

Sequence of Returns over a 20 year portfolio

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Understanding sequence of returns risk is one of the core concepts that affects retirement theory, yet it is so rarely talked about. We talk about how retirees should diversify their portfolios, adopt the 4% rule, have non-correlating asset classes, or just have a plan for when the market goes down. Please see the Sequence of Returns Article/Video going over the basic math. This article focuses on the 4% rule and how Sequence of Returns Risk could affect an overall account balance.

The 4% rule is a rule of thumb for how much a retiree should withdraw from a retirement account each year. William Bengen created the 4% rule based on data from stocks and bonds over a 50 year period. "Bengen concluded that, even during untenable markets, no historical case existed in which a four percent annual withdrawal exhausted a retirement portfolio in less than 33 years."

Have you ever wondered why if your account is earning 6% on average you can only take out 4%? Shouldn't 5% or even 6% be fine for most situations without depleting your principal? As we detailed in the last article/video, slippage on a portfolio when you take withdrawals can occur where you need to earn much greater returns to bring a portfolio back to whole after a down market. So, let's look at a hypothetical example where we have slippage occurring over a 20-year period.

	RoR	\$100,000	4% withdra	2.5% inflation		RoR	\$100,000	4% withdra	2.5% inflation		RoR	\$100,000	4% withdra	2.5% inflat
	5%	\$100,800.00	\$4,000			-10%	\$86,400.00	\$4,000			15%	\$110,400.00	\$4,000	
	5%	\$101,740.00	\$4,100.00	2.50%		10%	\$90,530.00	\$4,100.00	2.50%		10%	\$116,930.00	\$4,100.00	2.50%
	5%	\$102,624.50	\$4,202.50	2.50%		20%	\$103,593.00	\$4,202.50	2.50%		-10%	\$101,454.75	\$4,202.50	2.50%
	5%	\$103,448.16	\$4,307.56	2.50%		-10%	\$89,356.89	\$4,307.56	2.50%		15%	\$111,719.27	\$4,307.56	2.50%
	5%	\$104,205.32	\$4,415.25	2.50%		10%	\$93,435.81	\$4,415.25	2.50%		10%	\$118,034.42	\$4,415.25	2.50%
	5%	\$104,889.95	\$4,525.63	2.50%		20%	\$106,692.21	\$4,525.63	2.50%		-10%	\$102,157.90	\$4,525.63	2.50%
	5%	\$105,495.68	\$4,638.77	2.50%		-10%	\$91,848.09	\$4,638.77	2.50%		20%	\$117,022.96	\$4,638.77	2.50%
	5%	\$106,015.72	\$4,754.74	2.50%		10%	\$95,802.68	\$4,754.74	2.50%		10%	\$123,495.04	\$4,754.74	2.50%
	5%	\$106,442.89	\$4,873.61	2.50%		20%	\$109,114.89	\$4,873.61	2.50%		-10%	\$106,759.28	\$4,873.61	2.50%
	5%	\$106,769.58	\$4,995.45	2.50%		-10%	\$93,707.49	\$4,995.45	2.50%		20%	\$122,116.60	\$4,995.45	2.50%
	5%	\$106,987.72	\$5,120.34	2.50%		-10%	\$79,728.44	\$5,120.34	2.50%		10%	\$128,695.88	\$5,120.34	2.50%
	5%	\$107,088.76	\$5,248.35	2.50%		10%	\$81,928.10	\$5,248.35	2.50%		-10%	\$111,102.78	\$5,248.35	2.50%
	5%	\$107,063.65	\$5,379.56	2.50%		20%	\$91,858.25	\$5,379.56	2.50%		15%	\$121,581.71	\$5,379.56	2.50%
	5%	\$106,902.79	\$5,514.04	2.50%		-10%	\$77,709.79	\$5,514.04	2.50%		-10%	\$104,460.90	\$5,514.04	2.50%
	5%	\$106,596.03	\$5,651.90	2.50%		10%	\$79,263.68	\$5,651.90	2.50%		-10%	\$88,928.10	\$5,651.90	2.50%
	5%	\$106,132.64	\$5,793.19	2.50%		20%	\$88,164.59	\$5,793.19	2.50%		15%	\$95,605.15	\$5,793.19	2.50%
	5%	\$105,501.25	\$5,938.02	2.50%		-10%	\$74,003.91	\$5,938.02	2.50%		10%	\$98,633.84	\$5,938.02	2.50%
	5%	\$104,689.84	\$6,086.47	2.50%		10%	\$74,709.18	\$6,086.47	2.50%		-10%	\$83,292.63	\$6,086.47	2.50%
	5%	\$103,685.69	\$6,238.63	2.50%		20%	\$82,164.65	\$6,238.63	2.50%		10%	\$84,759.39	\$6,238.63	2.50%
	5%	\$102,475.38	\$6,394.60	2.50%		-10%	\$68,193.05	\$6,394.60	2.50%		10%	\$86,201.27	\$6,394.60	2.50%
Average RoR	5%				Average RoR	5%				Average RoR	5%			

