Sustainable withdrawal rates from your retirement portfolio

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Sustainable Withdrawal Rates From Your Retirement Portfolio

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This study reports the effects of a range of nominal and inflation-adjusted withdrawal rates applied monthly on the success rates of retirement portfolios of large-cap stocks and corporate bonds for payout periods of 15, 20, 25, and 30 years. A portfolio is deemed a success if it completes the payout period with a terminal value that is greater than zero. Using historical financial market returns, the study suggests that portfolios of at least 75% stock provide 4% to 5% inflation-adjusted withdrawals.

Key Words: *Retirement planning, Retirement wealth adequacy*

Specifying a sustainable withdrawal rate is an important factor to consider in retirement investment planning. The question we address is what percentage withdrawal rate applied to the initial value of a retirement portfolio can be sustained through a payout period? This is an important question since higher withdrawal rates produce greater retirement income from a given portfolio for a more attractive standard of living but are sustainable only for shorter payout periods. Lower withdrawal rates reduce the risk of running out of funds but provide less retirement income from the portfolio. Thus an investor approaching retirement is faced with the task of evaluating a range of alternative withdrawal rates combined with different portfolio asset allocations and payout periods to analyze their combined effects on retirement income and the survivability of a retirement portfolio.

The sustainable withdrawal rate problem has been addressed recently by Bierwirth (1994), Bengen (1994, 1996, 1997), Ferguson (1996), and Cooley, Hubbard, and Walz (1998). In this paper, we extend the work of Cooley, et a.l, (1998) by assuming monthly withdrawals of retirement income and monthly accruals of portfolio returns. We also update the analysis to include security returns through December 1997. Our analysis examines the effects of both nominal (constant percentage) withdrawals and inflation-adjusted withdrawals with different asset allocations on the success rates of retirement portfolios. A portfolio is identified as successful if it completes the payout period with a terminal value of zero or greater. Thus we assume that the investor is quite willing to consume principal but wishes to avoid exhausting the retirement portfolio prematurely.

Of course, different investors have different goals. Some plan to leave substantial amounts of their portfolios to heirs. However, the purpose of withdrawal rate analysis is to provide investors with a planning tool that can be used to evaluate the sustainability of various withdrawal rates. Clearly investors who wish to leave an estate must plan to withdraw a lower percentage annually from their portfolios than those who plan to consume most of the principal. Our analysis is presented so that investors can determine the range of withdrawal rates that is likely to achieve their goals.

Literature Review

In recent years, several studies have investigated the effects of asset allocation and withdrawal rates on the ability of portfolios to sustain retirement income. Much of this research has taken the form of short articles in the popular press suggesting asset allocations or withdrawal rates for retirement portfolios based on personal or professional experience. For example, Peter Lynch argues in a 1995 *Worth Magazine* article that based on his professional experience and knowledge of markets, a retirement portfolio with at least a 50% equity allocation would generally be able to sustain a 7% annual withdrawal rate. Scott (1996) developed tables indicating the combinations between the retirement portfolio withdrawal rate and the portfolio's rate of return that result in portfolio exhaustion for different retirement periods. She found that earning a higher return dramatically increases the allowable withdrawal rate, indicating that many investors should consider increasing the equity allocations of their retirement portfolios.

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Other studies have taken a more academic approach. Ho, Milevsky, and Robinson (1994) developed an analytical model to determine the optimal allocation between a risky and risk-free asset in order to minimize the probability that withdrawals will prematurely exhaust a retirement fund. Using historical returns from Canadian equities and treasury bills, they concluded that retirement funds should have a significantly larger allocation to equities than argued by conventional wisdom.

Using actual U.S. historical returns for various asset classes, Bierwirth (1994) calculated terminal portfolio values at the time of retirement. He found that the timing of returns affects retirement portfolio value as significantly as differences in mean returns. He illustrated the profound effect that a market "catastrophe" can have on long-term portfolio values.

