



From assets to income: A goals-based approach to retirement spending

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- While the population and life expectancies of retirees in Australia increase, portfolio yields remain at historically low levels. Further, as the superannuation system matures, more Australians are retiring with meaningful balances and are dependent upon them to sustain their livelihood throughout retirement. This confluence of circumstances means the need for retirees to implement informed portfolio spending strategies is more critical, and yet more complex, than ever.
- For retirees, the stakes are high, and the impact of subpar decisions can be severe. While every retiree's financial situation is unique enough that there is no one-size-fits-all strategy, developing and implementing a spending strategy can increase one's confidence in their ability to meet his or her retirement goals.
- Assets can be turned into income through regular withdrawals from a retiree's current holdings or by purchasing an investment product that is specifically designed to provide regular distributions. A key consideration for any retiree though will be aligning the strategy and product with the key goals they hope to achieve and the risks they face.
- Regardless of the means—a product offering an automated distribution feature, an annuity, or a goals based spending strategy developed with an advisor—the combination of complexity and consequences underscores the need for, and the value of, skilful guidance.

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Developing and overseeing a retirement-spending strategy can be a complex undertaking. As both life expectancies and the number of retirees who will need to rely on their superannuation portfolios increase, so too will the challenges facing retirees. Further complicating matters is the fact that yields on balanced and fixed income portfolios remain at historically low levels, leaving many retirees searching for ways to increase the income generated from their portfolios. This paper provides a framework to help investors and advisors turn an investment portfolio into a sustainable and relatively consistent level of income while at the same time planning for other financial goals.

Our goals-based retirement spending strategy has three components: a prudent spending rule tailored to each retiree's unique goals; a soundly constructed portfolio; and a withdrawal strategy aligning cash flow with expenses at the household level. Each component

involves complexities and trade-offs. The rewards of careful decision-making and the consequences of any missteps put a premium on skilful analysis and, for many investors, the insight of a knowledgeable adviser.

Notes on risk

IMPORTANT: The projections and other information generated by the Vanguard Capital Markets Model (VCMM) regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results, and are not guarantees of future results. Distribution of return outcomes from the VCMM are derived from 10,000 simulations for each modelled asset class. Simulations are as at March 31, 2017. Results from the model may vary with each use and over time. For more information, see the appendix.

Investments are subject to market risk, including the possible loss of the money you invest. Past performance is no guarantee of future returns. Bond funds are subject to the risk that an issuer will fail to make payments on time, and that bond prices will decline because of rising interest rates or negative perceptions of an issuer's ability to make payments. Investments in stocks issued by non-Australia companies are subject to risks including country/regional risk, which is the chance that political upheaval, financial troubles, or natural disasters will adversely affect the value of securities issued by companies in foreign countries or regions; and currency risk, which is the chance that the value of a foreign investment, measured in Australian dollars, will decrease because of unfavourable changes in currency exchange rates. Stocks of companies based in emerging markets are subject to national and regional political and economic risks and to the risk of currency fluctuations. These risks are especially high in emerging markets.

Funds that concentrate on a relatively narrow market sector face the risk of higher share-price volatility. Prices of mid- and small-cap stocks often fluctuate more than those of large-company stocks. Because high-yield bonds are considered speculative, investors should be prepared to assume a substantially greater level of credit risk than with other types of bonds. Diversification does not ensure a profit or protect against a loss in a declining market.

Performance data shown represent past performance, which is not a guarantee of future results.

Note that hypothetical illustrations are not exact representations of any particular investment, as you cannot invest directly in an index or fund-group average.

I. Develop a prudent spending rule tailored to each retiree's unique goals

It sounds simple, but choosing an appropriate portfolio spending rule that balances a retiree's competing goals—including differentiating wants from needs—is especially challenging. We divide retirees' goals into four primary categories¹:

1. Basic living expenses – Base amount of retirement income to cover core nondiscretionary, recurring living expenses

2. Contingency reserve – Maintain a sufficient reserve to address surprise events

3. Discretionary spending – Enable a level of spending beyond basic living expenses to maintain a preferred lifestyle

4. Legacy – Transfer wealth to heirs or charities

The importance of each of these goals relative to each other will be unique to each retiree and also influence the best approach to retirement spending.

Additionally, many critical factors affecting the outcome are beyond a retiree's control and are often unpredictable. For example, retirees have no control over the returns of the markets or the length of their planning horizon (their life expectancy). Yet, each of these variables significantly affects how much a retiree can "safely" withdraw from his or her portfolio to provide for current consumption while preserving the potential to generate future income for the rest of the retiree's life, however long.

Goals-based spending-rule options

A number of spending rules—each emphasising different spending objectives—have been developed to help retirees deal with changes in their individual circumstances and in the markets. Each rule places different emphasis on the competing priorities that many retirees are trying to balance: maintaining a relatively consistent level of current spending; and increasing—or preserving—the value of a portfolio to support future spending, bequests, and other goals.

Two of the most popular rules are:

- The "dollar plus inflation" rule. With this rule, upon retirement, a retiree selects the initial dollar amount he or she wants to spend from the portfolio and then increases that sum by the amount of inflation each year thereafter (one example of which is the "4% spending" rule [Bengen, 1994]²).
- The "percentage of portfolio" rule. With this rule, a retiree annually spends a fixed percentage of his or her portfolio balance so that the annual spending amount is automatically increased or decreased based on the markets' performance; this rule is thus highly responsive to the capital markets.

While these "rules of thumb" are used by many, they may not be flexible enough to provide a tailored solution for each retiree's unique circumstances.

Vanguard's dynamic spending strategy: a tailored solution for every retiree

To provide a customised solution for each retiree, we propose a hybrid of these two rules, which we call the "dynamic spending" rule. With this rule, annual spending is allowed to fluctuate based on the performance of the markets while at the same time moderating fluctuations in spending from year to year. This is accomplished by placing an annual ceiling and floor around each year's spending amount. As discussed in more detail below, the outcomes are significantly affected by the selection of the ceiling and floor percentages; this is where retirees, and their advisors, can tailor the strategy to provide the flexibility each retiree needs to meet his or her unique spending objectives.

¹ See Vanguard's *Roadmap to Financial Security* for more information.

² For a discussion on the applicability of the "4% spending" rule in Australia, see Blanchett, Serhan & Gee (2016) and Drew & Walk (2014).

First things first

An important step in developing a durable spending strategy involves carefully mapping out sources of both income and expenses. When accounting for income, retirees need to examine both the stability and the sustainability of each source. For example, a source such as the age pension or a lifetime annuity may be more stable and can reasonably be expected to persist throughout retirement, while others, such as income from trusts or part-time employment, may be less stable. In terms of expenses, the most important consideration is to separate discretionary spending (e.g., for travel and leisure) from nondiscretionary spending (e.g., for housing and food).

The gap between a retiree's income sources and expenses is the amount he or she needs to supplement from the investment portfolio. Obviously, if the amount needed from the portfolio is too high, the portfolio will be depleted regardless of the spending rule selected. That said, four primary levers affect how much a retiree can spend from his or her portfolio: the retiree's time horizon (i.e. life expectancy); the portfolio's asset allocation; the retiree's annual spending flexibility; and the retiree's desired degree of certainty that the portfolio won't be depleted before the end of his or her time horizon. Figure 1 highlights these variables and their effect on portfolio withdrawal rates.

As expected, the longer the retiree's anticipated time horizon, the lower the initial sustainable spending rate. Conversely, the shorter the time horizon, the more spending the portfolio is likely to be able to sustain. For example, a 65-year-old investor with a 35-year time horizon can spend less than an 85-year-old investor with a 15-year horizon as a percentage of the overall portfolio. Similarly, the more conservative the asset allocation, the lower the expected return over the time horizon and, therefore, the lower the spending rate. On the other hand, the more aggressive the asset allocation, the higher the initial spending rate can be—with one caveat: As the equity percentage increases, the return volatility will likely increase, and over shorter time horizons may actually increase the chance of prematurely running out of money.

The third lever, spending flexibility, can be defined as the proportion of total expenses that can be attributed to discretionary versus nondiscretionary spending. Simply put, what is the minimum you need "to keep the lights on" after accounting for ongoing income sources such as the age pension or other forms of "guaranteed" income? In general, the greater the proportion of expenses one can eliminate or minimise in

Figure 1. Four levers affecting portfolio withdrawal rates



Source: Vanguard.

any given year, the greater the level of spending flexibility. For example, if leisure and entertainment take up a large portion of each year's expenses, a retiree may be better able to endure a reduction in his or her portfolio-based income in a subdued or negative investment return environment.

Finally, the fourth lever—the degree of certainty a retiree desires regarding the chance for premature portfolio depletion—can be defined as the "success rate," or the likelihood that the portfolio will last for the investor's entire time horizon or life expectancy. The higher the preferred degree of certainty, the lower the spending rate.

As a general guideline, a prudent initial withdrawal rate for retirees entering retirement (that is, with a time horizon of approximately 35 years) is 3.5% to 5% of their portfolio balance. Typically, the 3.5% would apply to more conservative portfolios, and the 4% to 5% to more moderate or aggressive portfolios. Clearly, these rules can be broadly applied, and each investor's circumstances are unique, potentially allowing for more or less spending than this general guideline, as discussed later.

