+\frac{2}{m}, x+\frac{3}{m}$. Therefore, the present value may be written as:

$$a_x^{(m)} \cong a_x + \frac{m-1}{2m}$$

The present value of 1 payable at the end of each year which ceases on the death of a participant aged x for a fixed period of time n is denoted by $a_{x:\overline{n}|}$. It can be derived as:

$$a_{x:\overline{n}|} = a_x - {}_n/a_x$$

where

${}_n/a_x$ = an annuity on a life aged x deferred for n years.

Similarly, the present value of 1 payable at the end of each year which ceases on the death of a participant aged x for a fixed period of time n and payable m times a year is denoted by $a_{x:\overline{n}|}^{(m)}$. It is derived as:

$$a_{x:\overline{n}|}^{(m)} = a_x^{(m)} - {}_n/a_x^{(m)}$$

The joint life annuities are also important in this study because we are interested in estimating the pension factor for the spouse and child. A joint annuity payable to a life aged y, m times a year and commences at the end of each year in which a life aged x dies is denoted by $a_{x/y}^{(m)}$. It can be derived as:

$$a_{x/y}^{(m)} = a_y^{(m)} - a_{xy}^{(m)}$$

Also, the joint annuity with a certain period payable to a life aged y, m times a year after a life aged x dies with no payments to be made after n years from the present time is denoted by $a_{x/y:\overline{n}|}^{(m)}$. It is derived as follows:

$$a_{x/y:\overline{n}|}^{(m)} = a_{y:\overline{n}|}^{(m)} - a_{xy:\overline{n}|}^{(m)}$$

3. Data

The data on male pensioners who survived and male pensioners who retired at age 55 and died during retirement, and their survivors (spouse and children) were taken from the Pension Department, Public Service Department (PSD) Malaysia. The data set was from year 1991 to 2000 and the information collected related to date of birth, date of entry to the scheme, date of retirement, date of death, gender, final monthly basic salary, as well as other information on dependants such as date of birth, status and gender. Data were adjusted to exclude persons of unknown date of birth, date of entry to the scheme, date of retirement, date of death, gender and final monthly basic salary. Since the data on members of parliament, political secretaries, judges, members of the commission and members of the military are confidential, the study only focuses on government employees except for those whose information are classified as confidential.

4. Methodology

This section deliberates on the methodology that is used to achieve the objectives of the study. To estimate the longevity factor for a pensioner who survives and a pensioner who dies, a mortality table needs to be constructed. As mentioned in Sections 1 and 2, to estimate the longevity factor, we need the mortality rates and interest rate. In this study, the mortality rates of the Malaysian population in the years 1991 to 2000 were used. Since we only have an abridged life table for the Malaysian population, we expanded the table to a complete life table using the Heligman-Pollard model.[3] In this study, we used the interest rate of 3 per cent for the purpose of estimating the longevity factor.[4]

However, before we estimate the longevity factor for a pensioner who survives and a pensioner who dies for both policies, we develop a formula for the longevity factors for the pensioner, spouse and children separately for both policies as follows:

4.1 The Old Government Pension Policy

Under the old government pension policy, the longevity factors for a pensioner, spouse and children are formulated as follows:

(i) Longevity factor for pensioner, $L_i^x(p)$

From the theory of annuities, the longevity factor for a pensioner who chooses to retire at age x can be written as:

$$L_i^x(p) = a_x^{(12)} \cong a_x + \frac{11}{24}$$

(ii) Longevity factor for spouse, $L_i^x(s)$

According to the Pensions Laws of Malaysia (2001), the longevity factor for the spouse can be written as:

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[3] Refer to Ibrahim 2008.

[4] In the Pension Trust Fund, interest rate of 3% is used in the calculation of pension liabilities. This figure is therefore adopted in the calculation.

$$L_i^x(s) = 100\%\, a^{(12)}_{x/y\,:\,\overline{12.5}|} + 70\%\left[\frac{l_x - l_{x+12.5}}{l_x} * \frac{l_{y+12.5}}{l_y}\right] v^{12.5} a^{(12)}_{y+12.5}$$
$$+ 70\%\left[\frac{l_{x+12.5}}{l_x} * \frac{l_{y+12.5}}{l_y}\right] v^{12.5} a^{(12)}_{x+12.5/y+12.5}$$

where

$L_i^x(s)$ = longevity factor for a spouse of a particular pensioner *i* who chooses to retire at age *x*
x = retirement age of pensioner
y = age of spouse
l_x = number of lives at age *x*
v = $1/(1+i)$, where *i* is the interest rate