In three subsequent studies, Bengen (1994, 1996, 1997) dramatically extended Bierwirth's original research. Using annual returns data published by Ibbotson Associates, Bengen (1994) found that a retirement portfolio with a 50% equity-50% long-term bond allocation is able to sustain a 3% inflation-adjusted withdrawal rate for any possible 30-year period starting in 1926. After examining alternative asset allocations and withdrawal rates, Bengen concluded that if the market behaves in the future the way it has in the past, the typical retirement fund should have a 50-75% equity allocation, which would allow a 4% inflation-adjusted withdrawal rate for 35 years.

In his second study, Bengen (1996) extended his first study in several ways. Noting that his experience is that most investors are uncomfortable having their retirement fund invested 50-75% in equities, he investigates the effect of portfolio rebalancing during retirement on the ability of the retirement portfolio to support a minimum of 4% annual withdrawal rate. He found that lowering the equity composition of the portfolio by 1 percentage point each year does not significantly reduce the retirement portfolio's ability to support 4% or higher withdrawal rates. However diminishing the equity composition by 2 or 3 percentage points each a year does significantly diminish the portfolio's ability to support 4% annual withdrawal rates over a 35 year planning period.

Bengen's (1997) third study on this topic built on his previous work in several interesting ways. He analyzed the issue of sustainable withdrawal rates using quarterly portfolio returns instead of annual returns. He also included small-cap stocks and U. S. Treasury bills as well as larger equities and long-term U. S. Treasury bonds in hypothetical retirement portfolios. He found that initiating withdrawals at different quarters of the year did not significantly change his prior findings regarding withdrawal rate or the optimality of a 50-75% equity allocation. He concluded that investing in U. S. Treasury bills rather than longer term Treasury bonds slightly reduces the portfolio's ability to sustain the initial 4% annual withdrawal rate. He also found that investing up to about 50% of a portfolio's equity allocation in small-cap stocks and the remainder of the equity allocation in large-cap stocks increased a sample portfolio's ability to sustain high withdrawal rates over a longer time period.

Ferguson (1996) took an alternative tack and assumed that investors plan to leave the principal value of the retirement portfolio to heirs. The withdrawal plan he proposed involves consuming dividend income only from an equity-heavy portfolio. He suggested that a withdrawal rate of approximately 3% of the portfolio value would allow such a portfolio to retain its real value in the long run. The author cautioned that withdrawal plan that sustains the real value of a retirement portfolio restricts a retiree to a lower standard of living than withdrawals that ultimately consume the principal.

Using the same Ibbotson Associates (1996) data, Cooley, Hubbard, and Walz (1998) extended Bengen's work in several directions. They investigated the effects of a wide range of withdrawal rates (3 to 12%) on terminal values of portfolios through overlapping payout periods of 15, 20, 25, and 30 years. They also examined the most recent 50-year period (1946-1996) as well as the entire database (1926-1996) of large-cap stock and corporate bond market returns. Cooley, et al., found that a minimum allocation of 50% in equities is necessary to support withdrawal rates of 4% or more per year. In fact, they found that for shorter payout periods (15 years or less) withdrawal rates of 8%-9% are sustainable. They also found that inflation-adjusting the withdrawal rates dramatically lowers present consumption relative to future consumption.

Data and Methodology

The principal objective of our analysis is to calculate retirement portfolio success rates for various monthly withdrawal rate assumptions and various portfolio asset allocations for the 1926 to 1997 period and for the post-war 1946 to 1997 period. A portfolio of stocks and bonds is deemed successful at the end of an n-year payout period if its terminal value after withdrawals is positive. The terminal value of a portfolio in the analysis is the value per $1,000 after reinvestment at actual historical monthly rates of return and after monthly withdrawals.

The advantage of the portfolio success rate methodology is in the ability of the reader to scan a range of success rates relative to withdrawal rates, portfolio asset allocations, and years of payout. Since no methodology can specify an optimal withdrawal rate and portfolio allocation for investors, it is important to present the risk-return tradeoffs in the withdrawal rate decision in a manner that facilitates retirement investment planning.

In planning our study, we considered using life expectancies from various retirement ages as the numbers of years in the payout periods. Since retirements tend to occur between the ages of 55 and 70, the number of different life expectancies for men and women would substantially increase the number of calculations and tables to report. We concluded that the more general approach of providing success rates for 15 to 30 years in 5-year increments would allow the reader to determine which is most applicable to him or her.

