Life Insurance Product Evolution in Changing Actuarial Regime

Our Actuarial Science started with Commutation Functions,

As actuaries, we start our actuarial education with the theory of interest and the theory of life contingencies. We apply the knowledge for product pricing, risk management as well as financial reporting. Developed from these theories, the commutation functions are very powerful analytical solutions for actuaries to readily determine fair insurance premiums and reserves without carrying out complex calculations. Their application however limits to the conditions of a stable and fixed economic environment, which has made them lose shine when variable interest rate and mortality/morbidity conditions are involved.

later moved to Asset Shares,

For a general and systematic method to address the variable cash-flow requirements for life insurance, the actuarial techniques have moved to the concept of asset shares. The basic asset share calculation is comparatively simple. It involves a projection of cash-flows based on particular policy characteristics and experience assumptions (including gross premiums, investment returns, expenses, costs of insurance, lapses, policyholder dividends, taxes, etc) that the actuary feels are relevant for the purpose of the calculation. Asset share calculations have been used by actuaries for calculating premium rates, setting surrender cash values, establishing dividend scales, assessing profit signatures, testing solvency, making projections for policyholder illustrations and determining embedded values.

but it remained Deterministic in the past Century,

Apart from mathematics, probability and statistics, actuarial profession has to cater for other social aspects including finance, economics, social expectations, legislation, prudential regulations, practices of other related professional bodies, technology

advancement, etc. Communication of actuarial information especially on cumbersome numeric findings to cover for the wide audience needs has always been a challenge for the profession. Actuaries have frequently been criticized for the use of qualifying statements "e.g. … on the condition of …". This has largely made the profession stay with the deterministic techniques for the past decades after retiring the practice of commutation functions.

Use of conservative actuarial assumptions is the way to make deterministic models survive in dealing with complex product designs and risk management. Like, for financial guarantees embedded in traditional life insurance or modern variable annuity products, deterministic calculations fail to explicitly identify the cost of guarantee. These products are usually launched with subjective estimates, in particular on the investment return assumption where the actual long term average investment return to be achieved by the underlying assets is often assumed to have a margin above the expected interest rate used to price the product. This margin is expected to provide the relevant buffer to cover for the guarantee and allow the cash-flows as unfolded from the product in the future to have good statistical confidence to honour the obligations. Whilst, in the determination of the embedded value from the product's discounted cash-flows, a higher risk discount rate will be used to provide an implicit allowance for the guarantee charge on these deterministic cash-flows.

Often management is not interested in the details of the mathematics and simply refers the calculations as black-box models. Actuaries are usually the risk experts left behind to make or defend the subjective estimates used in these deterministic calculations. This overall practice has created the profession with an image of being conservative. Product competition has however created pressure to reduce the amount of implicit margins or increase the level and sophistication of guarantees for better customer value. This has led to the proliferation of different product designs, including lapse-supported products, universal products with minimum life-time interest guarantee, fixed index annuities, constant proportional portfolio insurance (CPPI), variable annuities, annual ratchet guarantees, etc. The validity of the traditional actuarial approach has been under challenge, in particular on its intuitive appeal amid volatile investment conditions and exotic product guarantees.

and centred on Immunization Theory as practical conditions.

For risk management, the initial actuarial concept has been built around immunization theory for portfolio construction, which aims to match asset and liability cash-flows to minimize the risk of interest rate fluctuations on insurance surplus. The concepts of duration and convexity are commonly used in deterministic projections to assess the

potential impact on surplus due to incremental change in fixed interest rates. These techniques however limit the application to high quality fixed interest security portfolios as well as product characteristics that do not bear material non-linear relationships with change of interest rates. To overcome these theoretical restrictions, actuarial science has to recourse to modern finance theory and stochastic processes to address the shortfall.

Deterministic Techniques involve use of Implicit Margins leading to Divergent Financial Evaluations for Insurer Soundness.