(iii) Longevity factor for child, $L_i^x(c)$

According to the Pensions Laws of Malaysia (2001), children of a pensioner are eligible for the derivative pension until age 21, or on receiving their first bachelor degree. However, in the study, we assumed that the children are eligible for the derivative pension until age 21 only. Because of these two constraints, the longevity factors for the child are divided into two parts, depending on the age of the child. The formula below is used in formulating the longevity factor for the child aged one up to nine:

$$L_i^x(c) = 100\%\, a^{(12)}_{x/z\,:\,\overline{12.5}|} + 70\%\left(\frac{l_x - l_{x+12.5}}{l_x} * \frac{l_{z+12.5}}{l_z}\right) v^{12.5} a^{(12)}_{z+12.5\,:\,\overline{n}|}$$
$$+ 70\%\left(\frac{l_{x+12.5}}{l_x} * \frac{l_{z+12.5}}{l_z}\right) v^{12.5} a^{(12)}_{x+12.5/z+12.5\,:\,\overline{n}|}$$

where

$L_i^x(c)$ = longevity factor for a child of a particular pensioner *i* who chooses to retire at age *x*
x = retirement age of pensioner
z = age of child.

For a child attaining age 10 to 21 years, the formula of the longevity factor for the child is as follows:

$$L_i^x(c) = a^{(12)}_{x/z\,:\,\overline{n}|}$$

where

x = retirement age of pensioner
z = age of child
n = number of years

4.2. The New Government Pension Policy

Under the new government pension policy, the longevity factor for a spouse can be written as:

$$L_i^x(s) = a_x^{(12)} \cong a_x + \frac{11}{24}$$

Also, the longevity factor for the child can be written as:

$$L_i^x(c) = a_{\overline{x/z:n}|}^{(12)}$$

Pensions are paid for the rest of the pensioner's life and in the form of derivative pensions to the spouse and child (if any) in the event of the pensioner's death. Hence, the longevity factors for a pensioner who survives and a pensioner who dies will be formulated and estimated separately for both pension policies. To estimate the longevity factor for a pensioner who survives, we developed four types of family models as follows:

Family Model I:	The pensioner is single (*p*)
Family Model II:	The pensioner has an eligible spouse only (*ps*)
Family Model III:	The pensioner has eligible children only (*pc*)
Family Model IV:	The pensioner has eligible spouse and children (*psc*)

Thus, the longevity factor for a pensioner who survives can be written as:

$$L_i^x = p_p \times L_i^x(p) + p_{ps} \times L_i^x(ps) + p_{pc} \times L_i^x(pc) + p_{psc} \times L_i^x(psc)$$

where

$$L_i^x(ps) = L_i^x(p) + L_i^x(s)$$

$$L_i^x(pc) = L_i^x(p) + L_i^x(c)$$

$$L_i^x(psc) = L_i^x(p) + L_i^x(s) + L_i^x(c)$$

p_p , p_{ps} , p_{pc} , p_{psc} are the probability for each type of family model mentioned above.

For a pensioner who dies, we developed three types of family models as follows:

Family Model I:	The pensioner has an eligible spouse only (*s*)
Family Model II:	The pensioner has eligible children only (*c*)
Family Model III:	The pensioner has eligible spouse and children (*sc*)

Thus the longevity factor for a pensioner who dies can be written as:

$$L_i^{d(x)} = p_s \times L_i^x(s) + p_c \times L_i^x(c) + p_{sc} \times L_i^x(sc)$$

where

$L_i^x(sc) = L_i^x(s) + L_i^x(c)$ and

p_s , p_c , p_{sc} are the probability for each type of family model mentioned above.

5. Estimated Results and Discussion

Based on our data collection, we found that a 3 per cent fall in the Family Model I, 94.1 per cent in the Family Model II, 1.79 per cent in the Family Model III and only 1.11 per cent in the Family Model IV for the case of a pensioner who survives. Therefore, in this study we used these probabilities as our assumptions to estimate the longevity factor for a pensioner who survives. Thus, the longevity factor for a pensioner who survives becomes:

$$L_i^x = 0.03 \times L_i^x(p) + 0.941 \times L_i^x(ps) + 0.0179 \times L_i^x(pc) + 0.0111 \times L_i^x(psc)$$

We found that 96 per cent fall in the Family Model I, 3per cent in the Family Model II and 1 per cent in the Family Model III for the case of a pensioner who dies. Therefore, in this study we used these probabilities as our assumptions to estimate the longevity factor for a pensioner who dies. Thus, the longevity factor for the pensioner who dies becomes:

$$L_i^{d(x)} = 0.96 \times L_i^x(s) + 0.03 \times L_i^x(c) + 0.01 \times L_i^x(sc)$$