As in earlier studies, the monthly data on financial market returns were provided by Ibbotson Associates (1998). The stock returns in the analysis are total monthly returns to the Standard & Poor's 500 Index. Corporate bond returns are total monthly returns calculated from the Salomon Brothers Long-Term High-Grade Corporate Bond Index and Standard & Poor's monthly high-grade corporate composite yield date. Returns for U. S. Treasury bills are 30-day returns reported by Ibbotson Associates. Monthly portfolio returns, month-end values, and month-end values after withdrawals are calculated for overlapping 15, 20, 25, and 30-year periods from January 1926 through December 1997. In that 72-year period there are 58 overlapping 15-year payout periods, 53 overlapping 20-year payout periods, 48 overlapping 25-year payout periods, and 43 overlapping 30-year payout periods.

Calculations of monthly portfolio returns implicitly assume rebalancing of portfolios each month to the desired allocation of stock and bonds. Annual inflation rates used in adjusting annual withdrawals are calculated from the consumer price index (CPI-U) for 1926 through 1996 published by Ibbotson Associates.

Month-end portfolio values that determine portfolio success rates after nominal withdrawals are calculated as follows:

$$V_t = V_{t-1}(1 + R_t) - W_t \qquad (1)$$

in which V_t is the remaining value of the portfolio at the end of month t, V_{t-1} is the value of the portfolio at the beginning of the month net of the previous month’s withdrawal, R_t is the rate of return on the portfolio for month t, and W_t is the amount withdrawn from the portfolio at the end of the month.

Month-end portfolio values that determine portfolio success rates after inflation-adjusted withdrawals are calculated as follows:

$$V_t = V_{t-1}(1 + R_t) - W_t(CPI_{Y-1}/CPI_{1925}) \qquad (2)$$

in which the variables are defined as in Equation (1) except (CPI_{Y-1}/CPI_{1925}) is the inflation adjustment for each year's (Y) monthly withdrawals. By multiplying the ratio of the previous year's consumer price index for urban consumers (CPI_{Y-1}) to the 1925 value of the CPI, the investor maintains the purchasing power of monthly withdrawals with a one-year lag. Lagging the inflation adjustment enables the hypothetical investor to adjust monthly withdrawals by a known rate of inflation.

Some investors may choose to withdraw funds at the beginning of the month, but that simply scales back the investment capital by one month's withdrawal. In that circumstance the withdrawal rates in Tables 1 through 5 would apply to the reduced investment capital after the first withdrawal. Also, our results would be unchanged by the end-of-month versus beginning-of-the-month timing decision if the actual investment of retirement funds occurs one month prior to the initial beginning of the month withdrawal.

The portfolio success rates in Tables 1, 3, and parts of Table 5 were developed using Equation (1) to calculate terminal values of portfolios and are the result of constant percentage withdrawals through the payout periods without adjustment for inflation. The portfolio success rates in Tables 2, 4, and parts of Table 5 assume that monthly withdrawals are inflation-adjusted and are the result of portfolio terminal values calculated with Equation (2). That is, the investor is assumed to initiate withdrawals at a specific withdrawal rate and then adjust each subsequent year's, thus month's, withdrawal amount by the previous year's percentage change in the consumer price index. The objective of inflation adjustment in Equation (2) is to maintain the purchasing power of the monthly withdrawal amount.

As an alternative to the portfolio success rate analysis, we revised the methodology so that the withdrawal rate is the open-ended variable rather than the terminal value of the portfolio. We constrain the terminal value of the portfolio to decline to zero just at the end of the last month of the n-year payout period. We then calculate withdrawal rates, nominal and inflation-adjusted, that are consistent with the zero terminal value assumption for the overlapping 15 year, 20 year, 25 year, and 30 year payout periods for 1926 through 1997 and for 1946 though 1997. Means, medians, standard deviations, minimums, and maximums of the withdrawal rates that just exhaust the portfolios are presented in Table 6.

