

The TAMRIS Consultancy

Variable Annuities + GMWBs A Review of Sequence of Return Arguments

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1 A review of “sequence of returns” arguments

This report looks at the modelling of sequence of return risk within the context of Variable Annuities with GMWB riders and alternative lower and higher cost portfolio structures.

The modelling concludes, based on the sequence of returns data used, that sequence of returns risk is not a risk to the ability of a lower cost, well structured and managed portfolio to meet financial withdrawals over time with sequence of return data sets used by product providers.

Indeed, the high costs and naïve systematic withdrawals of VAs + GMWBs specifically expose them to such risk. The report supports an argument that VAs + GMWBs are only competitive when we look at simple naïve high cost withdrawal strategies.¹

While a VA + GMWB provides a lifetime guaranteed income withdrawal - this is only once a portfolio is fully depleted - and takes away the risk of running out of capital, *investors who use such products assume other risks*: these risks include reduced certainty of income and capital security, a higher level of inflationary risk and reduced flexibility to adjust the relationship between asset allocation and financial needs over time².

If these products are to be safely sold, the risk assessment and product sales process will need to include a fair assessment of the exchange of risks and returns that are taking place. The ability to do so will be influenced by the degree of impartiality that an advisor has with respect to the sale and the range of portfolio options an advisor is able to provide; advisors that rely on this product as their main lifecycle wealth management tool will be unlikely to provide their clients with the necessary perspective and investors would do best to look to advisors who have strong structured investment processes that cater to a wide range of risk aversions.

2 Life cycle wealth management

Lifecycle wealth management is about the management of assets to meet financial needs over time while managing the risks to the ability of those assets to meet those needs.

While this means optimising the balance of the portfolio between short and long term assets to meet short and long term financial needs, it also means selecting a withdrawal rate (that will also necessarily vary over time), that can be safely maintained through periods of significant market and economic risk, and a structure capable of providing the necessary income and capital security to meet financial needs during risk events³.

Managing short and long term needs also means protecting the purchasing power of planned income and capital withdrawals, which, means that income and capital withdrawals today need to be set at a level capable of providing inflation protection over time. This is contrary to GMWBs, which, because of their high costs and limited structural flexibility, risk setting withdrawals at too high an initial level and of limiting the potential for long term inflationary increases.

A structure that can manage risk and return, while providing the necessary flexibility to meet the changing demands of individuals as they move from pre to post retirement and within retirement to stages of advanced capital depletion is critical.

Managing short term risks to financial security does not mean exposing a portfolio to risk by blindly taking a fixed withdrawal (as with a VA + GMWB), nor should it constrain the ability of a portfolio to provide the long term returns necessary to meet future financial security (as with a VA + GMWB).

¹ Where an advisor will construct a portfolio of MER mutual or segregated funds or other securities/products and follows a systematic withdrawal policy which does not differentiate between bonds or equities during rising and falling markets.

² Obviously, if these risks have not been communicated at the point of sale, the true nature of the product's risk and return profile over time has not been communicated and hence the contractual relationship underpinning the transaction is compromised.

³ This can only be achieved by complex integrated asset and liability modelling.

2.1 Income and capital security

The level of income and capital security in a portfolio is primarily dependent on the amount of yield bearing fixed interest investment in the portfolio, the extent to which the maturity structure of those investments match the size and timing of investor financial needs and the quality of those investments. High quality investments with maturity profiles that match investor portfolio withdrawals have a high degree of certainty of income and capital security. Dividends from equities and the quality of the balance sheets supporting those dividends also impact the level of income security within a portfolio.

Careful modelling of risk can also ensure that higher levels of inflation, lower market returns and other factors can be entered into the process that assesses an appropriate withdrawal rate.

The problem with GMWBs is that the product favours **a)** a high allocation to equities limiting the allocation to lower risk assets, **b)** that the lower risk assets are in mutual funds where the maturity structure does not match the withdrawal demands of the portfolio, **c)** the charging structure eliminates most of the income (interest and dividends) return in a low interest rate environment exposing the portfolio capital values which naturally have higher short term risk.

All these factors expose withdrawals and hence financial security to short term fluctuations in the prices of both equities and fixed interest securities. Low fixed interest allocations, high costs and high equity exposure impact both income and capital security.

Income and capital security is therefore swapped for the promise of a guaranteed income once capital is depleted within the plans. The problem is that there is also high degree of uncertainty over the final income guarantee benefit; inflation will impact the real value of the guarantee, taxation will impact the net value if taxed as income, investment returns will determine the extent to which the income guarantee is called upon and life expectancy the magnitude of the income guarantee once in payment. Giving up a higher level of income and capital security and financial flexibility during the duration of the portfolio for an uncertain future final pay-off is a risk in itself. The issues discussed in this section will be explored in the sequence of returns analysis noted in section 3.

2.2 Life expectancy

According to [statistics Canada](#), Canadians born in 2005 have a life expectancy of 80.4 years (males 78 and women 82.7). Based on 2000 to 2002 data, at birth, a Canadian [male](#) would have a probability of 4.6% of living to age 95, 15% of living to age 90, 32% chance of living to age 85 and a 49.9% chance of living to age 80.

A male aged 65 has an average life expectancy of 17 years (16.98) and would therefore be expected to live to age 82; a 70 year old would be expected to live to age 84; a 75 year old to 85.3 years; an 80 year old to 87.8 and a 90 year old to 93.87 years.

Based on the same tables, at birth, a Canadian [female](#) would have a probability of 12.6% of living to age 95, 29.9% of living to age 90, 50% chance of living to age 85 and a 66% chance of living to age 80. A female aged 65 has a life expectancy of 20.5 years and would therefore be expected to live to age 85.5; a 70 year old would be expected to live to age 86.5; a 75 year old to 88 years; an 80 year old to 90 and a 90 year old to 95 years.

Based on this analysis, the probability of at least one partner born in 2002 living till 95 is 16.6% and the probability of both being alive is 0.7%. At age 85 there is a probability of 77% that one will be alive and a probability of 48% that both will be alive. At age 90, there is a 40% chance that one will still be alive and a 7% chance that both will be alive.

Different estimates of life expectancy provide different probabilities; however, the modelling in section 2 clearly shows alternative lower cost structures outperforming the high cost, inflexible GMWB. While those with long life expectancies would, based on the analysis to hand, do better by avoiding GMWBs, those with shorter than average, average or marginally longer than average life expectancies, should steer well clear. to shorter life expectancies

3 Sequence of returns risk analysis

A favourite tool of VA + GMWB sellers is the sequence of returns argument. This is usually illustrated by comparing the performance of a market with poor returns at the start of the period to one with poor returns later on in the period.

The analysis discussed in this section of the document uses the [Manulife sequence of returns](#) calculation as a point of reference. Manulife's analysis shows a \$500,000 starting portfolio with withdrawals of \$25,000 a year increasing by 3% a year. Annual total returns on the S&P/TSX from June 2001 to June 2007 were used to illustrate **a)** a negative 7 year sequence (three years of negative returns followed by 4 years of positive returns), starting with the June 2001 to June 2002 return and repeated 5 times, and **b)** a positive return scenario where the sequence of returns were reversed (*four years of positive returns first then the three of negative*), and again repeated 5 times.