Spectrum of spending rules

We prefer to see these spending rules as a spectrum of choices based on the relative importance a retiree places on each lever, as shown in **Figure 1**. Thus, at one end of the spectrum is the dollar plus inflation rule, which is essentially the dynamic spending rule with a 0% ceiling and a 0% floor. At the other end of the spectrum is the percentage of portfolio rule, which is essentially the dynamic spending rule with an unlimited ceiling and unlimited floor. The dynamic spending rule is positioned in the middle of these two rules in terms of potential outcomes. **Figure 2**, on page 6, highlights the trade-offs of each rule more specifically.

For a retiree whose primary objective is spending stability, the “dollar plus inflation” rule (dynamic spending rule with a 0% ceiling and 0% floor) would likely be preferred. Although this rule allows for more stable spending from year to year than the other spending rules we discuss, it comes with the risk of either premature portfolio depletion or lifetime underconsumption. This is because the strategy is exposed to “sequence of returns risk”—that is, its application is indifferent to capital markets, given that the annual spending amount is automatically increased by inflation regardless of whether the portfolio’s market returns are positive or negative.

A significant period of underperformance without an adjustment in spending could result in the retiree running out of money before the end of the investing time horizon. Conversely, a significant period of market outperformance could provide a retiree the opportunity to increase spending if desired. Failure to appropriately tailor spending to market performance could thus mean a retiree either misses out on enjoying retirement to the fullest extent possible or, at the other extreme, overspends and depletes the portfolio too soon.

At the other end of the spectrum, for a retiree whose primary spending objective is not depleting the portfolio, the “percentage of portfolio” rule (dynamic spending rule with an unlimited ceiling and unlimited floor) would likely be preferred.

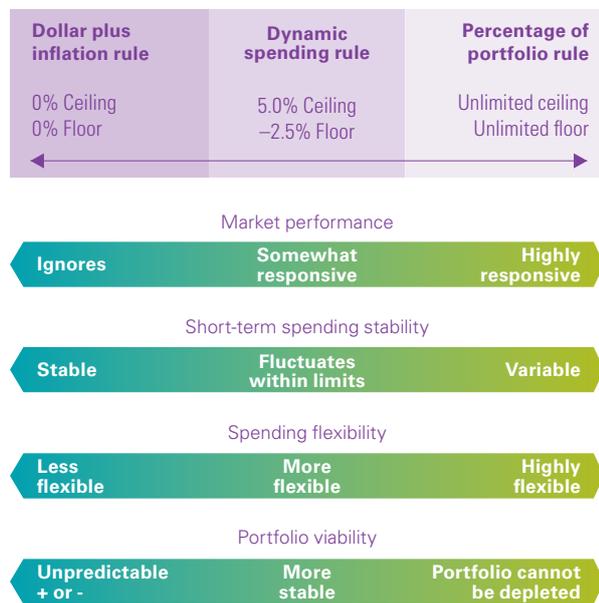
Although the retiree’s portfolio will not be depleted (even though the spending amount may be substantially reduced through time), the annual spending amount can fluctuate significantly, which may not be an option for retirees whose nondiscretionary or fixed expenses (such as housing or food) are a relatively high proportion of their total expenses. However, for those with very high levels of flexibility, this option may be preferred.

Endowment style spending rule

An additional iteration of the “percentage of portfolio” rule is the “endowment style” spending rule. In this case, however, spending volatility is dampened by spending a percentage of a portfolio’s average value over a period of time, often a few years, rather than at a single point in time. The “endowment style” approach may appeal to those looking for a mix of spending predictability with market awareness.

² As part of the planning process, it is important to differentiate between desired versus required spending, which has an impact on this discussion and other portfolio construction decisions (see Bennyhoff and Jaconetti, 2016).

Figure 2. Spectrum of spending rules



Source: Vanguard.

As previously mentioned, our dynamic spending rule is a hybrid of these two rules. With this rule, withdrawals are kept within a maximum percentage increase and minimum percentage decrease in real (inflation-adjusted) spending. The rule allows retirees to benefit from good markets by spending a portion of their gains, while weathering bad markets without a significant reduction in spending. Retirees accomplish this by saving some of their upside returns for use on a rainy day when the portfolio otherwise would have required a more significant reduction in spending (see **Appendix I** and **Figure A-1** for an in-depth example of this spending rule).

Implementing the dynamic spending rule

To implement the dynamic spending rule, a retiree calculates each year's spending by taking a stated percentage of the prior year-end's real portfolio balance. The retiree then calculates a ceiling and a floor by applying chosen percentages to the previous year's real

spending amount, such as a 5% ceiling (increase) and a -2.5% floor (decrease). The results are then compared. If the newly calculated spending amount exceeds the ceiling, the spending amount will be limited to the ceiling amount; if the calculated spending falls below the floor, the spending amount is increased to the floor amount. With this rule, depending on the ceiling and floor selected, spending can therefore be made relatively consistent while remaining responsive to the financial markets' performance—thereby helping to sustain the portfolio to meet future goals.

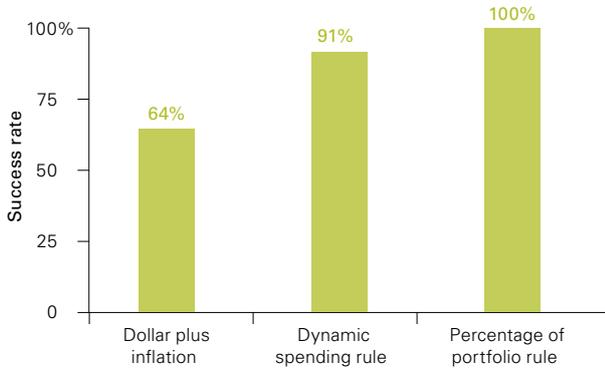
Quantifying the trade-offs

To demonstrate the trade-offs presented in **Figure 2**, we simulated an investor turning a portfolio of liquid assets into income over a 35 year horizon and compared the experience of using each spending rule: dollar plus inflation, the dynamic spending rule (with a -2.5% floor and 5% ceiling) and the percentage of portfolio rule. The results presented in **figures 3 and 4** both use 5% withdrawal rates on a \$1 million, Balanced (50% equity and 50% bond³) portfolio. We examined the trade-offs in a multiplier framework; that is, a multiple of initial balance or annual spending amounts.

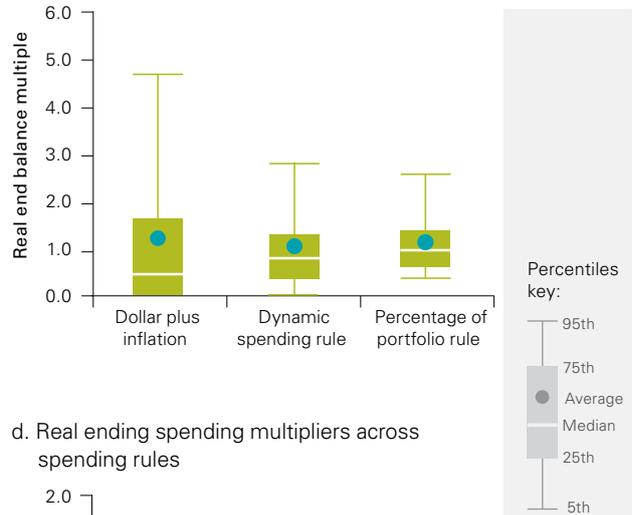
³ 50% equity is constructed with 40% Australian equities and 60% global ex Australian equities of which 30% is hedged. 50% bonds is constructed with 30% Australian bonds and 70% hedged global ex Australian bonds.

Figure 3. Comparison of various spending rules

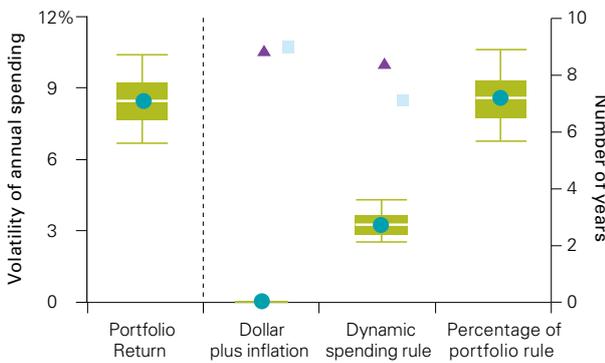
a. Portfolio success rates across spending rules



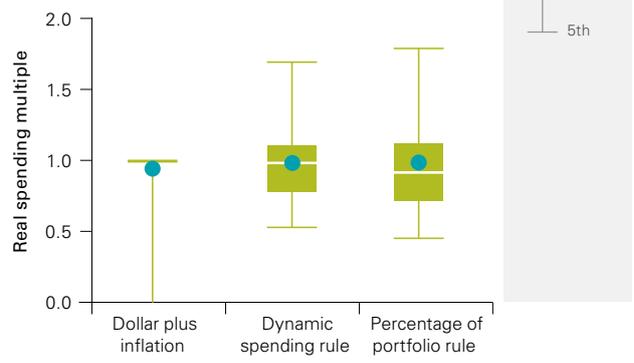
b. Real ending balance multipliers across spending rules



c. Annual real spending variation across spending rules



d. Real ending spending multipliers across spending rules



- ▭ Variation of annual spending when the portfolio successfully lasts the investor's time horizon (lhs)
- ▲ Median variation when the portfolio fails to last the investor's time horizon (lhs).
- Average number of years short of target when running out of money (rhs).

