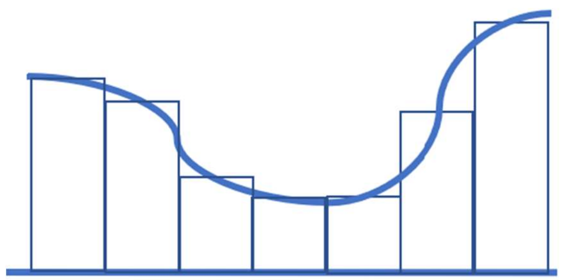
The DoubleBucket® Method

Using the Concept of Integral Calculus
to Optimize Retirement Withdrawals

One application of Integral Calculus is to calculate the area under a curve defined by a polynomial function. While calculus can be used to obtain the exact area, there is a simpler method that can do a nice job of estimating the value. This method was used to develop the theory behind Integral Calculus (see: en.wikipedia.org/wiki/Taylor%27s_theorem) and most anyone can grasp the concept without needing a math background. This technique positions several rectangles over the curve and then simply adds up the area of the rectangles. While this is not an exact method, it can closely approach the actual value as the number of rectangles increases. Graphically that solution might look like this:



In this example, adding the area of these 7 rectangles will approximate the area under the curve with respect to the X-axis.

What does this have to do with financial planning? Let's apply this concept to the year-by-year segments across a retirement span. For each year we can make an intelligent estimate of what it will cost in today's dollars to finance that future year. When income requirements are well known, all that is needed is a proper asset mix and a conservative estimate of the rate of return for that mix for each year. We can then add up those yearly figures to estimate the total amount needed to finance the overall span. Undoubtedly there will be errors in those yearly estimates -- some high and some low. In most cases those errors will roughly cancel each other resulting in a reasonable overall estimate.

To assist with this approach we've developed a method called the DoubleBucket® (www.thedoublebucket.com/resources). Our historical studies have shown that this method does a decent job for most 30-year retirement spans going back through history. We will call these the "good" spans and a withdrawal rate of five to six percent can typically be achieved. The remaining "bad" spans suffer due to 2 main factors: Inflation & Sequence of Returns (see www.thedoublebucket.com/_files/ugd/4a436d_61d39288153b4369851ffa2ff50239a8.pdf for more info). The good news, though, is that the average withdrawal rate for even the bad spans has exceeded 4% and it is guaranteed that the principal will not run out. If we think about this in relation to the 4% Rule this makes sense (see en.wikipedia.org/wiki/William_Bengen). The 4% Rule was derived from historical data that shows that a 4% withdrawal rate will survive even the worst spans over history.

However, in the good spans it's still just the 4% rule. Instead of planning for the worst the DoubleBucket Method optimizes returns for all spans.

In contrast to the 4% Rule there are four key aspects of the DoubleBucket Method that are differentiators:

1) The asset mix gradually changes over time starting with an aggressive mix and becoming more conservative near the end.

2) The ending principal is deterministic and always drains down to zero.

3) Withdrawals are based on market performance and expected returns on the current balance, not the original.

4) Withdrawals vary from year to year based on the percentage of remaining principal. However, they typically increase over time to keep up with inflation.

Variable Income Requirements

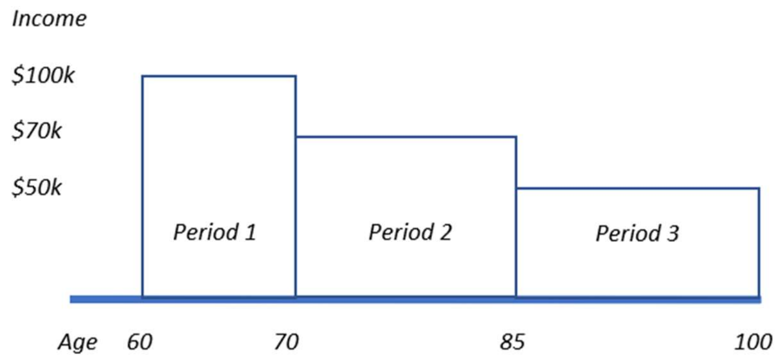
The 4% Rule is a good rule of thumb for a constant revenue stream. In the classic example a million-dollar retirement account will yield $40,000 per year. That amount does go up with inflation each year, but in real dollars it is constant. In practice though, a constant stream is rarely desired. There are several factors that vary withdrawal requirements, such as:

