Decision Rules and Maximum Initial Withdrawal Rates

by Jonathan T. Guyton, CFP®, and William J. Klinger

Executive Summary

- This paper uses stochastic (Monte Carlo) analysis to test the decision rules established by co-author Jonathan Guyton (*Journal of Financial Planning*, October 2004), which established higher initial withdrawal rates than reported in previous research. Investment return and risk modeling are based on two different investment data periods: 1973–2004 (to match Guyton 2004) and 1928–2004.
- The paper tests three equity allocations: 50 percent, 65 percent, and 80 percent.
- The paper develops confidence standards to measure the probability of sustaining an initial withdrawal rate for at least 40 years and the percentage of purchasing power maintained during the withdrawal period.
- The paper retains the portfolio management and withdrawal rules from the original work, and eliminates the inflation rule (which caps annual inflationary adjustments).
- It develops two new decision rules—the capital preservation rule and the prosperity rule—which act as "financial guardrails" when market conditions cause the initial withdrawal rate to rise or fall significantly.
- The paper concludes that initial withdrawal rates of 5.2–5.6 percent are sustainable at the 99 percent confidence standard for portfolios containing at least 65 percent equities. The 80 percent equity allocation provides greater purchasing power maintenance at slightly lower success rates, but with 50 percent equities, maximum initial withdrawal rates drop to as low as 4.6 percent.
- The two data periods provide virtually identical results.
- Consistently applying the two new decision rules effectively eliminates the risk of exhausting retirement assets.

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"How much income can I safely take from my investment portfolio?" continues to be among the most important and complex questions on which a financial planner can advise a client. Recent articles (Guyton 2004, Schlegel 2005) suggest that new thinking on this question could significantly alter the outcome of financial planning for retirement. If so, it is none too soon, since the first baby boomers will begin retiring within five years.

Previous research has consistently defined the *initial withdrawal rate* as the amount withdrawn in the first year of a withdrawal period divided by the portfolio value at the start of the withdrawal period. Not surprisingly, determining the maximum initial withdrawal rate has become something of a Holy Grail in retirement planning. In various writings since 1994, Bengen (1994, 1996, 1997) concluded that the maximum initial withdrawal rate with a 100 percent probability of success over a 30-year retirement distribution period ranged between 4.1 and 4.58 percent depending on the diversity of the equity asset classes employed. The 1998 Trinity study (Cooley 1998) concluded that a 4.0 percent initial withdrawal rate had nearly a 100 percent probability of success for 30-year periods between 1926 and 1995.

In Guyton's original article, he increased the time frame to 40 years, citing increasing life expectancies. He introduced three decision rules to govern (1) the source of each year's withdrawal, (2) the conditions under which withdrawals would be frozen following a year with poor investment results, and (3) the size of the cost-of-living increase in withdrawals following years with abnormally high inflation. These decision rules were systematically applied throughout a retirement distribution period beginning in 1973, chosen for its real-life "perfect storm" characteristics that included a severe market decline in the initial retirement years combined with inflation in the first decade of retirement that was three times the long-term historical norm. Using these decision rules, Guyton calculated the maximum initial withdrawal rate for this period to be 5.8 percent for a portfolio containing 50 percent equities, and 6.2 percent for a portfolio with 80 percent equities.

The use of this specific historical period definitely has its attractions. Chief among them is the severity of the real-life conditions faced by a 1973 retiree in the early years of retirement, thereby allowing future retirees to have confidence assuming they would not face even more adverse conditions. It is worth noting that the combined impact of inflation and the 1973–1974 bear market placed a 1973 retiree in a more financially uncertain position after five years of retirement at the end of 1977 than a 2000 retiree found after 2004 following the 2000–2002 bear market.

But the use of this perfect-storm historical period has its drawbacks. For starters, it is, after all, just one period of time. Moreover, its conclusions about initial withdrawal rates could prove overly generous in the face of even more severe conditions. Finally, it cannot provide the probabilities of success that could be calculated using a stochastic (Monte Carlo) analysis. But a stochastic approach is not without its limitations, either. In particular, one specific question cannot be avoided: How high a probability of success is high *enough*?

Mindful of these points, this paper uses a stochastic approach to test the impact of applying Guyton's decision rules to determine the maximum initial withdrawal rate for a retiree's investment portfolio. We conduct these tests to allow a comparison of the trade-offs between a higher (lower) initial withdrawal rate and the corresponding lower (higher) probability that the withdrawals are sustainable throughout the entire distribution period. We also measure the impact of these decision rules on purchasing power at various initial withdrawal rates. In addition, we examine the characteristics of scenarios that fail and we present a real-time method for identifying potential early warning signs when a scenario could be in danger of failing, as well as a decision rule for rescuing those scenarios.

