



## Consultation paper

# Solvency Requirements for Variable Annuities

The Reserve Bank invites submissions on this consultation paper by 03 October 2014.

Submissions and enquiries about this consultation should be addressed to:

Cavan O'Connor-Close

Adviser

Prudential Supervision Department

Reserve Bank of New Zealand

PO Box 2498 Wellington 6140

Email: [cavan.oconnor-close@rbnz.govt.nz](mailto:cavan.oconnor-close@rbnz.govt.nz)

Please note that a summary of submissions may be published. If you think any part of your submission should properly be withheld on the grounds of commercial sensitivity or for any other reason, you should indicate this clearly.

05 September 2014

## Introduction

1. Variable annuities are a life insurance product with unit linked or managed fund investment characteristics and optional guaranteed benefits for the policyholder.<sup>1</sup> In contrast to conventional annuity products where the policyholder has limited or no decision power over investments and may not be able to cancel the policy once the policy has been purchased, variable annuities allow the policyholder to make decisions post purchase or even cancel the policy, often with the full return of the original investment guaranteed. They are generally sold as a retirement income product. The biggest market for variable annuities is in the US and Japan but they have also grown in importance elsewhere around the world. The US Securities and Exchange Commission defines variable annuities as:

*“a contract between you and an insurance company, under which you make a lump-sum payment or series of payments. In return, the insurer agrees to make periodic payments to you beginning immediately or at some future date. You can choose to invest your purchase payments in a range of investment options, which are typically mutual funds. The value of your account in a variable annuity will vary, depending on the performance of the investment options you have chosen.”<sup>2</sup>*

2. As the definition says, a variable annuity consists of a lump sum or a regular payment over a number of years to an insurer. The insurer invests these funds on behalf of the policyholder in stocks, bonds or money market instruments, either directly or via a contracted party, and guarantees the insured a regular payment upon retirement for the rest of their lifetime. Payments above the guaranteed amount depend on the performance of the investment portfolio. The insured is therefore protected against downside risk while able to share in upside risk.
3. Compared to a traditional annuity product, the policyholder has more choice over what the funds are invested in and may withdraw them earlier, although some penalties may apply to any returns that have accumulated. These elements of a variable annuity have similarities to a unit linked investment or a savings account.
4. Variable annuities expose insurers to a number of risks. The main ones are insurance risk, market risk and behavioural risk.<sup>3</sup> Insurers use a variety of measures to manage those risks, from product design features and fees and charges to risk pooling, reinsurance and hedging strategies. Due to their unique characteristics, variable annuities require complex modelling of the liabilities and risk management techniques. Some insurance regulators offer a specific solvency treatment for variable annuities. The Reserve Bank’s Solvency Standard for Life Insurers does not currently provide for such a separate treatment. At the same time, there are currently no variable annuity products on offer in the New Zealand market as far as the Reserve Bank is aware but there is now some interest in introducing variable annuity products into the New Zealand market.
5. This consultation paper proposes a new component within the Reserve Bank’s existing life solvency standard to take account of the specific nature of variable annuities, and to provide for an appropriate solvency treatment. Section one provides an introduction and overview of variable annuities and their specific characteristics. Section two describes the main risks and risk management techniques used by insurers. Section three explains their current capital treatment under the Reserve Bank’s Solvency Standard for Life Insurers and summarises regulatory approaches adopted in some other jurisdictions. Section four proposes a new capital treatment of variable annuities. Section five concludes.

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<sup>1</sup> See Ledlie et al, 2008

