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Pfau, Wade Donald
National Graduate Institute for Policy Studies (GRIPS)

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by

Wade D. Pfau
Associate Professor
National Graduate Institute for Policy Studies (GRIPS)
7-22-1 Roppongi, Minato-ku, Tokyo 106-8677 Japan
Email: wpfau@grips.ac.jp
phone: 81-3-6439-6225

Abstract

An important and frequently studied question for retirees is: what is the optimal asset allocation during retirement? This article provides a brief but simple message that conservative asset allocations in retirement are quite acceptable after all. A wide range of asset allocations tend to provide very similar results in terms of sustainable withdrawal rates for given probabilities of failure. For example, with Monte Carlo simulations based on historical data parameters, a 4.4 percent withdrawal rate for a 30-year horizon could be supported with a 10 percent chance of failure using a 50/50 asset allocation of stocks and bonds. But the range of stock allocations supporting a withdrawal rate within 0.1 percentage points of this maximum extend from 27 to 87 percent. Though asset allocation will also impact the amount which can be left as bequests, it is the case that relatively low stock allocations can support retirees just as well for a given failure rate and retirement duration.

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Introduction

An important and frequently studied question for retirees is: what is the optimal asset allocation during retirement? This article provides a brief but simple message that conservative asset allocations in retirement are quite acceptable after all. A wide range of asset allocations tend to provide very similar results in terms of sustainable withdrawal rates for given probabilities of failure. For example, with Monte Carlo simulations based on historical data parameters, a 4.4 percent withdrawal rate for a 30-year horizon could be supported with a 10 percent chance of failure using a 50/50 asset allocation of stocks and bonds. But the range of stock allocations supporting a withdrawal rate within 0.1 percentage points of this maximum extend from 27 to 87 percent. Though asset allocation will also impact the amount which can be left as bequests, it is the case that relatively low stock allocations can support retirees just as well for a given failure rate and retirement duration.

Literature Review

With some exceptions, the withdrawal rate literature has tended to support relatively high stock allocations for retirees. Looking at overlapping 30-year periods from the historical data, William Bengen's seminal 1994 article concluded that retirees could safely withdraw 4 percent of their assets at retirement and adjust this amount for inflation in subsequent years for a 30-year retirement duration. Using the S&P 500 and intermediate-term government bonds (ITGB), he determined that retirees are best served with a stock allocation between 50 and 75 percent. Cooley, Hubbard, and Walz (2011) updated their famous "Trinity study" which provides success rates for different withdrawal rate and asset allocation strategies using historical simulations. They also conclude that retirees are best served with stock allocations of at least 50 percent. From their tables, a 75 percent stock allocation maximizes the success rates for 30 years of inflation-adjusted withdrawals using a 4 or 5 percent withdrawal rate.

Monte Carlo simulations provide another approach for studying the asset allocation question for retirees. Because of the way that overlapping periods are formed with historical simulations, the middle part of the dataset plays an overly important role in the analysis. With data since 1926, this overweighted portion tends to coincide with a severe bear market for bonds, and Monte Carlo simulations based on the same underlying data tend to show lower optimal stock allocations. Pfau (2011b) provides more explanation about this. Spitzer, Strieter, Singh (2007) use Monte Carlo simulations to provide illustrations for how withdrawal rates, asset allocations, failure probabilities, and bequest motives all interact for a 30-year retirement duration. Blanchett (2007) considers different glide paths for asset allocation during the retirement period and concludes that retirees could be best served with a fixed asset allocation of around 60 percent stocks. Blanchett and Blanchett (2008) make the point that the future expected returns for a 60/40 portfolio may be even one or two percentage points less than historical averages, and they show how portfolio failure rates relate to different capital market expectations.