We believe that combining the results from testing the impact of these decision rules using a stochastic approach with the results from the historical perfect-storm period can offer important insights concerning the maximum initial withdrawal rates.

Definitions, Methodology, and Data

We began by constructing our decision rules to match those in Guyton's 2004 paper.

The portfolio management rule (PMR) determines the source(s) of each year's withdrawal.

- Following years where an asset class has a positive return that produced a weighting exceeding its target allocation, the excess allocation is sold and the proceeds invested in cash to meet future withdrawal requirements.
- Portfolio withdrawals are funded in the following order: (1) overweighting in equity asset classes from the prior year-end, (2) overweighting in fixed income from the prior year-end, (3) cash, (4) withdrawals from remaining fixed-income assets, (5) withdrawals from remaining equity assets in order of the prior year's performance.
- No withdrawals are taken from any equity following a year with a negative return if cash or fixed-income assets are sufficient to fund the required withdrawal.

The inflation rule (IR) determines the size of the yearly withdrawal increase.

- Yearly withdrawals increase by the annual rate of inflation as measured by the Consumer Price Index (CPI) except when the withdrawal rule freezes the withdrawals.
- The maximum annual inflationary increase is 6 percent.
- There is no "make-up" for a "capped" inflation adjustment.

The withdrawal rule (WR) determines the conditions when portfolio withdrawals are frozen from one year to the next.

- Withdrawals increase from year to year in accordance with the inflation rule, except that there is no increase following a year where the portfolio's total return is negative.
- There is no "make-up" for a missed increase.

We chose the same asset classes, benchmarks, style-neutral asset allocation weightings (Table 1), and time period (1973–2004) as did Guyton to generate our assumptions for expected returns and standard deviations. This eliminates the possibility that differences in our findings could be attributable to differences in assumptions. In addition, these target multi-asset-class portfolios employ the major asset classes used by most financial planners in managing client investment portfolios.

Table 1: Target Multi-Asset Class Portfolio Allocations

Asset Class	Index	50% Equities	65% Equities	80% Equities
Cash	91-Day T-Bill	10%	10%	10%
Fixed Income	Lehman Agg. Bond*	40%	25%	10%
U.S. Large Cap Value	Russell 1000 Value*	10%	13%	15%
U.S. Large Cap Growth	Russell 1000 Growth*	10%	13%	15%
U.S. Small Cap Value	Russell 2000 Value*	7%	9%	10%
U.S. Small Cap Growth	Russell 2000 Growth*	7%	9%	10%
International Equities	EAFE	11%	15%	20%
Real Estate	Wilshire REIT **	5%	6%	10%

* Index commenced after 1973. Low-cost, no-load mutual fund used until index commencement.
** Wilshire REIT index commenced in 1988. NAREIT index used through 1987.

We were curious to know the extent to which these asset classes and allocations during this particular period (1973–2004) would influence our results. Therefore, we conducted parallel tests employing only one equity asset class (the S&P 500), using the period 1928–2004 as the basis for our performance assumptions for stocks, bonds, cash, and inflation. In examining these two periods, we noted the following:

- The average annual inflation rate was 1.6 percent higher from 1973 to 2004 than from 1928 to 2004.
- Real (weighted) average annual returns for the six equity asset classes in Table 1 were 0.9 percent-per-year lower from 1973 to 2004 than from 1928 to 2004 as measured by the S&P 500.
- Real average annual fixed-income returns were 0.5 percent-per-year higher from 1973 to 2004 than from 1928 to 2004.
- Real average annual cash returns were 1 percent-per-year higher from 1973 to 2004 than from 1928 to 2004.
- With each of the three overall asset allocations, total real returns were lower from 1973 to 2004 than from 1928 to 2004.

The point about overall real returns is noteworthy. It is tempting to evaluate how favorable or unfavorable a particular time period is for equities based only on nominal returns. This may be reasonable when the objective is simply to analyze portfolio growth over time; however, we believe it is a more appropriate measure of the investment climate to focus on real returns when the objective includes annual portfolio withdrawals that are increasing over time to keep pace with inflation.

Our analysis uses a Monte Carlo simulator (Glasserman 2004) written in C++ to model retirement portfolios over 40-year and 30-year periods and to apply the "artificial intelligence" contained in each decision rule. Each year's entire withdrawal was made on the first day of that year from the portfolio's assets according to the decision rules in effect. At that time, overweighted asset classes were also rebalanced to the target asset allocation unless the portfolio decision rule was applied. At the end of each year, asset class returns were applied before any rebalancing or the source of the next year's withdrawal was determined. Withdrawals rose annually by the prior year's inflation rate and were modified by any decision rules in effect. Asset returns and inflation were assumed to be lognormally distributed, with means and standard deviations calculated from historical performance over the relevant time period. We factored correlations into our model by constructing a covariance matrix based on those returns.