- Part-time income
- Discretionary spending (usually higher in early retirement)
- Mortgage expiration (if a mortgage is carried into retirement)
- Medical Costs
- Pensions & Annuities
- Delaying Social Security
- Inheritances or Trusts
- Differences in spousal ages and life expectancies

These factors effectively nullify the 4% rule. For a simple example let's say you retire at age 60 and want to guarantee that your money will last until age 100. Initially you would like to withdraw $100k per year until age 85. Then from age 85 to 100 your income requirement will go down to 80k as discretionary spending decreases. You'd also like to delay Social Security until age 70, which is $30k per year at that age. This defines 3 periods of your retirement span:

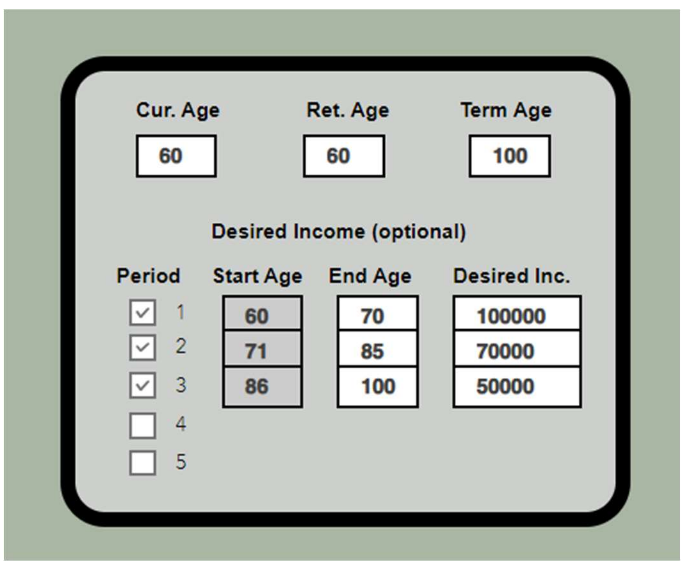
1) Age 60-70: 100k withdrawal
2) Age 71-85: 70k withdrawal (plus 30k Social Security)
3) Age 86-100: 50k withdrawal (plus 30k Social Security)

Because of inflation and varying investment returns, knowing how much principal is needed to finance this plan and how to adjust the yearly withdrawal rate is not necessarily obvious. This is where the DoubleBucket comes into play as it can approximate your required principal along with asset diversification and withdrawal rates for each year in each period. The DoubleBucket applies the method to each individual period and then combines them to derive an overall plan. Graphically, the span would look like this:



The DoubleBucket Method would then apply the concept of Integral Calculus breaking up each period into yearly segments. Adding up all the segments will estimate the principal requirement to fund the overall plan (we chose not to show the yearly segments because it would clutter the graph -- instead we do that in spreadsheet form in appendix 2 below). In this example the estimate to fund the plan is roughly $1.5 million. Since this is an estimate, a cushion should be added, or the yearly withdrawal rate could be adjusted down each year just to be safe. Even with these adjustments, this is still a better way to estimate the principal amount and withdrawal rates as opposed to the 4% Rule.

