

Asset Allocation for a Lifetime

by William P. Bengen, CFP

ohn and Wendy Elgar are a new client couple of mine, both retired and age 65. At a previous meeting, I had presented to them the method of retirement money management I had discussed in my October 1994 article in the *Journal of Financial Planning*, "Determining Withdrawal Rates Using Historical Data." They seemed quite interested, but as this follow-up meeting begins, it is clear they have a number of questions.

'Phase-Down' of Stocks During Retirement

Wendy: Bill, in your article you recommended a stock allocation of 50 percent to 75 percent at the start of retirement. Must we maintain that allocation throughout retirement? Even if I'm still in good health when I'm 80 years old, I don't think I'll want to have that much invested in stocks.

Bengen: My original paper assumed individuals would, in fact, maintain their original asset allocation throughout retirement, or until their objectives changed. Because of concerns such as yours, I decided to study alternative approaches. What if we, instead, assumed that the allocation in stocks was gradually converted to bonds over time?

Consider Figure 1, which depicts the nominal value after 20 years of a portfolio that had an initial value of \$100,000. Five alternative asset allocation strate-



gies are depicted here: one in which stocks are maintained at their original allocation throughout retirement, and four others for which stocks are reduced one-half percent, one percent, two percent and three percent, respectively, each year. Stocks are assumed to begin at 63 percent of the portfolio, which is about the mid-point of my original recommended range.

In addition, each strategy has had its initial withdrawal rate set at the maximum, which "guarantees" a minimum 30-year portfolio longevity. This follows from our assumption that your primary goal during retirement is to maximize your income. Lastly, the portfolios all are tax-deferred.

As you can see, for retirement beginning before 1955, the greatest portfolio

value was achieved by the strategy that *did not* reduce stocks. During those 29 years, from 1926 through 1954, the other strategies produced portfolio values that declined as their percentage reduction in stocks increased.

However, after 1954, the two strategies with the highest reduction in stocks (two-percent and three-percent reductions annually) suddenly leapfrogged above the other strategies, and stayed there for almost 20 years. This, of course, is the result of the "Big Bang," the 1973-1974 stock market decline. Those portfolios with the highest percentage of stocks got hurt the most. The two-percent and three-percent strategies had, of course, the lowest percentage of stocks of all the strategies, and were hurt the least.

John: That sounds interesting. Under a three-percent "phase-down" strategy, for example, we'd practically be out of stocks after 20 years, when we are 85. That would shield us against any stock market disaster in our later years, when we really want to protect our capital.

Bengen: Perhaps, but there is a high price to pay for that much insurance, as shown in this graph (Figure 2). When you reduce stocks each year and replace them with bonds, you are, in effect, replacing a high-return asset with a low-return asset. This lowers the expected return of the portfolio. Consequently, the initial withdrawal rate must be reduced correspondingly to compensate for that, so as to assure the target 30-

year minimum longevity.

As the chart shows, there is little reduction required in the withdrawal rate for stock phase-downs of up to about 1.5 percent a year. Above that percentage, you sacrifice increasing amounts of current withdrawals to maintain the portfolio. For example, the 2-percent phase-down starts with a withdrawal rate of 3.81 percent, which is about 8 percent less than the withdrawal rate for no phase-down. And the 3-percent phase-down is almost 21 percent less.

Wendy: That's a lot of annual income to give up. I don't think even an 8-percent income reduction is acceptable, let alone 21 percent. So are we back to square one?

Bengen: No, not at all. There is real value in reducing your stock allocation gradually over time. For example, if the stock market crash of 1929–1932 began in the 20th year of your retirement, my analysis shows that a zero-percent phased-down portfolio would have been down 46 percent over the four years, while a 1-percent phased-down portfolio would have been down “only” 30 percent. Big losses in either case, to be sure, but a bit easier to bear in the latter case. To top it off, the value of the zero-percent phased portfolio would have been substantially less than the value of the one-percent phased portfolio after the four-year crash, even though it entered the crash years with a substantially higher value.