We simulated a retiree's lifetime by performing the above calculations for each simulated year—for example, 40 times for an expected retirement of 40 years. Each scenario we studied contained 14,000 lifetime trials. The model is robust and allows decision rules to be turned on or off and assumptions to be changed.

Life Expectancy and Probabilities of Success

The issue of life expectancy posed an interesting choice. We could have treated it as an independent variable with its own mean and standard deviations; however, the planning situation of a retiree living to age 100 or beyond is far more challenging than for a retiree with an average life span. Put another way, the retiree who has lived to an average life expectancy and who has concerns about running out of money doesn't want to be told that "on average, you weren't supposed to be here"!

Because our research is really about people and their quality of life, we fixed the length of a retiree's distribution period at 40 years. We recognize that this assumption—while prudent—effectively understates the maximum initial withdrawal rate when considering a large number of retirees with their average life expectancy.

We also know that retirees desire a maximum level of confidence in any initial withdrawal rate that they select. We therefore define the *probability of success* (POS) as "the percentage of simulated lifetimes where the retiree's portfolio contained at least $1 at the conclusion of the distribution period." Since the decision rules employ many of the mid-course corrections that common sense might suggest, we believe that 95 percent is the minimally acceptable probability of success for a given initial withdrawal rate.

Withdrawal Enhancements from Decision Rules

We considered the *withdrawal enhancement* as applying one or more of the decision rules described above and define it as "the percentage increase in the initial withdrawal rate at a given probability of success." Table 2 depicts withdrawal enhancements for various decision rules using the three portfolios in Table 1.

Table 2: Withdrawal Enhancements from Decision Rules

	Max Initial WD[1] Rate		Withdrawal Enhancement		WR[3] Freezes
	90% POS[2]	95% POS	90% POS	95% POS	at 95% POS
No Decision Rules					
50% Equities (Multi-Class)	3.6%	3.3%	N/A	N/A	N/A
65% Equities (Multi-Class)	3.6%	3.1%	N/A	N/A	N/A
80% Equities (Multi-Class)	3.6%	3.0%	N/A	N/A	N/A
Portfolio Management Rule					
50% Equities (Multi-Class)	3.6%	3.3%	0%	0%	N/A
65% Equities (Multi-Class)	3.6%	3.3%	0%	6%	N/A
80% Equities (Multi-Class)	3.6%	3.2%	0%	7%	N/A
Inflation Rule					
50% Equities (Multi-Class)	4.1%	3.7%	14%	12%	N/A
65% Equities (Multi-Class)	4.1%	3.6%	14%	16%	N/A
80% Equities (Multi-Class)	4.0%	3.4%	11%	13%	N/A
Original Withdrawal Rule					
50% Equities (Multi-Class)	4.3%	3.9%	19%	18%	6
65% Equities (Multi-Class)	4.5%	4.0%	25%	29%	7
80% Equities (Multi-Class)	4.4%	3.9%	22%	30%	8
Modified Withdrawal Rule					
50% Equities (Multi-Class)	4.3%	3.9%	19%	19%	3
65% Equities (Multi-Class)	4.3%	3.9%	19%	26%	3
80% Equities (Multi-Class)	4.3%	3.8%	19%	27%	3
All 3 (Modified Withdrawal) Rules					
50% Equities (Multi-Class)	4.7%	4.3%	31%	30%	2
65% Equities (Multi-Class)	4.8%	4.3%	33%	39%	2
80% Equities (Multi-Class)	4.8%	4.3%	33%	43%	3

1. WD = withdrawal 2. POS = probability of success 3. WR = withdrawal rule

Under Guyton's original withdrawal rule, withdrawals were frozen following years where the portfolio's return was negative. This occurred even if the portfolio's previous results produced high enough returns so that the current withdrawal rate was still below the initial withdrawal rate. We believe that withdrawal freezes are unnecessary in this instance. Therefore, we modified the original withdrawal rule as follows:

- Withdrawals increase from year to year in accordance with the inflation rule, except that there is no increase following a year where the portfolio's total return is negative ***and** when that year's withdrawal rate would be greater than the initial withdrawal rate*.
- There is no make-up for a missed increase.

