

Sustainable spending rates in turbulent markets

Vanguard Research Note

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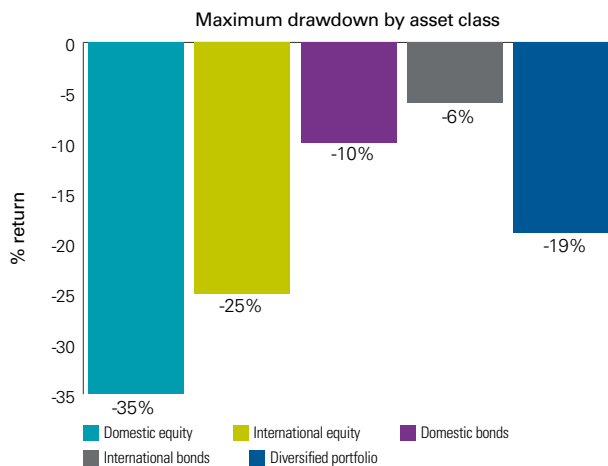
- Market shocks can have a damaging impact on an investment portfolio's ability to fund retirement spending.
- This paper addresses the impact of market shocks on sustainable withdrawals from a portfolio to fund retirement and also the portfolio's longevity.
- Our analysis suggests that a dynamic spending strategy that makes modest spending adjustments in response to a market downturn can preserve the portfolio's long-term spending power without large fluctuations in annual spending.

Acknowledgments: This paper is inspired by a Vanguard research paper first published in 2013 as a more dynamic approach to spending for investors in retirement by Colleen M. Jaconetti, Francis M. Kinniry, Jr., and Michael A. DiJoseph.

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In early 2020, as Covid-19 shut down large sectors of the global economy, equity markets tumbled. From their peak on 19 February to their low on 23 March, UK equity markets dropped by 35%¹. The shock not only affected UK equity markets but a broad range of asset classes. Even a diversified portfolio of 60% equity and 40% fixed income with a global market-cap based approach would still have suffered a fall of almost 19% during this short period².

Figure 1. 2020 peak-to-trough returns by major asset classes



Past performance is not a reliable indicator of future results.

Note: Domestic equity - MSCI UK Price Index, international equity - MSCI AC World Ex UK Price Index, domestic bonds - Bloomberg Barclays Global-Aggregate United Kingdom GBP Hedged - average price, international bonds - Bloomberg Barclays Global Aggregate ex Euro Aggregate GBP Hedged - average price. Asset allocation of the diversified portfolio is: domestic equity: 15%, international equity: 45%, domestic fixed income: 14%, international fixed income: 26%.

Source: Thomas Reuters Datastream. Data as at 19 February to 23 March 2020.

Market shocks can be especially unnerving for investors just beginning to withdraw money from their portfolios in retirement. Therefore, for retirees with higher basic living expenses or those looking for financial flexibility, it is important to have a prudent withdrawal strategy to meet retirement goals and preserve the long-term spending power of their portfolio, whatever is happening in the markets.

This paper investigates how withdrawal strategies can be managed during turbulent markets to support annual spending needs and protect the longevity of a portfolio. We address this topic in two steps:

- First, we define the different spending strategies that investors typically use in retirement and explore how they can be used to preserve a portfolio after a market downturn;

- Second, we simulate the long-term performance of the withdrawal strategies before and after the market shock of 2020 using Vanguard’s capital-market projections.

Three primary spending strategies

One of the most important factors in determining whether a retiree’s portfolio can withstand varying market shocks and volatility is the withdrawal strategy implemented. We review three commonly used spending strategies, each with a different emphasis on spending stability and portfolio preservation.

The first is the “pound-plus-inflation” rule. An investor using this strategy would select an initial amount that would be withdrawn annually from the portfolio. This selected amount would increase each year by inflation. For example, if an investor chose an initial annual withdrawal amount of £50,000 and inflation was 2%, the following year, £51,000 would be withdrawn from the portfolio. The goal of this strategy is to maintain stable annual spending unaffected by market performance. However, such an approach risks early depletion of the portfolio after a sequence of poor returns (Khang and Clarke, 2020³).

For those investors looking to maintain their portfolio, another option is the “percentage of portfolio” strategy. Here, an investor chooses a specific fixed percentage of the portfolio to withdraw each year. However, while this strategy ensures that the portfolio is never depleted, it can lead to big swings in annual withdrawals. For example, if the portfolio’s value declines by 20% in a given year, the annual spending amount will also decrease by 20%. Therefore, when markets are volatile, a retiree may have to tolerate large fluctuations in their spending power.

The third rule is “dynamic spending”, a hybrid of the previous two strategies. This strategy makes modest adjustments to withdrawals in response to market performance. The goal is to keep annual real (inflation-adjusted) spending relatively stable while also preserving portfolio longevity.

