Original Article

Design considerations for retirement savings and retirement income products

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ABSTRACT In the backdrop of a world with an ageing population and increasing life expectancy, the impact of the global financial crisis on the values of pension and superannuation funds has underscored the vulnerability of the wealth pool of retirees and their well-being during retirement. In light of this, it is important to examine how the design and delivery of retirement savings and income products can address these vulnerabilities. The purpose of this article is to review and evaluate the factors that need to be considered and the features that need to be incorporated in designing and developing retirement savings and retirement income products to address the concerns of investors, both in the accumulation and draw down phases of retirement investment management.

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INTRODUCTION

The global financial crisis and its devastating effects on stock markets around the globe had a particularly adverse impact on pension and superannuation funds in most developed countries. The average return in 2008 for pension funds in OECD countries was a negative 21.4 per cent.¹ In countries where pension funds had high exposure to the stock market, the losses were quite severe. Among OECD countries, Australian superannuation funds had the highest exposure to the equity market in 2008 at 59 per cent of

total assets. According to SuperRatings, an independent research group, the average return for Australian balanced superannuation funds in 2008 was a negative 19.67 per cent, followed by a negative 12.89 per cent return the following year.

In many of the OECD countries with mandated retirement savings systems, pension funds are moving from defined benefit systems to defined contribution (DC) systems. In DC schemes it is the fund members who make the investment decisions and who will also bear the cost of fund losses. Consequently, the global financial crisis took a direct toll on the financial status of pension fund members.

Fund contributors who suffer most after a significant downturn in financial markets are

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those with greater exposure to riskier asset classes, and those who are closer to retirement. After a downturn, as markets generally recover gradually over time, those who are close to retirement will have little time to recoup their losses before they reach retirement and draw down their remaining accumulated capital to provide for retirement income streams.

When investors experience a significant investment loss, their aversion to risk increases and a natural tendency at that point is to act immediately to cut further possible losses. Fund contributors commonly do this by switching to safer investment products or by changing over to more conservative asset mixes, reducing their exposure to equities. Such a flight from equities was in fact observed in most OECD countries. The Australian case is typical of this experience, where as reported by SuperRatings, personal contributions to superannuation funds plunged by more than 55 per cent over the 2 financial years following the crisis. The flight from equities after market downturns can often deprive investors from participating in the subsequent market gains that eventually follow.

The value of assets in the pension fund industry in OECD countries as at the end of 2006 amounted to US\$24.6 trillion, or 76 per cent of GDP.² This is expected to grow despite the global financial downturn, driven principally by government mandated superannuation schemes. Governments are conscious of the need to boost pension contributions further. The necessity to expand the pension and superannuation funds pool is the need to support an ageing population, a population that is also expected to have an increased life expectancy. The Australian projections, which are typical of other OECD countries is that in 2050, nearly 25 per cent of the population will be aged 65 years and over, compared with 13 per cent today, and that there will be only 2.7 people of working age for every person age 65 years and over, compared with 5 people today.³

Given the importance that retirement funds will play in the life of retirees in the future and the vulnerability of retirement funds to market vagaries, it is important that the manner in which

pension and superannuation funds are designed and utilized is carefully examined, against the backdrop of an ageing population that is living longer. Of concern is whether the needs of the fund contributors can be adequately met through the range of retirement savings and retirement income products offered to investors, both in the accumulation phase as well as in the drawdown phase of pension funds management. This article reviews the factors that need to be considered in designing retirement savings and retirement income products and the features that need to be incorporated to address the concerns of investors for retirement.⁴ The relevant issues from the standpoint of both the buyers of the products and the issuers are discussed in the article.