Analytical Results

Table 1 reports the portfolio success rates of nominal or constant monthly withdrawals ranging from 0.25% per month (3% annualized) to 1.0% per month (12% annualized) for annual overlapping periods from 1926 through 1997. As described above, the payout periods vary from 15 to 30 years in increments of 5 years, and asset allocations vary from 100% stocks to 100% corporate bonds in increments of 25%. Table 2 is similar to the analysis in Table 1 except the withdrawals are inflation-adjusted annually.

The portfolio success rates in Tables 1 and 2 allow an investor to evaluate the likely success of an initial withdrawal rate. For example, if an investor expected a 20-year payout period after retirement and was willing to accept a 75% success rate, he or she could select the 8% annualized withdrawal rate for nominal withdrawals and an asset allocation of at least 50% stock. If the investor planned to adjust withdrawals for inflation, the portfolio success rates reported in Table 2 justify 6% initial withdrawals from portfolios that are composed of at least 50% stock.

The portfolio success rates in Tables 3 and 4 are derived from post-war (1946-1997) monthly returns and withdrawals. Since the catastrophic events of the Great Depression of the 1930s and World War Two are not likely to be repeated, the post-war data allows the analysis of withdrawal rates and resulting portfolio success rates with market returns data that may be more relevant for the future. Tables 1 and 3 assume nominal withdrawals and are therefore comparable. Tables 2 and 4 report the effects of inflation-adjusted withdrawals.

The high financial market returns of the 1980s and mid-1990s improve the post-war portfolio success rates reported in Table 3 when withdrawal rates are not inflation adjusted. For a 20-year payout period and a tolerance of 25% failure (75% success), 9% is a viable withdrawal rate for the investor who maintains a 100% stock retirement portfolio. A withdrawal rate of 8% is successful if the investor maintains a portfolio of at least 50% stock.

If the investor plans to adjust withdrawals for inflation, the post-war analysis in Table 4 implies lower withdrawal rates. If the investor with a 20-year payout period prefers a 75% success rate or greater, he or she will limit the initial withdrawal rate to 5% and maintain a portfolio of at least 25% stock. A 6% withdrawal rate with a 100% stock portfolio has a 73% chance of success for a 20-year payout..

Recommended portfolio asset allocations often include an investment in near-cash assets such as U. S. Treasury bills. Table 5 reports the portfolio success rates for a portfolio of 60% stock, 30% bonds, and 10% treasury bills (60/30/10) for 1926 through 1997 and for the post-war period of 1946 through 1997.

The success rates for the 60/30/10 portfolio in Table 5 are comparable to the 50% stock/50% bonds portfolios in Tables 1 through 4 for nominal withdrawal rates. In the inflation-adjusted analyses, the comparability is not as clear, but the 60/30/10 and 50% stock/50% bonds portfolios provide very similar results.

The portfolio success rates reported in Tables 1 through 5 are equivalent to those reported in Tables 1 through 3 in Cooley, et al., (1998) for annualized withdrawal rates of 3% to 7%. For the higher withdrawal rates of 8 to 12%, portfolio terminal values appear to decline faster when the withdrawals are monthly. The comparatively lower portfolio success rates with monthly withdrawals are consistent regardless sample years or inflation adjustment. The analysis of monthly returns and withdrawals in Tables 1 through 4 suggests that choosing a withdrawal rate of 8% or greater is somewhat riskier than portrayed in Cooley, et al., (1998), which relies on annual returns and assumes annual withdrawals.