The "Why Sequence of Returns Matters" information sheet provided by Manulife showed a total difference between the two scenarios of \$1.75m; that is the difference between the sum of withdrawals and end asset values of both scenarios; the negative return scenario runs out of money and only provides \$654,000 of withdrawals, the positive return scenario provides withdrawals of \$1.5m and has an end value of \$894,000.

The information sheet drew attention to the "big difference": given that the negative return scenario showed income and capital running out at age 85, there is nothing to suggest otherwise that the difference is not some form of opportunity cost associated with a VA + GMWB purchase decision. But is this the real risk to investors of the sequence of returns argument?

This document provides the results of an independent analysis of the sequence of returns risk argument using simple alternative structures, strategies and costs relative to a VA + GMWB's own costs and asset allocation structures.

Chart 1 illustrates a typical insurance company presentation of the data in terms of capital values, and chart 2 the accumulated withdrawals for each scenario; one change to the figures used in the Manulife data is that withdrawals are made at the end of each year as opposed to the start. The chart shows the value of a portfolio 100% invested in the stock market: the dark red line shows the outcome with a negative start to the sequence, the blue line the outcome with a positive start to the sequence. Chart 2 shows the accumulated withdrawals for the two outcomes.

The charts appear to show the need for a **VA + GMWB** type product to manage the sequence of returns' risk. However, this presumes that an investor would have had all their assets in equities, that a VA + GMWB would be able to provide increasing income in a falling market (*the illustration shows the impact of an indexed income*) and that other structures are not able to manage sequencing risk.

Chart 1

Sequence of returns - difference between a bad start and a good start

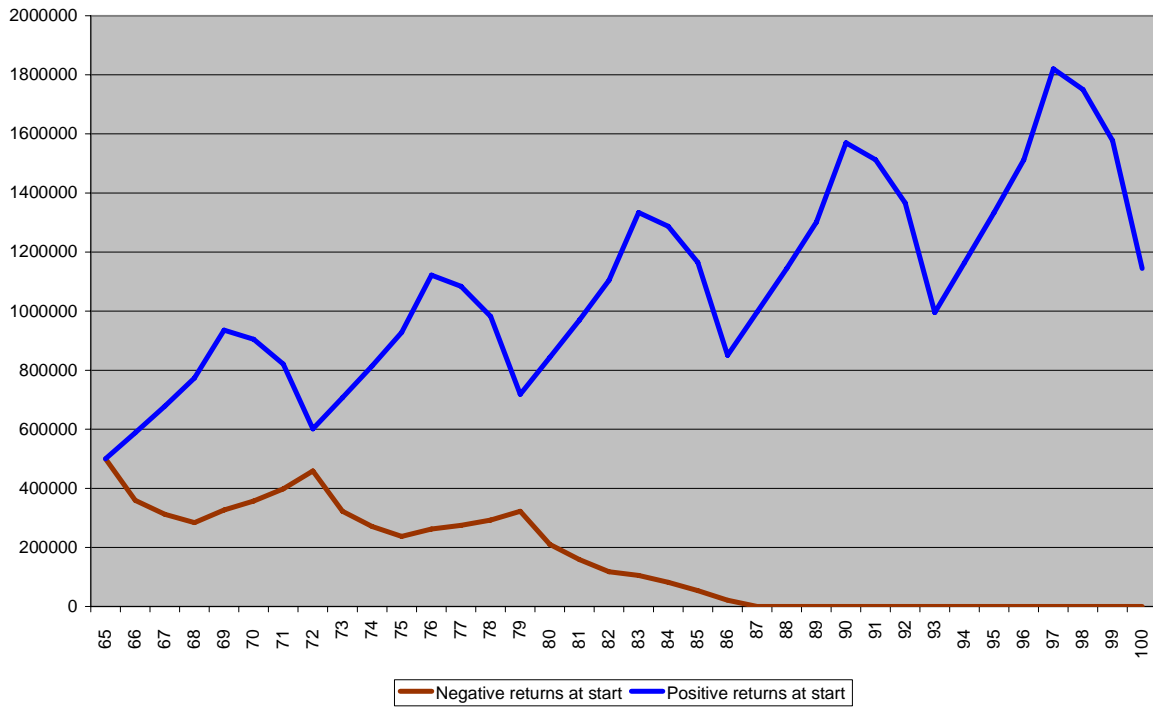
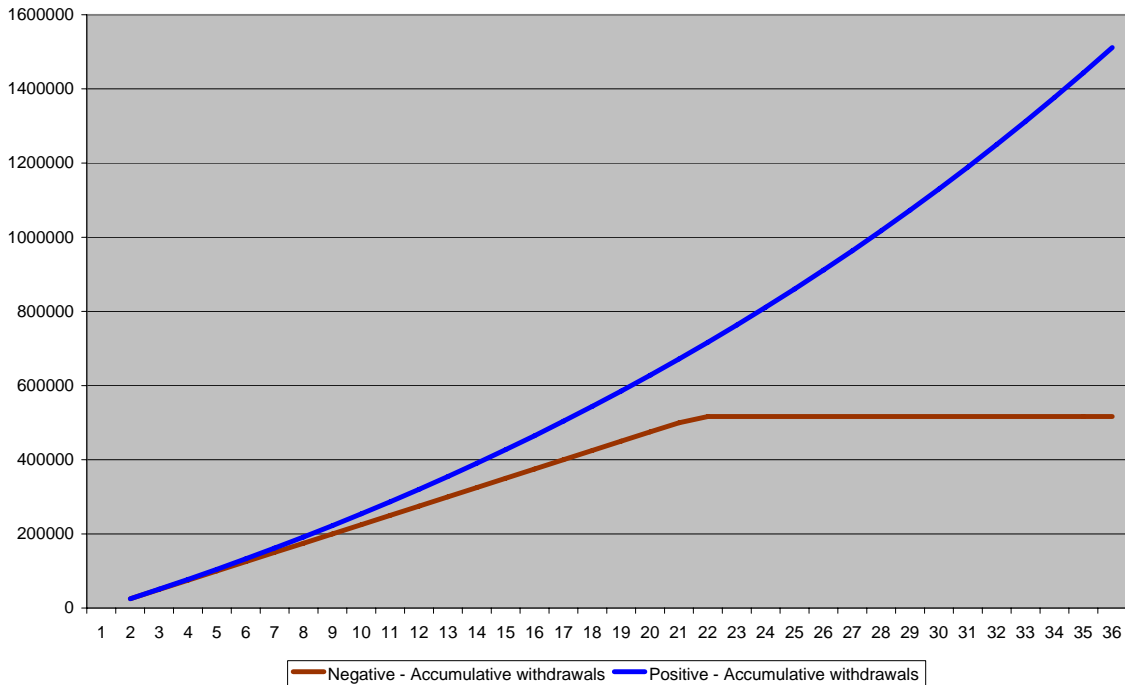


Chart 2 – accumulated withdrawals

Sequence of returns - difference between a bad start and a good start



3.1 Alternative scenarios

The following analysis compares the performance of a VA + GMWB with an allocation of 80% equities and 20% cash and bonds relative to a non insured portfolio invested 50% in equities and 50% in cash and fixed.