To apply this strategy, the retiree would determine a specific percentage of the prior year-end’s portfolio balance that would be used to calculate the current year’s spending. At the start of retirement, for example, a retiree might set the percentage at 5%. Every year the investor calculates their portfolio in real terms (reducing the portfolio size by the growth of inflation since retiring). The initial withdrawal rate is applied to this real figure.

¹ Source: Morningstar. MSCI UK Price Index. Returns calculated in pounds.

² Source: Thompson Reuters Datastream.

³ Khang, Clarke, 2020. Safeguarding retirement in a bear market.

Figure 2: Comparison of spending strategies

	Pound plus inflation	Dynamic spending	Percent of portfolio
Initial annual spending amount	£ 50,000	5% ceiling -2.5% floor	5% of portfolio
Market performance	Not affected	Somewhat responsive	Very responsive
Short-term spending stability	Stable	Fluctuates within stated limits	Unstable
Spending flexibility	Not flexible	More flexible	Highly flexible
Portfolio viability (success rate)	Unpredictable	More stable	100% success rate

Note: **Green**: positive outcome from spending strategy **Red**: negative outcome from spending strategy.

Source: Vanguard.

If the portfolio’s year-end real balance is £1,000,000, the retiree would withdraw £50,000 in the first year on an inflation-adjusted basis.

The retiree would also set a “ceiling” and “floor” to determine how much the portfolio withdrawals would fluctuate from year to year. Suppose they set a ceiling of 5% and a floor of -2.5%. At the end of the first year of retirement, the portfolio’s balance has increased to £1,122,000 and inflation was 2%. The real value of the portfolio would be £1,100,000 and 5% of this year-end balance implies real spending of £55,000. The retiree compares that amount with the initial £50,000 withdrawal and applies the 5% ceiling. The resulting withdrawal is £52,500 before adding in inflation to main the investor’s purchasing power. The retiree thus spends some of the portfolio’s gains but leaves some invested to provide a cushion when markets decline.

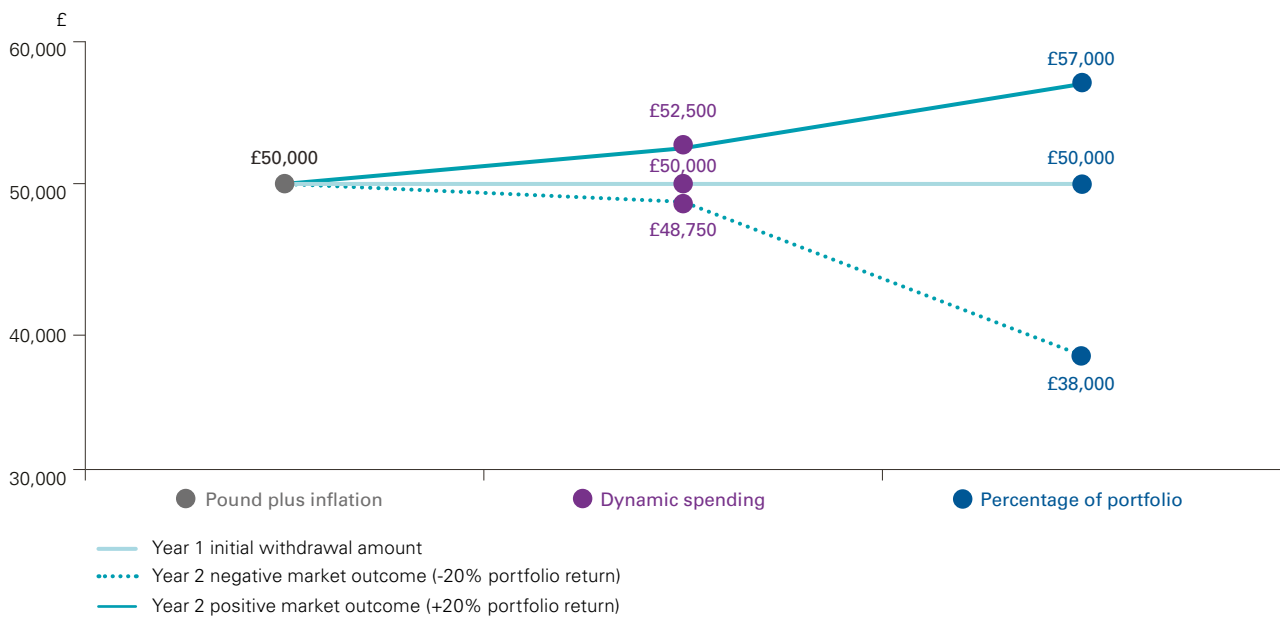
In practice, if the new annual spending amount is larger than the ceiling, it will be limited to the ceiling threshold. If the new annual spending amount falls below the floor, then it will be increased to the floor level. This strategy allows for the spending to fluctuate annually based on the market, but not any further than a pre-determined floor or ceiling. This protects the portfolio’s ability to withstand market swings, while offering a more stable annual spending withdrawal⁴.