Notes: This hypothetical illustration does not represent the investment results of any particular portfolio. All results are based on 10,000 VCMM simulations using each specified spending rule. The analysis assumes portfolios with a starting balance at retirement of \$1 million, with a balanced allocation of 50% stocks and 50% bonds, a time horizon of 35 years, and an initial portfolio withdrawal rate of 5%, gross of fees and taxes. See appendix II for further description of the VCMM. These results are based on return forecasts as at March 31 2017 and, while key characteristics of trade-offs between spending rules remain as shown, future experience will be subject to prevailing financial and economic conditions at the time of implementation. In part 3a, "success rate" is defined as the likelihood that the spending strategy will last for the investor's time horizon. In part 3c, portfolio return is measure in nominal terms to represent the headline impact to a retiree's liquid portfolio, while the annual spending changes are in real terms to represent the impact of uncertainty in changes to annual standard of living. Annual spending variation is the volatility of annual real spending with the trend removed as shown below. This is to ensure that the effect of the ceiling and floor on the sample path mean is not misleading.

$$variation = \sqrt{\frac{1}{N-1} \sum x_i^2}$$

Source: Vanguard.

Portfolio viability

As the market responsiveness of a rule decreases, a portfolio is more likely to be depleted prematurely. Therefore, while the dollar plus inflation rule may be appealing from a consistency perspective, the investor does not have the same confidence in the viability of his or her portfolio as with the percentage of portfolio rule.

This trade-off, is, in many ways, crucial, since without a positive balance in a portfolio there is no spending policy. **Figures 3a** and **3b** demonstrate how the rules affect the long-term viability of a portfolio, with the viability of the portfolio becoming more unpredictable as the spending rule becomes more restrictive to spending changes as markets move.

The success rate of a portfolio measures the probability that there is a positive balance at the conclusion of a 35 year time horizon. The dollar plus inflation rule shows the lowest success rate of 64%, as it does not respond to downwards market movements, so is more likely to run out of money (see **Figure 3a**). The rule also doesn't respond to upside movements, so in markets with strong growth, the investor will have a larger portfolio balance, which is shown by the larger dispersion of real ending balance multipliers after 35 years; the dollar plus inflation rule produced real ending balances ranging from 0 times the initial amount at the 5th percentile to 4.7 times the initial amount at the 95th percentile (see **Figure 3b**).

At the other end of the spectrum, the percent of portfolio rule is highly responsive to markets and therefore has a 100% success rate. By implementing a ceiling and floor through the dynamic spending rule, the investor can capture much of the benefits of the high success rate of the percent of portfolio rule, while also managing another key trade-off, the stability in spending required to meet many retirement objectives.

Market performance & short-term spending stability

Trade-offs between spending rules are driven by their responsiveness to market performance. By introducing a ceiling and floor, investors can incorporate elements of market responsiveness with spending stability.

Figure 3c compares the volatility of an investor's portfolio returns against the expected variation in real spending from year to year. The dollar plus inflation rule, which ignores the performance of markets, does not change spending in real terms from year to year assuming a positive balance remains. However, the higher chance of depletion (36% chance over a 35 year retirement) result in extreme expected variation when the portfolio is exhausted given the collapse in spending. Additionally, the 36% of the time the portfolio does run out of money, it does so more than 9 years before the goal on average.

At the other end of the spectrum, the percentage of portfolio rule allows annual spending to change with the full impact of market movements. This means that it is highly responsive to market movements, but it also avoids the scenario of complete portfolio depletion. By introducing a ceiling and floor, as demonstrated by the dynamic spending rule, the investor can find a middle ground between the two extremes.

In practice, the capacity of a retiree to tolerate uncertainty in changes to their year-to-year spending will drive their need for stability from their spending rule, and will be dependent on the relative mix of non-discretionary and discretionary expenses. A typical retiree with limited financial resources will generally seek to limit the variation of year-to-year spending to increase the probability of being able to meet non-discretionary spending needs over their full retirement.

With the dynamic spending approach illustrated, real spending never decreases by more than 2.5% or increases by more than 5% in any given year. With this approach, the year-to-year spending is shown to have a median expected variation of 3% assuming a positive balance, which is significantly lower than the percentage of portfolio approach. Additionally, there is a substantially lower probability of depletion, only 9%, compared to the 36% of dollar plus inflation, and when portfolio depletion does occur, it does so 2 years later than dollar plus inflation on average.

Spending flexibility

As our analysis of annual spending variation suggests, an investor with a higher ceiling and floor must be able to accommodate greater flexibility in their spending. Our analysis shows that the percentage of portfolio rule produces real annual spending multipliers (defined as the average real annual spending amount as a multiple of the initial amount spent) ranging from 0.45 to 1.8 at the 5th and 95th percentiles and 1.0 on average (see **Figure 3d**). This means that the investor must be able to tolerate a potential decrease in their real spending over time.

On the other hand, the dollar plus inflation rule produces a real annual spending multiplier of 1.0, unless the portfolio depletes, in which case it falls to zero. In practical terms, this would correspond to an investor with a starting portfolio balance of \$1 million and a 5% withdrawal rate spending \$50,000 or \$0 per annum adjusted by inflation. In reality, an investor would not let his or her portfolio drop to \$0, but potentially would have to make uncomfortable adjustments along the way. The dynamic spending rule's multiples range from 0.5 to 1.7 at the 5th and 95th percentiles and also average 1.0.

Ultimately, an investor with endless flexibility would likely choose the percentage of portfolio approach; however, for most retirees, this is simply not practical. In that case, dynamic spending can provide many of the benefits of the percentage of portfolio rule without giving up the relative consistency of real annual spending.

Tailoring the ceiling and floor percentages to meet each retiree's unique spending objectives

An important point in this discussion is that the outcomes are significantly affected by the selection of the ceiling and floor percentages. This is where retirees, and their advisers, can tailor the ceiling and floor percentages along the spectrum (from a 0% ceiling and 0% floor to an unlimited ceiling and an unlimited floor) to provide the flexibility each retiree needs to meet his or her unique spending objectives. For illustrative purposes, we used the 5% ceiling and the -2.5% floor as an initial starting point for the dynamic spending rule because it provides a balance between the trade-offs over the 35-year time horizon.

Figure 4 highlights the trade-offs of changing ceilings and floors. In each column, the ceiling is held constant and the effect of changing the floor is shown. The reverse is true of each row, where the floor is kept constant and the ceiling is changed. **Figure 4a** shows the success rate and is representative of the portfolio viability trade-off, and **Figure 4b** shows the median variation in annual spending (when the portfolio does not fail) to demonstrate the level of short-term spending stability. **Figure 4c** shows the average real spending multiplier (assuming the investor still has a positive portfolio balance) and demonstrates the need for flexibility in spending when increasing the floor.⁴

Our analysis found that the more flexibility retirees have in their floor (that is, the more they are able to reduce spending when the markets are performing poorly) the higher their success rate—meaning, the lower the chance that they will deplete their portfolio before the end of their planning horizon. In fact, retirees' ability to accept changes in their floor helps their portfolio more than increasing their ceiling hurts it. For example, a ceiling/floor combination of 5% and -2% is about 12 percentage points more successful, as measured by success rate, than a ceiling/floor combination of 5% and -1%. On the other hand, a ceiling/floor combination of 4% and -2.5% is about 1 percentage point less successful than a ceiling/floor combination of 3% and -2.5% (**Figure 4a**). There is a trade-off of course. As the investor increases their floor and/or ceiling, they take on more expected variation in their spending and therefore more uncertainty on how much it may change from year-to-year (**Figure 4b**).

⁴ The methodology for success rates is the same as **Figure 3a**, and annual spending variation the same as **Figure 3c**. The methodology for the spending multiple is a variation on **Figure 3d** in that it does not include observations where the investor has depleted their portfolio.

Figure 4. A decision on a ceiling and floor should take into account all trade-offs



Note: This hypothetical illustration does not represent the investment results of any particular portfolio. All results are based on 10,000 VCMM simulations using each specified spending rule. The analysis assumes portfolios with a starting balance at retirement of \$1 million, with a moderate allocation of 50% stocks and 50% bonds, a time horizon of 35 years, and an initial portfolio withdrawal rate of 5%. These results are based on return forecasts as at March 31 2017 and, while key characteristics of trade-offs between spending rules remain as shown, future experience will be subject to prevailing financial and economic conditions at the time of implementation. The annual spending variation is the median observed for each ceiling and floor combination assuming a successful spending outcome. The spending multiplier is based on the average observed spending multiple assuming the portfolio balance is still positive.

Source: Vanguard.