Table 1

Portfolio Success Rate with Monthly Withdrawals: 1926 to 1997
(Percent of all past payout periods supported by the portfolio)

	Annualized Withdrawal Rate as a % of Initial Portfolio Value									
Payout Period	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%
100% Stocks										
20 years	100	98	96	94	91	83	72	58	45	40
25 years	100	98	96	92	88	75	58	44	38	29
30 years	100	98	95	91	84	74	60	49	37	33
75% Stocks/25% Bonds										
20 years	100	100	100	96	94	83	68	51	38	30
25 years	100	100	98	96	90	73	50	40	29	19
30 years	100	100	98	95	88	63	51	35	26	14
50% Stocks/50% Bonds										
20 years	100	100	100	100	98	83	55	36	17	4
25 years	100	100	100	100	94	58	35	13	2	0
30 years	100	100	100	98	81	42	19	5	0	0
25% Stocks/75% Bonds										
20 years	100	100	100	100	100	62	23	11	4	0
25 years	100	100	100	100	60	17	6	0	0	0
30 years	100	100	100	95	21	5	0	0	0	0
100% Bonds										
20 years	100	100	100	91	47	36	15	4	0	0
25 years	100	100	96	48	29	8	2	0	0	0
30 years	100	100	53	26	2	0	0	0	0	0

20 years = 53 overlapping periods; 25 years = 48 overlapping periods; 30 years = 43 overlapping periods
Results for 15 years are available from the authors.

Table 2

Portfolio Success Rate with Inflation Adjusted Monthly Withdrawals: 1926 to 1997
(Percent of all past payout periods supported by the portfolio)

	Annualized Withdrawal Rate as a % of Initial Portfolio Value									
Payout Period	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%
100% Stocks										
20 years	100	100	91	77	66	57	42	32	28	19
25 years	100	100	85	69	56	42	33	29	25	15
30 years	100	98	81	65	56	44	33	33	19	7
75% Stocks/25% Bonds										
20 years	100	100	94	77	66	51	38	19	17	6
25 years	100	100	85	65	50	33	25	13	4	0
30 years	100	100	86	63	47	35	14	7	0	0
50% Stocks/50% Bonds										
20 years	100	100	92	75	55	30	17	9	2	0
25 years	100	100	79	52	31	15	4	0	0	0
30 years	100	95	70	51	19	9	0	0	0	0
25% Stocks/75% Bonds										
20 years	100	100	89	51	28	15	9	4	0	0
25 years	100	96	48	19	17	6	0	0	0	0
30 years	100	74	26	19	7	0	0	0	0	0
100% Bonds										
20 years	100	96	57	23	15	13	9	0	0	0
25 years	100	52	19	15	10	0	0	0	0	0
30 years	79	19	16	12	0	0	0	0	0	0

20 years = 53 overlapping periods; 25 years = 48 overlapping periods; 30 years = 43 overlapping periods
Results for 15 years are available from the authors.

Table 3
Portfolio Success Rate with Fixed Monthly Withdrawals: 1946 to 1997
(Percent of all past payout periods supported by the portfolio)

	Annualized Withdrawal Rate as a % of Initial Portfolio Value									
Payout Period	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%
100% Stocks										
20 years	100	100	100	100	100	94	79	61	45	45
25 years	100	100	100	100	100	82	57	39	39	29
30 years	100	100	100	100	100	83	61	48	43	35
75% Stocks/25% Bonds										
20 years	100	100	100	100	100	94	73	48	39	33
25 years	100	100	100	100	100	79	46	36	29	18
30 years	100	100	100	100	100	65	48	35	26	13
50% Stocks/50% Bonds										
20 years	100	100	100	100	100	88	55	36	15	6
25 years	100	100	100	100	100	54	32	7	0	0
30 years	100	100	100	100	83	35	13	0	0	0
25% Stocks/75% Bonds										
20 years	100	100	100	100	100	52	21	9	6	0
25 years	100	100	100	100	50	14	4	0	0	0
30 years	100	100	100	96	9	0	0	0	0	0
100% Bonds										
20 years	100	100	100	85	39	33	18	3	0	0
25 years	100	100	93	46	21	14	4	0	0	0
30 years	100	100	52	13	4	0	0	0	0	0

20 years = 53 overlapping periods; 25 years = 48 overlapping periods; 30 years = 43 overlapping periods
Results for 15 years are available from the authors.