A review of the withdrawal enhancements in Table 2 yields the following observations:

- The portfolio management rule provides modest benefits to withdrawal rates when high probabilities of success are desired. (Additional testing showed that its application also lowered the chance of failure by nearly 20 percent—from 6 percent to 5 percent—at the initial withdrawal rates tested.)
- The inflation rule provides noticeable benefits with all portfolios and probabilities of success.
- Both versions of the withdrawal rule provide significant benefits; however, the modified withdrawal rule introduced above generates about 60 percent fewer freezes. Thus, we use the modified rule for the remainder of the paper.
- Using all three decision rules increases the maximum initial withdrawal rate 30–43 percent at a given probability of success over applying no decision rules at all.

Analysis of Failed Simulations

Even with these improvements in the probabilities of success, we grew increasingly curious about the scenarios that failed. Specifically, we wondered:

- What patterns could be found in the nature and timing of the failures we observed?
- Is there an easily recognizable situation when a retiree's portfolio should be considered in jeopardy?
- Once such a situation is recognized, is there a systematic decision rule that would have a high probability of rescuing the portfolio and sustaining the retiree's income stream for the remainder of the 40-year time horizon?

We analyzed the failures for initial withdrawal rates with at least a 90 percent probability of success to determine the year in which the portfolio ran out of money. Breaking the 40-year horizon into four 10-year periods revealed that no failures occurred in the first decade, approximately 20 percent of failures took place in the second decade, nearly 55 percent occurred in the third decade, and about 25 percent came in the fourth decade. This made intuitive sense, and we make these observations:

- Failures are most likely to occur when there are abnormally adverse investment returns or inflation rates—either in magnitude or a prolonged duration (or both!)—relatively early in retirement. This, of course, describes the retiree's perfect storm.
- To further reduce the possibility of failure at a given initial withdrawal rate, a retiree must be willing to reduce their portfolio withdrawals under certain circumstances, rather than merely freeze them as required by the withdrawal rule.
- Positive circumstances could also arise permitting a retiree to increase their withdrawals in excess of annual inflation.

These observations make it tempting to recommend that retirees begin withdrawals "cautiously"; that is, to scale them back in the first five to ten years of retirement to be sure that they don't encounter conditions that could ultimately cause their initial withdrawal rate to prematurely exhaust their portfolio. Retirees who enjoy such an option should keep in mind the improvements that starting their portfolio withdrawals below the maximum rate (before later accelerating to that level) can bring to their long-term financial security, even as they consider how this may affect how they spend their time in retirement.

But most retirees—even if they do enjoy this option—desire a lifestyle that includes levels of travel, hobbies, and other activities that are not conducive to an approach that advocates starting by spending less and increasing withdrawals later if conditions are favorable.

It is frequently suggested that once retirees move through their so-called active phase of retirement, their income needs decline in real dollar terms. But real-life client experiences, coupled with dramatically rising health care costs and uncertainty about possible reductions in Social Security benefits, make us unwilling to consider the possibility of such natural reductions in a retiree's income needs.

Portfolio Rescue

Mindful of all this, we introduce the capital preservation rule (CPR). This decision rule is triggered when some combination of adverse conditions has caused the retiree's withdrawal rate to approach levels that threaten their ongoing income stream. The capital preservation rule determines the conditions and prescribes the withdrawal adjustment designed to resuscitate a portfolio in hopes of sustaining it throughout the remainder of the 40-year retirement horizon:

- The capital preservation rule applies when a current year's withdrawal rate—using the decision rules in effect—has risen more than 20 percent above the initial withdrawal rate.
- The capital preservation rule expires 15 years before the maximum age to which the retiree wishes to plan; for example, a retiree assuming she would not live beyond age 100 would discontinue the capital preservation rule after age 85.
- Under the capital preservation rule, is the current year's withdrawal is reduced by 10 percent. The other decision rules in effect are then applied to this decreased withdrawal amount.
- This decreased withdrawal becomes the basis for determining the following year's withdrawal amount.

We experimented with other capital preservation rule trigger points but found that this version yielded the greatest enhancements. A trigger point below the 20 percent threshold did not boost the probability of success in a noticeable way; it only served to unnecessarily increase the number of times the retiree's withdrawals were reduced. Keeping the capital preservation rule active during the final 15 years significantly reduced purchasing power without a corresponding increase in the probability of success at a given initial withdrawal rate. Not surprisingly, waiting for larger increases in withdrawal rates before applying the capital preservation rule caused the portfolio to be beyond saving far too often. (We also question how many retirees or financial planners would be comfortable allowing the initial withdrawal rate to rise much more than 20 percent before feeling the need to make at least modest reductions.) Finally, once the capital preservation rule was triggered, withdrawal reductions above 10 percent (say, 15 percent and 20 percent) did not noticeably improve the probability of success.