<sup>2</sup> <http://www.sec.gov/answers/varann.htm>

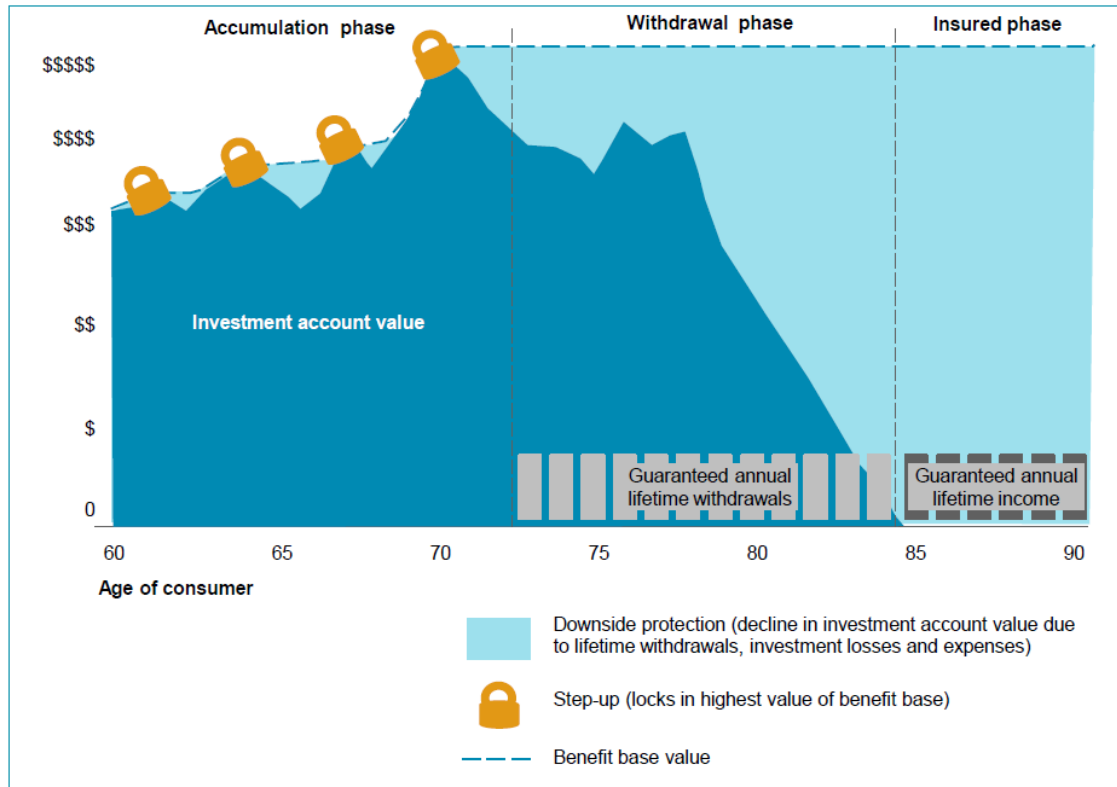
<sup>3</sup> The Geneva Association, March 2013

6. Stakeholders are invited to provide feedback on the proposed solvency treatment of variable annuities by 03 October 2014.

### **Section 1: variable annuities**

7. A variable annuity consists of a policyholder making a lump sum or a series of regular payments to an insurer. The insurer invests these funds on behalf of the policyholder who is guaranteed a regular minimum payment upon retirement for the rest of their lifetime. Compared to a standard annuity, the policyholder has a greater choice over investment options and may withdraw the funds early. Payments above the guaranteed amount depend on the performance of the investment portfolio managed by the insurer or another contracted party. Investments are typically in stocks, bonds or money market instruments. The insurer generally collects fees and charges in addition to the investment payment(s) from the policyholder.
8. Clauses within the contract specify certain minimum guarantees for the policyholder. These may be a guaranteed minimum income, withdrawal or accumulation benefit or the return any of the original investment funds that are left to the insured's estate or heirs. These guaranteed benefits are generally reflected in the names given to the different classes of variable annuities. The four most commonly cited variable annuities contracts are: guaranteed minimum income benefit, guaranteed minimum withdrawal benefit, guaranteed minimum accumulation benefits and guaranteed minimum death benefits. In practice, many variable annuity contracts include more than one of these benefits. More exotic variants may lock in benefits at certain points in time if the assets have increased (ratcheting) or guarantee a certain investment growth rate regardless of market performance (roll ups).
9. A main feature of a variable annuity is that it offers the policyholder protection against downside risk while letting him or her share in upside risk. If market returns are volatile and below expectations, the variable annuity provides a minimum guaranteed pay out and the return of policyholder's original investment either over a period of time through regular pay outs or by cancelling the policy and withdrawing the remainder of the investment, i.e. the original investment minus any pay outs that have already been made. If market returns are good, the profits are added to the original investment amount, thus increasing the investment fund. Depending on the terms and conditions of the contract, the increase in the value of the investment fund may be locked in, preserving it even when markets become more volatile.
10. For the holder, the value of a variable annuity is similar to that of an option. The value of its guaranteed benefits changes and may at any one time be in- or out-of-the money. Volatile markets increase the likelihood of the variable annuity being in the money as returns are low and the guaranteed return the variable annuity provides could be worth more than alternative investment options. Similarly, above average longevity increases the probability of the variable annuity being in the money as it continues to pay out the guaranteed minimum even when all the initial investment has been drawn down. This is also called the insurance phase of the variable annuity. Strong market returns and, for example, lower than anticipated market volatility could lead to the variable annuity being out-of-the money.

