

Mandatory Annuitization, Wealth Transfer and Welfare Enhancing Policy: Singapore's CPF Life Scheme.

Tan Boon Seng
Institute of Singapore Chartered Accountants

4 May 2015

Abstract

We estimate the wealth elasticity of longevity in Singapore and discuss its implication for the CPF Life policy in Singapore. Using data from 220 obituaries in 1989 and controlling for the trend of improved longevity over the century, we found a statistically significant wealth elasticity of longevity. Despite weaknesses of the research design, this result suggests that a mandatory life annuity is a regressive wealth transfer but not always a bad policy. When consumption and bequest are perfect substitute, there is no insurance benefit from annuity, and the policy is inefficient if administrative cost is positive. For the other extreme case that bequest has no value based on Brown (2003), the small elasticity of 0.0126 means that welfare improvement from insuring longevity risks more than compensate for welfare loss from the regressive transfer even for the poor, resulting in Pareto improvement. The plausible case that bequest and consumption are imperfect substitute most likely result in Kaldor-Hick efficiency meaning the policy is welfare enhancing but requires compensatory redistribution of wealth towards the poor.

Key Words: Life Annuity; Differential Mortality; Wealth Transfer; Central Provident Fund; Economic Efficiency

JEL: D61 (Allocative Efficiency, Cost-Benefit Analysis); H55 (Social Security and Public Pensions)

* Email: boonseng.tan@gmail.com

This is a preprint version of a paper that is forthcoming in the International Journal of Public Policy. The link to the actual paper will be provided when available.

1. Introduction

While UK is scrapping the mandatory purchase of annuity for pensioner above 75 years old in April 2011, Singapore's national annuity known as the CPF-Life – which has started in September 2009 as an opt-in scheme – becomes mandatory in 2013. The CPF-Life changes the drawn down policy of the Central Provident Fund (CPF) – Singapore's defined contribution social security – from monthly installments over 20 years that the retirees self manage, to choosing a mandatory annuity plan. On reaching 55 years old, CPF members can withdraw balance above \$134,000 (all currency in Singapore dollars), which is known as the CPF Minimum Sum, and transfer the remainder into a Retirement Account. Members with balance from \$40,000 to \$134,000 – except those with medical evidence of a shorter lifespan to opt out – are automatically enrolled. Part of the monies in the Retirement Account is used to pay for a life annuity, and the remainder is disbursed as monthly installments from the draw down age till the start of the annuity. The proportion in each part depends on the chosen plan. The plans are designed to provide a smooth cash flow stream, i.e. the payments for the installments and annuity are similar. The CPF members are the annuitants who pay an initial premium. The CPF Board is the insurer who pays out a constant periodic amount for as long as the annuitant is alive. Therefore, the annuitant transfers the consumption risk of unexpected longevity to the insurer. Surviving annuitants receive the funds of the dead cohort members. This excess return for the survivors is the mortality credit. Risk pooling is possible because insurer can *ex ante* predict the statistical lifespan of a group although it is impossible to predict the life span of an individual.

The policy debates about CPF Life basically revolve around two issues. Skeptics argue that longevity increases with wealth, and therefore a mandatory life annuity scheme is a regressive wealth transfer. On

the other hand, proponents argue that a life annuity scheme insures against consumption risk of unexpected longevity and is welfare enhancing as long as people are risk adverse. Both arguments are plausible. If the wealth transfer is small but the welfare improvement from the insurance is large, then the policy is Pareto efficient where everyone, including the poor, benefits from the policy. However, if the wealth transfer is large and there is welfare improvement from the insurance, the policy is still Kaldor-Hicks efficient but the distributive issue needs to be addressed. There exist two types of wealth transfers for an annuity – between annuitants and the insurer through annuity pricing, and among annuitants through differential mortality – that suggest a careful pricing of the annuity plans can theoretically be used as the wealth transfer mechanism. This paper seeks to advance the debate by establishing an estimate of the wealth elasticity of longevity using Singapore data, and then evaluate if the size of differential longevity is likely to lead to welfare improvement in the case of an actuarially fair annuity. We describe the CPF Life scheme in the next section to provide readers with the policy context.