PRODUCT DESIGN IN THE ACCUMULATION PHASE

Investing for retirement is a long-term proposition, associated with risk. There are numerous factors that contribute to overall investment risk such as market risk, liquidity risk, inflation risk, interest rate risk, credit risk and currency risk. But to the investor, investment risk ultimately translates to the probability of not being able to achieve an expected or targeted level of wealth at the time of retirement. Investors are provided with a choice of asset classes with different risk return expectations to invest in. Riskier asset classes such as equities offer higher expected returns based on their historical performance, but also higher risk, or a higher likelihood of not achieving the expected return. Safer asset classes such as long-term fixed income securities offer lower expected returns but a higher probability of achieving that return. Cash or cash equivalent asset classes offer the safest investment outcomes. The likelihood of achieving targeted levels of wealth can also depend on the investment horizon, given the time diversification effects of investment risk. Alles and Athanassakos⁵ and Alles and Murray⁶ showed evidence in favor of time diversification among UK and Canadian asset classes. On the basis of the premise of time diversification, longer horizon investors are typically advised to invest a higher proportion of wealth in riskier asset classes

and shorter horizon investors to invest a smaller proportion of wealth in riskier asset classes.

The common practice among superannuation and pension fund managers is to offer investors a range of asset class portfolios to invest in. Investors choose the mix of asset classes and their allocation of investment proportions to each class. The expectation is that the investor will choose a risk return profile in accordance with his/her risk preference. It is difficult to see how an unsophisticated investor can make an informed choice within such a decision framework. An information framework that would be simpler to understand and more meaningful to the investor would be to offer a range of target wealth levels at retirement point and the associated likelihoods of achieving that wealth. Risk return outcomes couched in such a framework would be more meaningful. The investment strategy of achieving such targets is known as life cycle investing or target date funds management. Life cycle investment funds are now offered as an investment option in 401(k) plans in the United States. To achieve these investment goals investment managers adopt a dynamic asset allocation strategy. The approach adopted by fund managers, consistent with life cycle investment strategies as suggested, for example, in Malkiel (p. 420),⁷ is to initially invest a high proportion of wealth in risky asset classes such as equities and progressively switch the exposure from risky asset classes to safer classes such as bonds as the age of the contributors increase and retirement approaches.⁷ Such glide strategies may not be effective when changing economic conditions make a differential impact on asset classes. The global financial crisis was a clear illustration of this. Fund managers would need to adopt a more tactical asset allocation strategy based on updated forecasts of asset class investment outcomes if retirees' investment goals are to be met.

Life cycle investment strategies cannot fully avoid the risk of a shortfall in terminal wealth, and this becomes an important issue particularly as retirement date draws closer. One solution to the problem of avoiding shortfall risk is to incorporate financial derivatives or insurance products with downside risk protection features.

RETIREMENT INVESTMENT PRODUCTS WITH RISK PROTECTION

A large proportion of superannuation funds are invested in equities, as contributors seek their potential for higher returns. But at the same time, equity asset classes have a high exposure to downside risk. For pension and superannuation fund contributors who wish to achieve a target level of wealth at retirement protecting their investment from downside risk becomes an important matter particularly as retirement time approaches. But downside protection comes at a cost. Understanding the risk of not being able to achieve targeted wealth levels at retirement point, and understanding the cost of avoiding that risk become important issues for investors. When pension products are designed, features that can manage these risks and provide risk protection need to be offered to investors.

One method of providing downside risk protection is to incorporate capital protected equity notes (PENs) in pension products. PEN is a generic term given to a class of products that are offered by financial institutions with slight variations in form. The nature of these products is that they guarantee the protection of the initial capital (or ensure a minimum return on capital) while allowing a limited participation in the upside of the share market, benchmarked to a share market index or a basket of shares. The cost of ensuring a minimum rate of return in a stock market investment, or the cost of a PEN can be determined using option pricing theory. Alles⁸ explains this method from the standpoint of European share investors. He further examines how this cost varies with the investment horizons, ranging from 1 to 20 years, and for a range of hypothetical protection levels, benchmarked to the risk-free rate. This technique would serve as a benchmark for valuing financial products that combine stock investments with some measure of downside protection. This information would be of interest to investors and to financial institutions, who wish to understand the cost of creating investment products with forms of capital guarantees for different horizons.

The challenge for financial institutions, however, is to offer products with the desired risk mitigating features at a cost that is viewed by investors to be acceptable.