Turning to financial reporting, differences in business objectives and risk preferences of the audiences have long been affecting the choices, designs and amounts of implicit margins as used in the traditional actuarial methods. These have led to different sets of actuarial numbers and methodologies used for regulatory (statutory accounting), general (GAAP) and supplementary (e.g. embedded value) reporting. For general reporting, the design of the reporting practice is often driven by local accounting profession as well. Thus, we have seen practices like US GAAP, UK Accrual, Canadian GAAP, Australian Margin on Services, etc which have driven the industry and product focus worldwide differently. Some choose the very distinct ends of the principle of exit value versus fulfilment value to map out their general reporting practices, whilst some stress on the principle of income and cost matching to emphasize deferred acquisition cost (DAC) recognition. Even though IFRS (Phase 1) has helped narrowing some general reporting differences, many practice variances are still pending for Phase 2 with agreement on the stochastic actuarial processes to address.

Actuarial Science predated Modern Capital Market Practice,

Historically, much of the foundation of actuarial theory predated modern financial theory. For intuitive appeal and easy layman communication, actuarial science has been developed along the path relying on assumptions for deterministic methods and comparing empirical evidence against assumptions to justify the relevancy of the black-box models, as opposed to the arbitrage free risk neutral valuation concepts used in modern financial theory. Thus, even when some actuarial calculations being expanded in the past decade to include certain stochastic elements to assess the financial implications on product guarantees, the actuarial processes taken has often focused on

historical real world investment returns and their standard deviation, and used past empirical data to generate the underlying simulation assumptions.

whose Traditional Techniques can lead to Arbitrage Opportunities for Investment Guaranteed Products.

For real world number projections, the concept begins with a risk-return relationship, and a risk premium (regardless of how small the premium may be) is assumed to exist between the two risky and riskless investments. Any financial projection into future years using real world number estimates for these investments, which include risk premiums in the underlying simulation data, will automatically unfold the expected risk premium as financial gains in the projection. Following the arbitrage free philosophy, this projection mechanism will however lead to an arbitrage opportunity by simply taking the risk into the future, which in reality does not exist per se, especially if some underlying conditions of the projection (like sustainability of financial obligations under negative equity) do not follow. In order to remove this oasis effect in financial valuation, either a deflator approach which the projected values are adjusted using relevant risk return rates to remove the illusory gains, or a risk neutral approach which produces the same expected risk adjusted return per the risk free rate for all different underlying investments, should be used when assessing financial guarantees.

The above risk neutral or market consistent principle is now advocated as the core principle for the actuarial processes to determine best estimate liabilities for life insurance under Solvency II, IFRS (Phase 2) and market consistent embedded value (MCEV), for the purpose of regulatory, general and supplementary reporting. As understood, financial reporting has a governing effect on insurance product designs. This potential movement in actuarial practice may likely influence our future life insurance product designs.

For Mutual Companies, Arbitrage on Investment Guaranteed Products is just an inter-generation matter which posts little issue,

It is noteworthy that many actuarial practices started to formulate when most of the insurance companies were operated in the form of (or similar to) mutual companies. Thus, it is natural for practices to develop along and appropriate with that environment. For mutual companies, most of the financial decisions in principle would only affect the

interests of different generations of policyholders. That is, often inter-generation matters were to be dealt with in a mutual company environment. Apart from the numeric aspects, it would be necessary to consider the social aspects (including reasonable policyholder expectations) in this respect. Thus, the use of real world valuations as well as deterministic methods would be sufficient, especially when the common form of products was participating life insurance.

For mutual companies, the key matter is on surplus management. Decisions on participating dividend distributions will in theory affect both current and future surplus distributions. Thus, it is easy and fair to refer to the experience variances on interest, mortality/morbidity and expenses to determine participating policyholder dividends. Often early surrenders will help generating surplus as well, given the heavy initial surrender penalties embedded in the traditional products. The use of asset share runs will be appropriate as the actuarial processes under this condition, especially when the asset strategy adopted to back the participating insurance liabilities is consistent with the immunisation philosophy, and the focus of surplus management is for maintaining an on-going sustainable business without the help of external resources instead of short term profit orientation.