These guardrails can significantly affect retirement outcomes and can be customised based on retiree’s unique goals. A larger floor limit allows for more flexibility in decreasing annual spending and thus a greater chance for portfolio longevity during large market swings.

Figure 2 summarises differences between the three spending strategies. In Figure 3, we illustrate the one-year change in real (inflation-adjusted) withdrawals for each of the three rules. In all cases, we assume an initial withdrawal in the first year of £50,000 or 5% of the portfolio’s balance. We then calculate how spending would change at the beginning of year two in response to a 20% market decline or a 20% rise for each of the rules. We assume that the entirety of annual spending is withdrawn from the portfolio at the beginning of each year. Note: The pound-plus-inflation strategy maintains an annual spending level of £50,000 for year one and in both market scenarios in year two. As Figure 3 demonstrates, the percentage of portfolio strategy gives a higher withdrawal amount than the dynamic spending strategy in positive markets, but a much lower withdrawal amount in a negative scenario.

4 Source: Jaconetti, DiJoseph, Kinniry, Pakula, Lobel, 2020. From assets to income: A goals-based approach to retirement spending.

Figure 3. Annual withdrawal amount (£) comparison



Notes: Assuming: starting withdrawal of £50,000 for all three portfolios. Initial portfolio value: £1,000,000. Percentage of portfolio spending 5%; dynamic spending starting with £50,000 with a 5% ceiling/2.5% floor. Pound plus inflation: £50,000 withdrawn in years 1 and 2 (both market scenarios). The pound-plus-inflation and dynamic-spending strategies increase with inflation each year, whereas the percentage-of-portfolio strategy does not.

Source: Vanguard.

Assessing hits to sustainable spending during market downturns

The amount that an investor can safely withdraw from a portfolio depends on the size of the portfolio and its expected returns. The larger the portfolio and the higher the expected return, the more, on average, an investor can withdraw.

A market shock such as that seen in February and March 2020 reduces the portfolio's value, diminishing the amount that can safely be withdrawn. But by lowering the valuations of securities, the shock can also raise expected returns, potentially offsetting some of this decline. A fall in stock market valuations has tended to be associated with higher future returns⁵. This relationship is subject to a lot of uncertainty, but we assume that, on average, it will hold in the future.

We can analyse this relationship by looking at two Vanguard Global Capital Markets Model® (VCMM) forecasts⁶, one from December 2019, before the market shock, and the other from March 2020⁷, after the market shock.

The long-term median projected UK equity return in December 2019 was 6.2% and increased to 7.2% in the March 2020 forecast⁸. We use these December 2019 and March 2020 VCMM forecasts to compare the performance of the dynamic spending strategy and the pound-plus-inflation strategy. The percentage of portfolio approach is excluded because of the extreme swings in annual spending that the strategy can sometimes produce during market shocks. The two strategies are simulated using the assumption of a diversified portfolio consisting of 60/40 equity/bond allocations with a domestic/international allocation based on global market capitalisation⁹. This results in a portfolio comprised of 12% domestic equity, 48% international equity, 8% domestic fixed income and 32%, international fixed income.

To test the effectiveness of spending strategies we conduct two analyses. First, we compute the spending available to the investor with an 85% chance of success and then we compute the spending rule's success rate. The success rate is defined as the percentage of times that a spending rule sustained a given level of withdrawals throughout retirement without the portfolio

⁵ Valuations are determined by the ratio of prices to earnings. We assume that a decline in prices means a decline in valuations. If long-term business and economic fundamentals deteriorate significantly, however, this assumption would be unwarranted. We believe that, on average, current market valuations are inversely related to future expected returns.

⁶ VCMM is a proprietary forecasting tool that provides investors with a range of possible future expected returns for a wide range of asset classes. For more information about the VCMM please see: Davis, Aliaga-Diaz, Ahluwalia, Polanco, Tasopoulos, 2014. Vanguard Global Capital Markets Model..

⁷ For the most recent forecast please see: Vanguard economic and market outlook for 2021: Approaching the dawn.

⁸ Please see the appendix for the full distributions of VCMM asset class forecasts for December 2019 and March 2020..