INFLATION LINKED RETIREMENT INCOME PRODUCTS

Investors who are more risk averse tend to invest in safer fixed income securities rather than in equities. But they can still be exposed to downside capital losses owing to inflation risk. A product that can help avoid this risk is the inflation-linked bond.⁹ These are medium to long-term securities whose principal is adjusted for movements in the consumer price index. Interest on TIBs is paid quarterly, at a fixed rate, on the adjusted capital value. At maturity, investors receive the adjusted capital value of the security.

The benefit to investors of investing in TIBs is that it is a long-term investment with a fixed long-term real yield that is free from inflation risk. TIBs will be an attractive investment vehicle for pension funds, superannuation funds and self-funded retirees who wish to make long-term investments in a capital secure asset class that also safeguards against the risk of purchasing power erosion owing to future inflation. The coupon interest rate offered on inflation-linked bonds can be expected to be lower than the interest rate offered on equivalent straight bonds. The lower return is the trade-off for the benefit of avoiding inflation risk.

Financial planners and fund managers should not, however, overlook some of the disadvantage of offering a greater choice of investment products to retirement investors. Brown¹⁰ points out that poor financial literacy among investors in OECD member countries is a contributory factor to the lack of financial security among retirees. Too many choices can add to the complexity of decision-making, leaving investors confused. Educating investors on investment opportunities and risk mitigating strategies would be an ongoing challenge to financial planners and advisors.

PRODUCT DESIGN IN THE DRAWDOWN PHASE

A major decision retirees have to make at the time of retirement is the structuring of the wealth

pool accumulated up to that point in the best possible manner to provide for their life during retirement. There are several factors to consider, some of which are uncertain by nature. The first uncertainty is the unknown life expectancy of the retiree, known as longevity risk. If the remaining life span of the retiree is known with certainty, a financial plan can be drawn to convert the asset pool to an income stream spread over that period. Unknown longevity leaves the retiree with a dilemma. If the asset pool is converted too quickly to an income stream or if the retiree lives longer than expected, the pool will exhaust prematurely, leaving the retiree in financial difficulties in later life. If the draw down is too conservative the retiree is deprived of a living standard that he/she could otherwise afford.

INCORPORATION OF ANNUITIES IN PENSION PRODUCTS

One way to provide for an income stream while avoiding longevity risk is the purchase of a pension, or life annuity. This entitles the retiree to a regular income stream for life, in exchange for an up-front lump sum payment out of the asset pool. The economic benefits of annuitizing a wealth pool were first demonstrated by Yaari.¹¹ Extending this work, Davidoff *et al*¹² shows that in the absence of a bequest motive and if markets are complete, a retiree can enhance his/her welfare by fully annuitizing his/her asset pool. This would point towards a strong demand for annuity products in financial markets. But the empirical evidence however, as reviewed in Brown¹⁰ is that annuity transactions and annuity markets internationally are relatively small. This has come to be known as the 'annuity puzzle'. Hu and Scott¹³ suggest that retirees may perceive the value of annuity products to be lower than their rational value owing to certain 'behavioral' biases such as loss aversion, mental accounting and heuristics. For example, loss aversion can reduce the attractiveness of an annuity, because the retiree may reject an actuarially fair annuity because the loss from possible early death looms twice as large as a gain possible from living long enough to earn back the annuity premium. While these behavioral biases may account for

the low demand for annuity products to some extent, annuity product markets have quite significant shortcomings, which constitute quite 'rational' reasons for the stagnation of annuity markets.

The shortcomings of annuity markets can be as a result of limitations on the supply side, as well as limitations on the demand side. On the demand side, one reason for the reluctance of retirees to fully annuitize their asset pools can be because of a bequest motive. But even in the absence of that motive the purchase of an immediate annuity can leave retirees with several perceived disadvantages. Giving up the asset pool can leave a retiree without recourse to any additional funds for unforeseen future needs such as an illness or a house repair/renovation. To provide for such contingencies retirees may wish to phase out the withdrawals or draw down the asset pool in several stages. The reluctance of a retiree to fully annuitize an asset pool can also stem from the options that continuing access to the asset pool would offer, such as the choice to invest in equity markets at a future time of choosing. The purchase of a straight life annuity can also have the disadvantage of eroding the purchasing power of the annuity stream over time owing to future inflation. To overcome these numerous disadvantages, the design of annuity products supplied to the market must incorporate features catering to these diverse needs of retirees. Limitations on the supply of annuity products without such flexibilities reflect an incomplete market, which can deter annuitization.