The model assess both a registered investment outcome (what if assets are held within a RRIF and all withdrawals exposed to income tax) or outside a registered plan where withdrawals are exposed to capital gains, dividend and income tax. The following are the main assumptions.

- a. a cash and fixed component return of 4% per annum fully taxable as interest income; this is a conservative bond return assumption and below those used by the two alternative studies (*Ibbotson and Fidelity*) that are assessed in a separate report;
- b. charges on a competitive low cost alternative management structure of 0.75% on fixed interest and 1.25% on the equity component;
- c. fees on a higher cost alternative (*non VA + GMWB*) structure of 2.5% per annum;
- d. charges on the high equity content (*80% equities*) **VA + GMWB** of 3.4%;
- e. that the fixed interest component on the alternative portfolio is more or less dedicated and matched to the liability profile; no securities need to be sold to meet immediate financial demands in the event of a market decline as there is always accessible capital available from maturing lower risk assets to meet expenditure needs (*individual bonds are purchased to mature at a specific date and equity sales are used to purchase additional bonds*);
- f. that withdrawals are made from the cash and fixed interest component of the alternative portfolio when equities are falling; when equities are rising, sufficient equities are sold each year and reinvested in fixed interest to retain a 6 year withdrawal buffer;
- g. a withdrawal buffer of 6 years is used as a central benchmark for this exercise – this is a simplifying assumption given that the buffer would last longer than six years because of dividend and interest income;
- h. where an advanced withdrawal strategy is modelled, instead of immediately realising equities as soon as the market recovers, equity realisations are made in year 2 of a market rebound; this is to mirror the fact that markets may still be under valued after the first year of a market recovery and the economic cycle still at an early stage;
- i. that a joint life annuity at age 80 would cost 9.6% and that guaranteed minimum withdrawals where capital has been depleted within the GMWB are taxed wholly as income.
- j. taxation of dividends and capital gains on withdrawals are taken into consideration in the registered analysis and equity returns decomposed into an assumed dividend and capital gain return;
- k. taxation of dividends and capital gains is not assessed in the registered analysis and total returns are used to model portfolio outcomes;
- l. a naïve 100% allocation to an equity index ETF with an MER of 0.25% and no other charges is also provided which relates back to the original analysis of the first report into VAs + GMWBs;
- m. a marginal income tax rate of 33%, a capital gains tax rate of 50% of the marginal income tax rate and dividend tax rate of 8%.

3.2 Assessment of returns used in sequence of returns

The returns used in the sequence of returns analysis provided by Manulife, is a fairly volatile sequence characterized by steep drops and significant rises. The overall return, 6.5% p.a. arithmetic, is fairly low by historical standards: as far as average nominal rates of return are concerned, the 7 year repeating cycle is very much at the lower end of historical relationships which have been close to 10% on average since the 1950s for the Canadian market place.

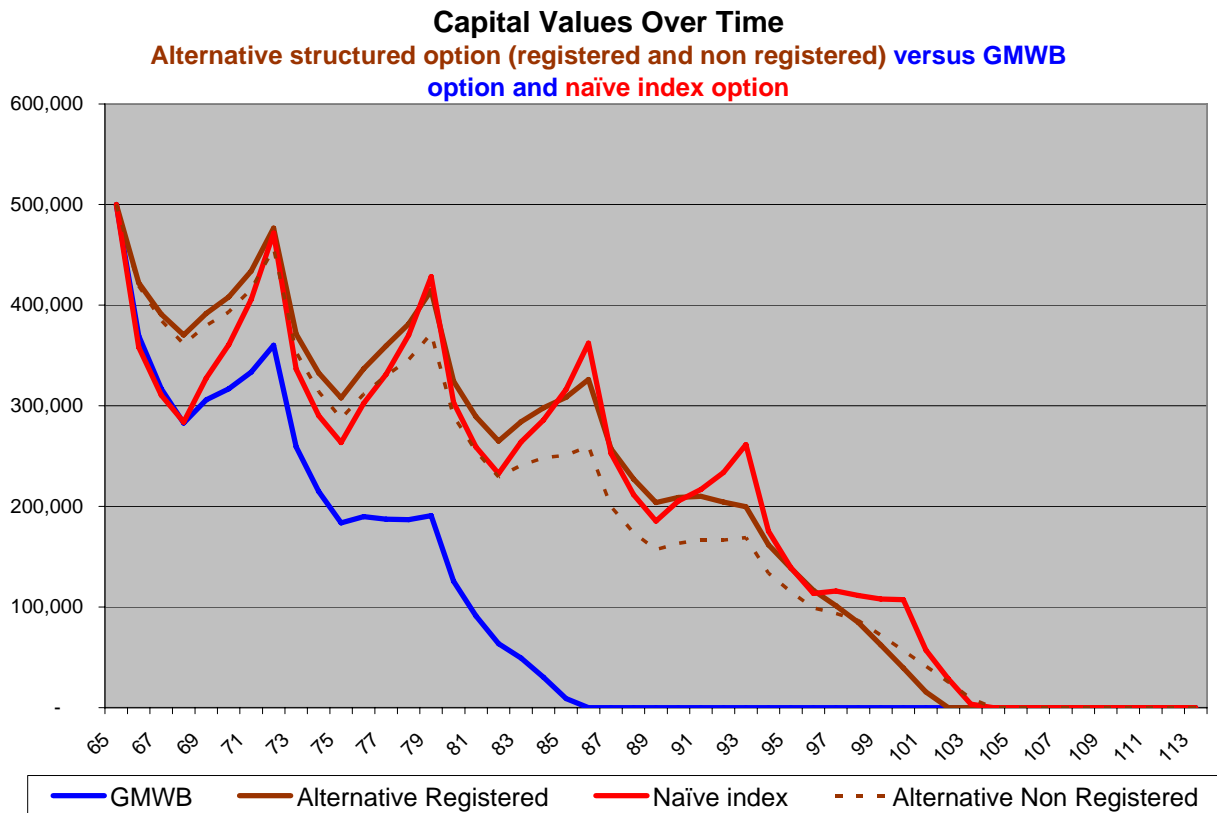
The 2.5% risk premium, if bonds were to return 4% per annum on average, is neither the highest risk premium nor the lower risk premium achieved. According to Dimson, Marsh and Stuanton in "Triumph of the Optimists", the average risk premium over bonds in the Canadian market place has been 4.5% between 1900 and 2000 (1.1% after 3.4% VA + GMWB costs), 2.1% between 1960 and 2000 (-1.3% after VA + GMWB costs), 0.5% between 1970 and 2000 (-2.9% after VA + GMWB costs) and -1.1% from 1980 to 2000 (-4.5% after 3.4% VA + GMWB costs).

The average return of the sequence of returns used for the Sun Life product's marketing is higher than that used by Manulife.

3.3 Analysis 1 – negative return scenario, no inflationary increase, registered investments

Chart 3 shows the comparative performance of a low cost alternative (50% equities/50% cash and bonds) to a VA + GMWB (80% equity/20% Bond) with no inflationary increases on the withdrawal amounts – it also includes costs of the VA + GMWB and the lower cost structured alternative.