Diagram 1



(Source: United States General Accountability Office 2012, reprinted in The Geneva Association, 2013)

## Section two: risks and risk management

11. Variable annuities expose insurers to a number of risks. The key risk categories are: insurance risk, market risk and behavioural risk.<sup>4</sup> The main insurance risk is longevity risk. If the portfolio of policyholders live longer on average than estimated, the life-time income guarantee (used in a wider sense here to also include withdrawal guarantees) is likely to exceed the value of the funds invested by the policyholder. In the diagram above, the insurance element is called on when all the funds in the investment account are exhausted. This would constitute a claim pay out for the insurer.
12. The main market risks are interest rate risk, equity risk, foreign exchange risk and credit risk. It is the risk associated with higher than anticipated market volatility not generating the expected returns, resulting in a shortfall between guaranteed pay outs and investment returns. Market risk is a crucial risk component and will be elaborated on further on in this document.
13. Behavioural risk captures the risk that the assumed rate of policy cancellations differs from what actually happens or that policyholders switch between investments within the variable annuity product. This will affect an insurer's liabilities. Shorter than anticipated persistency means that the insurer will not have the fee income from the insured party. At the same time, the insurer will also not have to provide the guarantees. Lapse rates may be correlated with market returns. A low volatility market environment in which asset returns are good could lead to higher lapse rates as policyholders have other investment options and the option value of the guaranteed benefits of the variable annuity may be out of the money from the policyholder's perspective. Conversely, if market returns are below expectations, the policy is likely to be in the money and lapse rates may

<sup>4</sup> The Geneva Association, 2013

be lower than expected. Also, policyholders switching their investment strategies can affect an insurer's liability position and lead to a change in risk.

### Risk management

14. Insurers manage the risks described above in a number of ways, including through the collection of fees and charges, product design, risk pooling, reinsurance and hedging strategies. Most of these risk management tools are fairly standard in the insurance industry. The use of sophisticated dynamic hedging strategies is more specific to variable annuities.
15. Fees and charges are used to pay for the expenses of administering variable annuities, paying broker fees and partly also for providing the guaranteed benefits and managing risk in normal market conditions. Some of the common fees and charges used are:
  - Investment management charge for the services provided by the investment managers;
  - Surrender charges may become payable if the policyholder wishes to cancel the policy during the initial period and are used to recoup commission expenses;
  - Rider charges cover part of the cost of providing certain guarantee options;
  - Administrative charges to cover administrative expenses; and
  - Insurance charge to cover some guaranteed benefits.
16. These fees and charges are designed to cover some or all of the risks and day to day costs of offering variable annuity contracts but they are unlikely to produce sufficient income to manage downside risk. This is particularly so since fees and charges are often linked to the value of the investment account. If in a downturn the value of the investment account goes down, then so does income from fees and charges.
17. Having a large number of policyholders allows for risk pooling and for more accurate estimation of parameters. This might help with managing longevity assumptions and behavioural risks, e.g. lapse rates, but not market risk, although a larger portfolio of investments does allow for diversification benefits. The insurer also has to be alert to self selection and any biases that introduces. The group of policyholders may differ from the general population, rendering any assumption based on statistics from the general population less reliable.
18. Another form of risk pooling can be achieved by pooling different lines of life-insurance business. A portfolio of life insurance policies could provide a hedge against longevity risk. The costs associated with longer than expected life expectancy for the variable annuities portfolio would be offset by higher returns from the life insurance portfolio, assuming that the two groups of policyholders share a similar trend. However, this effect also works the other way around and some regulators do not allow insurers to pool variable annuity business with other forms of insurance business.
19. Reinsurance transfers the risk, or the part that is being reinsured, to another insurer. However, the availability of reinsurance for some of the guaranteed benefits of variable annuities may be limited and costly and it exposes the insurer to the risk of the reinsurer failing to honour its side of the contract, i.e. counterparty risk.
20. Providers of variable annuities have increasingly been using hedging strategies to manage market risk, which is one of the biggest risks faced by variable annuity insurers. This involves putting together a portfolio of derivatives with the aim of ensuring that the portfolio of asset matches the option value of the liabilities regardless of movements in underlying market risk parameters. Hedging strategies for variable annuity liabilities generally involve the purchase of index-based futures and forwards, swaps and options.