Table 4
Portfolio Success Rate with Inflation Adjusted Monthly Withdrawals: 1946 to 1997
(Percent of all past payout periods supported by the portfolio)

	Annualized Withdrawal Rate as a % of Initial Portfolio Value									
Payout Period	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%
100% Stocks										
20 years	100	100	91	73	64	55	39	33	27	21
25 years	100	100	82	61	46	39	32	29	29	21
30 years	100	100	74	57	48	43	35	35	22	13
75% Stocks/25% Bonds										
20 years	100	100	91	70	61	45	36	21	21	9
25 years	100	100	75	50	39	29	25	14	7	0
30 years	100	100	74	48	35	35	13	9	0	0
50% Stocks/50% Bonds										
20 years	100	100	88	64	42	27	15	3	0	0
25 years	100	100	64	36	25	11	0	0	0	0
30 years	100	91	48	35	13	0	0	0	0	0
25% Stocks/75% Bonds										
20 years	100	100	82	48	21	0	0	0	0	0
25 years	100	93	36	4	0	0	0	0	0	0
30 years	100	65	9	0	0	0	0	0	0	0
100% Bonds										
20 years	100	100	58	9	0	0	0	0	0	0
25 years	100	54	4	0	0	0	0	0	0	0
30 years	91	0	0	0	0	0	0	0	0	0

20 years = 53 overlapping periods; 25 years = 48 overlapping periods; 30 years = 43 overlapping periods
Results for 15 years are available from the authors.

Tables 1 through 4 report several counter-intuitive portfolio success rates for 30-year payout periods in portfolios of 75% and 100% stock with high withdrawal rates. The tables report 18 instances where portfolio success rates for 30-year payout periods are greater than the success rates for 25-year payout periods. If a withdrawal rate is not successful in providing 25 years of retirement income, how can it be successful for 30 years? The explanation of these results has to do with the number of overlapping payout periods of 25 years versus 30 years used in calculating percentage success rates. The final five 30-year payout periods do not begin on the same date as the final 25-year payout periods and end 30 years later. All of the overlapping payout periods end on December 31, 1997. If the 25-year payout periods were limited to 43 periods all beginning at the same month as the 30-year payout periods, the success rates of the 30-year payout periods would be equal to or less than that of the 25-year payout periods. Thus the anomalous results in the 25-year and 30-year payout periods are unfortunate byproducts of the overlapping periods methodology adopted for this paper and applied in most of the literature on this topic.

The analysis reported in Table 6 addresses the problem of withdrawal rates and portfolio success from a different perspective. For each n-year payout period of monthly historical returns, a withdrawal rate is calculated that reduces the value of the portfolio to zero just at the end of the last month of the payout period. The means, medians, and other descriptive statistics of the marginally successful withdrawal rates for the 15, 20, 25 and 30-year payout periods are reported in Table 6 for all months from January 1926 through December 1997 and also for January 1946 through December 1997. Part A of Table 6 reports nominal withdrawal rates, and Part B reports inflation-adjusted withdrawal rates. Only the 60/30/10 portfolio was considered in the analysis reported in Table 6.

The figures in Table 6 suggest that risk neutral investors who are willing to accept a 50% probability of portfolio success may plan to withdraw substantial amounts. A similar conclusion could have been drawn from Tables 1 though 5. However, Table 6 provides convenient information on the distribution of marginally successful withdrawal rates. For example, the investor who plans on a 20-year payout period of inflation adjusted withdrawals would examine the figures in the lower right hand corner of the table. The mean and median withdrawal rates are very close at 7.4% and 7.2%, and the minimum such rate is 4.9%.

Summary

This paper reports the effects of withdrawal rates, nominal and real, on success rates of retirement portfolios of stocks and bonds. The financial market returns used in calculating terminal values of portfolios are monthly returns to large company stocks, high-grade corporate bonds, and 30-day U. S. Treasury bills reported by Ibbotson Associates for January 1926 through December 1997. The analysis is repeated for the January 1946 through December 1997 post-war period. The findings are similar to those reported in Cooley, et al., (1998). Monthly variations in stock and bond market returns plus monthly withdrawals appear to reduce portfolio success rates for higher (8% +) withdrawal rates.

