# Can Buckets Bail-Out <br> a Poor Sequence of Investment Returns? 

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A bear market early in retirement - i.e. when you start withdrawing money from a portfolio -- can have a devastating impact on the sustainability of your income stream. This irrefutable mathematical fact has been demonstrated by a number of authors including myself and has led many individuals to consider FinSurance products, such as put options, guaranteed minimum withdrawal benefits and other structures to guard against this risk.

Some commentators have expressed the view that by placing a few years worth of retirement income needs into safe investments and not touching the remaining funds in the event of a bear market, they can somehow avoid the ruinous impact of a poor sequence of investments returns. A fringe element of this sect believes that if markets decline a retiree should simply be counseled to only take income from their bond allocation and then "wait for the stock allocation to recover" and thus avoid selling at a loss.

These strategies are an optical illusion at best and create a potential for grave disappointment at worst. If you are unlucky enough to earn a poor sequence of initial returns, "bucketing" your retirement income is not a guaranteed bailout. In this brief article I will try to convince you of this fact using what logicians call a counterexample.

As in any discussion (or debate), one's assumptions are critical and our current story is no exception. To make this a fair apples-to-apples comparison I must arrange my story so that all else is equal, or as economists say ceteris paribus. I will start with two hypothetical retirees: Stephanie and Brett. They both begin their retirement with exactly $\$ 100,000$ in liquid assets from which they would like to receive or generate $\$ 750$ per month which is \$9,000 per annum, for as long as possible. Note that under a fixed 7\%
investment return per year the funds would only last for 21 years. Granted, this is a (very) high and therefore unsustainable spending rate and I would never counsel either of them to withdraw this much. My point for this article is not to suggest a prudent spending rate but to examine the impact of two strategic alternatives. Later I will return to the impact of this and other assumptions.

Now, Stephanie chooses to invest her entire $\$ 100,000$ in one balanced mutual fund that internally has 30\% of its assets allocated to cash instruments and the remaining 70\% allocated to diversified equities or stocks. This allocation is periodically rebalanced by the mutual fund manager so that Stephanie can rest assured that she has a 70/30 equity/cash mix on an ongoing basis. I will also assume that this balanced portfolio is expected to earn an arithmetic average of $7 \%$ per annum net of all fees. Remember that each month Stephanie plans to liquidate as many units as necessary (more during a bear, less during a bull) to create the desired income of $\$ 750$. This is known as a systematic withdrawal plan (SWiP).

In contrast to Stephanie, Brett decides to implement a so-called "buckets" approach to retirement income management. He places \$25,400 of his \$100,000 nest egg in cash instruments to cover the next 3 years ( 36 months) of $\$ 750$ per month expenses. The remaining $\$ 74,600$ is invested in a pure equity portfolio that -- I am assuming -- is expected to earn an arithmetic average of $8 \%$ per annum. It will not be touched or tapped for three whole years.

The reason Brett has set aside precisely $\$ 25,400$ is because I have also assumed cash is yielding a constant and predictable $4.0 \%$ per annum. The present value of 36 monthly cash flows of $\$ 750$ at $4.0 \% / 12=0.333 \%$ per month is exactly $\$ 25,400$. This bucket of cash will generate the desired payments and Brett will not have to "sell at a loss" or liquidate any stocks if the market takes a tumble during the first three years of withdrawals (a.k.a the retirement risk zone).

Notice that if we focus on the total portfolio held by either Stephanie or Albert at the time of retirement, they both are expecting their investments to earn 7\% per annum. Stephanie selected a mutual fund that is projected to earn $7 \%$, while Brett has $25.4 \%$ (=\$25,400 / \$100,000) allocated to cash earning 4.0\% and 74.6\% (=\$74,600 / $\$ 100,000$ ) allocated to equities earning $8 \%$. This also works out to an average of $7 \%$.

It is very important to keep track of the total asset allocation since it will have a direct impact on my subsequent arguments. In fact, all of the above return assumptions - i.e. 4\% for cash and 8\% for equity and 7\% for the balanced fund -- were not arbitrary. They were selected so that at the point of retirement Stephanie and Brett have the same asset allocation but different withdrawal strategies. Otherwise, any comparison is meaningless. Whether you place the money in bucket or funds you still have a total asset allocation to consider.

One final assumption that I will now make for the sake of my counterexample - and this one is a bit artificial -- is that equities as an asset class will earn one of only three possible investment returns with equal probability. Namely, equities will either earn 8\% (the average) or earn $35 \%$ or they will lose $19 \%$ in any given year. The arithmetic average of these three numbers is exactly $8 \%$. The standard deviation of the random variable consisting of three possible investment returns is the square root of the expression: $(1 / 3)(0)+(1 / 3)(0.27)^{\wedge} 2+(1 / 3)(0.27)^{\wedge} 2$, which is approximately $21.9 \%$.