21. The two main hedging strategies are static and dynamic hedging. The terms static and dynamic refer to the frequency with which hedges are being adjusted to match changes in the option value of the liabilities. Static hedging involves the purchase of standard long term financial products. Future market movement may be factored in but rebalancing of hedges is very infrequent and may only take place at predetermined points in time or not at all. Static hedges are cheaper to operate than dynamic hedges and generally lend themselves better to managing liabilities when guarantees are simple and can be more easily predicted. In theory, static hedges mostly leave a greater residual risk as they do not tend to match liabilities as well as dynamic hedges should.
22. A dynamic hedge consists of a portfolio of financial instruments and derivatives which is frequently rebalanced so that the value of the portfolio of assets continues to match the option value of the liabilities. Although frequent, in the presence of transaction costs rebalancing is not instantaneous and only takes place if certain trigger thresholds are met. Dynamic hedging can reduce market risk and also allow the insurer to adjust to movements on the liabilities side driven by changes in lapse rates or mortality assumption. However, it does not eliminate risk completely, and brings its own risks and transaction costs.
23. Hedges against market risk provide protection against a number of exposures to movements in asset values and volatilities. These are usually referred to as “the Greeks”. The name stems from the Greek letters used to describe these movements. The most common ones are:
- Delta: the change in the option value of the liability due to a change in the value of the managed assets;
  - Rho: the change in the option value of the liability due to a change in the interest rate;
  - Vega: the change in the option value of the liability due to a change in the volatility of the asset;
  - Gamma: the rate of change of delta due to a change in the asset values.
24. The first three Greeks are first order Greeks, meaning that they are calculated by taking first partial derivatives. Gamma is the second partial derivative of the option value with respect to the asset value. There are more second order Greeks and other Greeks that measure the sensitivity of one Greek to changes in another Greek but the Greeks listed above are generally viewed as the most important ones for managing market risk for a portfolio containing options.
25. In theory, the use of liquid financial instruments that can be traded in deep markets with little transaction costs allows insurers or those acting on behalf of insurers to reduce these market risk. However, it is important to realise that not all risk can be eliminated. Hedging behavioural and insurance risks is more difficult and there is a whole array of other risks that cannot be hedged away. One aspect of this is the long term nature of annuity liabilities. Moreover, apart from any unhedged Greeks, there are basis risk, credit risk, liquidity risk, lapse risk, model risk, operational risk and execution risk. In the New Zealand context, accessing deep and liquid markets is likely to involve offshore markets, which introduces exchange rate risk and the need for currency hedging. Then there are risks from differences in the quality of the hedging strategy such as rebalancing frequency and the kind of derivative instruments that are purchased. The impact of extreme events is another important risk that is likely to be not fully reflected in strategies based on relationships that hold in normal market conditions or even where some market stress is included.
26. It is worth highlighting some of these risks. Basis risk is the risk that the underlying managed funds do not exactly track market indices that are the reference point for the hedging instruments. Credit risk is the risk that one’s counterparty fails to honour their obligations. Holding market instruments often comes with margin requirements, which can lead to liquidity risk from having to post additional collateral due to adverse market movements. In addition, extreme market events in particular can render hedging strategies ineffective. For instance, market freezes or cost blow outs could make a rebalancing of the hedging portfolio more difficult or impossible.

27. The quality of the risk management therefore depends not only on the hedging itself but also on how these other remaining risks are addressed. From a regulator's point of view, the quality of a risk management programme, including the hedging strategy, often requires an analysis on a case by case basis. Insurers are generally expected to state their hedging and risk management strategies in a hedging programme that is agreed with the hedge provider if that aspect is contracted out.

### **Section three: current regulatory treatment**

28. The Reserve Bank's Solvency Standard for Life Insurers can be applied to variable annuity business but it does not currently include any specific requirements or guidance for calculating the more complex liabilities or allow for the effects of dynamic hedging to be taken into account. Some jurisdictions around the world have specific regulatory requirements for variable annuities, including a prescribed solvency treatment for dynamic hedging that takes account of the risks and benefits associated with that form of hedging.
29. Variable annuities require complex modelling of the assets and liabilities. Although there is currently nothing in the Reserve Bank's solvency standard that would prevent the use of complex modelling techniques, there is also no guidance as to which techniques should be used or what the Reserve Bank's expectations as regards prudential assumptions or outcomes are.
30. Under the Reserve Bank's existing solvency standard, variable annuity insurers have to calculate capital as per the general requirements stipulated in sections 55 to 108. They are able to take full credit for reinsurance arrangements in line with the treatment of reinsurance for other life insurance business. Section 14 of the Solvency Standard for Life Insurance Business specifies that the best estimate liability must be calculated net of reinsurance. A reinsurance recovery risk charge applies as per Sections 56 and 100 and the following sections to take account of the risk of the insurer not being able to fully recover on reinsurance contracts.
31. Moreover, the Solvency Standard for Life Insurance Business provides for the solvency calculation to be done net of any hedges in place at the validation date. Current or static hedges already in place are therefore fully reflected in the solvency calculation. Predicting risk mitigation effects from frequent rebalancing of the hedges, as is the case under a dynamic hedging strategy, is not reflected. Variable annuity providers that use dynamic hedging might argue that their solvency requirement as currently calculated overstates their risk exposure and ignores the risk mitigating effects of dynamic hedging. Assuming that dynamic hedging is associated with higher transaction costs, not reflecting the risk mitigating benefits in the solvency calculation might disincentivise its use as a risk management tool.
32. Regulators in other jurisdiction with variable annuity business allow for the solvency requirement to reflect a degree of the risk mitigating benefits of dynamic hedging. The amount of capital reduction that regulators allow generally reflects the quality of, and experience with, the risk mitigation achieved by dynamic hedging and may involve an element of case by case analysis and decision-making.
33. For example, APRA's prudential standard LPS 110 includes an attachment on the capital treatment of variable annuities. The Attachment A prescribes that more sophisticated modelling needs to be carried out for variable annuity business and that this modelling must cover both insurance and asset risk simultaneously. The capital requirement is calculated by a formula that attaches a weighting of up to 70 percent on the capital outcome with dynamic hedging included. The remaining 30 percent assume that no dynamic hedging takes place but allows for hedge positions that are in place on the valuation date to be taken into account.

$$\text{Capital} = E * \text{Capital including hedging} + (1-E) * \text{Capital excluding hedging}$$

With  $E$  = an “effectiveness factor” reflecting the level of sophistication of the dynamic hedging and ranging from 0.3 for start ups to 0.7 for more established insurers.