2. The CPF-Life Scheme

The CPF-Life changes the drawn down policy of the Central Provident Fund (CPF) which is Singapore's defined contribution social security. The employer and the employee jointly fund the CPF, at contribution rates proportional to wage up to \$4,500 (as of 2008) that decreases with age brackets, to an individual account. The fund is managed by the CPF Board that invests the fund mostly in Singapore government bonds. In fact, the CPF interest rate is pegged to the bond yield. The initial policy objective of the CPF is a portable, i.e. not tied to any employer, funded social security. A funded social security does not depend on intergeneration transfer and has a defined contribution rate instead of defined benefits. The CPF policy objective has been expanded over the years: it becomes a source of fund for housing, medical care, approved investment and education – even the CPF contribution rate becomes a

policy tool to adjust wage cost for managing business cycle. These expanded objectives, especially using CPF to fund housing purchase, strongly modify the retirement portfolio that CPF members hold. The proportion of CPF withdrawal for housing remains above 50% since 1970, while the withdrawal share for retirement drops to the region of 20%-30%. McCarthy, Mitchell and Piggott (2002) suggest that most Singaporean will retire asset rich but cash poor.

The concern of insufficient retirement cash probably resulted in the Minimum Sum Scheme in 1987. Under the scheme, CPF members must set aside a minimum amount of their CPF at age 55 – the portion above this sum can be withdrawn – to fund a monthly income to support a basic standard of living during retirement. This minimum sum is determined by the CPF Board and pays the members monthly installments for 20 years starting from the retirement age. However, concerns of insufficient retirement cash remains. The data from the 2006 CPF Board Annual Report shows that 20% of the CPF members between 50-55 years old have less than the S\$80,000 minimum sum. Furthermore, this cohort exclude many self employed individuals and homemakers that comprises 54% of Singapore resident. Chia and Tsui (2003) shows the minimum sum at retirement age is not sufficient for subsistent living during the expected lifespan of a female elderly. In the CPF reform in 2007, the government introduced the mandatory life annuity known initially as the National Longevity Insurance Scheme and later renamed as the CPF-Life. Initially twelve annuity plans were proposed in 2007, which was reduced to four opt-in plans in 2009, and further reduced to two mandatory plans in 2013. The CPF Board administers the CPF-Life scheme. From 2010 to 2012, CPF members reaching 55 years can opt to join one of the four CPF Life plans and enjoy a special bonus (L-bonus). Starting from 2013, CPF members reaching 55 years old will automatically join one of the two schemes if they meet two conditions. First, they have a minimum balance of \$40,000 in their CPF account. CPF members with less than \$40,000 can join by topping up

their CPF balance, or choose to receive monthly payments for 20 years. Second, they are not proven to have a shorten lifespan due to a medical condition. The following is the administrative detail:

When CPF members reach 55 years old (the first cohort born in 1958 reach this age in 2013), they can withdraw the portion of their CPF above the minimum sum of \$134,000 and retain the remaining fund in a Retirement Account. Members who meet the conditions for mandatory annuity choose to join either the Basic plan or the Standard plan – the Standard plan is the default if eligible members do not indicate their choice – and the chosen plan cannot be changed later. Once the member chooses the plan, the premium is collected and transferred to a non-interest bearing refundable premium account. The remaining balance is transferred to an interest bearing retirement account. The interest rate is pegged to the 10-year government bond with an additional 1% for the first \$60,000. The payout starts at the drawdown age of 65 using the funds from the retirement account. By designing the plan carefully, the retirement account is exhausted at the start date of the plan, and the annuity continues with approximately the same payout for life. The annuity payout is reviewed and adjusted annually based on the variation in the CPF interest rate and the mortality experience over time. The members may leave a bequest. If death occurs before the start of the annuity, the bequest is the portion of the retirement account that is not yet disbursed and the whole refundable annuity premium. If death occurs after the annuity starts, the bequest is the refundable premium less the cumulative annuity payout disbursed if the difference is positive. Given this background information, we next examine the correlation between longevity and wealth.

3. Correlation between Wealth and Longevity

In an article dated 16 February 2008 in the Straits Times, Towridge Deloitte, the actuary tasked to price the premium of CPF-Life, reported that there was no robust local data for adjusting the annuity premium based on wealth. However, many lay people believe that the rich lives longer than the poor for various reasons. In an article dated 21 May 2004 in the Forbes Magazine, Dan Seligman surveyed three explanations for the belief that the rich lives longer than the poor: greater access to medical care of the rich, greater stress in low level jobs, and better health literacy.