However, in view of the longevity factor, we can say that for the RM1 monthly pension, the government needs the estimated total amount of a longevity factor for the pensioners. Therefore, to study the impact on the longevity factor for the pensioner who survives or the pensioner who dies, the financial analysis on the percentage increase of the estimated longevity factor between the new and old government pension policies can be calculated by:

$$PI^x = \left(\frac{L^{new} - L^{old}}{L^{new}} \right) \times 100$$

Table 1 shows the estimated longevity factors for a male pensioner who survives or a male pensioner who dies for both policies at a particular age x. In the study, we only considered those in the age range of 55 until 60 years. From this table, it can be seen that the longevity factors for a male pensioner who survives or he who dies under the new government pension policy are much greater compared to the old government pension policy. This factor actually depends on the estimated values of $L_i^x(p)$, $L_i^x(s)$, $L_i^x(c)$, and also the probabilities for each type of family models used in the study. Here, the values of $L_i^x(p)$, $L_i^x(s)$ and $L_i^x(c)$ depend on the conditions given in each policy. The estimated longevity factors for a male pensioner who survives and he who dies under the new government pension policy are much greater compared to the old government pension policy. This means that under the new government pension policy, the pensioners and their dependents will get more pension payments compared to the old government pension policy. Thus we can conclude that the new government pension policy will benefit government employees or pensioners as their financial burden is likely to be reduced during their retirement period.

We also found that the percentage increase in the estimated longevity factors between the new and old government pension policies for a male pensioner who survives and a male pensioner who dies are around 42 per cent and 75 per cent respectively. In other words, under the new government pension policy, the pensioners who survive and the pensioners

Table 1. Summary of estimated longevity factors and the percentage increase for both pension policies.

	New Policy		Old Policy		PI^x	
Age (x)	L_i^x (new)	$L_i^{d(x)}$ (new)	L_i^x (old)	$L_i^{d(x)}$ (old)	survive	die
55	32.30497	17.87104	18.57921	4.03139	42.49	77.44
56	31.51763	17.47607	18.20002	4.04795	42.25	76.84
57	30.72247	17.07396	17.81569	4.06009	42.01	76.22
58	29.92012	16.66486	17.42643	4.06751	41.76	75.59
59	29.11125	16.24893	17.03241	4.06987	41.49	74.95
60	28.29658	15.82634	16.63384	4.06683	41.22	74.30

who die and their dependents are estimated to get pension payments of around 42 per cent and 75 per cent more respectively, compared to the old government pension policy.

In addition, we found that the estimated longevity factor for a pensioner who survives is greater than the estimated longevity factor for a pensioner who dies under both policies. The reason could be that in estimating the longevity factor for a pensioner who survives, the payments involved the pensioner, spouse and the children but in estimating the longevity factor for a pensioner who dies, the payments only involved spouse and children. Besides, under the old government pension policy, the payments for spouse and children will decrease to 70 per cent after 12½ years.

Therefore, we can conclude that the new government pension policy will have favourable financial implications for government employees or pensioners because they will be getting more pension payment. Consequently government employees or pensioners will be financially better off during their retirement period. Though they are expected to live longer, their pension payments will also be higher in line with the increasing cost of living.

6. Conclusion

The findings of this study suggest that the new government pension policy offers more favorable financial implications for government employees or pensioners in the future. The new government pension policy is expected to reduce the financial burden of government employees or pensioners. The change in the pension scheme is benefecial as the cost of living in Malaysia has been on the increase. Also, the life expectancy of the Malaysian population has increased. Hence, based on the results of our study, we conclude that government employees or pensioners are better off during their retirement under the new government pension policy compared to the old government pension policy. The methodology used in this study could be used as a guideline by the government if it were to improve the new government pension policy so as to reduce further the financial burden of public sector employees or pensioners taking into consideration the increasing cost of living as well as the life expectancy of the Malaysian population.

Acknowledgements

The authors would like to thank the Ministry of Higher Education, Malaysia for financial support.

References

Hooker, P.F. 1957. *Life and Other Contingencies.* London: The Syndics of the Cambridge University Press.

Ibrahim, R.I. 2008. Expanding an abridged life table using the Heligmann-Pollard model. *Matematika* **24(I)***:* 1-10.

Pension Laws of Malaysia. 2001.Kuala Lumpur: International Law Book Services.

Jordon, C. W. 1967. *Life Contingencies* (2nd ed.). Chicago: Society of Actuaries.

Leibfritz, W. 2003. 'Retiring later makes sense'. OECD Observer, Economic Policy Reforms, Norway.

Lindell, C. 2003. Longevity is increasing. What about the retirement age? *4th International Research Conference on Social Security*, Centre for Pensions, Finland.

Machnes, Y. (2000). Increasing Life Expectancy and Reforms in Pension Plans. Department of Economics, Bar-Ilan University, Israel.

Neill, A. 1977. *Life Contingencies.* London: William-Heinemann Ltd.

Public Service Department, Malaysia. Pension Division. Available at *http://www.jpa.gov.my/.*

Rappaport, A.M. (2002). Living to 100 and beyond: Implications of longer life spans. *Journal Benefits quarterly* **19(2**): 27-35.