⁹ The asset allocation approach is based on the global market capitalisation of domestic equity and bonds as at 31 December 2019. The equity domestic exposure is based on the FTSE All-World Index and the bond exposure from the Bloomberg Barclays Global Aggregate Index.

being depleted. To compare the spending rules we felt it was most appropriate to use the 85% mark as a benchmark for success.

To assess the market downturn's impact on spending, we consider the three different scenarios:

- A base case, made up of the full 10,000 VCMM 'return' scenarios;
- An optimistic scenario, made up of the 5,000 returns above the 50th percentile;
- A pessimistic scenario, made up of the 5,000 returns below the 50th percentile.

Figure 4 displays the sustainable level of annual real spending that would result in an 85% success rate for both the dynamic spending rule and the pound-plus-inflation rule before and after the crisis over a 30-year time horizon.

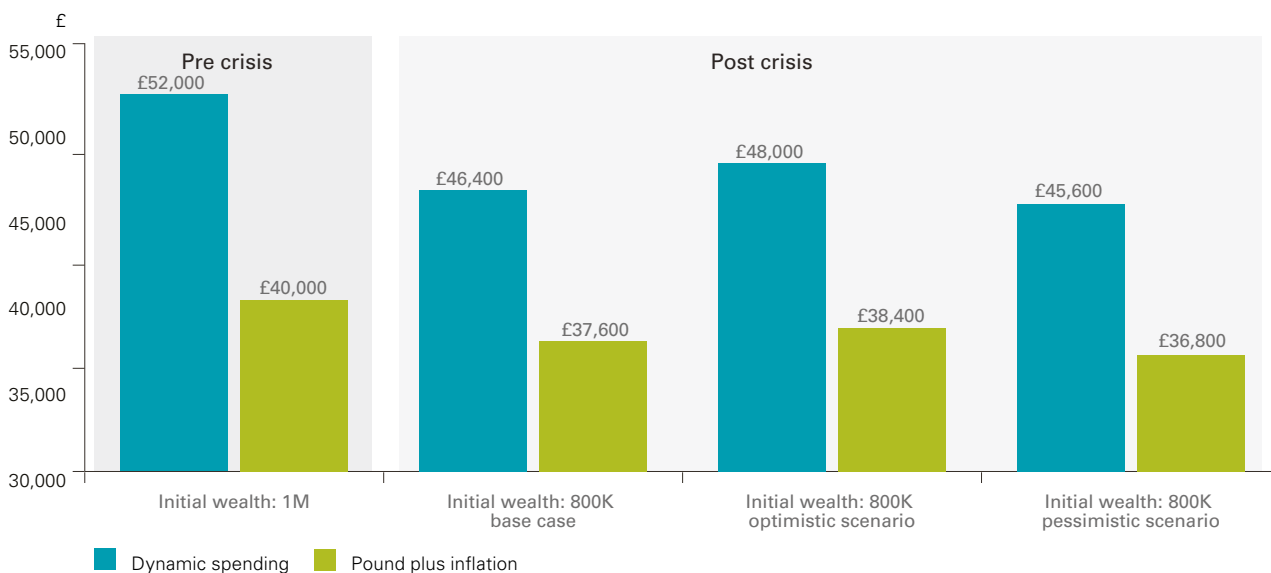
Based on our pre-crisis expected asset returns as at December 2019, a £1,000,000 portfolio implementing a dynamic spending strategy could sustain an average annual spending withdrawal of £52,000 (lower in some years, higher in others) and still maintain at least an 85%

success rate. A portfolio using the pound-plus-inflation strategy could only sustain an annual spending withdrawal of £40,000.

Post crisis, we use expected asset returns as of March 2020, with an initial portfolio value of £800,000 representing a 20% decline from £1,000,000. For the base case scenario, the dynamic spending strategy allows for higher annual spending, £46,400 on average, whereas the pound-plus-inflation strategy allows for only £37,600. The sustainable withdrawal amount from the dynamic spending strategy remains higher because the small adjustments to annual spending allow for a larger portion of the portfolio to be protected and compounded when returns are stronger in the future.

The dynamic spending strategy provides, therefore, a higher sustainable withdrawal amount in the base, optimistic and pessimistic scenarios after the crisis than the pound-plus-inflation rule. In fact, in all three scenarios, dynamic spending after the market shock is higher, on average, than the pound-plus-inflation spending before the shock in December 2019.

Figure 4. Real sustainable spending in times of crisis



Notes: Assuming: 85% success rate over 30 year time horizon. Time horizon pre crisis: 30 years after December 2019. Time horizon post crisis: 30 years after March 2020. Ceiling: 5% Floor: -2.5%. Asset allocation: domestic equity: 10%, international equity: 40%, domestic fixed income: 17.5%, international fixed income: 32.5%.

Source: Matlab; Vanguard Capital Markets Model. Data as at December 2019 (pre crisis) and March 2020 (post crisis).