Adjusting the withdrawal rate

The trade-off concept has implications for retiree withdrawal rates, as shown in **Figure 5**. The figure demonstrates initial portfolio withdrawal rates for both a 0%/0% ceiling/floor (dollar plus inflation) rule and a 5.0%/–2.5% ceiling/floor rule using different time horizons and asset allocations⁵ targeting an 85% success rate. As the figure shows, retirees who can incorporate flexibility into their annual spending needs are able to set higher initial portfolio withdrawal rates, which can help them be in a better position to meet their near-term financial objectives.

For example, a balanced investor who wants stable inflation-adjusted spending (that is, a 0% ceiling and a 0% floor) with a 35-year time horizon can set an initial portfolio withdrawal rate of 4.2%, assuming an 85% chance that he or she will not run out of money. If that same retiree has the flexibility to cut spending back by 2.5% in years when the market is performing poorly, and if he or she can limit increases in real annual spending to no more than 5.0% if the markets are performing well, the retiree could set the initial portfolio withdrawal rate at 5.3%, which is 1.1 percentage points higher than the previous example.

In short, when choosing a floor and ceiling combination, there are trade-offs between maintaining the desired level of current spending (spending multipliers and expected annual variation) and preserving the portfolio to support future spending objectives (success rate). In selecting a floor and ceiling, retirees and their advisers must have a solid understanding of their income and expenses; the more they can tolerate fluctuations in spending, the more likely they are to achieve their longer-term spending objectives (see the *First things first box* on **page 4** for more information).

Figure 5. Portfolio initial withdrawal rates (%) targeting an 85% success rate for various asset allocations and time horizons

		0% Ceiling / 0% Floor (Dollar plus inflation)					5.0% ceiling/–2.5% floor (Dynamic spending rule)				
		Time horizon (years)					Time horizon (years)				
	Asset allocation	10.0	20.0	30.0	35.0	40.0	10.0	20.0	30.0	35.0	40.0
30/70	Conservative	10.3	5.7	4.3	3.9	3.7	11.5	7.0	5.7	5.3	5.0
50/50	Balanced	10.2	5.8	4.5	4.2	3.9	11.4	7.0	5.7	5.3	5.1
70/30	Aggressive	10.0	5.8	4.6	4.3	4.1	11.1	6.8	5.6	5.2	5.0

Notes: Rates are gross of any fees or taxes. Any fees and taxes are assumed to be paid from the withdrawal amount. Portfolio allocations are: Conservative — 30% stocks/70% bonds; Balanced — 50% stocks/50% bonds; Aggressive — 70% stocks/30% bonds. Withdrawal rates were determined using data from the VCMM as at March 31 2017. While key characteristics of trade-offs between spending rules, asset allocation and time horizon will remain as shown, future experience will be subject to prevailing financial and economic conditions at the time of implementation and may increase or reduce the initial withdrawal rates that target a given success rate. See **Appendix II** for further description of the VCMM.

Source: Vanguard.

⁵ Describes growth/defensive asset allocation of investment options.

II. Construct a broadly diversified retirement portfolio

The second prong of our retirement-income strategy is a well-constructed portfolio. Four core investment principles underlie Vanguard's investment philosophy and form the basis on which we construct investment portfolios (Vanguard, 2017). These principles are: First, create clear, appropriate investment goals. Second, develop a suitable allocation using broadly diversified assets. Third, minimise investment costs. And fourth, maintain perspective and long-term discipline. The principles apply to investors accumulating assets and to those in the drawdown phase of their investing life-cycle.

When it comes to building an investment portfolio for retirees, there are generally two approaches: the income-focused approach and the total-return approach. With an income-focused approach, the objective is to construct a portfolio with a natural yield (representing dividends, interest and franking credits where applicable) consistent with retirees' spending objectives. With this approach, asset allocation and diversification decisions are driven primarily by the natural yield of the investments selected, rather than by the retirees' time horizon, risk tolerance, and financial goals. The diversification, costs, and asset allocation of this portfolio may vary over time, depending on market conditions. With a total-return approach, the intent is to construct a portfolio based on a holistic view, matching the asset allocation to the retiree's risk-return profile that aligns with their goals, using diversified investments, minimising costs, and remaining disciplined with the strategy's implementation over time.

Many investors spend much of their working lives trying to achieve a "savings target," that is, an approximate target portfolio balance that they believe will support their goals in retirement. As a result, once retired, investors are often psychologically averse to spending from the portfolio in an amount that would make their balance drop. Understandably, the result is that many retirees are drawn toward an income-focused approach without realising the possible negative implications. Ironically, as we discuss next, it's possible that the income-focused approach may put their portfolio at greater risk than a total-return approach.

We want to first point out that the income-focused and total-return approaches are identical, to a point. With each method, retirees spend some or all of the income or natural yield generated by their portfolios. But when a retiree needs to spend in excess of the portfolio's

yield, these two approaches diverge. This additional spending can be achieved either by reallocating the portfolio toward higher-income-producing assets (income focused approach) or by spending from the other component of the investor's total return, that is, from the portfolio's capital appreciation.

Advantages of a total-return approach

By focusing on the total return earned by the portfolio rather than its individual components, a total-return approach offers several advantages over an income-focused method, including:

- Maintaining a portfolio's diversification.
- Allowing more control over the size and timing of portfolio withdrawals.

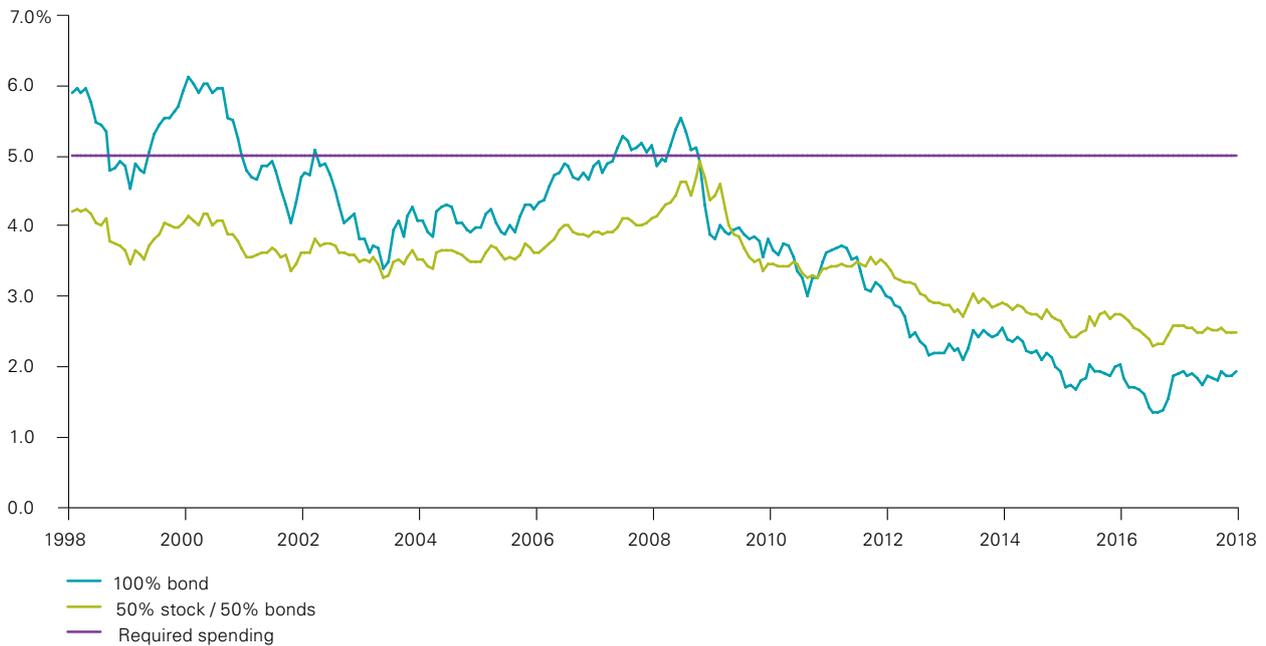
Maintaining portfolio diversification:

Diversification can be a powerful strategy for managing volatility, allowing investors to establish portfolios with risk profiles that are consistent with their goals and preferences. Although every portfolio is subject to market risk, idiosyncratic risks are largely avoidable. Since a portfolio's dividend yield is the primary driver of investment selection with the income-focused approach, the portfolio is likely to overweight higher-yielding stock or bond sectors, resulting in a less diversified portfolio than one constructed following a total-return approach. For example, even within the domestic equities asset class, the Australian market is very concentrated with the top 50 stocks comprising 77 per-cent of the S&P/ASX 300 index. Ranked by dividend yield, only 36 stocks make up 77 per-cent of the dividend yield of the S&P/ASX 300. This is also evident at the sector level with the Financials sector making up 50 per-cent of the dividend yield.

Allowing more control over the size and timing of portfolio withdrawals:

With an income-focused approach, a retiree's annual spending is limited to the portfolio's natural yield, so the retiree has less control over his or her annual spending amounts. On the other hand, investors who follow a total-return approach have more control over the size and timing of portfolio withdrawals (versus the income-focused approach) because these investors are willing to spend from capital appreciation in the years when their portfolio's yield falls below their required spending amount. Likewise, any excess income generated by the portfolio can be reinvested.