The price of annuities available in the market, and the ability of annuitants to identify the level of risk inherent in annuity products are other important factors to the success of annuity markets. If the prices of annuities are too high, retirees will be reluctant to purchase annuities, preferring instead to retain the asset pool. Brown¹⁰ observes that prices in annuity markets in many countries around the world are significantly higher than their actuarially fair values.¹⁴ One reason for this may be adverse selection. That is, the mortality rates of annuitants are actually lower than the mortality rates of the

general population that are used to calculate actuarially fair values. The prices of annuities offered in the market are therefore higher than the computed actuarially fair values. If mortality rates for population sub-groups were available annuity issuers could price annuities more effectively. A second reason for high annuity prices is the risk premium that annuity providers may demand if longevity risk cannot be diversified away, or if some systematic longevity risk remains with the annuity provider.

Another important requirement for the success of annuity markets is for the pricing information to be fully informative. Consumers must be able to easily identify all risks, including the default risk associated with the annuity provider and the product, so that the price of the annuity can be linked to product risk. This is important because the purchase of an annuity involves the exchange of immediate cash for a stream of cash flows that extends far into the future, which naturally raises the spectre of default risk.

To cater to the diversity of retirees' annuitization and drawdown needs there appears to be much scope for the market to provide flexible solutions that allow partial annuitization as well as a mix of partial annuities and phased payout arrangements. More efficient pricing of annuity products can also help develop annuity markets. The underdevelopment of annuity markets and the welfare loss to retirees on account of this also point towards a role for the governments of the respective countries to rectify this situation. For example, governments in some countries have taken a proactive role to this end by offering tax incentives to encourage the setting up annuity income streams.

THE LONGEVITY ANNUITY

The longevity annuity is a recent innovation that is yet to gain widespread use in the retirement investment industry. But it is a product that can be advantageous to retirees in a variety of circumstances. The longevity annuity is an annuity payment stream that commences at a future date, as opposed to an immediate life annuity that commences payments forthwith. The annuity premium is paid up front when the

annuity contract is entered into, but the payments commence at a future date and is contingent on the survival of the retiree at that point. Scott¹⁵ compares the cost of purchasing a longevity annuity to the purchase of an asset (bond) that provides an equivalent cash flow with certainty. He shows that because longevity annuity cash flows are conditional on the survival of the purchaser it is cheaper than the cost of purchasing the certain cash flow stream. The price of the longevity annuity will become cheaper as the commencement of the payout point is extended. He demonstrates that for a retiree allocating 10–15 per cent of wealth to a longevity annuity gives spending benefits comparable to an allocation to an immediate annuity of 60 per cent of wealth or more. The longevity annuity can also serve to reduce the ‘behavioral’ biases that retirees may have towards annuities. By purchasing a longevity annuity the retiree has control over the asset pool until the commencement of the annuity stream, thereby reducing the uncertainty of the planning horizon, which is a factor that figures in behavioral biases.

VARIABLE ANNUITIES

The purchase of a straight life annuity can place a retiree in a position of illiquidity, as the retiree will be deprived from accessing an asset pool to invest in equity markets at a future time of choosing. A way of acquiring this choice is provided by a variable annuity. A variable annuity typically provides an exposure to investment returns and incorporates a put option on the equity market, so that they provide a guaranteed living income benefit. In addition they will incorporate some form of longevity insurance. As a product that incorporates a number of features sought by retirees, variable annuities have grown in popularity among retirees. But its popularity could be partly attributed to the tax incentives that they enjoy in some countries.