There is some evidence in the academic literature showing a positive correlation between longevity and wealth. Feinstein (1993) reviewed earlier literature and generally found higher socioeconomic status correlates with longevity. The theory of health capital (Grossman, 1972) postulates a positive correlation – Investment in health capital increases both life expectancy and productivity, and higher productivity increases income. More recently, positive correlation is empirically found by Attanasio and Emmerson (2003) for UK, Deaton and Paxson (2001) for US, and Gaudecker and Scholz (2007) for Germany. These studies indicate that finding a positive correlation in Singapore is likely.

Attanasio and Emmerson (2003) had two waves of retiree surveys for UK, Deaton and Paxson (2001) was able to link Current Population Survey with mortality data for US from 1975 to 1995, and Gaudecker and Scholz (2007) used a large database of pension holders in Germany. We were constrained by the availability of a reliable public database containing information on wealth of the deceased. We used data from newspaper obituary to construct a simple model, controlling for non-wealth factors that could affect longevity, to test the relationship between longevity and wealth. The model was as follows:

$$\ln(\text{Age}) = \alpha + \beta_1 \ln(\text{Wealth}) + \beta_2(\text{Gender}) + \beta_3(Z) + \varepsilon$$

The dependent variable “Age” was the age of death reported in the obituary, and measured longevity. We used the size of the obituary, measured in column-centimeter, as a proxy for “Wealth”. Based on the 1989 rate card, the Straits Times, Singapore’s main English language newspaper, charged a flat rate of \$23 per column centimeter for obituary. We assumed that obituary was a normal good, i.e. consumption of the good increased with wealth, and hence the size of the obituary was a proxy for the wealth of the surviving family. We used the log form for “Age” and “Wealth” so that β_1 became an elasticity which would be unit-free. As we measured “Wealth” using a proxy instead of a true measure, the elasticity specification avoided interpreting β_1 in terms of the unit for the proxy. We had to control for other factors that affect longevity. Women were known to live longer than men. The Singapore Yearbook of Statistics 2011 reported that life expectancy at birth in 2010 was 79.3 for male and 84.1 for female (Singapore Department of Statistics, 2011: 11). The variable “Gender”, which was “1” for male and “0” for female, would capture the gender-specific difference in longevity through β_2 . Singaporeans were living longer over the years. The Singapore Yearbook of Statistics 2011 reported that life expectancy at birth was 78.0 for 2000 and increased to 81.8 for 2010 (Singapore Department of Statistics, 2011: 11). The increased longevity of younger cohorts was due to better living conditions, advance in medical science and other factors. We controlled for the non-wealth factors that increased longevity through the variable Z. We used the average life expectancy at birth of the population covered by the US Social Security Program to proxy for Z. This data was available from Bell and Miller (2005). With the control variables, β_1 measured the wealth elasticity of longevity – i.e. the percentage change in longevity with 1% increase in wealth – without the influence of confounding factors.

The data were taken from 258 published obituaries in the Straits Times from January 1989 to February 1989. The National Library Board provided the digital archive of the Straits Times through the NewspaperSG website (<http://newspapers.nl.sg/>). When the data was collected in 2011, on-site computers at the National Library Board could access the 1845-2009 archives, and off-site computer could access the 1845-1989 archives. We chose the latest year that could be accessed off-site. The obituaries were classified as advertisements under five sections: Section “321 Death” were obituaries placed by family members of the deceased, “322 Acknowledge” acknowledged condolence placed earlier by well-wishers, “323 Condolences” were obituaries placed by well-wishers such as organizations linked to the family of the deceased, “324 In-Memoriam” were placed at the death anniversaries, and “325 Requiems”. We used section 321 to collect information about the size of the obituary, age and gender of the deceased. We calculated the deceased’s year of birth, from the age and the year of the obituary placement, for calculating the variable Z. To fit the age criterion for CPF-Life, we eliminated 38 observations with age below 55 and obtained 220 samples with birth year from 1892 to 1934.

Bell and Miller (2005) provided data of life expectancies at selected age by gender and year of birth, from 1900-2010, for the population covered by the US Social Security Program. The general increase in longevity in US population would not be affected by the change in wealth in Singapore, but would be affected by global advances in medical sciences and living conditions affecting both countries. We used the average longevity of the genders to remove gender-specific longevity improvement from the variable Z, i.e. we calculated the average of the male and female life expectancies at birth as a proxy for variable Z. Regression of the average (of male and female) longevity showed an annual improvement by 0.3 years. We used this result to extrapolate the variable Z for birth years between 1892 and 1899. As we had already calculated the birth year from the obituaries, we could link the calculated variable Z to each datum.