This is a purely hypothetical scenario where we take 3 portfolios that will average 5% over 20 years. Portfolio 1 has linear returns, portfolio two starts and ends with a downturn, and portfolio 3 starts and ends with an upturn. Each portfolio has you taking out a 4% withdrawal rate increasing for 2.5% inflation per year (year 2 \$4100). You should notice the pure linear 5% rate of return per year performs the best ending at \$102,475.38, and there is quite a bit of variance. Even if you had better initial years, you wouldn't beat the 5% linear return in this



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model. This is why limiting volatility could matter in retirement. In fact, a really smart guy named Harry Markowitz won the Nobel prize helping to create Modern Portfolio theory where you typically look at returns and the risk needed to hit those returns. Then instead of purely maximizing returns you try to lower your risk for a specific return. This is one of the reasons most firms and advisors try to create diversified portfolios for clients. This is a big reason the 60/40 stock/bond split became popular as a rule of thumb.

Now let's look at an actual market scenario using the S&P 500. On a side note, if you ever want to show poor market returns include 2000 to 2009 which constitutes the "Lost Decade" in the US.

Source: <https://www.sli>

		\$100,000		
2000	-9.10%	\$87,264.00	\$4,000	
2001	-11.89%	\$73,275.80	\$4,100.00	2.50%
2002	-22.10%	\$53,808.10	\$4,202.50	2.50%
2003	28.68%	\$63,697.29	\$4,307.56	2.50%
2004	10.88%	\$65,731.93	\$4,415.25	2.50%
2005	4.91%	\$64,211.52	\$4,525.63	2.50%
2006	15.79%	\$68,979.29	\$4,638.77	2.50%
2007	5.49%	\$67,750.47	\$4,754.74	2.50%
2008	-37.00%	\$39,612.42	\$4,873.61	2.50%
2009	26.46%	\$43,776.62	\$4,995.45	2.50%
2010	15.06%	\$44,477.92	\$5,120.34	2.50%
2011	2.11%	\$40,057.32	\$5,248.35	2.50%
2012	16.00%	\$40,226.20	\$5,379.56	2.50%
2013	32.39%	\$45,955.43	\$5,514.04	2.50%
2014	13.69%	\$45,821.08	\$5,651.90	2.50%
2015	1.38%	\$40,580.28	\$5,793.19	2.50%
2016	11.96%	\$38,785.47	\$5,938.02	2.50%
2017	21.83%	\$39,837.18	\$6,086.47	2.50%
2018	-4.38%	\$32,126.93	\$6,238.63	2.50%
2019	31.49%	\$33,835.44	\$6,394.60	2.50%
Average RoR	7.68%			

One of the first things that I find interesting is the 4% rule is going to work in absolute terms. If you go to SSA.GOV and calculate mortality, both men and women shouldn't run out of money using the 4% rule. There of course is the problem of an 85-year-old person slowly depleting their assets when they could be facing catastrophic medical expenses. The average rate of return over these 20 years is 7.68%. Most people wouldn't complain if I told them over retirement they would average 7.68% but clearly that didn't work out here. This is one of the worst-case scenarios, but you may want to consider creating multiple models for yourself showing a variety of scenarios so you can figure out where your pain points are in retirement.



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Some rules of thumb you may want to consider when looking at Sequence of Returns Risk:

1. You may need a plan to manage your withdrawals over retirement, don't just set it and forget it.
2. Limiting your volatility may be desirable which is usually a different goal than match or beat the market
3. What is your plan if the market goes down?
4. Do you have a 1-4 year plan to mitigate a down market?

<https://www.investopedia.com/terms/f/four-percent-rule.asp>

<https://www.macrotrends.net/2324/sp-500-historical-chart-data>

<https://www.ssa.gov/OACT/population/longevity.html>

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<https://www.investopedia.com/terms/m/modernportfoliotheory.asp>

<https://www.investopedia.com/terms/l/lost-decade.asp>

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