MANAGING LONGEVITY RISK

Retirees avoid longevity risk by purchasing life annuities or longevity annuity products, but they in turn pass on the risk to the suppliers of these

products who are usually the pension plans or insurance companies. Managing longevity risk becomes an important task for annuity issuers. If the annuitant lives longer than expected, the cash outflows of the annuity provider becomes greater. Annuity providers have a natural advantage in risk diversification because idiosyncratic longevity risks of individual annuities can be diversified away in a large pool of annuities. However, if the life expectancy of the population as a whole improves in the future, the annuity provider is left with a ‘systematic’ component of longevity risk. But if annuity providers also offer life insurance products the systematic longevity risk associated with a portfolio of life annuities can serve as a natural hedge against the longevity risk associated with a portfolio of life insurance policies. This is because an unexpected improvement in life expectancy would reduce the present value of cash outflows of a portfolio of life insurance policies. One would therefore expect life insurance companies to have a natural inclination to selling longevity annuities or selling longevity insurance. Despite this, as Byrne and Winter¹⁶ point out, pension funds and life insurance companies show a reluctance to actively pursue the marketing of annuity products. This may be because of adverse selection problems and the difficulties of managing their residual longevity risk due to the lack of suitable financial products for managing this risk. Wang *et al*¹⁷ demonstrate an immunization model for determining the optimal life insurance–annuity product mix for hedging longevity risk based on the Lee–Carter mortality forecasting model.¹⁸ However, in a situation where annuity providers are not in the business of life insurance, (or vice versa) in-house hedging of longevity risk would be infeasible. Also, effective immunization may not be possible if there are large differences in the durations of annuity products and life products.¹⁹ In such circumstances, longevity and mortality swaps can be used for hedging residual longevity risk.

Dowd *et al*²⁰ demonstrate the use of ‘survivor swaps’ for transferring the mortality risk related to a specific population cohort with another. Such a swap can be used by an institution carrying the

diversifiable risk of a narrow population cohort as an instrument for diversifying mortality risk across different population cohorts. Cox and Lin²¹ demonstrate the design and pricing of 'mortality swaps' that can exchange the risk of unexpected improvements to population mortality with unexpected deterioration to population mortality. An independent swap dealer can offer such swaps to annuity providers and life policy issuers separately to serve as longevity risk hedging instruments. However, it is likely that the ability of life insurance and annuity providers to internally hedge longevity risk or for annuity providers to hedge longevity risk through swap contracts will be constrained owing to the limited availability of such swap contracts in the market.²² A different avenue for managing this risk is through the process of securitizing longevity risk, whereby the risks are passed on to investors in capital markets.

SECURITIZATION OF LONGEVITY RISK

Securitization is the technique of transforming illiquid assets held by financial institutions into marketable securities sold in financial markets. A solution for reducing the exposure to longevity risk of pension funds, insurance companies and other annuity providers is the construction of capital market instruments linked to longevity risk. But a pre-requisite to this is the availability of a benchmark for measuring longevity risk, in the form of longevity indices for the overall population as well as for specific population sub-groups. Given a set of well-accepted and suitable indices, it would be possible to construct longevity bonds or survivor bonds in various forms. In longevity bonds either the coupon or principal, or both, is at risk of default if longevity improves in excess of expectations. Sellers of these instruments can then hedge longevity risk. Longevity bonds have yet to be successfully structured and issued in capital markets.²³ There could be several reasons for this. One difficulty in structuring a longevity bond is identifying a suitable mortality index that would serve as a benchmark for the longevity risk carried by the hedger. The mortality indices currently available

as benchmarks are countrywide indices, which may not be representative of the population cohort an annuity issuer would wish to hedge against. Using such a benchmark would result in an incomplete hedge and leave the issuer with basis risk. Antolin and Blommestein²⁴ point out that one way governments could play a role in developing the market for longevity risk products is by producing reliable longevity indices for a range of population sub-groups that can be used as more appropriate benchmarks for pricing longevity risk hedging products.²⁵ Most longevity products that are currently available or being developed offer a hedge against current longevity risk. Pension funds are also interested in hedging future longevity risk. To forecast future mortality rates and life expectancy stochastic models such as the Lee–Carter mortality model are presently used in the industry.¹⁸ Wills and Sherris²⁶ point out that the Lee–Carter model's suitability for pricing longevity bonds is restricted owing to the limitations in incorporating a risk adjustment into the mortality distribution. Other techniques for pricing longevity bonds such as the Wang transform also has limitations owing to the unrealistic assumption that the market price of mortality risk is constant across all ages and time. Wills and Sherris²⁶ provide the methodology for structuring and pricing of longevity risk for a multi-age annuity portfolio allowing for age dependence in the mortality, and a tranche structure in the security.