To use the DoubleBucket Method, all that is required is to enter the income requirements for each period of retirement. On the website it would look like this (www.thedoublebucket.com/variable-annuity):



In addition to the above data, estimated returns for future time buckets are also needed. By default, we've analyzed historical returns to estimate those future returns. Those figures can be modified, but for starters we suggest using the defaults. From that data the "DoubleBucket Annuity Table" is generated which lays out the asset diversification and yearly withdrawal rate for each year of retirement. An example is listed in appendix 1 below. Note how the withdrawal rate changes at the inflection points between each period of retirement (from 70 to 71 and 85 to 86). Also note how asset diversification becomes more conservative as you progress through the span.

In summary, the DoubleBucket Method is a more scientific way to estimate asset diversification and withdrawal rates as compared to the 4% Rule especially when income requirements vary during different phases of retirement. The primary benefit is to optimize withdrawals from a given principal over a fixed time period. A classic use-case is to use the DoubleBucket Method for discretionary spending and then use Social Security and possibly an annuity or pension to guarantee non-discretionary needs. For more information there are whitepapers and videos listed here: https://www.thedoublebucket.com/resources . If you have questions or comments, please see our contact page (https://www.thedoublebucket.com/contact).

Please see appendices below.

Thank you,

-The DoubleBucket® Team

www.thedoublebucket.com/about

Appendix 1

Key: **CSH-***Cash*, **GLD-***Gold*, **10Y-***10 Year Bonds*, **CORP –** *Corporate Bonds*, **S&P-***S&P 500*, **VAL-***Value Stocks*, **NASD-***NASDAQ*, **INTL-***International Stocks*, **REIT-***Real Estate*, **WD-***Yearly Withdrawal Rate*

The Double Bucket Annuity Table

YR	CSH%	GLD%	10Y%	CORP%	S&P%	VAL%	NASD%	INTL%	REIT%	WD %
60	11.41	12.87	11.60	9.62	7.42	12.84	8.94	2.23	23.08	6.89
61	11.58	12.86	11.63	9.54	7.51	12.83	8.85	2.21	23.00	7.04
62	11.76	12.84	11.67	9.45	7.61	12.82	8.75	2.18	22.92	7.20
63	11.97	12.83	11.71	9.36	7.71	12.80	8.64	2.15	22.83	7.37
64	12.20	12.82	11.75	9.26	7.82	12.79	8.51	2.12	22.73	7.56
65	12.45	12.81	11.81	9.15	7.95	12.77	8.37	2.08	22.61	7.78
66	12.63	12.79	11.75	9.22	7.88	12.76	8.43	2.05	22.49	8.03
67	12.84	12.77	11.70	9.31	7.81	12.74	8.49	2.00	22.34	8.31
68	13.07	12.76	11.65	9.41	7.73	12.71	8.55	1.95	22.17	8.61
69	13.33	12.75	11.59	9.53	7.64	12.68	8.61	1.89	21.98	8.96
70	13.63	12.75	11.54	9.67	7.53	12.64	8.67	1.81	21.76	9.34
71	11.35	13.26	12.00	10.03	7.66	12.87	8.77	1.81	22.25	6.85
72	11.57	13.43	12.14	10.13	7.56	12.73	8.59	1.75	22.10	6.99
73	11.82	13.61	12.29	10.24	7.46	12.57	8.40	1.68	21.93	7.14
74	12.10	13.80	12.46	10.36	7.34	12.40	8.19	1.60	21.74	7.31
75	12.40	14.03	12.64	10.49	7.21	12.21	7.96	1.52	21.54	7.49
76	12.68	14.13	12.78	10.49	7.28	12.14	7.76	1.43	21.31	7.71
77	12.99	14.24	12.93	10.50	7.36	12.05	7.55	1.32	21.05	7.94
78	13.34	14.37	13.11	10.50	7.44	11.96	7.30	1.20	20.76	8.21
79	13.74	14.53	13.31	10.52	7.53	11.85	7.02	1.07	20.43	8.51
80	14.18	14.70	13.54	10.53	7.64	11.73	6.71	0.91	20.06	8.85
81	14.59	14.90	13.68	10.77	7.53	11.59	6.58	0.74	19.62	9.25
82	15.07	15.13	13.85	11.06	7.40	11.43	6.42	0.53	19.12	9.72
83	15.62	15.40	14.06	11.39	7.26	11.23	6.23	0.29	18.53	10.25
84	16.26	15.74	14.31	11.78	7.10	11.00	5.99	0.00	17.83	10.87
85	17.13	15.83	14.30	11.91	6.68	10.67	5.82	0.00	17.67	11.66
86	14.93	16.67	15.01	12.42	6.54	10.62	5.61	0.00	18.20	9.02
87	15.69	17.01	15.26	12.55	6.11	10.15	5.13	0.00	18.11	9.47
88	16.57	17.41	15.56	12.69	5.60	9.59	4.58	0.00	18.00	10.01
89	17.61	17.87	15.91	12.86	5.01	8.94	3.92	0.00	17.87	10.64
90	18.60	17.71	15.98	12.30	5.41	8.85	3.45	0.00	17.71	11.47
91	19.80	17.50	16.07	11.62	5.88	8.75	2.87	0.00	17.50	12.48
92	21.30	17.25	16.18	10.77	6.48	8.63	2.14	0.00	17.25	13.75
93	23.22	16.93	16.32	9.68	7.24	8.46	1.22	0.00	16.93	15.36
94	25.75	16.50	16.50	8.25	8.25	8.25	0.00	0.00	16.50	17.50
95	28.72	15.84	15.84	7.92	7.92	7.92	0.00	0.00	15.84	20.80
96	33.17	14.85	14.85	7.43	7.43	7.43	0.00	0.00	14.85	25.75
97	40.60	13.20	13.20	6.60	6.60	6.60	0.00	0.00	13.20	34.00
98	55.45	9.90	9.90	4.95	4.95	4.95	0.00	0.00	9.90	50.50
99	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00