Figure 6. Yields on traditional investments have fallen over the last 20 years



Notes: Bond yields and Equity dividend yields are for the period 1 July 1997 – 31 December 2017. 100% bonds comprises 30% Bloomberg AusBond Composite & 70% Bloomberg Barclays Global Aggregate. The stock component of the stock / bond mix comprises 40% S&P/ASX 300 and 60% MSCI World ex Australia. The chart does not include the effect of interest rate differentials from currency hedging on yields.

Source: Vanguard, using data from Factset.

As a result, total-return investing also affords the investor a greater ability to implement flexible spending rules, by adjusting spending in proportion to the growth of the overall portfolio, rather than by focusing on the income that it is yielding. As previously discussed, the more retirees can tolerate some short-term fluctuations in their spending, the more likely they are to achieve

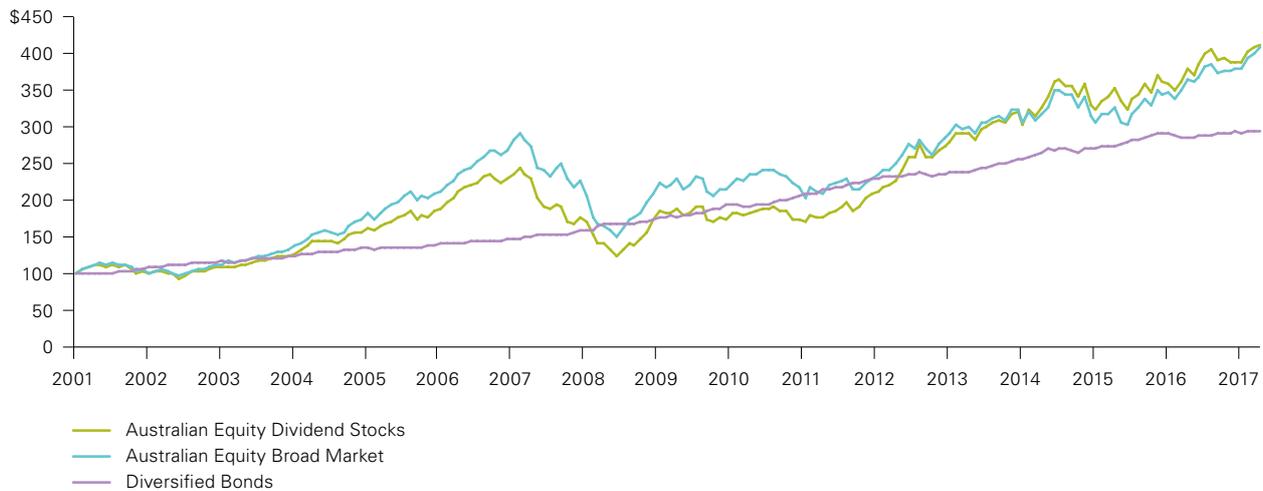
their longer-term investing goals. Additionally, a total-return approach can prevent the temptation to adjust asset allocation settings to manage the required yield. Such an approach could compromise the retiree’s long term goals, inadvertently introducing market timing risks and higher trading costs.

Figure 7. Summary of negative portfolio impacts resulting from common investor practices

Common investor practice	Portfolio impact (vs a market-cap-weighted portfolio at sub-asset-class level)
1. Increasing the portfolio’s exposure to dividend-centric equity.	Decreases diversification of an equity portfolio by overweighting certain sectors, and increases the portfolio’s overall volatility and risk of loss if the strategy is used as a bond substitute.
2. Overweighting of high-yield bonds and underweighting investment grade bonds	Increases the portfolio’s exposure to credit risk, raises the portfolio’s overall volatility and increases correlations with the equity portion of the portfolio.
3. Shortening duration - overweighting cash and term deposits in preference to bonds	Shortening duration through an allocation to cash or term deposits may dilute the long term defensive characteristics and diversification of a market-cap exposure to bonds. In addition, shortening duration may forego the additional income received from holding bonds with longer duration.

Source: Vanguard.

Figure 8. Dividend-paying stocks are not bonds: Growth of \$100, October 31, 2001 - December 31, 2017



Notes: Cumulative compound return of Stocks and Bonds from October 31, 2001 – December 31, 2017. Australian Equity Dividend Stocks – S&P/ASX 100 Industrials, Australian Equity Broad Market - S&P/ASX 300 Index, Diversified Bonds – 30% Bloomberg AusBond Composite & 70% Bloomberg Barclays Global Aggregate Hedged AUD.

Source: Vanguard, using data from Factset.

Appeal and challenges of income-focused investing

Traditionally, many retirees were able to follow an income-focused approach to meet their retirement-income needs because their portfolios' natural yield exceeded a prudent portfolio withdrawal rate. Not only did this income source meet the spending needs of many retirees, but many retirees also remained accumulators.

But the challenge for an income-focused investor today is that yields on traditional bond and balanced portfolios have fallen over the past 20 years, as shown in Figure 6, to the point that the yield of a globally diversified 50% equity / 50% bond portfolio hovered around 2.5% as of December 31 2017, and a 100% bond portfolio at 1.9%, excluding the effect of interest rate differentials from currency hedging. For an income-focused investor, using the portfolio's natural yield as a guide for how much to spend would lead to a shortfall of about 50% relative to a hypothetical 5% spending objective. This spending gap can be resolved either by overweighting income-producing assets, which often changes a portfolio's fundamental risk profile, or by adopting a total-return approach, as described earlier. This section focuses on three common methods, and their pitfalls, that investors use to try to either, increase their

portfolios' income return or reduce the perceived risk of capital loss from duration in fixed income (Figure 7 summarises these methods and the likely impact on a portfolio).

Common investor pitfall 1: Increasing portfolio's exposure to dividend-centric equity:

An often-advocated equity approach to increase income is to shift some or all of a fixed income allocation into higher-yielding dividend-paying stocks. But stocks are not bonds, displaying higher volatility and the potential for greater losses. Moreover, as seen in Figure 8, dividend stocks are highly correlated with the broad equity market, and have had similar volatility. For those investors who view fixed income as providing not just yield but also diversification, dividend-paying stocks fall well short as a substitute.

Investors also may be inclined to shift from broad-market equity to dividend- or income-focused equity. However, these investors also may inadvertently change the risk profile of their portfolio, because dividend-focused equities tend to display a bias toward "value stocks." Although some may consider dividend paying stocks to be a less risky subset of the broader equity market, the risks can nevertheless be substantial, owing to the fact that portfolios focused on dividend-

Dividend Imputation Tax System

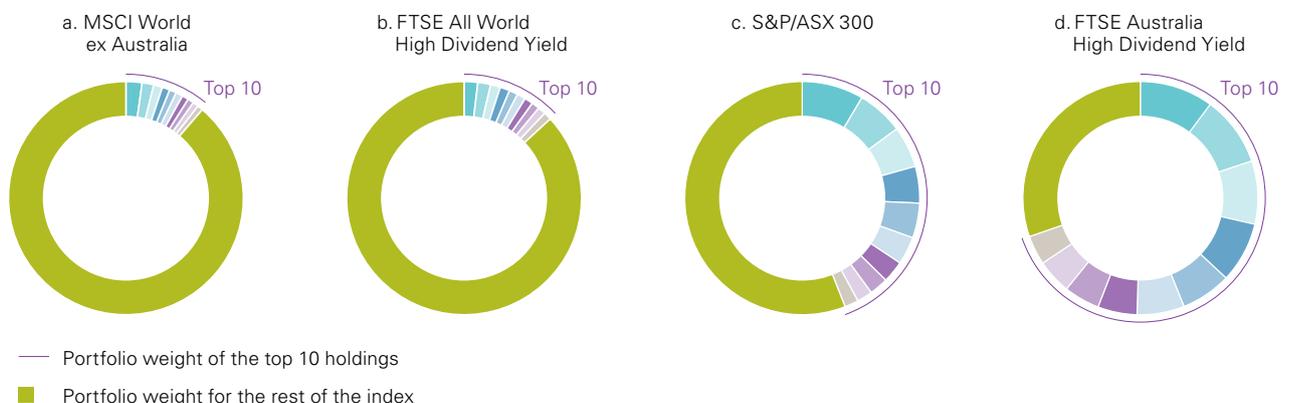
Introduced in 1987 with the objective to prevent double taxation of dividend income, franking credits apply to the tax paid on earnings generated from the domestic activities of Australian companies. The distribution of franking credits reduces the applicable tax rate on

dividend income to that of the end investor. For investors with a lower tax rate than the corporate rate (including most retirees), a cash refund is received.

paying stocks tend to be overly concentrated in certain individual stocks and sectors. **Figure 9**, for example, shows the market capitalisation of the 10 largest companies for the broad market and dividend yield indices across both Global equities and Australian equities. The dividend yield indices show higher stock concentration compared to the broader equity market. The concentration of the Australian market is high at 44%, and increases to 70% for the comparable dividend yield index. This further increases the concentration risks for investors employing dividend yield strategies in the Australian market, which is a common investment practice due to the receipt of franked dividends. It is critical that investors are appropriately assessing the trade-off between additional income and the risk inherent in a concentrated portfolio of securities.