Chart 3



The blue line is the VA+GMWB, the solid maroon line the registered alternative portfolio, the dotted maroon line the non registered alternative portfolio and the red line the naïve index withdrawal. It is important to

note why the non registered portfolio outperforms the registered: once capital is depleted within a GMWB the income provided by the guarantee is likely to be fully taxable whereas withdrawals from a non registered alternative will be primarily a return of capital in the scenario assessed; this means withdrawals from the non registered alternative will drop relative to a registered alternative portfolio option.

Once we add structure and lower costs to an alternative portfolio option (*and costs to the GMWB*), the alternative structure is better able to provide the same level of withdrawals while providing a much higher level of income (*fixed interest yields returns*) and capital security (*capital accessible and realisable with minimal liquidity risk*). It is the GMWB that runs out of capital well within the lifetime of the individual.

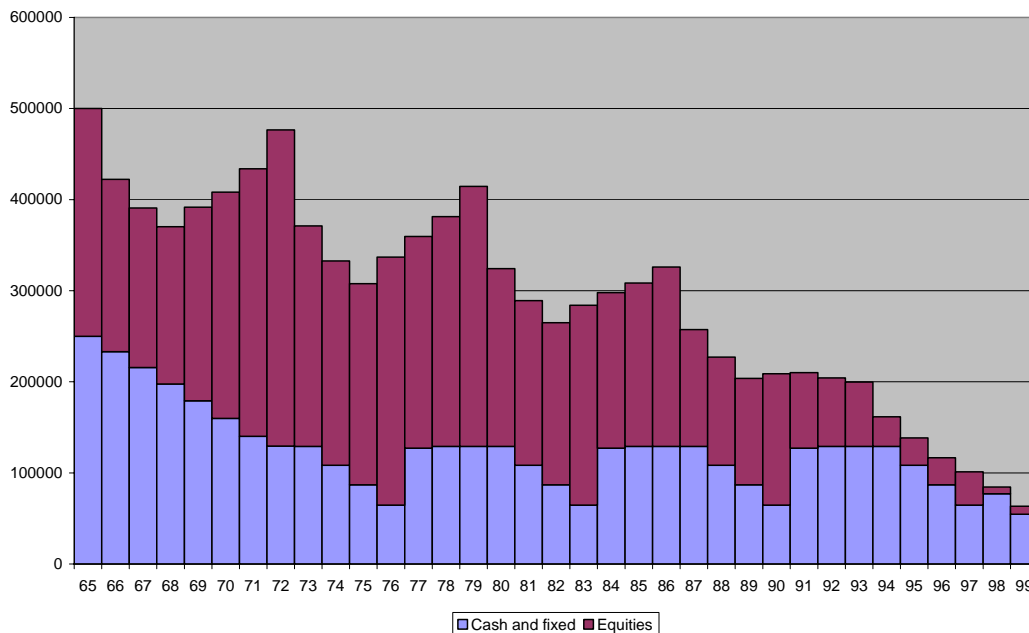
The first TAMRIS report into VAs + GMWBs looked at a comparison with a simple naïve index withdrawal strategy; the rationale being to test the hypothesis that VAs + GMWBs and their costs were efficient at managing equity risks. The precepts of this analysis are incorporated into current modelling. The red line clearly shows, that given the assumptions, a simple very low cost strategy is more efficient than a VA + GMWB and also provides a superior return outcome to the low cost 50/50 option with a naïve systematic withdrawal strategy – in other words, a low cost systematic withdrawal option with a balanced portfolio is not superior at managing the negative sequence of returns’ risk in question.

3.3.1 Flexibility and structural integrity

The alternative portfolio option (balance fixed and equity) also provides the structural integrity and flexibility to transfer into a traditional annuity at a later date; the structure structural integrity means that at the point capital available is closer to depletion, it is more or less wholly invested in lower risk asset classes posing less of a liquidity risk. Chart 4 shows the life cycle asset allocation profile of the registered alternative portfolio structure in chart 3; structure and lower costs allow a non VA + GMWB vehicle to provide enhanced potential for inflation protection and greater flexibility in managing the ability of assets to meet financial needs.

Chart 4

Alternative Portfolio - Cash and Bond life cycle asset allocation



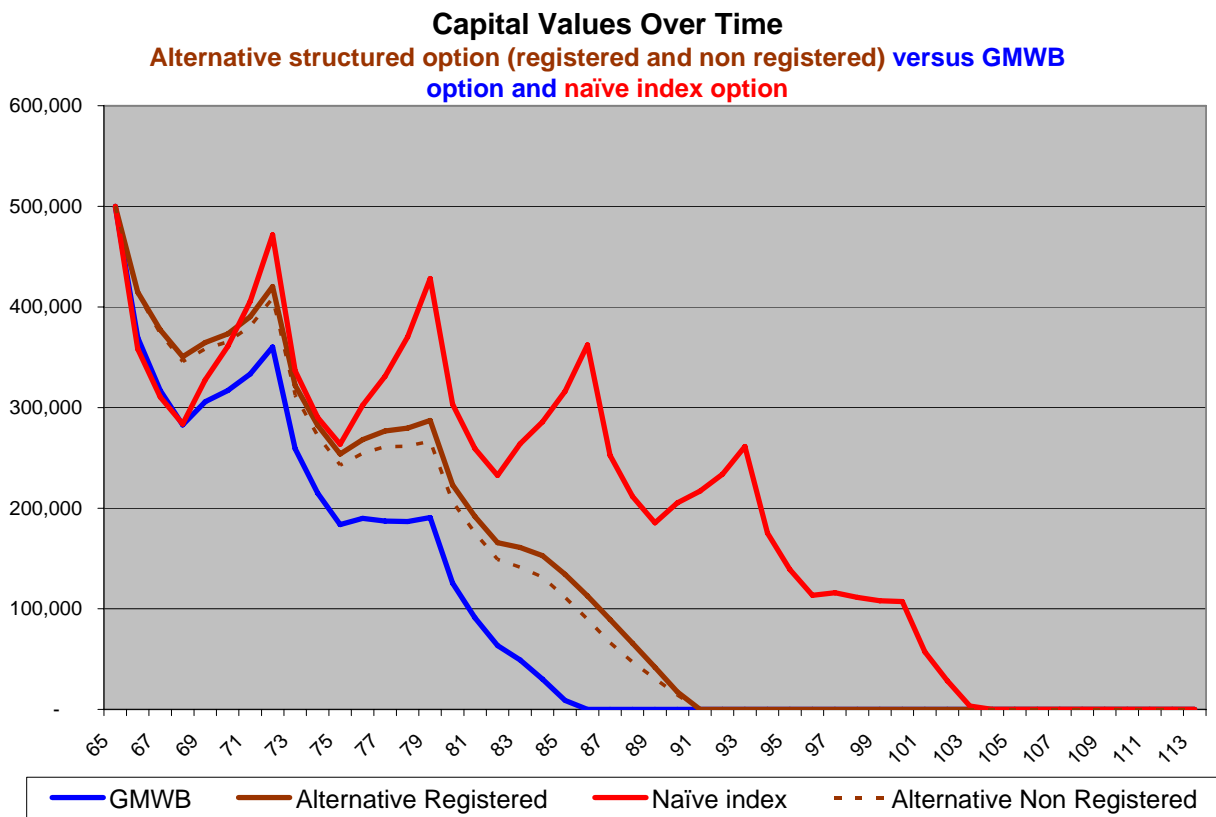
Based on a joint life annuity rate of 9.6% at age 80, the alternative investment would be able to purchase an income stream of \$25,000 for \$260,000 and still have capital to spare. As such, a lower cost structure using

the sequence of returns provided leads to a similar withdrawal and superior income and capital security outcome than that provided by a VA + GMWB.