A critical drawback with the use of real world estimates in valuing insurance liabilities as highlighted before is that it has not factored in the cost of hedging (or the funding cost for the availability of external resources) to honour the future product guarantees (if any) in the determination mechanism, versus the risk neutral valuation. In substance, the real world valuation has assumed that capital or surplus would be readily available to meet any future cash-flow shortfall for the undertaking to continue. The risk utilities on positive cash-flows and negative cash-flows are the same and there is no funding cost involved to turn any future negative cash-flow into positive. This underlying assumption may consider valid in a mutual company environment, if the likelihood of the extreme situations of bankruptcy can be eliminated in the projection, and the funding issues become matters between generations of policyholders. This operating environment should in theory generate an in-different effect on funding costs to validate the condition for the real world mechanism.

but it is a totally different story for Stock Insurance Companies.

However, the life insurance industry has now moved largely to a stock company environment. For modern actuarial practices, it is relevant to consider implications from a wider stakeholder perspective, especially like general reporting from more a capital market shareholder perspective. With this, it is natural to see that the use of risk neutral valuation, which allows for the potential hedging costs or capital funding costs in the

liabilities, is a justified practice in the actuarial processes to determine insurance liabilities. Otherwise, who will compensate for the shareholders to avail capital for the risks they take to support the guarantees, in addition to the strategic and operating risks that they face with the business, which suppose to be compensated from the explicit product margins available from product sales after the hedging cost for the guarantee.

It means anti-selection against Shareholders.

Save the protection insurance components, for the pure saving (or endowment) component of a life insurance product, one can easily see that any product design is effectively to dissect the investment return expected to be achieved by the underlying assets over the lifetime of the insurance policy, amongst policyholder (in the form of benefit return), shareholder (in the form of interest spread for the capital employed to fund for the business and assume various business risks other than investment guarantee risk), investment return guarantor (in the form of hedging cost or capital funding cost), distributor, investment manager, management including miscellaneous services maintenance (in equivalent asset charges), and tax bureau. Depending on product design, the financial patterns between benefits and obligations amongst the stakeholders (in particular between policyholder and investment return guarantor) can alter dramatically with any change on the underlying investment risks. For stock companies, the benefit and obligation conflict is no longer a timing issue between generations of policyholders as for mutual companies.

The conflict has posted a big challenge on actuarial pricing especially in a low interest rate high volatility environment. The engagement of risk neutral pricing in the actuarial processes, which implies an explicit recognition of hedging cost when pricing guarantees, can help actuaries unload the burden on making subjective estimates under deterministic methods. However, this change in pricing practice may lead to a paradigm shift on product focus by the industry.

Even there are different views on Insurance Guarantee Evaluation,

Consequently, even when stochastic actuarial processes are supported by world actuarial professions; detailed principles for supplementary MCEV reporting have been endorsed in 2009 CFO Forum; exposure draft for IFRS (Phase 2) for insurance contract general reporting has been published for formal implementation in 2014 (with an opening balance sheet as of end 2012); and Solvency II (despite one year deferral) is

scheduled to commence at the beginning of 2014 for European insurers, there remain divergent views on how actuarial valuations and the resulting solvency measures should be performed, in light of the implications on past practices and the resulting legacies to be experienced by different jurisdictions. The US has not yet fully subscribed the practices as originated from the European Community. Asia has largely taken a wait-and-see attitude in the above movements. Even though China has already adopted the framework of IFRS (Phase 2) as its general reporting standard for insurance companies, the actual practice especially on the determination of liabilities for long term guarantee is at variance with the essence in IFRS exposure draft.

it will capital penalise Shareholders when Arbitrage occurs.

Due to the presence of the non-forfeiture law in the US, American life insurance products have generally provided higher investment guarantees than European counterparts. Because of the savings focus in Asia as well as cultural preference for guarantees, Asia has commonly borrowed American designs on life insurance products. These products may however find themselves easily capital penalised under the risk neutral regime. Also, the retroactive recognition of guarantee costs upon the introduction of the new regime would easily produce surplus shocks to the stock companies, which would impact the current shareholders directly. Some of these stock companies might in fact be listed and converted in the past decade from their mutual, in which substantial surplus was released to the past policyholders upon demutualisation. Any change in actuarial practice as induced by the risk neutral regime might lead to a heavy regulatory and operational risk penalty to these shareholders.