We estimated the model by Ordinary Least Square regression. The sample consisted of 220 observations of which 59% were male. The mean age of death was 73.8 – comparable to life expectancy at birth of 75 in 1989 – and the range was 55 to 97. The proxy variables for Wealth has a mean 82.7 (range 5 to 620) and Z has a mean of 54.2 (range 45.2 to 61.3). One weakness of the data was its sampling frame: it was a convenience sample that might systematically differ from the population we wanted to estimate in terms of wealth and longevity. Only about 10% of the 13,000 deaths in 1989 resulted in an obituary in the Straits Times, others could have placed the obituary in other newspapers, or not had an obituary at all. With the caveat in extrapolating the result outside the sample, we present the regression result, with the t-statistics below the parameters, as follows:

$$\ln(\text{Age}) = 5.87 + 0.0126\ln(\text{Wealth}) - 0.0061(\text{Gender}) - 0.03(\text{Z})$$

(96.0)	(2.24)	(-0.785)	(-30.4)
--------	--------	----------	---------

The regression diagnostics showed that we had a meaningful model: the adjusted R-squared was 0.823 showing reasonable explanatory power, the F-statistics for $\alpha=\beta_1=\beta_2=\beta_3=0$ was 339.6 showing we could rule out that all the parameters are jointly insignificant, and the Durbin-Watson statistic was 2.01 showing that we could rule out “false” fit due to serial correlation.

As expected, we obtained a significant and positive wealth elasticity, but the value was small (0.0126). We also obtained a negative coefficient for gender (male =1) as expected, but the difference was not statistically significant. The coefficient of variable Z was negative and significant as expected. As age of death increased, the birth year would be earlier, and the life expectancy at birth would be shorter because of the general trend of increased longevity.

Our research supported the proposition that the poor die younger than the rich in Singapore and have a rudimentary estimate of the wealth elasticity of longevity (0.0126). The range of the CPF wealth for eligible annuitants was 40,000 to 134,000, or the maximum was 335% of the minimum. Given that the maximum CPF wealth was truncated because monies above the Minimum Sum were withdrawn, 335% would be the lower bound of the wealth differential. The difference in age of death calculated from the wealth elasticity was therefore 4.2% of the life expectancy at age 55. Life expectancy at age 55 for 1989 was not available, so we extrapolated the data from the period life table for 2006 (Singapore Department of Statistics, 2011: 3-11). The life table reported that the 2006 average life expectancy at birth was 80.3 years, and at age 55 was 27.2 years, while Singapore Department of Statistics (1990) reported the 1989 average life expectancy at birth was 75. The life expectancy at birth had increased 5.3 years over two decades, and we estimated that the 1989 average life expectancy at age 55 was $27.2 - 5.3 = 21.9$. The 4.2% difference would translate to a difference of 0.8 year or 9.6 months, which is a lower bound since the wealth differential is actually greater as explained earlier.

4. Economic Welfare and Differential Longevity

As long as people are risk averse, the availability of an insurance – the annuity is an insurance against consumption risk arising from unexpected longevity – improves economic welfare in aggregate although there is redistribution. The core policy question is really whether the mandatory annuity scheme is Pareto or Kaldor-Hick efficient. It is important to be clear what enters the utility function when evaluating economic welfare, although policy debates almost never state this assumption clearly, because the results are very different. In the case of annuity, the burning question is whether bequest is counted, and if so whether it is counted in full.

Assuming that bequest matters as much as consumption, i.e. perfect substitute, then the utility function is only dependent on total wealth which is the sum of life time consumption and bequest. There is no insurance benefit from the annuity in this case. If we find a significant and positive wealth elasticity of longevity, the result means that the mandatory annuity is a regressive wealth transfer and a bad policy. Many policy analysts implicit made this assumption when arguing the case against mandatory annuity. In fact, as there is no insurance benefit in this case, an annuity can never be a good policy as long as there is an administration cost.