Stay with me here. By virtue of the fact that Stephanie has invested in a fund that has $70 \%$ in equities and $30 \%$ in cash - and to be consistent with our previous assumptions - Stephanie's fund will also earn one of three possible investment returns. She will either earn $27 \%$ (the good) or she will lose $13 \%$ (the bad) or she will earn $7 \%$ (the average). All of them are with equal probability. Note that the standard deviation for her mutual fund's random return is the square root of $(1 / 3)(0)+(1 / 3)(0.20)^{\wedge} 2+(1 / 3)(0.20)^{\wedge} 2$, which is $16.3 \%$. And, just to convince yourself that the math works out, notice that ( $\$ 74,600 / \$ 100,000$ ) times $21.9 \%$ is exactly $16.3 \%$. In other words at time zero both of them have an equivalent total asset allocation but a very different strategic plan for how
to generate an income during the next three years. Figure 1 illustrates the possible returns that Stephanie and Brett will encounter.

Figure 1


We now get to the interesting part. The way I have set up the counterexample, during the next three years there are 27 distinct economic scenarios that can take place. The 27 comes from 3 possibilities in the first year, times three in the second year, times three in the third year. Table \#1 at the end of this article illustrates the 27 scenarios and the value of Stephanie and Albert's portfolio at the end of those three years based on each of those scenarios.

For example, suppose that during the first 3 years of retirement the general stock market goes down for three years in a row. In this case Brett's equity investment of $\$ 74,600$ loses 19\% (A.P.R.) for three years - mathematically this is a factor of (1 -
$0.19 / 12)^{\wedge} 36$-- which is a total $43 \%$ destruction in value. As you can see from Table \#1 after three years of retirement his $\$ 74,500$ has shrunk to $\$ 41,996$. And, of course, his cash allocation has been completely spent. In contrast, Stephanie has experienced the same 3 year bear market while spending the same \$9,000 per year. Her diversified (70/30) fund has lost 13\% each year, but she emerges from her 3 year SWiP with $\$ 45,105$ which is not very pretty but it is better than Brett's situation.

This, of course, is just one of the 27 possible scenarios but it is a most revealing case. The intuition for this result is as follows. Although Stephanie and Brett start-off with the exact same asset allocation, they both end-up with a completely different asset mix at the end of the three years. Because Brett has spent his cash, he is now 100\% invested in equities while Stephanie is still holding a balanced 70/30 portfolio. A 100\% exposure to equity is good when markets are going up, but horrible when they are going down. Ergo, you have not protected yourself against a poor sequence of returns.

Indeed, Table \#1 offers some optimistic news for Brett. If markets increase strongly (35\%) for three years in a row, he will end up with $\$ 210,002$ while Stephanie will only have $\$ 181,854$. This gap of almost $\$ 40,000$ is quite impressive and to some might seem to vindicate the buckets approach. But remember, the reason this happens is because Brett implicitly has a more aggressive (equity) asset allocation as he progresses through retirement. All his spending comes from cash. This creates a natural and lopsided rebalancing effect towards equity.

Of the 27 scenarios in Table \#1, a total of 16 of them favor Brett and 11 of them favor Stephanie. Yes, there is a 60\% chance Brett will be better-off and a 40\% Stephanie will be better off. Yes, the odds might favor Brett, but this is not a guaranteed way to avoid a poor sequence of returns. Most importantly, notice that just about in all scenarios for which the market lost money in the first 2 or 3 years, Stephanie is better-off than Brett. In other words, Brett had not protected the sequence.

What could change our results in the real world as opposed to this hypothetical model? Of course if both Stephanie and Brett decide to spend less - all else being equal - then they have obviously reduced their exposure to sequence of returns risk. In the extreme, if neither of them decided to withdraw any money whenever markets are down they will have immunized themselves against sequence of returns risk, (but might starve in the process). Also, a less aggressive allocation might reduce the risk, but the funds might not last as long as necessary, etc.

In sum, my only point is as follows. If you decide to adopt the so-called buckets approach to retirement income planning then beware of the fact that your total asset allocation and implicit exposure to equity will fluctuate unpredictably over time. Moreover, if indeed you experience a poor initial sequence of investment returns - so that you have been forced to liquidate all your cash investment -- you might find yourself with a 100\% equity exposure well into retirement and possibly deep into a bear market. This is in contrast to the non-bucketer (ok, lousy word) who is maintaining the same exact asset mix and hence the same risk profile over time. Sure, the market may recover by the time you have to tap into the equity portion - or it may not.