As Cooley, et al., (1998) concluded, investors who expect long payout periods should choose an asset allocation that is at least 50% common stock and a lower withdrawal rate. Conversely, a higher withdrawal rate appears to be sustainable for shorter payout periods, such as 15 or 20 years, provided the portfolio has a substantial percentage of stocks. Investors who plan to inflation adjust withdrawals should choose lower withdrawal rates and invest at least 50% of the portfolio in stocks. Finally, the lower withdrawal rates of 3% and 4% recommended by some analysts appear to be excessively conservative for portfolios with at least 50% stock, unless the investor wishes to leave a substantial portion of the initial retirement portfolio to his/her heirs.

Since the choice of a withdrawal rate involves individual preference for current consumption, uncertainty of life expectancy, and variable financial needs, there is no single globally optimal withdrawal rate. Each investor must determine the appropriate balance of the risk of running out of funds versus a higher, more enjoyable standard of living early in retirement. Most authors tend to favor a more conservative approach that virtually guarantees a substantial positive terminal value of the retirement portfolio. Such an approach exchanges post-retirement quality of life for end of life financial security. Some retirees may prefer not to make that tradeoff. In the final analysis the choice of a portfolio withdrawal rate, within a reasonable range, requires very personal choices that perhaps are beyond the scope of financial analysis.

Table 5
Portfolio Success Rates with Monthly Withdrawals from a Portfolio of 60% Stock, 30% Bonds, and 10% Treasury Bills
(Percent of all past payout periods supported by the portfolio)

	Annualized Withdrawal Rate as a % of Initial Portfolio Value									
Payout Period	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%
	1926-1997									
Unadjusted withdawals:										
20 years	100	100	100	98	96	87	58	40	32	13
25 years	100	100	100	96	92	65	44	27	13	0
30 years	100	100	100	95	88	53	35	16	0	0
Inflation adjusted withdrawals:										
20 years	100	100	96	77	60	42	21	13	2	0
25 years	100	100	83	58	40	25	10	0	0	0
30 years	100	98	79	51	33	12	0	0	0	0
	1946-1997									
Unadjusted withdawals:										
20 years	100	100	100	100	100	94	61	42	33	15
25 years	100	100	100	100	100	68	43	25	11	0
30 years	100	100	100	100	100	52	35	13	0	0
Inflation adjusted withdrawals:										
20 years	100	100	94	67	55	36	21	15	3	0
25 years	100	100	71	46	29	25	11	0	0	0
30 years	100	96	65	35	30	13	0	0	0	0

Table 6
Distributions of Portfolio Withdrawal Rates that Produce Terminal Portfolio Values of $0
Asset Allocation = 60% Stocks, 30% Bonds, 10% Treasury bills

A. Nominal monthly withdrawals									
	Payout periods, 1926-1997					Payout periods, 1946-1997			
	15 years	20 years	25 years	30 years		15 years	20 years	25 years	30 years
Mean	11.5%	9.8%	8.8%	8.4%		12.0%	10.1%	8.9%	8.5%
Standard deviation	2.3%	1.8%	1.5%	1.5%		2.3%	1.7%	1.3%	1.2%
Median	11.0%	9.5%	8.7%	8.2%		11.4%	9.6%	8.6%	8.1%
Minimum	6.9%	6.0%	5.4%	5.2%		8.9%	7.7%	7.3%	7.1%
Maximum	17.5%	13.9%	11.6%	10.9%		17.5%	13.9%	11.6%	10.8%
B. Inflation-adjusted monthly withdrawals									
	Payout periods, 1926-1997					Payout periods, 1946-1997			
	15 years	20 years	25 years	30 years		15 years	20 years	25 years	30 years
Mean	9.5%	7.6%	6.7%	6.2%		9.5%	7.4%	6.3%	5.9%
Standard deviation	2.2%	1.8%	1.6%	1.4%		2.4%	1.9%	1.8%	1.5%
Median	9.4%	7.5%	6.5%	6.1%		9.3%	7.2%	5.7%	5.3%
Minimum	6.0%	4.9%	4.3%	4.0%		6.0%	4.9%	4.3%	4.0%
Maximum	14.4%	11.3%	10.0%	8.9%		14.4%	11.3%	10.0%	8.9%

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