Common investor pitfall 2: Overweighting of higher-yielding bonds and underweighting investment grade bonds: Another common strategy an investor may use for increasing yield is to increase the portfolio's allocation to higher-yielding bonds that are exposed to moderate or even significant credit risk. The risk here is that credit risk tends to be correlated with equity risk, as is demonstrated during periods of equity market distress. This risk tends to be heightened when investors move into riskier bonds, including contingent convertible securities like hybrids, at the expense of investment-grade government and corporate bonds, which are a proven diversifier during periods in which diversification is needed most (**Figure 10**). Investors who use this strategy are sacrificing diversification benefits in hopes of receiving higher current income from their portfolio.

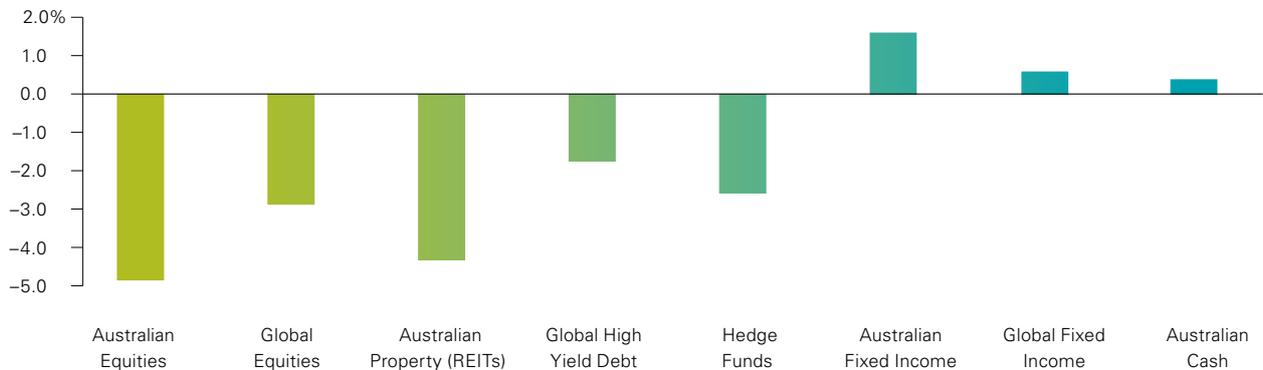
Figure 9. Strategies targeting higher dividend yields can increase concentration risks



Notes: Stock concentration numbers are as at 31 December 2017.

Source: Vanguard, using data from Factset.

Figure 10. Median asset returns during the worst Australian equity months (January 2007 to December 2017)



Notes: Median asset returns during the worst decile of Australian equity monthly returns for the period January 2007 – December 2017. Australian Equities – S&P/ASX300 Accumulation Index, Global Equities – MSCI World ex Australia Index, Australian Property – S&P/ASX 300 A-REIT Index, Global Property – FTSE/NAREIT Developed Index in AUD, Global High Yield Debt – Bloomberg Barclays USD Hedged, Hedge Funds – Morningstar Hedge Fund category, Australian Fixed Income – Bloomberg AusBond Composite Index, Global Fixed Income – Bloomberg Barclays Global Aggregate Index hedged into AUD, Australian Cash – Bloomberg AusBond Bank Bill Index.

Source: Vanguard, using data from Factset.

Common investor pitfall 3: Overweighting cash and term deposits in preference to bonds:

A further commonly used strategy among investors has been to allocate to term deposits to satisfy the defensive allocation of the portfolio in an effort to reduce duration and protect capital. Following the Financial Crisis, Australian banks sought to reposition their capital structure to be less reliant on wholesale funding by boosting deposits. The competition for deposits resulted in an increase in term deposit rates, when compared to the yield of longer duration bonds. This appears to have been a temporary occurrence with yields generally shifting back to favour bonds over term deposits (see **Figure 11**). While bonds and term deposits offer some similar characteristics such as capital preservation, liquidity, and income, there are some important differences that investors need to take into account.

It is important to recognise the role of bonds in a portfolio, which provide ballast during equity market down turns. During times of equity market weakness, bond yields have typically fallen providing additional capital returns from bonds. Correspondingly, a fall in yields for term deposits results in lower income, as the short duration provides little additional compensation in the way of increased capital return. This results in an

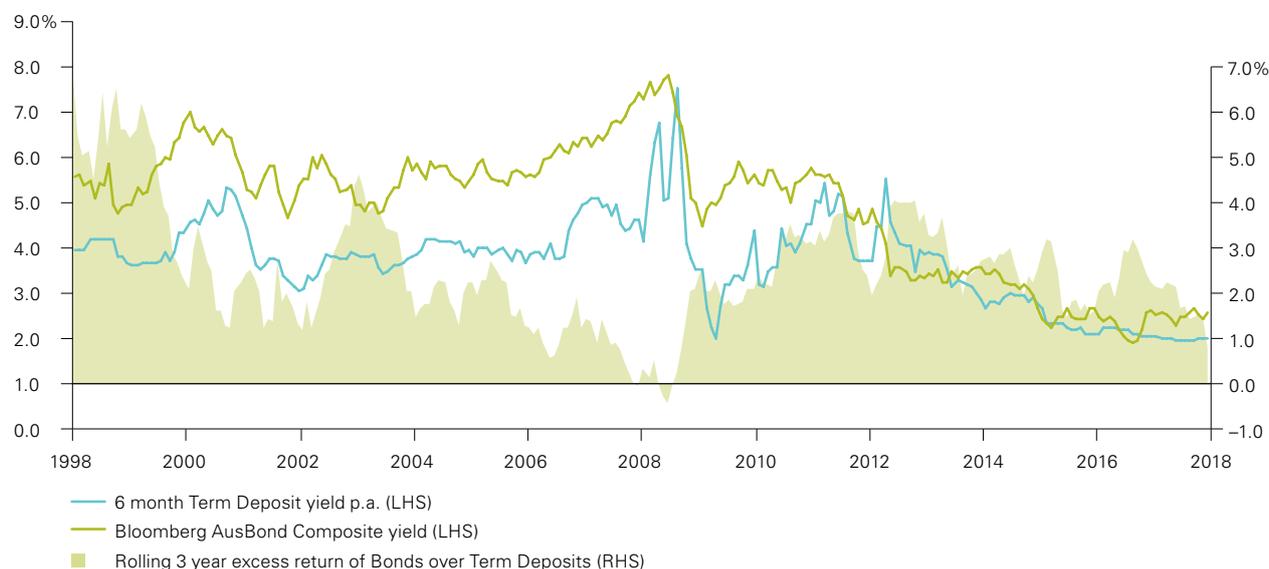
opportunity cost from holding term deposits as a defensive exposure to cushion against equity downturns (**Figure 11**).

In summary, retirees who pursue the preceding strategies may believe they will be rewarded with a more certain level of income, or greater defensive characteristics. Unfortunately, a number of unintended consequences can result from moving away from a broadly diversified portfolio.⁶ Concentrating on higher-yielding sectors results in a less diversified portfolio, potentially higher levels of risk, and an increased chance of falling short of long-term financial goals. Similarly, moving away from bonds for the defensive portion of the portfolio can compromise long term diversification benefits.

A total-return approach, on the other hand, offers a number of portfolio benefits, including matching asset allocation to long term financial goals, maintaining diversification, and limiting concentration risks.

⁶ For more on the role of bonds including scenario analysis on the effect of shortening or lengthening duration, see *Vanguard's approach to constructing Australian diversified funds* (Geysen, Zahm, Smart and Johnson, 2017).

Figure 11. Yield comparison Australian composite bond index vs 6 month term deposit rate (January 1998 - December 2017)



Notes: 6 month Term Deposit yield from 1 January 1998 to 31 December 2017 sourced from RBA statistics (RBA.gov.au), Bloomberg AusBond Composite yield from Jan 1998 to Dec 2017 sourced from Bloomberg and uses the monthly Yield to Worst measure. The 3 year excess return of Bonds over Term Deposits is a 3 year compound total return of the Bloomberg AusBond index minus the three year compound return of Australian 6 month Term Deposits from 1 January 1998 to 31 December 2017.

Source: Vanguard, using data from Factset, Bloomberg and RBA.gov.au.

III. Implementation considerations

In deciding the appropriate withdrawal rate and spending strategy for their assets, it is also important for retirees to consider their broader financial picture. For most retirees, this will include superannuation assets and age pension benefits, but other retirees may have some additional sources of income such as rental income, annuity income, or defined benefit income.

In this section we discuss the broader potential sources of income and wealth in retirement, important rules governing retirement spending and assets, and considerations for how to integrate these items into the withdrawal rate and spending strategy decision.

Sources for retirement spending

Superannuation: At retirement, an individual can start a pension to access their superannuation savings. The most prevalent option to access super savings in retirement is an account-based pension which allows individuals to withdraw their capital and earnings at their discretion, subject to minimum withdrawals.

Age pension: The Commonwealth Government age pension forms a source of income designed to act as a safety net for retirees. It acts like an inflation protected annuity, providing longevity protection and adjusting for inflation over time. Benefits are means tested and potentially unavailable to those with higher assets or income levels. This means that if the retiree plans on maintaining a comfortable standard of living, they need to consider a sustainable rate of spending from their financial assets, such as superannuation, to ensure they have enough income to supplement the age pension^{7,8}.