However, the perfect substitute assumption is not generally tenable unless one's current wealth is unlikely to be consumed in one's lifetime. For cases without surviving dependent, or with dependent of substantial earning powers, bequest and consumption also cannot be perfect substitute. For the case without surviving dependent, the value of bequest is zero. Compared to a rich annuitant, a poor annuitant has low consumption level meaning the marginal utility of a dollar in consumption is high, and is more likely to exceed the marginal utility of a dollar in bequest, especially if the dependent has substantial earning power. When a dollar in consumption is worth more than a dollar in bequest, the consumption insurance in the annuity becomes valuable and the mandatory annuity policy can become welfare improving. Finding a significant and positive wealth elasticity of longevity then indicates two possible scenarios. First, if the regressive wealth transfer in the poor is smaller than the welfare improvement from the insurance, the policy is Pareto efficient where everyone, including the poor, benefits from the policy. However, if the wealth transfer from the poor is larger than the welfare improvement from the insurance, the policy is Kaldor-Hicks efficient but the distributive issue needs to be addressed.

Modeling the economic efficiency of the policy is not trivial and there are few studies to date dealing with this aspect. Brown (2003) assumes that bequest has zero value – the other extreme of the perfect substitute case – and shows that with low administration cost, complete annuitization is welfare enhancing even for those with higher-than-average expected mortality rates. Specifically, Brown uses US data and shows that a “67 year old, college educated, white male” lives 3.4 years longer than a “67 year old, less than high school educated, black male” (without differentiating on education, the difference is 16 months). If mandated with a uniformly priced annuity, the expected shorter lifespan of the “67 year old, less than high school educated, black male” results in a negative transfer on the order of 20 percent based on the money’s worth calculation – the money’s worth is the ratio of the expected present value from annuity payments divided by the annuity premium. Using a log utility function to calculate the annuity equivalent wealth – which is how much non-annuitized wealth gives the same marginal utility for holding \$1 of an actuarially fair annuity (Mitchell, Poterba, Warshawsky and Brown, 1999; Brown, 2001) – Brown shows that the “less than high school educated, black male” is willing to pay \$1.296 to access \$1 of fair annuity. This result – a loss of 20% via regressive transfer but a willingness to pay \$1.296 to access \$1 of fair annuity for the group with the shortest expected life span – means that a mandatory annuity will benefit all annuitants resulting in a Pareto efficient policy.

Is the result in Brown (2003) directly applicable to Singapore? Our estimate of 9.6 months longevity differential is smaller than the 3.4 years differential (or even the 16 months differential without accounting for education), which means that we are likely to find Pareto efficiency in the Singapore context. However, this outcome is uncertain because of two factors. First, Brown (2003) assumes that bequest has a value of zero, which is clearly not the case for most people. If bequest is an imperfect substitute for consumption, the longevity differential could result in either a Kaldor-Hicks or a Pareto efficient policy. Lockwood (2012) shows that bequest motives will drastically change the result and play

a central role in explaining the near absence of private annuity purchases (known as the annuity puzzle in the literature). He shows that the difference in utility gain for the consumption insurance, with and without bequest motive, is as much as a factor of two. Lockwood points out that with bequest motives, the family as insurance has the advantage over market insurance that the individual values the net bequests he leaves should he die young. Family insurance need not increase the individual's consumption as much as market insurance for an individual with bequest motives to prefer it to market insurance.

Second, unlike the full annuitization in Brown (2003), the CPF Life is a partial annuitization scheme where the annuitants hold a portfolio of annuity and non-annuitized wealth including human and social capitals – generating income from work and intra-family wealth transfer – housing and other financial wealth such as cash and non-annuitized CPF savings. The annuitant faces two types of risk – the longevity risk that requires a steady level of consumption, and the uninsured medical risk that occurs irregularly consuming a large lump sum. Holding a portfolio of wealth, instead of annuitizing all wealth, provides a better match of the portfolio of risks. Furthermore, given the value limits of the CPF Life plans, the consumption portion for the poor is mostly funded by the annuity, while the consumption portion for the rich uses the annuity as a minor supplement. Modeling the welfare effect of partial annuitization requires knowing the allocation of the wealth portfolio by income group.

5. Conclusion and Limitation

Using data from obituaries, we estimated the wealth elasticity of longevity to be significant but small and positive at 0.0126, which translated to a 9.6 months difference in live expectancy between the rich and poor. The estimate would not convince many readers for two reasons: First, the sample from those

whose family put up obituaries may not be representative of those who are mandated into the CPF Life plans. There is a problem of external validity for extrapolating outside the sample. Second, using the size of obituary, which is assumed to be a normal good, to proxy for wealth of the deceased is an indirect measure. There is a problem of construct validity. Measuring wealth is more difficult than it appears especially if we include non financial wealth in human and social capital. Even the CPF balance, which arises from cumulative labor income less withdrawal for various permitted uses, is a partial measure of wealth even though the CPF balance is used in administering the policy. Better data source will be useful to verify our tentative result in future research. Despite these caveats, we have obtained a statistically significant result which seems plausible and consistent with theoretical expectations.