The capital preservation rule does not come without drawbacks—chiefly the lost purchasing power each time the rule is triggered. This is the trade-off that accompanies a higher initial withdrawal rate and—as will be seen—the virtual elimination of the running-out-of-money failure scenario. It is worth remembering that other financial planning techniques can be applied to offset years with decreases required by the capital preservation rule, such as tapping cash reserves, changing the withdrawal composition's taxation to increase after-tax income, and borrowing against home equity.

When Prosperity Rules

During a 40-year withdrawal period, however, a retiree is also likely to experience times with sufficiently positive investment results that cause their withdrawal rate to fall even as their actual withdrawal amount continues to increase with inflation. To this point, none of the decision rules permit a retiree to take advantage of such positive conditions by increasing their withdrawals (beyond inflation) should such prosperity occur. Since such increases would help offset the purchasing power losses caused by the inflation or capital preservation rules, we believe they are worth exploring. Thus, we introduce the prosperity rule (PR):

- The prosperity rule applies in years with a withdrawal rate more than 20 percent below the initial withdrawal rate.
- Under the prosperity rule, the current year's withdrawal is increased by 10 percent. The other decision

rules in effect are then applied to this increased withdrawal amount.
- This increased withdrawal amount becomes the basis for determining the next year's withdrawal.

To fully analyze the impact of the capital preservation and prosperity rules, we measured the percentage of purchasing power maintained during each successful simulation. To do so, we calculated the median net present value (NPV) of the total of all withdrawals during the 40-year period as well as the median NPV of the withdrawal in year 40.

An example may be useful. A $50,000 initial withdrawal repeated for 40 years with increases only for inflation produces purchasing power NPV of $50,000 in year 40. The total purchasing power NPV in this example is $2 million. Thus, a scenario resulting in a $1.6 million median total purchasing power NPV maintained 80 percent of total purchasing power.

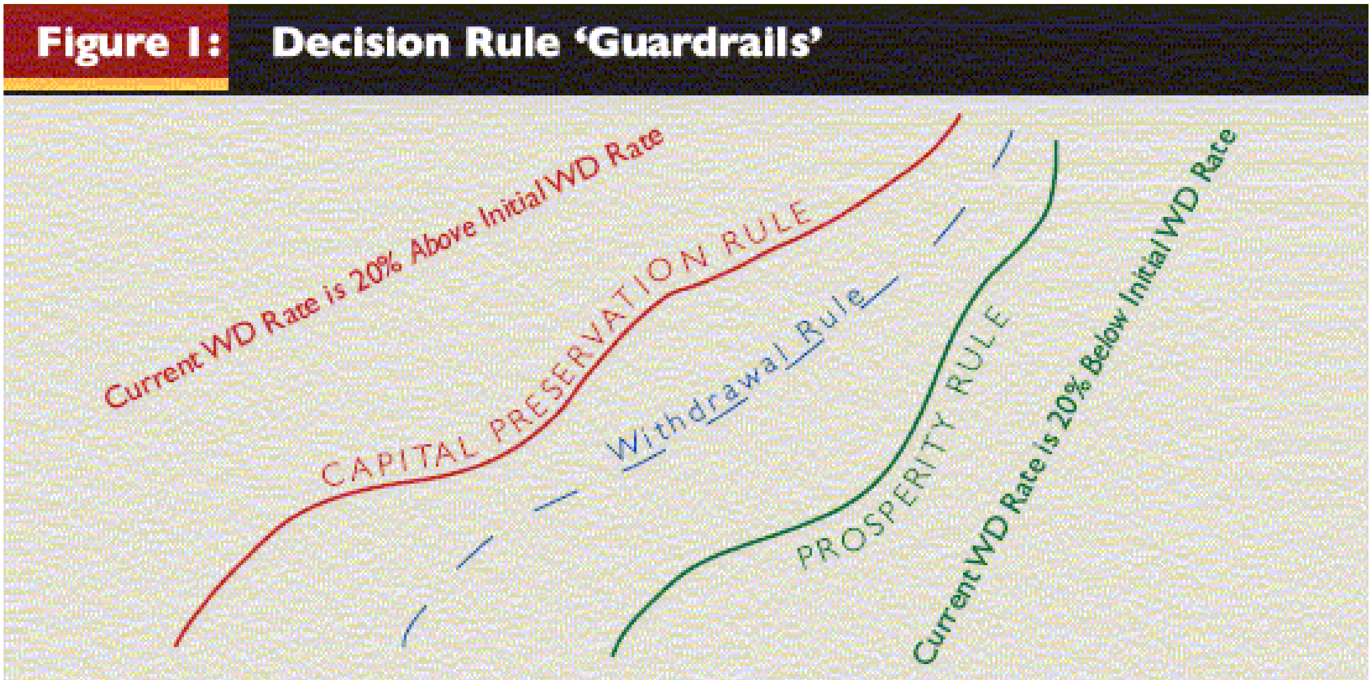
Table 3 presents the impact of applying the capital preservation and prosperity rules along with the portfolio management and withdrawal rules. During these tests, we found that removing the inflation rule increased the purchasing power maintained by more than 10 percent without reducing the probability of success. Accordingly, we will no longer apply the inflation rule when the capital preservation rule is also in force.