Non-superannuation liquid assets: Additional non-super assets, like shares or cash, can support spending in retirement. Non-super assets provide additional flexibility for retirement planning given that access is not restricted by age, providing flexibility for an early retirement. This flexibility has the trade-off, of course, of reduced tax advantages, particularly during accumulation.

⁷ See the *ASFA Retirement Standard* for up to date estimates of modest and comfortable living standards <https://www.superannuation.asn.au/resources/retirement-standard>.

⁸ For more information on the age pension, refer to the Department of Human Services.

Additionally, for those with mandated withdrawals from superannuation that exceed spending needs, those additional withdrawals will often be placed in investment accounts external to the superannuation environment.

Other sources of income: While they are not prevalent in Australia, annuities and defined benefit pensions can provide stable cash flow in retirement to meet essential needs. While defined benefit pensions are provided by an employer, annuities must be purchased, so the security of a guaranteed life time income stream must be weighed against the large initial outlay and reduced flexibility in spending.⁹

Several additional pillars should be considered for a complete view of retirement income sources. These include investment property, rental income, home equity, and employment income.

In all cases, the predictability and longevity of the income source are important considerations to incorporating it as part of a retirement spending plan.

Retirement rules to be considered for spending

An individual or couple making spending decisions for retirement must consider the regulations governing the access to different sources of retirement income. Age, the size of assets, income received, and tax rules all affect when core pillars of retirement income can be used to meet expenses. This in turn can affect long term retirement plans, such as when to retire.

Age: Access to superannuation assets is restricted until an individual reaches their preservation age, which means that anyone retiring before this age must fund their expenses from other sources, like non-superannuation assets^{10,11}.

Asset size: The size of an individual or household's assets may impact retirement decision making. Above certain thresholds, the age pension can be affected as the assets test starts to reduce the fortnightly age pension based on a taper rate¹². At even higher thresholds, households are no longer eligible to receive a pension. Additionally, a new rule, the transfer balance cap, introduced from 1 July 2017, limits the size of account-based pension accounts to a maximum of \$1.6 million.

Income received: Income earned from employment or investments forms part of the means test of the age pension, alongside the previously mentioned assets test. Once income has exceeded certain thresholds, age pension payments decrease, and beyond further thresholds, households are no longer eligible for the age pension.

For the latest rules refer to the respective websites of the Department of Human Services and the Australian Taxation Office.

Putting it all together: A general framework for spending in retirement

A well-structured retirement spending strategy requires consideration of many elements including, the retiree's goals, sources of income, regulatory rules and spending rules. To tie these elements together it is best to adopt a cohesive framework, as set out in **Figure 12**. The framework can be utilised by those approaching retirement, or in retirement to plan spending for the year ahead. There are three primary steps in this framework:

1. Determine basic-living expenses, discretionary spending, and other retirement goals
2. Assess cash flow sources from the investment portfolio(s) and other sources
3. Apply the selected spending rule to the investment portfolio(s) and align cash flow sources to spending goals.

Spending order guide

- 1 Spend your cash flows including dividends, interest and minimum withdrawals from super first as these will already have been taxed; then spend from liquid taxable assets.
- 2 When spending down assets, drawing from your taxable assets and then from your concessional tax accounts is typically more advantageous to maximise the benefits of higher after tax returns for as long as possible.

⁹ Before purchasing an annuity, the tax and pension treatment should be considered. Government policy may act as an incentive or disincentive to including an annuity in a spending strategy.

¹⁰ After the preservation age (currently adjusting to age 60), but before age 65, the individual can either begin a transition to retirement (TTR) pension which allows them restricted access to their super account or for full access they can officially retire. After 65, the investor can access their super even while still working.

¹¹ The retirement age to access the age pension is increasing gradually from 65.5 to 67 by 2023. For more information see the Department of Human Services: <https://www.humanservices.gov.au/individuals/services/centrelink/age-pension>.

¹² For a more detailed explanation of the age pension means test see Murphy (2017).

What about changes to my age pension?

Given the means testing (asset and income test) of the age pension benefit, retirees will want to assess not just the age pension they have today, but also the age pension benefit they would receive if their assets were lower (higher). For those considering an annuity purchase, this will be a critical step to assess if their assets decreased (increased) and age pension increased (decreased) would they meet their basic living expenses

and liquidity needs. Given the irrevocable nature of many annuities, retirees will want to be sure of their need before purchasing as part of their retirement plan. A thorough understanding of one's basic living expenses and liquidity needs along with guaranteed income sources will help in making this assessment.

Prudent retirees will begin the planning process of understanding goals, assessing potential cash flow sources, and applying appropriate investment and spending strategies in advance of their actual retirement. Then, throughout their retirement, retirees should monitor all of these elements as their situation may change.

Determine goals: Retirees should consider the four primary retirement goals, as set out in **Section I**. Spending, whether basic living expenses or discretionary spending, impacts the liquid assets available for both the contingency reserve and legacy objectives. Retirees will need to be mindful of how their spending patterns impact these goals where maintaining particular wealth levels is the objective.¹³

Assess cash flow sources: Once goals have been set, the investor then considers the cash flow they will receive during the year. We categorise cash flows into two sources: 1. Cash flow from "other sources", such as age pension, annuities, defined benefit income, rental income, etc. 2. Cash flow from liquid investment portfolios (superannuation and non-super assets). Investment cash flows include required withdrawals from superannuation pension accounts along with interest, dividends, and capital gain distributions from taxable accounts. The spending rule selected will dictate how the investment cash flows are utilised and whether additional assets will be sold to fund further spending.

Generally, retirees will want to have a good understanding of the level of guarantee and certainty in amount of each of these cash flows. Guaranteed and highly certain payments such as the age pension, annuities, and defined benefit income serve an important role for basic living expenses as we'll see below. Other sources of cash flow such as rental or business income may be less certain.

Apply spending rule and align cash flow with goals: The household now has three estimates, their spending goals, their expected "other source" cash flow, and expected investment cash flow.

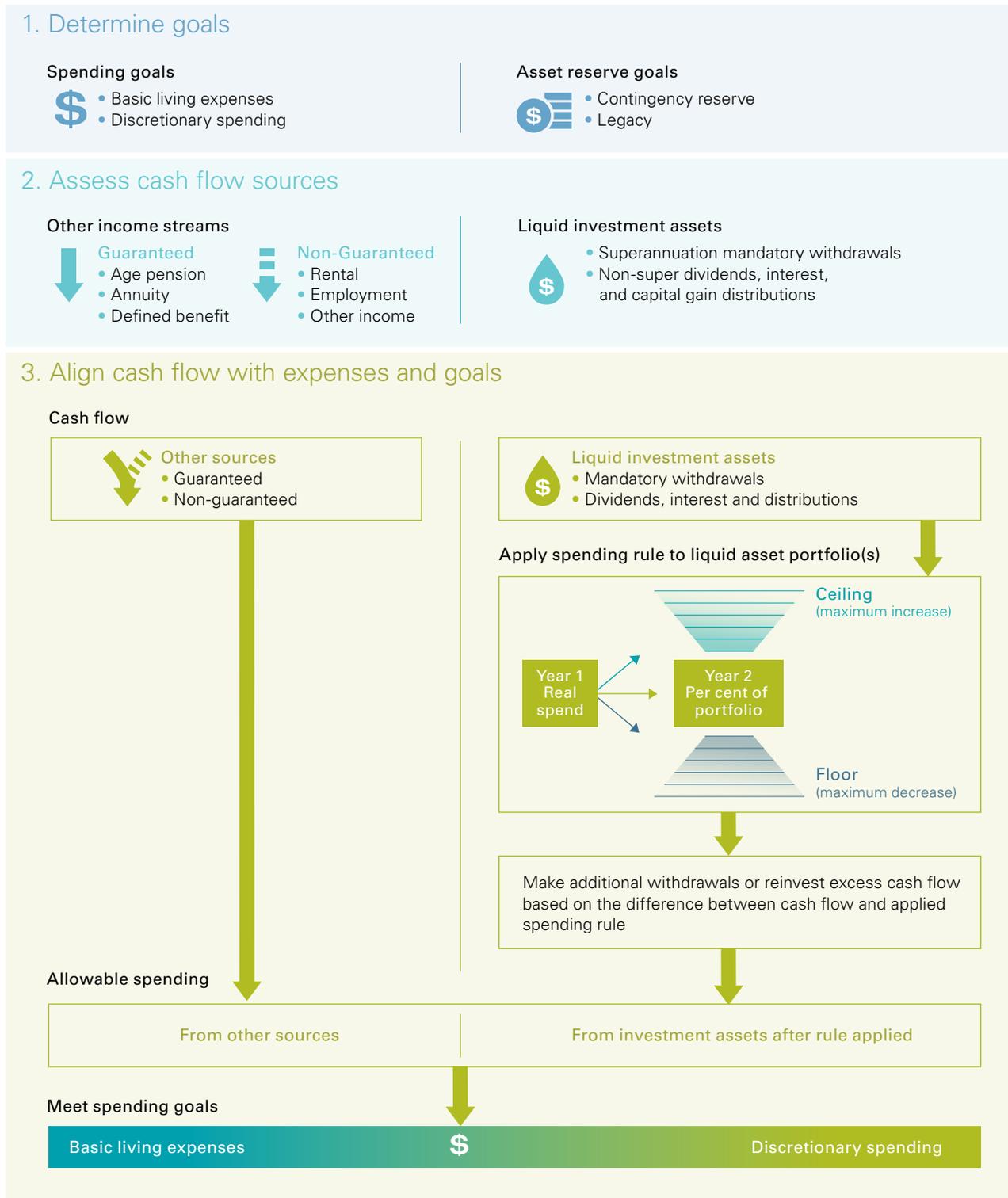
Vanguard's approach of prioritising goals (see **Section I** and Vanguard's roadmap to financial security) encourages investors to first meet basic living expenses from income sources that are both stable and will likely last the investor's full lifetime. For many households, the age pension may achieve this goal and would be the right place to start. Other cash flow sources such as annuity income can further fund basic living expenses.