34. APRA’s standard states that hedging or modelling should cover all risks, imperfections and costs. The maximum 0.7 weighting on the capital outcome with hedging included is only awarded if the hedging addresses all economic risks or if the model includes scenarios to capture any risks that are not hedged. If that is not the case, the attachment makes it clear that the weight on dynamic hedging should be substantially reduced to close to zero. APRA reserve the right to override the insurer’s own judgement by specifying a value of  $E$  if it deems the value chosen by the company as not appropriate.
35. Dynamic hedging models and their simulations differ across firms. Some may hedge some risks but not other (see the Greeks discussed above), other may have a more conservative risk tolerance or use scenario based simulations. Others again rely on stochastic techniques. This might explain why APRA’s standard makes requirements at a high level with decisions made on a case by case basis reflecting the quality of the hedging and modelling.
36. The Irish regulator has adopted a more prescriptive standard which, however, also includes case by case analysis. Its “Requirements on Reserving and Risk Governance for Variable Annuities” allow for an offset to take the positive effects of dynamic hedging into account.<sup>5</sup> However, the offset may not be more than what can be justified by actual experience and the more sophisticated the modelling, the higher the offset can be. The Irish requirements seem to prescribe stochastic analysis and a minimum conditional tail expectation or the equivalent value-at-risk measure to be used. An independent actuary has to provide a report that covers, amongst others, analysis and justification of the impact of the dynamic hedging, basis risk and the economic scenario generator. If any of the items listed are not covered by the actuarial report, the capital adequacy requirement has to be increased. The economic scenario generator is subject to minimum requirements, e.g. extra prudence must be used if a Gaussian model or constant volatility is used. Similar to APRA, the Irish requirements list the risks that need to be taken into account. Some of the risks that are explicitly mentioned are basis risk, operational risk, model risk, lapse risk, counterparty risk and behavioural risk. Although the Irish requirements go into more detail, it seems that the capital outcome is still subject to a case by case analysis of the quality of the modelling and the hedging strategy.
37. Other regulators around the world, e.g. in Bermuda, either have or are in the process of choosing an approach that allows insurers to use internal modelling to calculate their solvency capital requirement subject to supervisory approval.<sup>6</sup> This supervisory approval usually includes reporting requirements with an emphasis on detailed explanations of the choice of assumptions and the degree of prudence reflected in them. The extent to which regulators prescribed model assumptions or parameters seems to vary, however, with some regulators taking a more prescriptive approach than others.
38. What all of these standards have in common is a recognition that the modelling of the assets and liabilities and the hedging programmes may differ across variable annuity providers and the regulator is involved in determining the capital outcome. The small sample of jurisdictions we have reviewed incorporates elements of the regulator being involved in case by case analysis and decision-making regarding the capital outcome. Regulators also specify the risks that should be included in the hedging strategy or as part of the scenario modelling. Some regulators prescribe particular modelling techniques, e.g. stochastic techniques, and a minimum level of conservatism reflected in the modelling.

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<sup>5</sup> See Central Bank of Ireland, 2010

<sup>6</sup> Bermuda Monetary Authority, 2013



### A proposal for a specific solvency treatment of variable annuities

39. As noted above, the Reserve Bank's current solvency standard already provides for a capital requirement for variable annuity products to be calculated. But the current version does not offer any particular guidance on how to calculate the assets and liabilities of a variable annuity product, which generally requires more complex modelling, and it gives no credit for the benefits of dynamic hedging, which is becoming more and more the predominant risk mitigation technique for variable annuity providers. The Reserve Bank is not averse to amending its solvency standard to incorporate a specific treatment for variable annuities but considers that any specific capital treatment should be in line with the existing standard. This means that the focus should be on achieving certain prudential objectives without being overly prescriptive in terms of how these are met.
40. Any allowance for dynamic hedging should be transparent and easy to understand and reflect the sophistication of the underlying modelling of the assets and liabilities and the extensiveness and quality of the hedging. It is also important to recognise that dynamic hedging does not eliminate all risk and some of its underlying assumptions, such as the availability of deep and liquid markets, may not hold when most needed. The Reserve Bank therefore considers it important that an insurer actively addresses these risks in a forward-looking manner. The role of the appointed actuary is extremely important in this regard and could be complemented by further independent expert analysis. Most importantly, any capital credit should reflect the quality of the underlying modelling and hedging whilst still delivering a prudent capital outcome. That means the capital outcome should reflect more prudent assumptions than the Best Estimate Assumptions. Consequently, the capital outcome will be more conservative than that based on Best Estimate Assumptions.
41. The Reserve Bank has the following priors for the establishment of a separate capital treatment of variable annuities;
1. There is some justification for incorporating a specific treatment of variable annuities within the Reserve Bank's Solvency Standard for Life Insurance Business
  2. The capital calculation should be principled, transparent and easy to follow
  3. Any credit for dynamic hedging should be prudent and commensurate with the sophistication of the underlying modelling and the scope of the hedging programme
  4. The assumptions made as part of the modelling must be realistic and prudent and the financial impact of varying those assumption must be clear.
  5. Any risks not covered by the hedging strategy or included in the modelling should be identified and addressed by the insurer, for example by holding extra capital against them.
  6. There should be a written, clear and transparent hedging programme
  7. The hedging programme, modelling and the treatment of residual risks should be analysed and considered by an appropriately qualified independent actuary.
  8. The capital outcome should be prudent and more conservative than that based on Best Estimate Assumptions.