Table 3: Impact of Capital Preservation and Prosperity Rules on Success and Purchasing Power with Single-Class Equities

65% Equities (S&P 500)	Initial WD[1] Rate	Avg. # of Cuts/Raises	% Total PP[2] Maintained	% Initial PP In Year 40 WD
PMR[3], WR[4], CPR[5] Only				
100% Success	5.0%	2 / NA	83%	76%
99% Success	5.5%	3 / NA	79%	70%
98% Success	5.9%	3 / NA	77%	67%
95% Success	6.4%	4 / NA	74%	62%
90% Success	7.0%	4 / NA	70%	57%
PMR, WR, CPR, PR[6]				
100% Success	4.6%	3 /10	114%	140%
99% Success	5.1%	3 / 9	104%	118%
98% Success	5.4%	4 / 9	99%	108%
95% Success	6.0%	4 / 8	91%	91%
90% Success	6.5%	5 / 7	84%	79%

1. WD = withdrawal
2. PP = purchasing power
3. PMR = portfolio management rule
4. WR = withdrawal rule
5. CPR = capital preservation rule
6. PR = prosperity rule

It may be useful to imagine the capital preservation and prosperity rules acting as financial "guardrails" that govern withdrawals under extreme conditions, both negative and positive. Unless such extreme conditions (the current year's withdrawal rate straying more than 20 percent from the initial withdrawal rate) are present, the portfolio rule and withdrawal rule are sufficient to govern withdrawals. Figure 1 illustrates the relationship between these decision rules.



Using a 65 percent single equity (S&P 500) portfolio, Table 3 shows the maximum initial withdrawal rate at various probabilities of success, the average number of times in a 40-year retirement that these rules were triggered, as well as their impact on purchasing power.

Table 3 presents the maximum initial withdrawal rates that are available by applying these two new decision rules at various probabilities of success. Perhaps most obvious, adding the capital preservation rule permits very attractive initial withdrawal rates at strikingly high success rates. On the other hand, the withdrawal cuts it requires (combined with the freezes from the withdrawal rule) cause withdrawals to increase more slowly than inflation.

The prosperity rule offsets this drawback. In fact, it generates significantly more raises than the cuts from the capital preservation rule. Moreover, at several initial withdrawal rates, the prosperity rule actually allows the purchasing power maintained to exceed 100 percent.

Perhaps most significantly, the introduction of the capital preservation and prosperity rules effectively changes the retiree's greatest long-term concern from "what is my chance of running out of money?" to "what happens to my purchasing power?" This essentially eliminates the single greatest fear of most retirees. But the declines in purchasing power suggest that the strategy of maximizing the initial withdrawal rate at a given probability of success has both unintended and unsatisfactory consequences.

Table 4 uses the 65 percent multi-asset-class equity portfolio from Table 1 based on the 1973–2004 period to replicate the analysis in Table 3. While the overall patterns were similar, using multiple-equity asset classes produced higher initial withdrawal rates and fewer capital preservation rule cuts at given probabilities of success than when equities were invested exclusively in the S&P 500. This pattern also appeared at given initial withdrawal rates when we modeled a single-equity (S&P 500) portfolio for the 1928–2004 period or the 1973–2004 period to match the time frame used in Table 4.

Table 4: Impact of Capital Preservation and Prosperity Rules on Success and Purchasing Power with Multi-Class Equities

65% Multi-Class Equities	Initial WD[1] Rate	Avg. # of Cuts/Raises	% Total PP[2] Maintained	% Initial PP In Year 40 WD
PMR[3], WR[4], CPR[5] Only				
100% Success	6.3%	1 / NA	90%	87%
99% Success	7.0%	2 / NA	86%	81%
98% Success	7.2%	2 / NA	85%	79%
95% Success	7.9%	3 / NA	80%	73%
90% Success	8.4%	3 / NA	77%	67%
PMR, WR, CPR, PR[6]				
100% Success	6.3%	1 / 3	93%	97%
99% Success	7.1%	2 / 3	88%	90%
98% Success	7.3%	2 / 2	88%	86%
95% Success	7.8%	3 / 2	84%	80%
90% Success	8.4%	3 / 2	79%	73%

1. WD = withdrawal
2. PP = purchasing power
3. PMR = portfolio management rule
4. WR = withdrawal rule
5. CPR = capital preservation rule
6. PR = prosperity rule

Decision Rules and Confidence Standards for Decision-Making

We have demonstrated the impact on initial withdrawal rates, probabilities of success, and purchasing power from applying four decision rules:

1. Portfolio management
2. Withdrawal
3. Capital preservation
4. Prosperity

Choosing which decision rules to apply depends entirely on the benefits a retiree most values and the trade-offs he or she is willing to make. Table 5 summarizes the combination of decision rules that maximize the initial withdrawal rate. In all cases, the portfolio management rule should be used.