To acknowledge Capital Market Practice for Insurance Supervision,

In order to protect policyholders against adverse situations, a minimum regulatory solvency standard is needed for regulators to enforce intervention. There is a wide variety of solvency measures taken by world insurance supervisors, ranging from a pure formula basis to a more sophisticated dynamic solvency testing standard (including the risk based capital (RBC) regime). Like the RBC system in the US, the regulatory solvency measure is often based on statutory financial statements, which are comparatively easy to provide the quantifiable answers for easy trail of the calculations. It may fail to catch every single risk aspect on product guarantees. However, the beauty is that the overall practice is more transparent than the black-box modelling under risk neutral stochastic

actuarial processes, which is heavily reliant on robust models and robust assumptions that none may comprehend it fully unless being deeply involved in the process.

it will require Skilled Resources for Enforcement.

The solvency regime as advocated under Solvency II involves substantial modelling, which in essence aims to keep all risks transparent for the board/management to make conscious decisions. On the surface, this will shift the appointed actuary's burden for making subjective actuarial judgement to the board/management for quantifiable and objective decisions in line with the supervisory goal. However, the board/management will likely continue to regard the actuarial models as black box models, and even more so under these risk neutral stochastic processes. The industry will naturally evolve to become competition amongst black box models. In order to police the industry, the regulator has to be on top of the models of each industrial player to ensure fair play. This will demand much sophisticated actuarial skills, and a much bigger technical team that it may otherwise be available by the regulator for supervision under the current solvency regime involving easy calculation trail. Undoubtedly, this will pose a big challenge to the Asian regulators. It is likely that they will watch the development in the US before refining their solvency regimes.

Before Supervision ready to regulate Insurers on Cost of Arbitrage,

However for Asian insurers and actuaries, it may not be relevant to take a wait-and-see attitude. It should spend efforts to understand the potential implications. For the European insurance subsidiaries in Asia, it is natural that they may have to withdraw from the guaranteed return product segments, as they have to price in the guarantee under the risk neutral regime. In fact, foreign insurers are withdrawing from certain Asian markets, like Taiwan and Japan, due to the local situation of high product guarantee. Whilst for domestic insurers, they may enjoy the current benefit of continuing the traditional pricing practice which makes their products price attractive to drive away their foreign counterparts. However, when the new regime (an international consistent standard of regulation which final form may be at slight variance to the coming Solvency II, but the principles will likely be unchanged) comes in the future, the laggards will have to face the change and may easily suffer more painful surplus shocks especially if their portfolios have substantial uncovered guaranteed liability positions. Thus, it is appropriate for Asian actuarial professions to make known of the potential

regulatory and operational risks to the industry so that it can head down a healthy strategic product direction.

As a quick snapshot, Solvency II requires undertakings to set up technical provisions which correspond to the current amount undertakings would have to pay if they were to transfer their insurance obligations immediately to another undertaking. For insurance liability measurement, IFRS exposure draft specifies an explicit, unbiased and probability-weighted estimate of the future cash flows that will arise as the insurer fulfils the insurance contract; adjusted for the time value of money and including an explicit estimate of the effects of uncertainty about the amount and timing of those future cash flows. In addition, for market variables, estimates should be consistent with observable market prices. CFO Forum has stated that the value of in-force under MCEV should consist of present value of future profits, adjusted with time value of financial options and guarantees; frictional costs of required capital as well as cost of residue non hedgeable risks. In summary, the objective of the new financial reporting regime is to market value the insurance liabilities such that they can be transferrable as per other financial securities and funded by the capital markets, if required.

Actuaries should allow the true Cost of Guarantee for Insurance Guaranteed Products to fairly treat Stakeholders;

Apparently, in market valuing liabilities, the modern actuarial processes have to validate findings with capital market valuations to achieve the above financial reporting objective. Like modern variable annuity products, their actuarial pricing and valuation may need to check against Black-Scholes Option pricing mechanism. Actuaries will need to understand that these products exhibit negative gamma characteristics, which dynamic hedging will lead to gamma loss. Because of the effect of volatility smile, simple delta hedging may not be enough. Delta and gamma hedging may be required, which will further increase the hedging cost. Also, market volatility is not constant. But the charges on variable annuity product are usually fixed, which effectively has locked in its priced volatility. Vega hedging may be relevant to fence against any capital raid by hedge fund managers amid wide fluctuation of implied volatility over an economic cycle. The new actuarial valuation regime will require all these costs till the end of the long term contract to be properly allowed for and brought to current as well. Likely, the new regime will see refinement on these product designs to reduce the hedging costs.