OPTIMIZING INVESTMENT AND WITHDRAWAL PLANS

Retirement products must not only incorporate features to manage the different types of risks but they must also optimize these features from the retiree's standpoint. Retirees have a range of different risk appetites as well as specific investment, income, funding and bequest requirements during and after retirement. Retirement products and withdrawals schemes must be designed to incorporate these individual needs. The investment industry is yet to offer streamlined products that can be tailored to meet individual needs. But research on designing and delivering such products is ongoing. Significant

contributions have been made by Milevsky and Robinson²⁷ and Milevsky,²⁸ who provide the methodology for determining the sustainable withdrawal rate within a unified framework that integrates the accumulation and withdrawal phases of the investment life cycle, while incorporating the uncertainties associated with investment returns and longevity. Milevsky *et al*²⁹ incorporate the possibility of annuitization in the analysis and derive the optimal investment and annuitization strategies to maintain sustainability or minimize financial ruin.

Horneff *et al*³⁰ evaluates how the integration of annuitization plans and investment linked survival contingent payouts and the switching between these at an optimal point in the future affects the well-being of retirees with different degrees of risk aversion. They show that for retirees with low risk aversion, integrated strategies that switch to life annuities optimally at the age of 80–85 years can enhance welfare by 25–50 per cent. Horneff *et al*³¹ further shows that when investors move their funds from liquid savings to survival contingent products gradually from middle age retirement, welfare can be enhanced by 50 per cent. Horneff *et al*³² model a dynamic utility maximizing investor holding both equity and longevity insurance and who is free to adjust the portfolio allocation of total financial wealth as well as of the annuity over time, while purchasing variable payout annuities any time and incrementally. They show that the retiree will optimally combine variable annuities with withdrawals from the financial wealth so as to match the desired consumption profile. Optimal stock exposures decrease over time, both within the variable annuity and the withdrawal plan. They conclude that welfare gains from this strategy can amount to 40 per cent of financial wealth, and that additionally many retirees will do almost as well as the fully optimized outcome if they hold variable annuities invested in stocks and bonds in the ratio of 60:40.

While these research efforts to model the optimal investment/withdrawal/insurance mix is ongoing, the challenge for providers of pension and insurance products will be to translate these research results to marketable products and offer

to investors in an easily comprehensible manner and at a reasonable price. The second challenge is to educate retirees and other consumers of retirement products about the features and characteristics of these products so that they can judge the suitability of these products to their particular circumstances and make informed decisions about the choices they make.

SUMMARY AND CONCLUSIONS

This article reviewed the issues that need to be considered in designing retirement savings and retirement income products and the features that need to be incorporated to address the concerns of investors for retirement in a world where the vulnerability of retirement funds to market vagaries and a population that is ageing have become serious concerns.

Design considerations in the accumulation phase and in the draw down phase of retirement products were examined. In the accumulation stage, strategies for mitigating inflation risk and managing investment risk for investors who are approaching their retirement dates were reviewed. In the draw down phase, the welfare effects of incorporating life annuity, longevity annuity and variable annuity products were discussed, and the current research in this area were examined. Obstacles to the development of annuity product markets, techniques for the management of longevity risk and mechanisms for the securitization of longevity and mortality risks were identified as areas needing further development for facilitating the expansion of retirement product offerings. The need for further research into developing and offering retirement products that are more closely tailored to meet retirees' individual needs was also identified. The ongoing research on providing a holistic approach to retirement investment management incorporating the accumulation and drawdown phases within a unified framework was discussed.

Measures that governments and policymakers could adopt to facilitate the provisioning of welfare enhancing retirement savings and income products to the market were identified in the article. Among these are initiatives for enhancing consumer education and financial literacy,

measures for the development of suitable longevity indices for benchmarking and pricing purposes, and tax incentives to facilitate retirement product markets.

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