3.3.2 Higher cost comparison

Chart 5 shows the same analysis as chart 3 but this time with an expensive 2.5% per annum annual management expense ratio. What this chart shows is that the alternative portfolio would need to purchase an annuity sometime between age 80 and 82 to guarantee income for life; this is because the portfolio would need to move exclusively to lower risk assets to fund withdrawals. As it is, the capital available at age 80 would be less than that required to purchase an annuity for \$25,000 under the assumptions provided. Capital available of \$223,209 would purchase an annuity of \$21,418 at a joint life annuity rate of 9.6%.

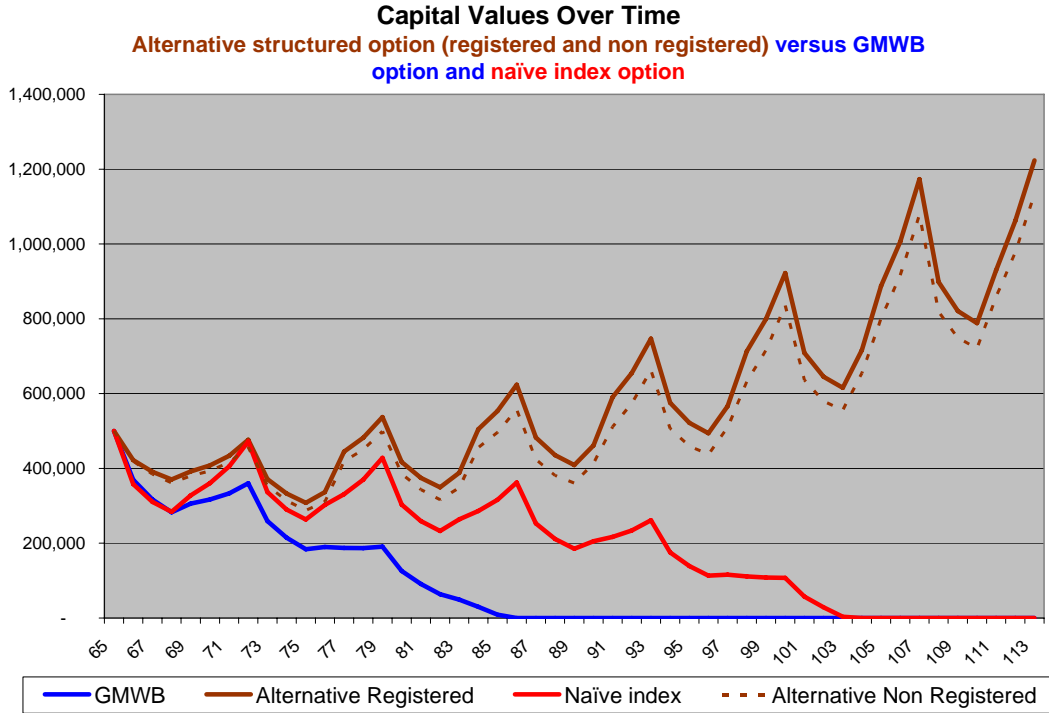
Chart 5



3.4 Analysis 2 – negative return scenario, proactive strategy, registered investments

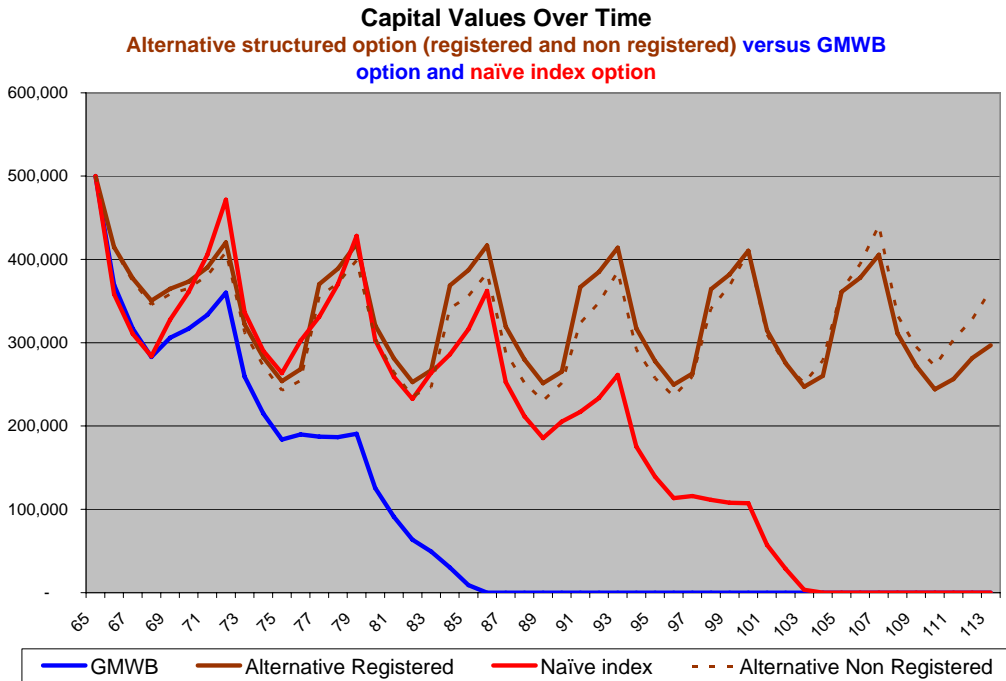
What if, instead of realising equities to fund expenditure as soon as we receive a positive annual return, we waited for the second year of positive returns before withdrawals commence. Chart 6 compares the performance of a low cost 50/50 portfolio structure against a high cost 80/20 VA + GMWB with level withdrawal payments.

Chart 6



The conclusion to be drawn from the above chart is that a lower cost structured approach that sells relatively high and avoids selling in market downturns has the potential to provide greater income and capital security, higher returns and greater financial flexibility. With this type of approach shown above, even a structured higher cost industry solution (Chart 7) has relative value.