Spending targets and success rate

We also sought to assess which strategy had the greater chance of delivering a positive portfolio account balance after 30 years.

Applying three annual spending targets (a conservative £30,000, a moderate £40,000 and an aggressive £50,000), we compared the pound-plus-inflation rule with the dynamic spending rule by the projected success rate of the portfolio.

Note: In the dynamic spending simulation, the initial spending target is for the first year only. The strategy allows for the annual spending amount to diverge from this amount based on the stated ceiling and floor limits. A pound-plus-inflation rule uses the annual targeted spending yearly, adjusted for inflation. Figure 5 displays the probability for success of these rules with the varying spending targets both pre- and post-crisis for the base case (See Appendix for full chart of simulations):

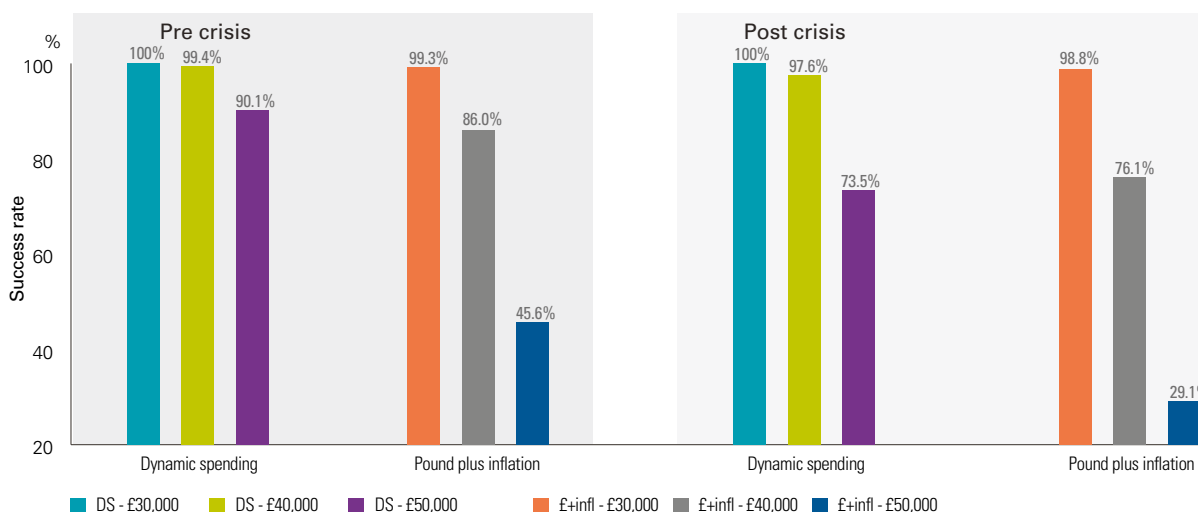
As we can see on Figure 5, the dynamic spending approach gives an investor the better chance of success than the pound-plus-inflation strategy for all three of the spending targets both pre- and post-crisis. In December 2019, a £1,000,000 portfolio following the dynamic spending strategy with a £40,000 spending target had a 99.4% probability of ending the 30 years with a positive portfolio balance. The probability for the pound-plus-inflation rule is lower at 86%.

In this simulation, as the spending target increases from £40,000 to £50,000, the probabilities of success for both strategies decrease. However the success rates drop further for the pound-plus-inflation strategy. For example, before the crisis, the dynamic spending strategy has a success rate that drops from 99.4% to 90.1% if the spending target increases from £40,000 to £50,000, but the pound-plus-inflation rule success rate drops further from 86% to just 45.6%.

In the post-crisis analysis, the probability of success for the pound-plus-inflation strategy remains lower than the dynamic spending strategy and drops by a larger percentage from the pre-crisis success rate. Using the £40,000 spending target, the success rate for the dynamic spending strategy drops 1.8 percentage points from 99.4% before the crisis to 97.6% post crisis. The pound-plus-inflation strategy drops 9.9 percentage points from 86% pre crisis to 76.1% post crisis.

All three of the spending targets suggest that the dynamic spending strategy produced a higher success rate both before and after the crisis than the pound-plus-inflation strategy. The higher the initial spending target, the greater the disparity between the success rates of the two strategies.

Figure 5. Probability of success after a market crash with £30,000-£50,000 real annual spending targets



Notes: Assuming: starting withdrawals of £30,000 - £50,000. Time horizon pre crisis: 30 years after December 2019. Time horizon post crisis: 30 years after March 2020. Ceiling: 5%. Floor: -2.5%. Asset allocation: domestic equity: 12%, international equity: 48%, domestic fixed income: 8%, international fixed income: 32% base case only. Source: Vanguard.