Investment cash flows will be the next source to meet basic living expenses and discretionary spending. However, these investment cash flows also need to be compared to the "allowable spending" based on the spending rule selected for the liquid asset portfolio. For example, as required withdrawals from superannuation account-based pensions increase with age, retirees will need to be very mindful of the likely excess cash flow relative to their spending rule. Using a spending strategy, such as dynamic spending with ceiling and floor, to set an appropriate spending level will provide the guidance of how much of these investment cash flows can be spent versus should be reinvested. The reinvestment of this surplus ensures that the household has the best chance of meeting their long-term goals, including maximising discretionary spending, but also funding contingency or legacy requirements.

If all cash flow is less than the spending goals and the investment cash flow is less than the "allowable spending" set by the spending rule, the household will typically supplement the difference by accessing non-super liquid assets or withdrawing additional superannuation funds above the minimum required withdrawal amounts.

¹³ See *Vanguard's Roadmap to Financial Security* for more information.

Figure 12. Visualises the process of setting and meeting spending goals by providing a decision making framework which seeks to breakdown the complexity faced by retirees.



Source: Vanguard.

Conclusion

Vanguard's retirement spending strategy is a framework to help investors maximise their chances of achieving their financial goals over an unknowable number of years in retirement. The three key steps to our goals-based approach are to develop a prudent spending rule tailored to each retiree's unique goals; build a soundly constructed portfolio; and execute an efficient investment and withdrawal strategy balancing retirement goals and aligning cash flow with expenses.

Each step involves complexities and trade-offs. The stakes are high, and the impact of subpar decisions can be severe. This combination of complexity and consequence underscores the need for skilful guidance, giving advisors an opportunity to have a profound impact on the financial well-being of their clients.

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Appendix I. Dynamic spending rule illustration

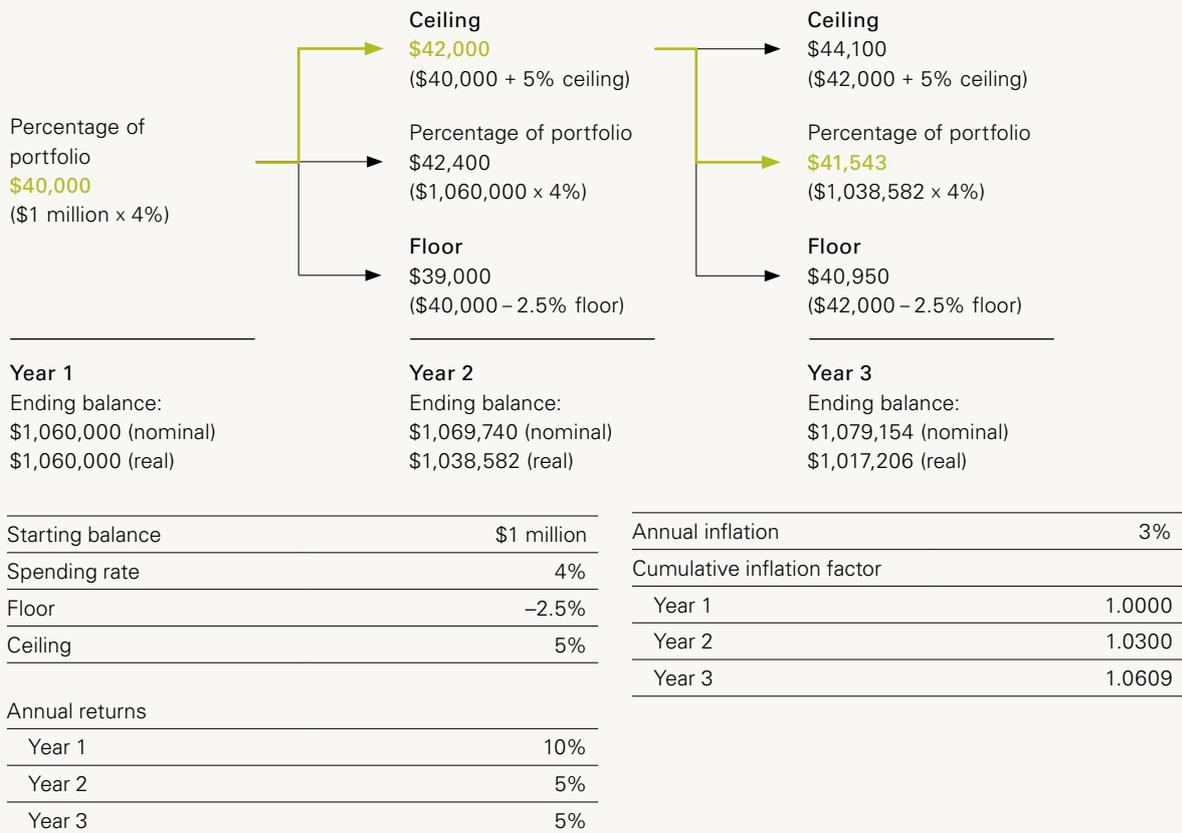
The process is as follows:

1. Calculate each year's spending by taking a stated percentage of the prior year-end's portfolio balance. For example, a retiree with a \$1 million portfolio and an income need of \$40,000 per year would start by taking 4% of the portfolio in year one.
2. Calculate a ceiling and a floor by applying chosen percentages to the prior year's inflation-adjusted spending amount, such as a 5% ceiling and a -2.5% floor. In the example in **Figure A-1**, given a 3% rate of inflation, the ceiling and floor would be calculated as \$42,000 and \$39,000, respectively. The percentage of portfolio amount, after accounting for investment gains and the prior year's spending, would be \$42,400.

3. Compare the results. If the newly calculated spending amount exceeds the ceiling, you limit spending to the ceiling amount; if the calculated spending is below the floor, you increase spending to the floor amount. In the example, since the \$42,400 percentage of portfolio amount exceeds the ceiling of \$42,000, spending would be constrained to the ceiling.

In short, this rule helps retirees maintain income for basic expenses while allowing for more discretionary income if market returns are favorable.

Figure A-1. Dynamic spending strategy example: Percentage of portfolio with ceiling and floor



Notes: This hypothetical illustration does not represent the investment results of any particular portfolio. The figure shows a hypothetical three-year example of a spending strategy using the *percentage of portfolio with ceiling and floor* method. Here the Year 2 spending amount is constrained by the ceiling rule, while Year 3's spending amount is constrained by neither the ceiling nor the floor. Green lines emphasise which of the three calculated amounts should be used as each year's spending withdrawal.

Source: Vanguard.

Appendix II. About the Vanguard Capital Markets Model

IMPORTANT: The projections or other information generated by the Vanguard Capital Markets Model regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results, and are not guarantees of future results. VCMM results will vary with each use and over time.

The VCMM projections are based on a statistical analysis of historical data. Future returns may behave differently from the historical patterns captured in the VCMM. More important, the VCMM may be underestimating extreme negative scenarios unobserved in the historical period on which the model estimation is based.

The VCMM is a proprietary financial simulation tool developed and maintained by Vanguard's Investment Strategy Group. The model forecasts distributions of future returns for a wide array of broad asset classes. Those asset classes include U.S. and international equity markets, several maturities of the U.S. Treasury and corporate fixed income markets, international fixed income markets, U.S. money markets, commodities, and certain alternative investment strategies. The theoretical and empirical foundation for the Vanguard Capital Markets Model is that the returns of various asset classes reflect the compensation investors require for bearing different types of systematic risk (beta). At the core of the model are estimates of the dynamic statistical relationship between risk factors and asset returns, obtained from statistical analysis based on available monthly financial and economic data. Using a system of estimated equations, the model then applies a Monte Carlo simulation method to project the estimated interrelationships among risk factors and asset classes as well as uncertainty and randomness over time. The model generates a large set of simulated outcomes for each asset class over several time horizons. Forecasts are obtained by computing measures of central tendency in these simulations. Results produced by the tool will vary with each use and over time.

The primary value of the VCMM is in its application to analysing potential client portfolios. VCMM asset-class forecasts—comprising distributions of expected returns, volatilities, and correlations—are key to the evaluation of potential downside risks, various risk–return trade-offs, and the diversification benefits of various asset classes. Although central tendencies are generated in any return distribution, Vanguard stresses that focusing on the full range of potential outcomes for the assets considered is the most effective way to use VCMM output.

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