For fixed annuity products embedded with CPPI design, actuaries using stochastic processes would find that because of the internally fixed gearing effect, these products would largely perform in only certain economic scenarios depending heavily on the

favourable initial conditions. This would have an implication on expense cash flows for liability measurement if probability weighting was applied. For lapse-supported products, it would find that they also exhibit negative gamma characteristics on policyholder behaviour. The profit margin as unveiled in the deterministic process would usually be its highest as reflected by the chosen assumption on policy behaviour, and any variance in experience will see the margin being eroded rapidly. The probability weighted value under the new financial reporting regime may easily give a different financial picture versus the deterministic process on these products.

and consider Market Reaction on Income and Net Assets Volatility.

In substance, the actuarial processes for the three new reporting standards can be calibrated. For a life insurance policy, if its future liabilities can be replicated reliably to an asset portfolio with observable market values, the market value of the replicated portfolio will be its technical provision. If not, a risk margin representing the cost of capital will be added to the probability weighted best estimate liabilities to form the technical provision. The remaining positive discounted net cash flows at policy inception will form the residue margin of the insurance policy. Under the proposed IFRS, this residue margin will be amortised over the lifetime of the policy by means of a carrier. For Solvency II and MCEV, this residue margin can be capitalised as shareholder equity for solvency and embedded value purposes. Apart from the recognition effect on the residue margin, annual profit on this insurance policy should have its expected value equal to the capital return as defined by the market from time to time for the capital employed to underwrite the risks of this policy, which the technical provision has probability weighted for their emergence. This expected value of annual profit will however be subject to a probabilistic distribution function as defined by the outcome distribution functions of the net risks that the policy undertakes. This will lead to income statement volatility comparable to the company's aggregated risk distribution function.

Capital Market will penalise Stock Insurers for any Substandard Risk Adjusted Performance,

The move to the new reporting standards is expected to lead to closer matching between assets and liabilities. For those companies who do not do so, they will not only see higher solvency capital requirements, but will also see greater income statement volatility. These will easily make them produce a substandard risk-adjusted return to

shareholders, which the capital markets may further penalise against them for any funding or risk transfer request. Naturally, this will drive the board/management to reduce investment guarantees on long term products in order to improve asset-liability matching. On the other hand, improving the value of residue margin is clearly the way for enhancing embedded value, which will infer the preference to reduce the relative technical provision as well. Insurers can readily achieve this either by writing more term protection insurance policies, which generally produce substantial residue margins, or by wrapping the saving insurance products against unitised investment funds or capital market instruments for direct portfolio replication to reduce risk margins and liabilities.

which makes Insurers focus on Protection Products & wrap Saving Products around Investment Funds and Capital Market Vehicles.

In the nutshell, the new financial reporting regime will impact the actuarial processes, and will lead to further integration of actuarial theory with modern finance theory. This will naturally increase the transferability between life insurance products as priced under actuarial theory; and investment fund and capital market products as priced under modern finance theory. This is expected to make the pricing for saving elements of life insurance products similar to that in the investment fund/capital markets, and the pricing for protection insurance components remain unique to the industry. For proper asset-liability management, life insurance products will therefore easily appear in a commingled form of investment fund/capital market vehicles attached with term protection riders in the new actuarial regime. The resulting product design will however demand a more sophisticated operating platform to administer, which may increase the operational risk of the company. However, in light of market expectations, companies will naturally prefer to drive a product design that may slightly increase the operational risk but at a great reduction in asset-liability mismatch risks so as to minimise capital commitment; reduce income statement volatility; and increase embedded value. This may be the reason why non-guarantee unit linked products have been so popular in the advanced Asian markets, which the actuarial professions have taken note of the changing actuarial regime.

Advanced Asian Markets have thus made that Move.

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