Less common are studies supporting very low stock allocations. Terry (2003) is one exception, as he argues that retirees are best served with 100 percent bonds. However, Pfau (2011a) explains how these findings are invalidated by a severe computational error. Terry calculates that stocks would support only a 1.85 percent withdrawal rate with a 10 percent chance of failure, when in actuality with his rather optimistic assumptions for stocks, this withdrawal rate should be closer to 6.52 percent. More recently, Harlow (2011) analyzes asset allocation in retirement using a downside risk perspective, which moves beyond failure rates and also quantifies the degree of failures as well. He determines that stock allocations between 5 and 25 percent work best. Two characteristics of his study also worth mentioning are that it is based on probabilities of survival, which effectively lowers the retirement duration well below 30 years, and that the simulations are not parameterized to the historical averages in Ibbotson Associates' *Stocks, Bonds, Bills, and Inflation* (SBBI) data for total returns in U.S. financial markets since

1926. As seen in Table 1, Harlow (2011) assumes lower real stock returns and higher real bond and bill returns than the historical averages.

Table 1

Summary Statistics for U.S. Real Returns Data, 1926 - 2010

			Correlation Coefficients		
	Arithmetic Means	Standard Deviations	Stocks	Bonds	Bills
Stocks	8.70%	20.39%	1	0.08	0.09
Bonds	2.52%	6.84%	0.08	1	0.71
Bills	0.69%	3.90%	0.09	0.71	1

Source: Own calculations from *Stocks, Bonds, Bills, and Inflation* data provided by Morningstar and Ibbotson Associates. The U.S. S&P 500 index represents the stock market and intermediate-term U.S. government bonds represent the bond market.

Real Asset Return Assumptions from Harlow (2011)

			Correlation Coefficients		
	Arithmetic Means	Standard Deviations	Stocks	Bonds	Bills
Stocks	6%	16%	1	0.20	0.15
Bonds	3%	7%	0.20	1	0.35
Bills	1%	2.5%	0.15	0.35	1

Methodology

The maximum sustainable withdrawal rate (MWR) is the highest withdrawal rate that would have provided a sustained real income over a given retirement duration. At the beginning of the first year of retirement, an initial withdrawal is made equal to the specified withdrawal rate times accumulated wealth. Remaining assets then grow or shrink according to the asset returns for the year. At the end of the year, the remaining portfolio wealth is rebalanced to the targeted asset allocation. In subsequent years, the withdrawal amount adjusts by the previous year's inflation rate and the order of portfolio transactions is repeated. Withdrawals are made at the start of each year and are not affected by asset returns, so the current withdrawal rate (the withdrawal amount divided by remaining wealth) differs from the initial withdrawal rate in subsequent years. If the withdrawal pushes the account balance to zero, the withdrawal rate was too high and the portfolio failed. The MWR is the highest rate that succeeds. No attempt is made to consider taxes or portfolio management fees.

Monte Carlo simulations are performed using a lognormal distribution for (1 + return). 10,000 simulations are made for each of 260 combinations of underlying portfolio real returns and standard deviations. Average real arithmetic returns range in one percentage point increments from -2 percent to 10 percent, while standard deviations range in one percentage point increments from 1 percent to 20 percent. For retirement durations of 10 to 40 years in 5 year increments, the maximum sustainable withdrawal rate is calculated for each of the 10,000 simulated returns from each of the 260 return/volatility combinations. These MWR distributions allow one to pinpoint a particular withdrawal rate linked to a given chance for failure.

As well, 100 points on the efficient frontiers of the 3 financial assets are estimated using standard mean-variance optimization methods for each of the two sets of asset return expections in Table 1. For each retirement duration and failure rate shown in Tables 2 and 3, regressions were performed to explain the MWRs as a function of the portfolio return, standard deviation, and ratio of portfolio returns to standard deviations. This allows for interpolation of the MWR estimates for efficient frontier points since the return/volatility characteristics of the points on the efficient frontier fall between the simulated integer values for returns and standard deviations. In Tables 2 and 3, the optimal asset allocation represents the point from the efficient frontier which provides the highest fitted withdrawal rate from the regression equation. The ranges for the asset allocations represent those points on the efficient frontier which support estimated MWRs that were within 0.1 percentage points of the maximum possible MWR.