Table 5: Decision Rule Summary for Maximizing the Intitial Withdrawal Rate

Condition:	Action:
Prior Year's Return Is Negative	Apply Withdrawal Rule
Current WD[1] Rate Is Within 20% of Initial WD Rate	Increase Prior Year's WD by CPI
Current WD Rate > Initial WD Rate by 20%	Apply Capital Preservation Rule
Current WD Rate < Initial WD Rate by 20%	Apply Prosperity Rule

1. WD = withdrawal

Most retirees share four ideals when taking yearly withdrawals from their investment portfolios:

1. Maximize withdrawals (and withdrawal rates), especially early in retirement
2. Eliminate the possibility of running out of money
3. Avoid undesired changes to the income stream (that is, reductions or freezes)
4. Maintain purchasing power

In considering these ideals, we found two *confidence standards* that seem to maximize the attributes most prized by retirees while minimizing the risks they most fear.

- For retirees seeking a virtually bullet-proof withdrawal plan, choose an initial withdrawal rate where the probability of success and the median purchasing power maintained are both at least 99 percent (*the 99 percent confidence standard*).
- For retirees who desire (or need) a higher initial withdrawal rate and are willing to accept a small amount of risk, choose an initial withdrawal rate where the probability of success and the median purchasing power maintained are both at least 95 percent (*the 95 percent confidence standard*).

We recognize that both the 95 percent and the 99 percent confidence standards will subject retirees to a small number of income reductions (due to the capital preservation rule) and a somewhat larger number of freezes (due to the withdrawal rule), even though virtually all of their purchasing power—both total and final year—is maintained. Not only do we believe that many retirees will find these reductions more than offset by their higher initial withdrawal rate, but increases via the prosperity rule have the ability to mostly, if not entirely, offset this lost income.

Table 6 presents the maximum initial withdrawal rates that meet these standards for a 40-year withdrawal period at various equity allocations, using both a single equity (S&P 500) as well as multi-class equities. Each scenario applies the portfolio management, withdrawal, capital preservation, and prosperity rules. Though we also present a 90 percent standard, we are much more comfortable with the 95 percent and 99 percent confidence standards. In evaluating the results, we observed that

- The initial withdrawal rates with 50 percent equities are noticeably lower than with 65 percent or 80 percent equities due to the difficulty in keeping pace with inflation from the lower equity allocation.
- The trade-offs between the 65 percent and 80 percent equity portfolios are quite subtle at initial withdrawal rates in the 5.5–6.0 percent range; the 80 percent equity portfolio maintains quite purchasing power but at slightly lower probabilities of success.
- Withdrawal reductions from the capital preservation rule occur no more than 10 percent of the time at very high probabilities of success.
- The greater the equity allocation, the more raises received due to the prosperity rule; these raises occur

more frequently than the cuts under the capital preservation rule.

Table 6: 40-Year Withdrawal Rates with High Success and Purchasing Power Maintenance Using Portfolio Management Rule, Withdrawal Rule, Capital Preservation Rule, and Prosperity Rule

	Confidence Standard	Initial WD[1] Rate	Success Rate	Avg. # of 'Triggers' Cuts/Freezes/ Raises	Total PP%[2]	Year 40 PP%
One Equity (S&P 500)						
50/40/10	99%	4.5%	100%	3 / 7 / 7	100%	108%
	95%	4.8%	100%	3 / 8 / 7	95%	97%
	90%	5.0%	100%	3 / 8 / 6	92%	91%
65/25/10	99%	5.2%	99%	4 / 8 / 9	102%	114%
	95%	5.7%	97%	4 / 9 / 8	95%	98%
	90%	6.0%	95%	4 / 9 / 8	90%	91%
80/10/10	99%	4.7%	99%	3 / 8 /13	129%	178%
	95%	5.6%	95%	4 / 8 /11	110%	135%
	90%	6.3%	90%	5 / 9 / 10	99%	112%
Multi-Class Equities						
50/40/10	99%	4.6%	100%	2 / 5 / 6	99%	103%
	95%	4.8%	100%	2 / 5 / 5	97%	101%
	90%	5.1%	100%	2 / 5 / 5	92%	90%
65/25/10	99%	5.3%	100%	2 / 6 / 7	100%	106%
	95%	5.5%	99%	3 / 6 / 7	96%	98%
	90%	5.8%	99%	3 / 7 / 6	92%	90%
80/10/10	99%	5.6%	99%	3 / 7 / 9	101%	113%
	95%	6.2%	95%	4 / 7 / 8	96%	96%
	90%	6.3%	94%	4 / 7 / 8	93%	93%