All things considered, I recommend that you adopt a phase-down of one percent of your stock allocation each year, shifting it into intermediate-term bonds. This is a subjective recommendation, in that the one-percent phased portfolio looks like a good compromise between growth of wealth, withdrawal rate, and late-retirement volatility. It satisfies my personal “Goldilocks test”: neither too big, nor too small, but just right. You may build less wealth than otherwise if the markets are strong, but you will be spared considerable pain in a major market event later in retirement. And you can use virtually the same withdrawal rate as you would have had with the zero-percent phased portfolio.

FIGURE 1

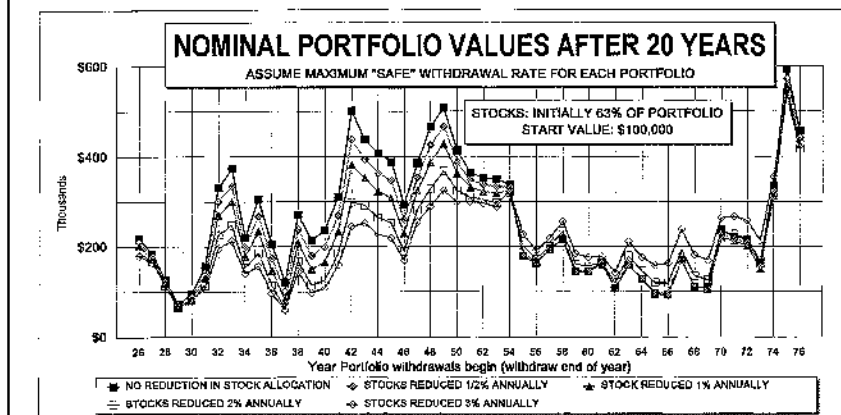
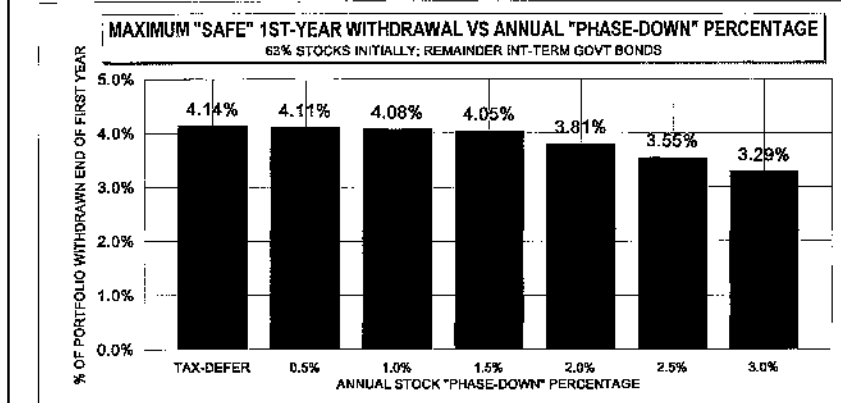


FIGURE 2



Choosing Initial Allocation

Wendy: Bill, you recommended in your article a stock allocation of 50 percent to 75 percent at the start of retirement, with a preference for as close to 75 percent as the client could tolerate. We don't really feel comfortable with three-quarters of our investments in stocks. What are the consequences to us of a lower allocation?

Bengen: Let's answer that by looking at some charts. The first one (Figure 3) depicts the maximum percentage you can withdraw from portfolios with different concentrations of stocks. As before, we are assuming that the portfolio is tax-

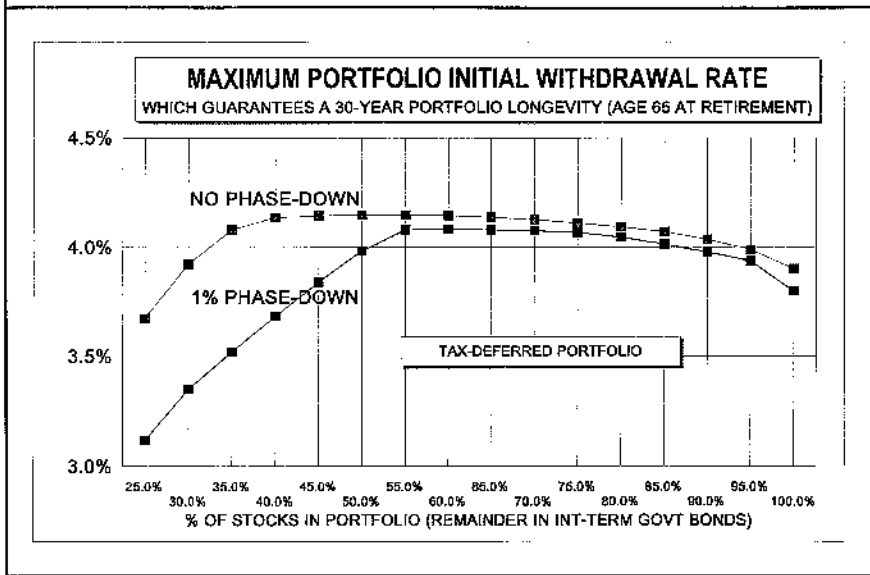
deferred, and that it must last a minimum of 30 years.