The key point of this paper is on interpreting the positive wealth elasticity of longevity, specifically if the result means that the CPF Life is a bad policy. A positive wealth elasticity of longevity under mandatory annuity with uniform pricing will result in a regressive transfer, but may not be a bad policy if the welfare gain from consumption insurance is positive. At one extreme, bequest and consumption are perfect substitutes and there is no value for annuitization. This scenario happens in the case where a person is unlikely to consume all his wealth even to an unusually old age. At the other extreme bequest is worth nothing, the result from Brown (2003) and our estimate of the wealth elasticity of longevity suggest that mandatory annuity is Pareto efficient and even benefit the poor in utility terms. However, Lockwood (2012) shows that plausible bequest can substantially reduce the value of bequest. Furthermore, the CPF Life plans are partial annuity that has less insurance coverage for the consumption risk in Brown (2003). However, modeling partial annuity, especially deferred annuities in the CPF Life plans, is not trivial and we do not have the wealth allocation by income level to conduct feasible simulation. Although we do not have hard evidence, the available evidence suggest that mandatory annuitization in the CPF Life plan is likely to be Kaldor-Hicks efficient. The implication of this conclusion

is that the policy is welfare improving but require compensatory wealth transfer from the rich to the poor. A policy package pegged to the CPF Life plans and income level is worth considering.

Reference

Attanasio, O. P. and Emmerson, C. (2003) Mortality, Health Status, and Wealth. *Journal of the European Economic Association*, 1(4): 821–850.

Bell F.C. and M.L. Miller. (2005) Life Tables for the United States Social Security Area 1900-2100. Actuarial Study No. 120. Social Security Administration, Office of the Chief Actuary. SSA Pub. No. 11-11536. (Available at url: http://www.ssa.gov/OACT/NOTES/pdf_studies/study120.pdf)

Brown, J. (2001). Are the Elderly Really Over-Annuitized? New Evidence on Life Insurance and Bequests. In D. A. Wise (Ed.), *Themes in the Economics of Aging*: 91-124. University of Chicago Press.

Brown, J. (2003) Redistribution and Insurance: Mandatory Annuitization with Mortality Heterogeneity. *Journal of Risk and Insurance*, 70(1): 17-41.

Chia, N. C. and Tsui, A. K. C. (2003). Life annuities of compulsory savings and income adequacy of the elderly in Singapore. *Journal of Pension Economics and Finance*, 2(01): 41-65.

Deaton, A.S. and Paxson, C. (2001). Mortality, Education, Income, and Inequality among American Cohorts. In *Themes in the Economics of Aging*, David A. Wise (ed): 129 – 170, University of Chicago Press

Feinstein J.S. (1993). The Relationship between Socioeconomic Status and Health: A Review of the Literature. *The Milbank Quarterly*. Vol. 71(2): 279-322

Gaudecker, H.-M. von and R. D. Scholz (2007): Differential Mortality by Lifetime Earnings in Germany. *Demographic Research*. Vol. 17: 83–108.

Grossman, M. (1972). On the Concept of Health Capital and the Demand for Health. *Journal of Political Economy*. Vol. 80: 223–255.

Lockwood, L.M. (2012). Bequest motives and the annuity puzzle. *Review of Economic Dynamics* Vol. 15(2): 226-243.

McCarthy, D., Mitchell, O. S., & Piggott, J. (2002). Asset Rich and Cash Poor in Singapore? Retirement Provision in a National Defined Contribution Pension Fund. *Journal of Pension Finance and Economics*, Vol. 1(3): 197-222.

Mitchell, O., Poterba, J., Warshawsky, M., and Brown, J. (1999). New Evidence on the Money's Worth of Individual Annuities. *American Economic Review*, 89: 1299-1318.

Singapore Department of Statistics. (1990). *Yearbook of Statistics 1990*. Singapore: Singapore National Printers.

Singapore Department of Statistics. (2011). *Yearbook of Statistics 2011*. Singapore: Singapore National Printers.