Appendix 2

This example spreadsheet shows how the Double Bucket Method can estimate the required principal to fund a 20-year retirement span with a constant $100k income stream. Note that the asset allocation is an estimate of what you might use to fund each future year.

	Req Income	Req Savings	Inf Adjusted Return		cash	bonds	stocks	real-estate
65	$100,000.00	$100,000.00	0%		100%	0%	0%	0%
66	$100,000.00	$100,000.00	0%		100%	0%	0%	0%
67	$100,000.00	$96,000.00	2%		30%	50%	10%	10%
68	$100,000.00	$94,000.00	2%		30%	50%	10%	10%
69	$100,000.00	$92,000.00	2%		30%	50%	10%	10%
70	$100,000.00	$86,000.00	3%		10%	40%	35%	15%
71	$100,000.00	$83,000.00	3%		10%	40%	35%	15%
72	$100,000.00	$81,000.00	3%		10%	40%	35%	15%
73	$100,000.00	$78,000.00	3%		10%	40%	35%	15%
74	$100,000.00	$70,000.00	4%		0%	30%	55%	15%
75	$100,000.00	$67,000.00	4%		0%	30%	55%	15%
76	$100,000.00	$64,000.00	4%		0%	30%	55%	15%
77	$100,000.00	$62,000.00	4%		0%	30%	55%	15%
78	$100,000.00	$52,000.00	5%		0%	20%	60%	20%
79	$100,000.00	$50,000.00	5%		0%	20%	60%	20%
80	$100,000.00	$47,000.00	5%		0%	20%	60%	20%
81	$100,000.00	$45,000.00	5%		0%	20%	60%	20%
82	$100,000.00	$36,000.00	6%		0%	10%	70%	20%
83	$100,000.00	$34,000.00	6%		0%	10%	70%	20%
84	$100,000.00	$32,000.00	6%		0%	10%	70%	20%
85	$100,000.00	$30,000.00	6%		0%	10%	70%	20%
		$1,399,000.00						
		Total Savings to fund the plan						