Either way, you have neither reduced nor mitigated financial risk but simply taken a bet on scenarios you believe will not happen. Safety is just a mirage.

Table \#1: Brett "Buckets" and Stephanie "SWiPs"
There are 27 Scenarios: Who Is Better Off in Three Years?

| Scenario | Stephanie's Wealth |  | Brett's Wealth |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Avg, Avg, Avg | \{7\%,7\%,7\%\} | \$93,345 | \{8\%,8\%,8\%\} | \$ | 94,760 |
| Bad, Bad, Bad | $\{-13 \%,-13 \%,-13 \%\}$ | \$45,105 | \{-19\%,-19\%,-19\} | \$ | 41,996 |
| Good,Good, Good | \{27\%,27\%,27\%\} | \$181,854 | \{35\%,35\%,35\%\} | \$ | 210,002 |
| Avg,Avg,Bad | \{7\%,7\%,-13\%\} | \$75,509 | \{8\%,8\%,-19\%\} | \$ | 72,247 |
| Avg,Bad,Avg | \{7\%,-13\%,7\%\} | \$73,757 | \{8\%,-19\%,8\%\} | \$ | 72,247 |
| Bad,Avg,Avg | \{-13\%,7\%,7\%\} | \$71,878 | \{-19\%,8\%,8\%\} | \$ | 72,247 |
| Bad,Bad,Avg | \{-13\%,-13\%,7\%\} | \$56,190 | \{-19\%,-19\%,8\%\} | \$ | 55,083 |
| Bad,Avg,Bad | \{-13\%,7\%,-13\%\} | \$57,942 | \{-19\%,8\%,-19\%\} | \$ | 55,083 |
| Avg,Bad,Bad | \{7\%,-13\%,-13\%\} | \$59,480 | \{8\%,-19\%,-19\%\} | \$ | 55,083 |
| Avg,Avg,Good | \{7\%,7\%,27\%\} | \$114,813 | \{8\%,8\%,35\%\} | \$ | 123,545 |
| Avg,Good,Avg | \{7\%,27\%,7\%\} | \$116,920 | \{8\%,35\%,8\%\} | \$ | 123,545 |
| Good,Avg,Avg | \{27\%,7\%,7\%\} | \$119,180 | \{35\%,8\%,8\%\} | \$ | 123,545 |
| Good,Good,Avg | \{27\%,27\%,7\%\} | \$148,387 | \{35\%,35\%,8\%\} | \$ | 161,074 |
| Good,Avg,Good | \{27\%,7\%,27\%\} | \$146,280 | \{35\%,8\%,35\%\} | \$ | 161,074 |
| Avg,Good,Good | \{7\%,27\%,27\%\} | \$143,528 | \{8\%,35\%,35\%\} | \$ | 161,074 |
| Bad,Bad,Good | \{-13\%,-13\%,27\%\} | \$69,559 | \{-19\%,-19\%,35\%\} | \$ | 71,815 |
| Bad,Good,Bad | $\{-13 \%, 27 \%,-13\}$ | \$73,405 | \{-19\%,35\%,-19\%\} | \$ | 71,815 |
| Good,Bad,Bad | $\{27 \%,-13 \%,-13 \%\}$ | \$76,780 | \{35\%,-19\%,-19\%\} | \$ | 71,815 |
| Good,Good,Bad | \{27\%,27\%,-13\%\} | \$120,551 | \{35\%,35\%,-19\%\} | \$ | 122,806 |
| Good,Bad,Good | \{27\%,-13\%,27\% | \$116,705 | \{35\%,-19\%,35\%\} | \$ | 122,806 |
| Bad,Good,Good | \{-13\%,27\%,27\%\} | \$111,681 | \{-19\%,35\%,35\%\} | \$ | 122,806 |
| Avg,Bad,Good | \{7\%,-13\%,27\%\} | \$90,955 | \{8\%,-19\%,35\%] | \$ | 94,193 |
| Avg,Good,Bad | \{7\%,27\%,-13\%\} | \$94,801 | \{8\%,35\%,-19\%\} | \$ | 94,193 |
| Bad,Avg,Good | \{-13\%,7\%,27\%\} | \$88,667 | \{-19\%,8\%,35\%\} | \$ | 94,193 |
| Bad,Good,Avg | \{-13\%,27\%,7\%\} | \$90,774 | \{-19\%,35\%,8\%\} | \$ | 94,193 |
| Good,Avg,Bad | \{27\%,7\%,-13\%\} | \$96,650 | \{35\%,8\%,-19\%\} | \$ | 94,193 |
| Good,Bad,Avg | \{27\%,-13\%,7\%\} | \$94,898 | \{35\%,-19\%,8\%\} | \$ | 94,193 |