Findings

Tables 2 and 3 provide the findings for this study for each set of asset return assumptions. First, Table 2 is based on historical averages. Some well-known results include that sustainable withdrawal rates are higher both for shorter retirement durations and for higher allowable failure probabilities. As well, the optimal stock allocation tends to increase both for longer retirement durations and for higher allowed failure probabilities. For instance, with a 30-year retirement duration, an acceptable failure rate of only one percent allows for a withdrawal rate of 3.6 percent. This maximum withdrawal rate results from a stock allocation of 27 percent. With a 5 percent chance for failure, the withdrawal rate can be increased to 4.1 percent and the optimal stock allocation increases to 36 percent. As well, for a 10 percent failure rate, 4.4 percent is the highest withdrawal rate and it is provided with 50 percent stocks.

But what this study really emphasizes is how wide the range of "nearly optimal" asset allocations can be. The range of stock, bond, and bill allocations are also shown which provide a withdrawal rate within 0.1 percentage points of the maximum. For instance, again for a 30-year retirement and one percent failure rate, withdrawal rates of at least 3.5 percent can be supported with stock allocations ranging from 15 to 43 percent. For the 10 percent failure rate, stock allocations between 27 and 87 percent did nearly as well as the optimal 50 percent stock allocation. For shorter retirement durations, which would be closer to what is found in studies that incorporate mortality rates into their calculations, it is possible to see quite low stock allocations (even under 10 percent) as part of the nearly optimal portfolios.

Next, Table 3 repeats the analysis using the capital market forecasts from Harlow (2011). When compared to historical averages, these are more pessimistic for stocks and more optimistic for bonds and bills. Though the same general trends as found in Table 2 still apply, we can also observe a reduction of stock allocations in the optimal and nearly optimal portfolios as well. To provide one example, in the case of the 30-year retirement duration with a 10 percent chance of failure, now the highest supported withdrawal rate is 4.3 percent, and this occurs with a stock allocation of 34 percent. Stock allocations between 18 and 60 percent provide nearly the same level of withdrawal rates.

Conclusion

Sustainable retirement withdrawal rates depend on capital market expectations, retirement durations, asset allocations, and acceptable failure probabilities. While this is all generally known, what this article does in particular is to show how lower stock allocations can support withdrawal rates nearly as well as higher stock allocations. This is true even with simulations based on the historical data, which may provide an overly optimistic view for forward-looking stock returns. These results are important to emphasize, because many retirees will be weary of high stock allocations, and the traditional advice from withdrawal rate studies for retirees to keep at least 50 percent stocks may not really help that much after all. Lower stock allocations can potentially perform nearly as well in supporting a given withdrawal rate while also perhaps allowing nervous retirees to sleep more peacefully at night.

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Table 2 SBBI Historical Data			Optimal Asset Allocation (%)			For Withdrawal Rates Within 0.1% of Maximum					
						Range Stocks (%)		Range Bonds (%)		Range Bills (%)	
Retirement Duration (Years)	Failure Rate (%)	Withdrawal Rate (%)	Stocks	ITGB	T Bills	Min	Max	Min	Max	Min	Max
10	1	9.1	13	27	61	6	20	0	58	22	94
10	5	9.7	20	56	25	10	34	16	75	0	74
10	10	10.1	28	72	0	16	43	41	75	0	43
10	20	10.7	40	60	0	24	67	33	75	0	7
10	30	11.4	100	0	0	52	100	0	48	0	0
15	1	6.2	16	41	43	8	29	8	75	0	84
15	5	6.8	27	73	0	15	42	37	75	0	48
15	10	7.1	33	67	0	20	52	48	75	0	22
15	20	7.7	55	45	0	29	96	4	71	0	0
15	30	8.5	100	0	0	78	100	0	22	0	0
20	1	4.8	20	58	22	10	36	16	75	0	74
20	5	5.4	31	69	0	19	47	51	75	0	30
20	10	5.7	38	62	0	23	63	37	75	0	9
20	20	6.3	79	21	0	40	100	0	60	0	0
20	30	7.1	100	0	0	86	100	0	14	0	0
25	1	4.0	25	75	0	13	41	27	75	0	61
25	5	4.6	33	67	0	21	54	46	75	0	19
25	10	4.9	43	57	0	25	73	27	75	0	1
25	20	5.6	100	0	0	59	100	0	41	0	0
25	30	6.4	100	0	0	88	100	0	12	0	0
30	1	3.6	27	73	0	15	43	37	75	0	48
30	5	4.1	36	64	0	22	60	40	75	0	14
30	10	4.4	50	50	0	27	87	13	73	0	0
30	20	5.2	100	0	0	72	100	0	28	0	0
30	30	5.9	100	0	0	90	100	0	10	0	0
35	1	3.2	28	72	0	17	46	43	75	0	40
35	5	3.8	40	60	0	23	67	33	75	0	9
35	10	4.1	58	42	0	31	100	0	69	0	0
35	20	4.9	100	0	0	79	100	0	21	0	0
35	30	5.6	100	0	0	91	100	0	9	0	0
40	1	3.0	31	69	0	18	50	49	75	0	32
40	5	3.5	42	58	0	24	73	27	75	0	4
40	10	3.9	68	32	0	34	100	0	66	0	0
40	20	4.7	100	0	0	83	100	0	17	0	0
40	30	5.4	100	0	0	92	100	0	8	0	0