Consultation question:

- 1 Do you agree with these priors? Please elaborate.

42. Variable annuities require sophisticated modelling of the assets and liabilities. This can be done by using scenario based or stochastic methods and requires choices and assumptions to be made. Stochastic analysis may be more expensive but generally provides for a more extensive analysis

of possible outcomes and may more appropriately capture asymmetric risks that could be missed by deterministic or scenario based modelling. Scenario based analysis, on the other hand, allows for in-depth testing of specific scenarios. If a stochastic analysis based on Monte Carlo simulations is chosen, a decision as to the choice of the underlying distributions may need to be made. A good data set might indicate a certain type of distribution, e.g. a normal distribution, but that might not always be the case and for reasons of prudence it could be advisable to put more emphasis on adverse outcomes and choose fatter tails. The modeller also has to decide on a calibration such as the value-at-risk (VAR) level or a conditional tail expectation (CTE).

43. The Reserve Bank's current solvency standard does not prescribe any of these modelling decisions in a lot of detail. Instead, it relies on actuaries using their professional expertise and integrity to make these decisions as long as the outcome is in line with the Reserve Bank's overall requirements. Some regulators are more prescriptive and determine the modelling approach, for example that stochastic methods must be used, and set the calibrations within those approaches, e.g. a CTE basis 90. A prescriptive approach is always less flexible and at this stage the Reserve Bank is of the view that provided its prudential objectives, such as a prudent capital outcome, are met, practitioners should be allowed to make assumptions and decisions by drawing on their expertise and professional standards.
44. The Reserve Bank's current Solvency Standard for Life Insurance Business includes a prescribed mortality assumption for annuities in Appendix A, section 9. This requires the insurer and its appointed actuary to use a base of 90 percent of the Best Estimate Assumption and an additional 2 percent improvement assumption. The mortality assumption is an important assumption but not the only important assumption that an internal modelling approach needs to take into account. Prescribing it is therefore contradictory within an internal modelling approach. It is proposed that modellers can make their own mortality assumption, provided they are sufficiently prudent. The Reserve Bank's prescribed mortality assumption for other annuity business and assumptions made by other regulators such as APRA or under Solvency II in the EU may serve as reference points for the modeller to establish whether his or her assumption is sufficiently conservative in conjunction with consideration of relevant international experience of the relevant risks .
45. The Reserve Bank considers that the benefits of more prudent assumptions ought to be reflected in the capital requirement. This can be accomplished by linking the weight attached to the part of the capital calculation that includes the effects of dynamic hedging to the level of conservatism built into the assumptions and choice of modelling.

Consultation questions:

- 2 Do you have any comments on the Reserve Bank's proposal to refrain from prescribing particular modelling methods, distributions and calibration levels?
- 3 Do you agree that the quality and sophistication of the modelling and hedging should affect the capital allowance?

46. APRA's approach of reducing the capital requirement without dynamic hedging taken into account by up to a specified percentage amount to allow for the benefits of dynamic hedging to be reflected in the capital outcome. It is transparent and relatively easy to follow. In addition, it offers sufficient flexibility to allow quality aspects to be taken into account when deciding on the capital credit and a prudent outcome can be ensured by capping the maximum capital allowance at a predetermined level. A further advantage may be that some insurers that are active in both markets are already familiar with this approach.
47. Variable annuities are currently at best a niche product in New Zealand. Experience of New Zealand based insurers with these types of products is therefore extremely limited, although other

types of annuity and fixed income products are available. Given the novelty of variable annuities in the New Zealand market, it is proposed to set the initial allowance slightly below that adopted by APRA. Concretely, this means that while the same calculation takes place, the maximum weight that can be put on the outcome with dynamic hedging taking into account is 0.6. For start up companies, i.e. insurers with less than two years' experience, the maximum weight on dynamic hedging is 0.3.

$$\text{Capital} = w * \text{KDH} + (1-w) * K$$

KDH is the capital requirement for asset and insurance risk with the effects of dynamic hedging included