Chart 7

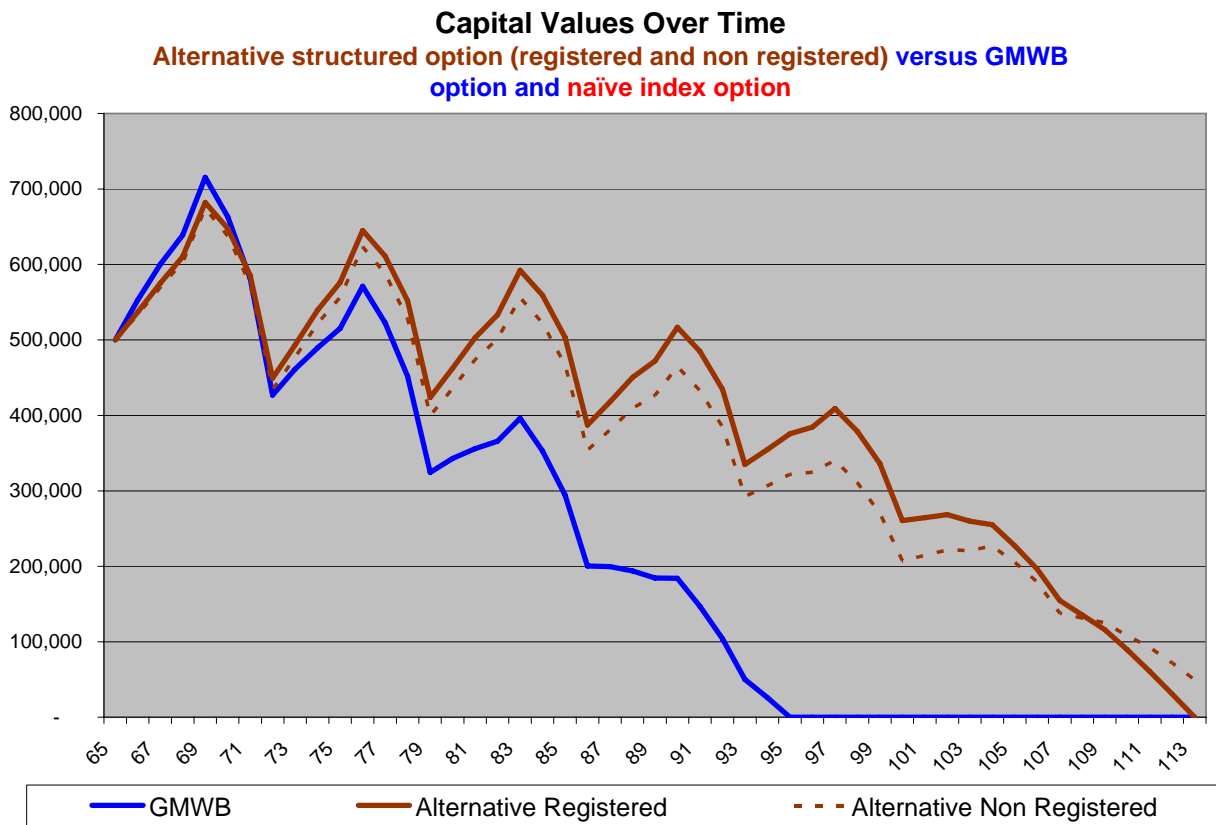


There is little point after a long bear market to realise equities in the first year of recovery when values may still be significantly below those of the previous peak. Once we incorporate fees and structure, and avoid having to sell low, we find that a VA + GMWB, with a naïve systematic withdrawal policy, is inefficient at providing income and capital security, and that lower cost structured options provide enhanced income and capital security. This is based on the sequence of returns used in the sequence of returns data assessed.

3.5 Analysis 3 - Positive return scenario

Chart 8 uses the positive start “return sequence” and compares the performance of a low cost structured alternative to the higher cost VA + GMWB. Withdrawals are \$25,000 in the first two years, increasing to \$31,938 thereafter in response to the VA + GMWB reset. Both the non guaranteed, lower cost, structured portfolio and the VA + GMWB meet this withdrawal requirement.

Chart 8



While the gross withdrawals from registered accounts do not drop post capital depletion of the VA+GMWB, withdrawals from the non registered investments do – see chart 9. The volatility in net withdrawals prior to VA+GMWB depletion is due to capital gains on units sold to meet withdrawals and the decline post depletion due to the fact that the alternative portfolio needs to realise less capital to meet a lower after tax VA+GMWB withdrawal.

The model deducts taxation from VA+GMWB gross withdrawals to arrive at a net figure which the alternative non guaranteed portfolio must meet after tax (interest, dividend and capital taxes).

Chart 10 shows the same comparison but with equity sales on the alternative option delayed until after the first year of positive equity returns

Chart 9

Non registered - Withdrawals from alternative structure V Withdrawals from GMWB

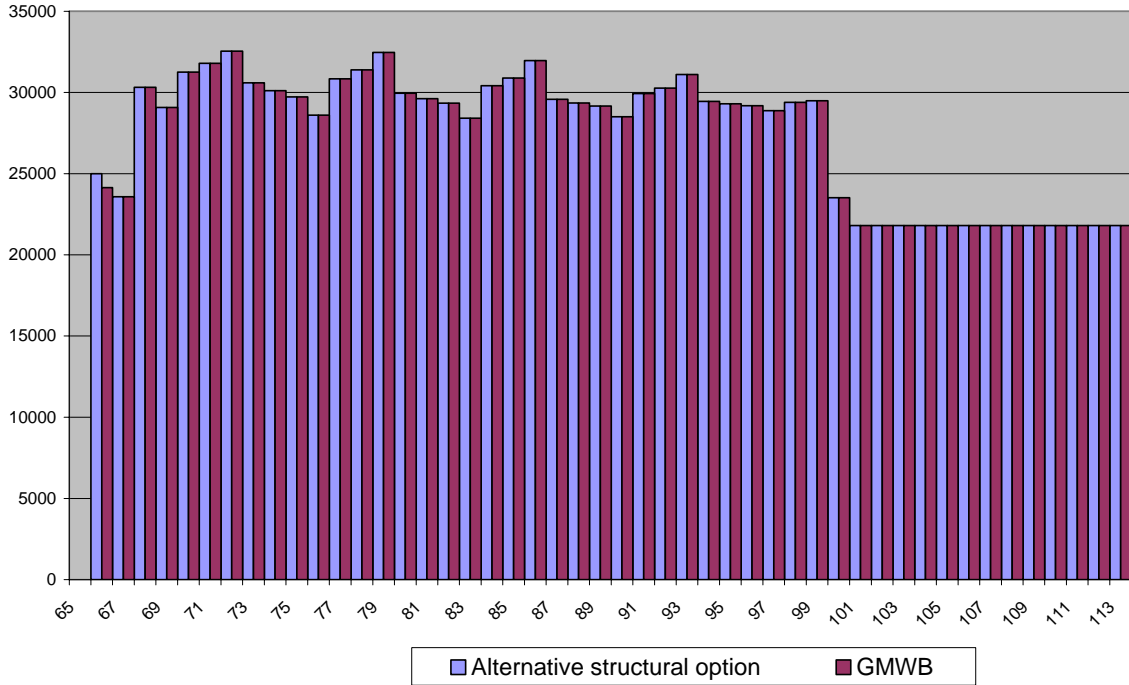
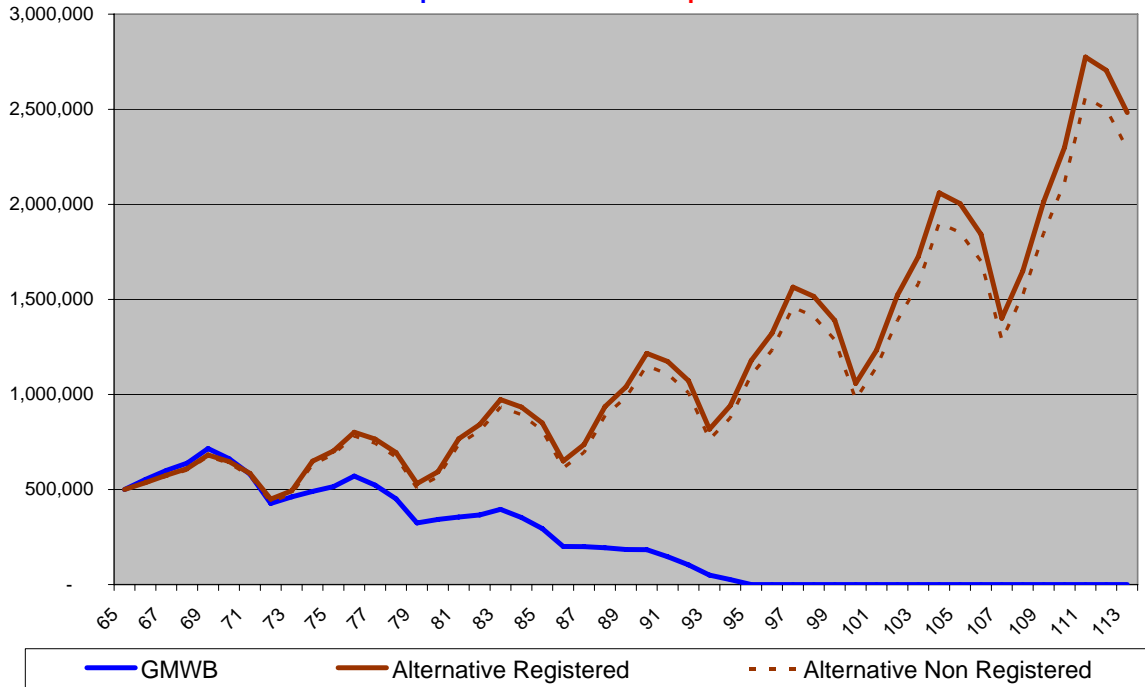