1. WD = withdrawal   2. PP = purchasing power

Table 7 presents the same results for a 30-year withdrawal period. For many retirees, this may be a more appropriate time period due to their retirement age or health history. It can also be a useful gauge of financial security as retirees progress through retirement. It may be surprising that initial withdrawal rates do not show greater increases with a time period that is 25 percent shorter. Yet when seeking such high success rates (at least 95 percent), attempting even higher initial withdrawal rates causes too many scenarios (more than 5 percent) to fail.

Table 7: 30-Year Withdrawal Rates with High Success and Purchasing Power Maintenance Using Portfolio Management Rule, Withdrawal Rule, Capital Preservation Rule, and Prosperity Rule

	Confidence Standard	Initial WD[1] Rate	Success Rate	Avg. # of 'Triggers' Cuts/Freezes/ Raises	Total PP%[2]	Year 40 PP%
One Equity (S&P 500)						
50/40/10	99%	4.6%	100%	2 / 6 / 5	99%	104%
	95%	4.9%	100%	2 / 6 / 5	96%	96%
	90%	5.2%	99%	2 / 6 / 4	92%	90%
65/25/10	99%	5.2%	99%	2 / 6 / 7	102%	111%
	95%	5.9%	96%	3 / 7 / 6	95%	98%
	90%	6.4%	92%	3 / 7 / 5	92%	91%
80/10/10	99%	4.7%	99%	2 / 6 / 9	119%	152%
	95%	5.7%	95%	3 / 6 / 8	107%	123%
	90%	6.3%	90%	3 / 7 / 7	100%	112%
Multi-Class Equities						
50/40/10	99%	4.6%	100%	1 / 4 / 4	100%	103%
	95%	4.9%	100%	1 / 4 / 4	97%	100%
	90%	5.3%	100%	1 / 4 / 3	94%	90%
65/25/10	99%	5.4%	99%	1 / 5 / 5	99%	102%
	95%	5.7%	98%	2 / 5 / 4	95%	96%
	90%	5.9%	98%	2 / 5 / 4	95%	92%
80/10/10	99%	5.4%	99%	2 / 5 / 7	107%	119%
	95%	6.2%	95%	2 / 5 / 6	96%	99%
	90%	6.5%	91%	2 / 6 / 5	94%	94%

1. WD = withdrawal   2. PP = purchasing power

What-Ifs

Though our results provide answers to some significant issues facing retirees and financial planners, they also lead to a variety of "what if" questions. To name a few:

- What is the appropriate application of the decision rules if a retiree believes his or her real income need (including health care costs) will decrease at some point later in retirement?
- How would the 99 and 95 percent confidence standards change if a retiree were able to gradually scale back their employment earnings and begin portfolio withdrawals at lower levels until they fully retire?
- What if real rates of return over the next 40 years do not resemble the distributions of historical returns?

(Our preliminary work on this question suggests that, when applying the decision rules, the key trade-off is between the initial withdrawal rate and the amount of purchasing power maintained, not the probability of success.)

Though our work did not attempt to address such questions, we believe our model provides a framework that can be tailored to apply the decision rules to accommodate the potential trade-offs between a retiree's financial goals, their willingness to accept risk, and their view of the future.

Conclusion

Our analysis using Monte Carlo simulations supports the conclusion that the application of a few simple but powerful decision rules can significantly increase maximum initial withdrawal rates while virtually eliminating the possibility that a "perfect storm" could cause a retiree to run out of money. This analysis generated results consistent with previous research that was based on a 1973 retirement date. In addition, the application of the capital preservation rule in conjunction with the prosperity rule virtually eliminates the possibility of a retiree running out of money at these initial withdrawal rates. These new decision rules also provide for purchasing power maintenance.

Questions about maximum initial withdrawal rates cannot be answered with a single number because retirees have varying thresholds for their financial security and need not adhere to a one-size-fits-all set of trade-offs. For portfolios containing at least 65 percent equities, initial withdrawal rates of 5.2–5.6 percent are sustainable over a 40-year period at the 99 percent confidence standard and rise to 5.7–6.2 percent at the 95 percent confidence standard.

We hope our work will help financial planners and their clients make sound decisions that lead to retirements that are both rewarding and fulfilling.

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