K is the capital requirement for insurance and asset risks without dynamic hedging included. Hedge positions in place at the valuation date can be reflected as per the Reserve Bank's Solvency Standard for Life Insurance Business

Consultation questions:

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|---|---|
| 4 | Do you agree with the proposed approach for determining the capital calculation of variable annuity products when dynamic hedging is used   |
| 5 | Do you have any comments on the concept of capping this allowance at a predetermined levels and making the actual amount of credit dependent on the quality and sophistication of the underlying modelling and hedging? |
| 6 | In your view, is the proposed maximum allowance, i.e. the proposed weightings, adequate?  |

48. The prime responsibility for the modelling of the liabilities and the effects of the dynamic hedging lies with the insurer and its appointed actuary. But it is important that this modelling is done robustly and explained in a clear and transparent manner. It is proposed that in addition to the work done by the appointed actuary, the insurer commissions a report prepared by an independent actuary, i.e. an actuary other than the appointed actuary and someone who has no links to or involvement in the business, to the Reserve Bank's satisfaction. The independent actuary's report should be prepared for the insurers, its appointed actuary and the Reserve Bank. Its main tasks are to analyse the modelling, including any assumptions, provide written justification for any choices that have been made, explain in detail the level of prudence reflected in the modelling and analyse in detail the effects of the dynamic hedging under different market conditions and by taking all possible risks into account. The report has to analyse any risks not expressly hedged or any other remaining risks such as basis risk, operational risk or model risk. The report has to clearly explain any additional prudence that has been used to compensate for those risks. Based on this information, the independent actuary may propose a capital allowance level, i.e. the weight placed on the capital outcome with the effects of dynamic hedging included, which the Reserve Bank will then confirm or adjust.
49. The insurer must have a hedging strategy in place which clearly sets out which market risks are hedged; the operational arrangements around the hedging strategy; rebalancing frequency, thresholds and triggers; any risks associated with the hedging or not addressed by the hedging, including basis risk, model risk or operational risk, and how those risks are taken into account; and any costs associated with the hedging and how they are covered.

Consultation questions:

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| 7 | Do you think the Reserve Bank is right in requiring an actuarial report and a hedging programme?            |
| 8 | Are there any other items that should be included in either report? Please specify with supporting reasons. |

50. Although the Reserve Bank envisages the independent actuary's report to propose a weight reflecting the quality and prudence of the hedging and modelling, the Reserve Bank reserves the right to confirm or overrule that proposed risk weight. While the Reserve Bank does not have any priors as to how many or what percentage of providers should receive the maximum credit, it views attainment of the full 0.6 weight subject to quality aspects and therefore something that not every provider will automatically receive. The following criteria should be taken into account by both the independent actuary and the Reserve Bank in reaching a decision on the weight. The list is non-exhaustive.

- Appropriateness and conservatism of the underlying modelling of the liabilities including material assumptions e.g. distributions, VAR or CTE level;
- Choice of economic scenarios, stochastic and/or scenario based analysis, quality and detail of analysis, conservatism included in the modelling;
- Detail and quality of the hedging programme, including its ongoing effectiveness;
- Rebalancing triggers and frequency;
- Markets risks that are hedged, gamma, first order Greeks, higher order Greeks;
- Analysis, impact and treatment of basis risk, liquidity risk, operational risk, model risk, lapse risk, credit risk, the longevity risk and path dependency;

### Summary

51. The Reserve Bank's solvency standard for life insurance business currently does not allow for a separate treatment of variable annuities. Variable annuities require complex modelling of the liability side and often involve sophisticated risk mitigation techniques such as dynamic hedging. While the solvency standard allows for a regulatory capital calculation to be performed, it does not adequately cater for the complexities of variable annuity products. Following regulatory practice in other jurisdictions from around the world, this consultation paper proposes a specific capital treatment for variable annuities. The proposed treatment reflects New Zealand circumstances where the annuity market is traditionally small. Although there are at present no variable annuity products in the New Zealand market as far as the Reserve Bank is aware, there are proposals for launching such a product. The proposed capital treatment is intended to provide regulatory clarity while contributing to variable annuity insurers holding prudent levels of capital.