Sustainable withdrawal rates

Each client's circumstances are unique. While there are multiple considerations, we have tried to cover two of the most common considerations: the risk profile of their investment and their time horizon.

Figure 6 illustrates the real sustainable withdrawal rates across a combination of differing asset allocations that would meet an 85% success rate for a £1,000,000 portfolio across the stated time horizon.

The dynamic spending strategy allows for greater initial spending than the pound-plus-inflation strategy, while still maintaining the longevity of the portfolio at an 85% success rate. This is true across a variety of time horizons and asset allocations. On average, the dynamic spending strategy allows for around a 1-percentage-point increase in the sustainable withdrawal rate compared to the pound-plus-inflation strategy across the differing time horizons and asset allocations.

Figure 6. Sustainable withdrawal rates across different risk profiles and time horizons

Asset allocation	Pound-plus-inflation strategy Ceiling/floor: 0%/0% (Time horizon - years)			Dynamic spending strategy Ceiling/floor: 5.0%/-2.5% (Time horizon - years)		
	10yrs	20yrs	30yrs	10yrs	20yrs	30yrs
Conservative	10.0%	5.1%	3.7%	11.1%	6.3%	4.9%
Moderate	10.4%	5.9%	4.6%	11.5%	7.0%	5.8%
Aggressive	10.6%	6.6%	5.5%	11.5%	7.3%	6.1%

Notes: Rates are gross of taxes. Any tax is assumed to be paid from the withdrawn amount. Portfolio allocations are: conservative-20% stocks/80% bonds, moderate-50% stocks/50% bonds, and aggressive-80% stocks/20% bonds. Each portfolio featured a home bias of 25% towards domestic equities and 35% towards domestic bonds. The rest of the international allocations are based on global market cap for FTSE All World and Bloomberg Barclays Global Aggregate Index. Withdrawal rates were determined using data from the VCMM. See Appendix for further description of the VCMM. The withdrawal rates are based on the portfolio meeting an 85% success rate over the stated time horizons.

Source: Matlab; Vanguard Capital Markets Model.

What's left after 30 years?

The previous simulations featured a time horizon of 30 years. While this assumes a long life expectancy (age 95 for someone who retires at age 65), some people may enjoy longer lives. Therefore, a further aspect we should consider is the size and importance of the bequest an investor wants to leave.

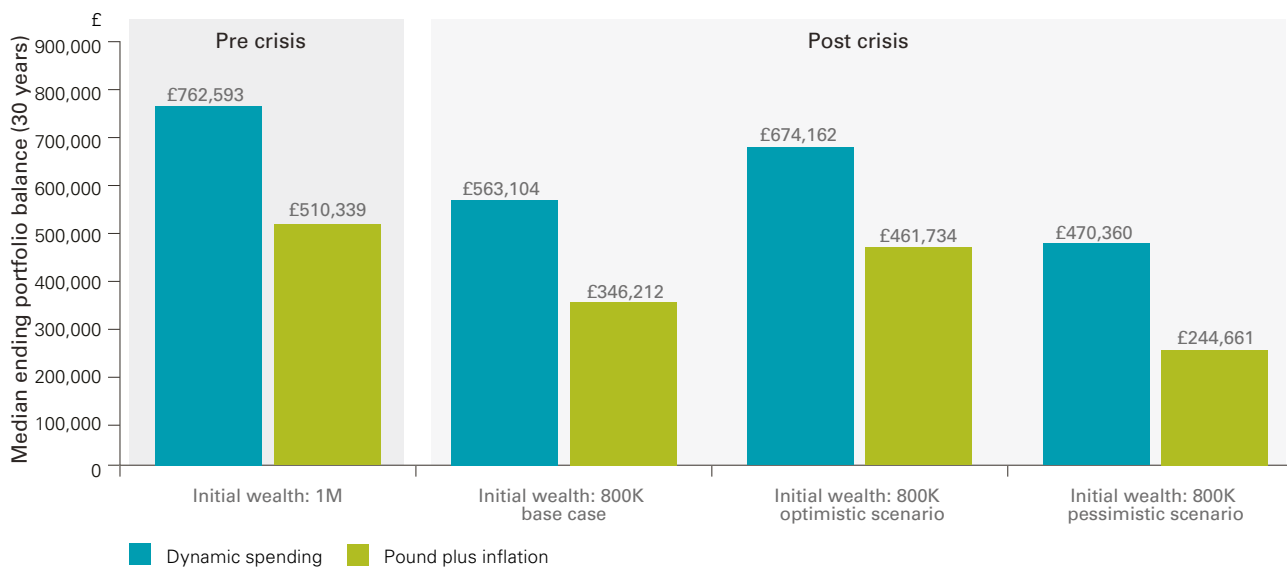
We provide a perspective on the resources that would be available for a bequest after an exceptionally long life by estimating the value of the portfolio at the end of the 30-year horizon.