Table 3 Harlow (2011) Assumptions			Optimal Asset Allocation (%)			For Withdrawal Rates Within 0.1% of Maximum Range Stocks (%)		Range Bonds (%)		Range Bills (%)	
Retirement Duration (Years)	Failure Rate (%)	Withdrawal Rate (%)	Stocks	Bonds	T Bills	Min	Max	Min	Max	Min	Max
10	1	9.6	6	14	81	1	12	1	28	60	98
10	5	10.0	8	18	74	2	17	4	40	42	94
10	10	10.2	11	26	63	3	25	8	58	17	89
10	20	10.6	31	69	0	11	53	26	69	0	63
10	30	11.0	43	57	0	25	75	25	69	0	18
15	1	6.5	7	16	77	1	15	3	35	49	96
15	5	6.9	11	24	65	3	24	6	55	22	91
15	10	7.1	17	40	42	5	43	12	69	0	82
15	20	7.5	36	64	0	20	61	39	69	0	36
15	30	7.9	51	49	0	27	90	10	69	0	10
20	1	5.0	8	20	72	2	18	4	43	39	94
20	5	5.4	14	32	55	4	34	9	69	0	88
20	10	5.6	31	69	0	8	51	20	69	0	72
20	20	6.0	40	60	0	24	68	32	69	0	22
20	30	6.4	58	42	0	30	100	0	69	0	3
25	1	4.2	10	22	68	2	22	5	50	29	93
25	5	4.5	17	40	42	5	45	12	69	0	82
25	10	4.8	33	67	0	14	55	32	69	0	55
25	20	5.2	43	57	0	25	75	25	69	0	17
25	30	5.6	66	34	0	31	100	0	69	0	0
30	1	3.7	11	24	65	3	25	6	57	18	91
30	5	4.0	25	57	18	7	50	16	69	0	77
30	10	4.3	34	66	0	18	60	40	69	0	41
30	20	4.7	46	54	0	27	82	18	69	0	11
30	30	5.0	76	24	0	36	100	0	64	0	0
35	1	3.3	12	28	60	3	29	8	67	4	89
35	5	3.6	31	69	0	10	53	22	69	0	68
35	10	3.9	36	64	0	20	61	39	69	0	34
35	20	4.3	50	50	0	28	88	12	69	0	8
35	30	4.7	87	13	0	40	100	0	60	0	0
40	1	3.0	13	30	56	4	36	9	69	0	88
40	5	3.4	33	67	0	12	55	28	69	0	60
40	10	3.7	38	62	0	22	65	35	69	0	27
40	20	4.1	53	47	0	28	95	5	69	0	6
40	30	4.5	100	0	0	45	100	0	55	0	0