52. Interested parties are invited to submit their feedback on this consultation **by 03 October 2014**.

## Appendix

### Draft new attachment to the Reserve Bank's Solvency Standard for Life Insurance Business

#### Solvency treatment of variable annuities

1. The solvency treatment of variable annuity products must be in accordance with this attachment. This attachment replaces the insurance risk capital charge and the asset risk capital charge except the asset concentration risk capital charge as per sections 55 to 108 of this standard for variable annuity products. The reinsurance recovery risk capital charge has to be included if appropriate.
2. Variable annuities are a life insurance product with unit linked or managed fund investment characteristics and optional benefits for the policyholder. This exposes the insurer to investment (or market) risk.
3. Variable annuities require sophisticated modelling of the assets and liabilities and special risk management techniques. The modelling can be done by using stochastic methods, scenario based analysis or a combination of the two and must produce a more conservative capital outcome than that based on Best Estimate Assumptions. Regardless of the modelling technique used, the modeller must make sufficiently prudent assumptions and use additional prudence for any model deficiencies or remaining risks. Any form of modelling has to be validated and stress tested on a regular basis.
4. The economic scenarios underpinning the modelling must reflect adverse market outcomes. This can be achieved by including real market data from periods that have experienced unusual significant market stress or by adding stress factors to real market data. The modelling of economic outcomes has to be documented in a clear and transparent way.
5. The insurer may replace the Prescribed Assumptions specified in Appendix A with its own assumption. Where the insurer opts to do this, any assumption it makes has to be sufficiently prudent. The level of prudence chosen by the insurer has to be fully explained. The Reserve Bank's assumption in Appendix A and those prescribed by other regulators may serve as useful reference points in explaining the level of prudence chosen.
6. If dynamic hedging or any other form of forward-looking hedging is used as a risk management tool, the insurer must have a detailed written hedging programme approved by its Board of Directors. This must include a
  - Overview of business;
  - Risk target / risk appetite statement;
  - Description of the dynamic hedging arrangements, including operational aspects responsibilities and governance structures in respect of the hedging programme and its effectiveness;
  - Frequency of rebalancing and trigger thresholds;
  - The market risks to be hedged, i.e. gamma, other first order or second order Greeks;
  - Explanation of the financial instruments to be used in the hedging;
  - Description of the model used including supplier, version, development background and support and back up arrangements;
  - Analysis of model parameter estimation;
  - Analysis of behavioural risks including lapse rates, basis risk, liquidity risk; any non-hedged risks; operational risk; legal risk; credit risk; longevity risk and any hedging imperfections;

- Analysis and explanation of the ability to hedge positions in the future and how to cope with periods of illiquidity in markets;
  - Analysis and description of the effectiveness of the hedging and monitoring arrangements;
  - Extensive discussion and analysis of economic scenarios used for the forward-projections;
  - If appropriate, a detailed explanation of the choice of distributions and VaR or conditional tail expectation;
  - Assessment of the impact on income from fees and charges from adverse economic conditions;
  - Explanation of any additional prudential measures taken to compensate for remaining risks, non-hedged risks, periods of unusual market stress or any other reasons; and
  - Analysis of any other relevant risks and issues.
7. The prime responsibility for the modelling, including the impact of the hedging programme, lies with the insurer and its appointed actuary. In addition to the role of the appointed actuary, the insurer must appoint an appropriately qualified independent actuary satisfactory to the Reserve Bank to provide a detailed analysis of the modelling of the assets and liabilities and the hedging programme, taking into account the risks stated in section 5 of this attachment and any other relevant aspects, including financial and business risks associated with the variable annuity product. For the purpose of this requirement, an independent actuary is an actuary different and independent from the insurer's appointed actuary and someone who is not involved in any activities related to the insurer's business or variable annuity product and the hedging strategy, including any operational aspects. The report must be submitted to the Reserve Bank and should help inform the insurer's risk management strategy and its appointed actuary.
8. In particular, the actuarial report must assess and comment on the economic scenarios and their assumptions and the degree of conservatism assumed in those scenarios and elsewhere in the modelling and hedging framework. The report must also assess the appropriateness of any chosen distributions and prudential calibrations. The independent actuary should propose a weight that should be attached to the capital outcome with dynamic hedging included. The Reserve Bank will consider the risk weight and confirm or amend it as it deems appropriate.
9. The capital calculation where a dynamic hedging programme is used must be done as follows:

$$\text{Capital} = w * \text{KDH} + (1-w) * K$$

KDH is the capital requirement for asset and insurance risk with the effects of dynamic hedging included.

K is the capital requirement for insurance and asset risks without dynamic hedging included. Hedge positions in place at the valuation date can be reflected as per the Reserve Bank's Solvency Standard for Life Insurance Business.

w and (1-w) are the weights attached to the respective capital calculations. W is determined by the Reserve Bank and must not exceed 0.6. For start up companies, defined as a company with less than two years of experience, w may not be more than 0.3.

The actuarial report by the independent actuary may suggest risk weights that will be confirmed or adjusted by the Reserve Bank. In arriving at a risk weight, the independent actuary must consider and explain the level of prudence reflected in the modelling and the hedging programme. Any unhedged risks must be analysed and the potential impact on the

licenced insurer's solvency margin must be quantified. In general, the less prudent the modelling and the hedging, the lower the value  $w$  should take. The reverse also holds.

10. The asset concentration charge, and if appropriate the reinsurance recovery risk capital charge, must be added to the capital outcome.

## References

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US Securities and Exchange Commission, “Variable Annuities”, website at <http://www.sec.gov/answers/varann.htm>