Chart 10

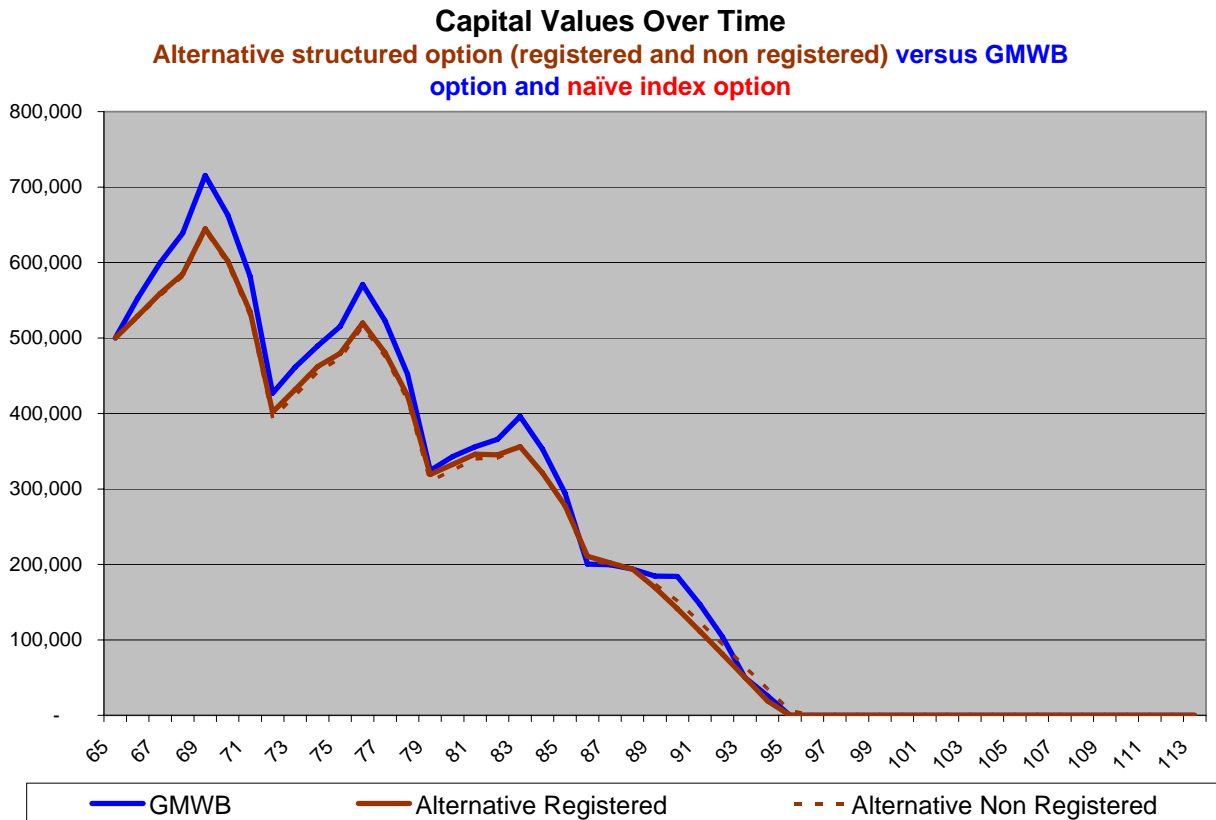
Capital Values Over Time
Alternative structured option (registered and non registered) versus GMWB option and naïve index option



3.6 Analysis 4 - Positive return scenario, higher cost structured option

Charts 11 and 12 provide the same analysis as 8 and 10, but this time with the higher cost (2.5% per annum) structured option.