In Figure 7, we show the ending median real portfolio value for both the dynamic spending strategy and the pound-plus-inflation strategy.

As the chart illustrates, the dynamic spending strategy gives an investor a better chance of financial flexibility, as the median ending real portfolio value at year 30 is greater both pre- and post-crisis when compared to the pound-plus-inflation strategy. Before the crisis, a £1,000,000 portfolio with £40,000 in initial annual spending would have a median real portfolio balance of £762,593 if a dynamic spending rule is implemented. By contrast, a portfolio with a pound-plus-inflation strategy would return a median balance of just £510,339 after 30 years.

The dynamic spending strategy also remains the optimal strategy after the crisis, with a higher median portfolio balance than the pound-plus-inflation strategy in the base, optimistic and pessimistic scenarios.

Figure 7. Median ending real portfolio value after 30 years with £40,000 spending target



Notes: Assuming: starting withdrawal of £40,000. Time horizon pre crisis: 30 years after December 2019. Time horizon post crisis: 30 years after March 2020. Ceiling: 5%. Floor: 2.5%. Asset allocation: domestic equity: 10%, international equity: 40%, domestic fixed income: 17.5%, international fixed income: 32.5%.

Source: Matlab; Vanguard Capital Markets Model.

Conclusion

Market downturns can cause a sense of unease for investors, but taking on a dynamic spending strategy can mitigate some of the effects on retirement spending. This strategy, on average, creates a higher success rate and median ending portfolio value than the pound-plus-inflation strategy, while also offering protection from the significant swings in annual spending that the “percentage of portfolio” strategy brings with it.

By slightly adjusting annual withdrawal rates, the dynamic spending strategy helps the investor to weather the effects of market shocks on their portfolio value, while preserving a stable withdrawal rate.

Appendix - VCMM return projections and VCMM simulations:

Vanguard's forward-looking expectation for key asset classes as of December 2019 and March 2020. Forward-looking expected returns increased from December 2019 to March 2020, due to the drop in equity prices between

these two time periods. Vanguard's VCMM forecast is presented as a distributional framework. For more information about Vanguard's forecast, please see the Vanguard Economic and Market Outlook¹⁰.

Figure 8a. VCMM forecast - December 2019:

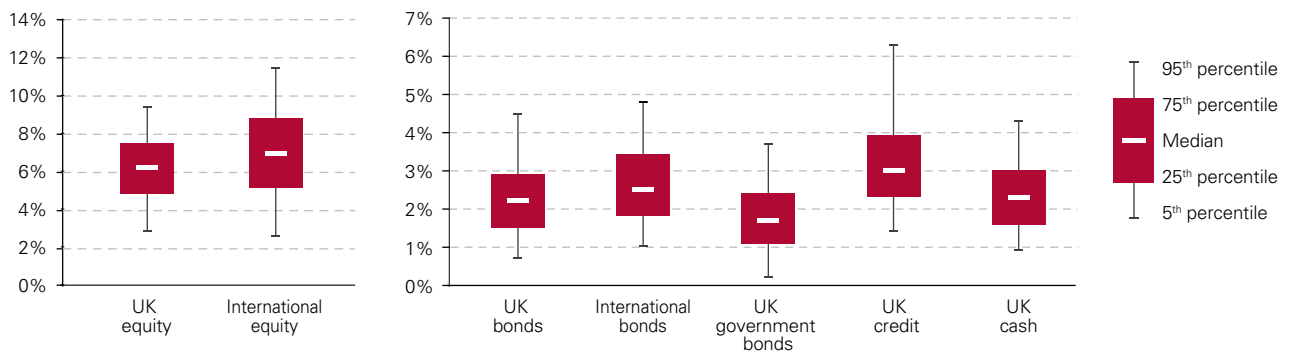


Figure 8b. VCMM forecast - March 2020:

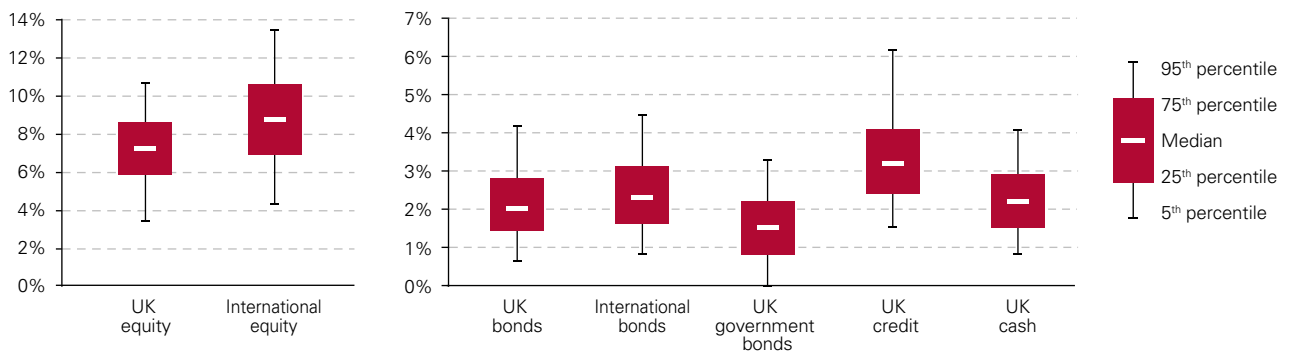
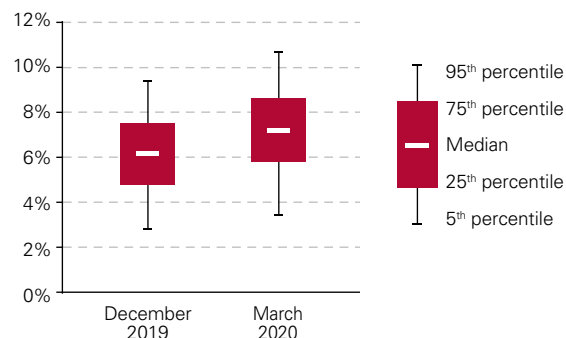


Figure 8c. VCMM equity forecast – December 2019 and March 2020:



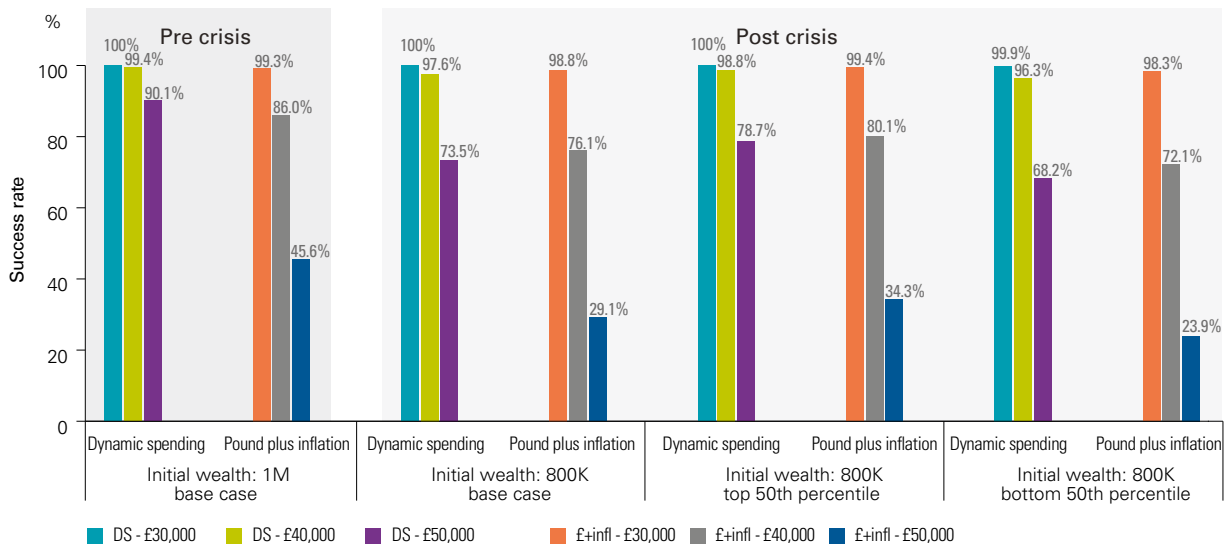
Source: Vanguard.

¹⁰ Vanguard economic and market outlook for 2021: Approaching the dawn.

Figure 9 displays the full amount of success-rate simulations for the dynamic spending and pound-plus-inflation strategy. This builds on to Figure 5, by adding on

the results for a base case, top 50th percentile and bottom 50th percentile for the post-crisis data.

Figure 9. Probability of success after a market crash with £30,000-£50,000 annual spending targets all scenarios



Notes: Assuming starting withdrawals of £30,000 - £50,000. Time horizon pre crisis: 30 years after December 2019. Time horizon post crisis: 30 years after March 2020. Ceiling: 5%. Floor: -2.5%. Asset allocation: domestic equity: 10%, international equity: 40%, domestic fixed income: 17.5%, international fixed income: 32.5%, base case, top 50th percentile, bottom 50th percentile.

Source: Vanguard

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.

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