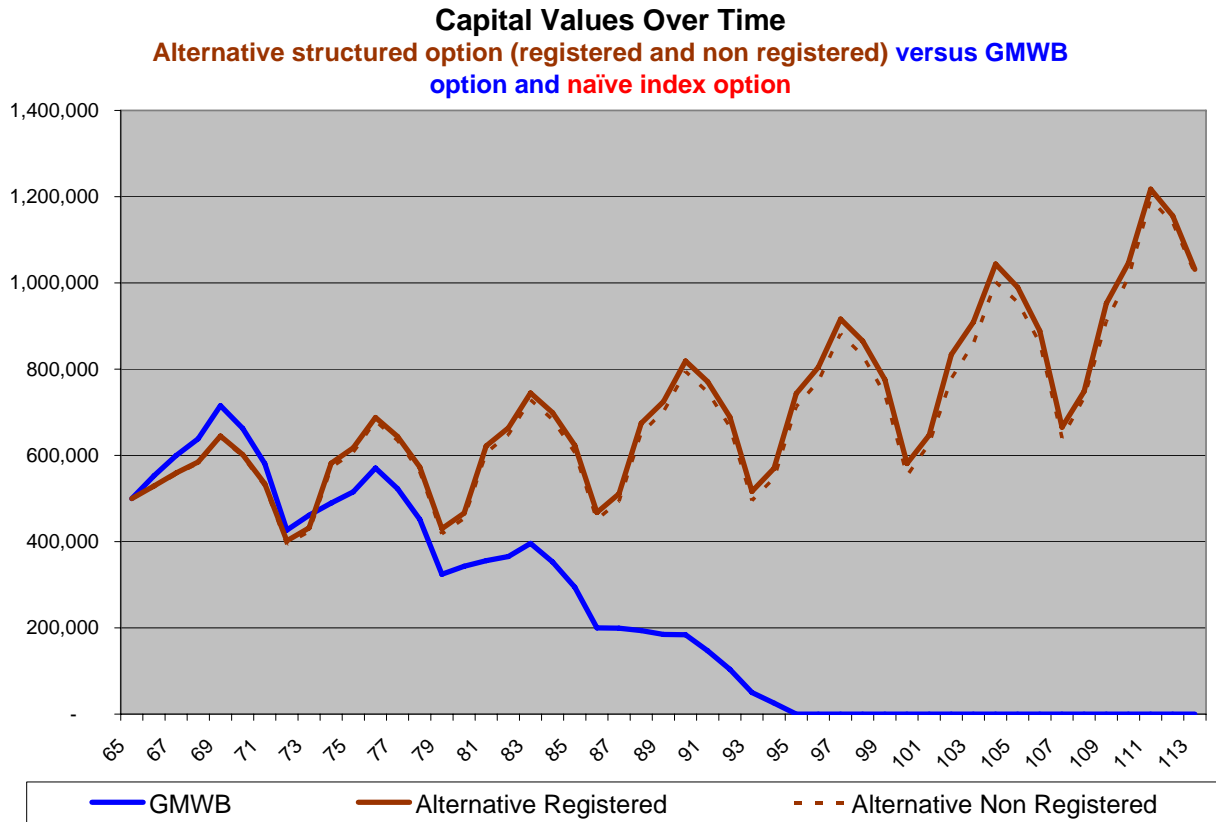
Chart 11



In this scenario we see the non VA + GMWB supporting higher withdrawals, but with capital running out by age 95; even higher cost portfolio management services, providing they are structured have the flexibility and integrity to provide enhanced management of income and capital security. The alternative option is obviously the lower risk option and the only reason the VA+GMWB provides a similar level of income and capital security is because of the higher equity return profile; in other words it has achieved the same outcome with a higher level of risk.

Chart 12 shows the capital values of the high cost alternative option with equity sales, to replenish the bond allocation, delayed until the second year of positive equity returns. This is not something that can be replicated by a high equity allocation GMWB, given that low risk asset allocations would be insufficient to provide the necessary financial cushion in down markets.

Chart 12



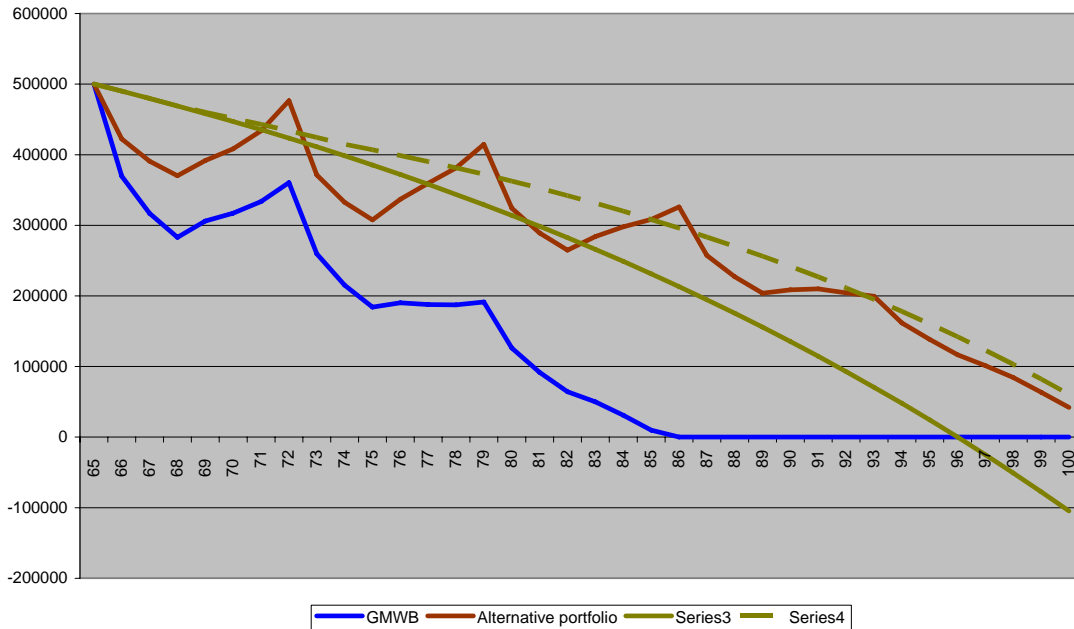
The lower cost option assessed in this report is a viable cost option – many investment counselors already operate on such a basis and many new product offerings from established financial institutions are capable of delivering on a comparative cost basis. What should be clear from the positive return analysis is that a non VA+GMWB structure is just as capable of managing a negative return scenario as it is capable of managing and benefiting from a positive return scenario. VAs+GMWBs on the other hand, with their high costs, their naïve structural management and their inflexibility, pose significant risks to short and long term income and capital security.

3.7 Analysis 5 – No cost cash and fixed comparison

Chart 20 is a variation of Analysis 1, chart 3: it includes a projection of a cash account yielding 3% with withdrawals of 5% or \$25,000 a year and a lower risk fixed interest portfolio yielding some 4% over the lifetime of the portfolio, again with 5% annual withdrawals. These low risk options have no management expenses associated with them.

Chart 13

Lower cost structured option (50% low risk/50% equity) versus high cost bundled GMWB option (80% equity)



Based on the return sequence used, simple (no cost) low risk strategies are more effective than a VA + GMWB at managing the negative return scenario as well as providing income and capital security.

3.8 Summary Sequence of Returns analysis

A VA + GMWB is not an efficient method of managing sequence of returns risk – naïve systematic withdrawal strategies and lower cost structured options are more efficient –, nor is it flexible or adaptable enough to plan effectively for future needs. A lower cost structured approach retains the flexibility to purchase an annuity at a later date at the same as being able to adjust withdrawals to suit circumstances, if need be, much more easily.

4 Conclusion

The burgeoning breed of variable annuities with guaranteed minimum withdrawal benefits (VAs + GMWBs) purport to better manage risks to income security. In fact, these products provide lower levels of ongoing income and capital security due to costs, structure and recommended high equity allocation. They also only provide a “guaranteed income” once capital is depleted.

1. VAs + GMWBs provide little or no certainty of income and capital security for supporting withdrawals during risk events.
2. High costs and high equity allocations expose the ability of assets held within VAs + GMWBs to greater risk and reduce their ability to support inflationary increases through risk events.
3. VAs + GMWBs in their current form can only add value to income security when equities are more likely to out perform the additional costs of the exercise.
4. The guaranteed withdrawal is not a guaranteed income until capital is depleted with the value of the guaranteed income being devalued by inflation, taxation and the uncertainty over life expectancy.
5. In a risk event, short and long term income and capital security is more likely to be impaired by investing in VAs + GMWBs compared to a lower cost portfolio option with integrated, structured planning and management of withdrawals and asset allocation.

Risk management solutions that lead to a higher rate of capital depletion than a structured lower cost solution would provide, swing the balance of risk and return away from long term financial security to a focus on short term risk management and narrow the benefits provided to a limited range of outcomes; in other words an economic and market disaster scenario where the insurance companies may no longer be able to provide the guarantee. AIG is a good example of an insurance company that has issued guaranteed income withdrawal products that may not be able to honour its own guarantee.