The top line in the chart is from my original research—that is, no phase-down is assumed. As you can see, within a range of 35-percent to 85-percent stocks, the withdrawal rate is remarkably constant, diverging from its peak by no more than about 2 percent. In fact, given the great uncertainties of predicting the future performance of markets, I treat all withdrawal rates in this range as essentially equal, or 4.1 percent.

John: But that's a much wider range of stock allocations than you discussed in your paper.

Bengen: Yes, because this chart alone

FIGURE 3



does not tell the whole story. I rejected stock allocations less than 50 percent because, even though they met the criterion for a 30-year minimum longevity, they had many scenario years that expired in the 30-to-35-year range. That was too low a margin of safety for my taste. I rejected stock allocations over 75 percent because of the potential for volatility, as well as for their high sensitivity to small changes in the withdrawal rates. A small deviation in future returns from past performance could drive the portfolio longevity below our 30-year minimum.

Wendy: It looks as if the introduction of phasing down changes the shape of the graph substantially.

Bengen: Yes, as we discussed earlier, initial withdrawal rates for the phased portfolio all are lower than for the non-phased portfolio. The initial withdrawal rate for allocations less than 50 percent now is much lower than before, so they can be ruled out on that basis alone. I still am not comfortable with stock allocations in excess of 75 percent, so we are left with the same range we had in my earlier analysis—50-percent to 75-percent stocks, initially. Note that at any stock allocation in this range, you are sacrificing very little annual income versus the non-phased portfolio.

John: What allocation do you recommend for us?

Bengen: You've told me that your primary goal is having your money last during retirement, while maximizing your withdrawals. However, you also said you would like to leave some money to the children, if possible. You have thus defined yourselves as moderate-risk investors: your goal is a blend of income and growth of capital for heirs. Therefore, I recommend a starting percentage of 63 percent in stocks, which is in the middle of the range of 50-percent to 75-percent stocks. For conservative-risk investors, I would recommend a 50-percent allocation of stocks to address their abiding fears of a stock market decline. For aggressive-risk investors interested in maximizing wealth to pass on to their heirs, I might recommend the maximum 75-percent stock allocation. All investors can use the same initial withdrawal rate, about 4.1 percent.

Given your current age of 65, we can express your asset allocation by this simple formula:

$$\% \text{ of portfolio in stocks} = 128 \text{ minus your age}$$

The constant in the formula, 128, was derived from the observation that each year the percentage of stocks in your portfolio will decline by one per-

centage point, owing to our one-percent phased approach. In contrast, each year your age will increase by one, owing to the dictates of Mother Nature. Thus, the sum of your age and the percentage of stocks in your portfolio, each moving in opposing directions at the same rate, always will be a constant. By adding your current age, 65, to the percentage allocation of stocks I am recommending for you, or 63 percent, we determine the constant to be 128.

This formula will last you the rest of your lifetime. Each year, I will automatically reduce your allocation to stocks by 1 percent, from a beginning allocation of 63 percent.

John: I accept the characterization of us as moderate-risk investors. But what if we decide in the future to become more conservative? Can you change the allocation then to suit us?

Bengen: Of course. At that time, your formula will change to the following:

$$\% \text{ of portfolio in stocks} = 115 \text{ minus your age}$$

As with the earlier equation, the constant, 115, was determined as the sum of your current age, 65, and the percentage of allocation of stocks for a conservative investor of your age, which we have determined previously to be 50 percent. This new equation calls for 13 percent (63% - 50%) fewer stocks than the earlier equation, at the same age. To adjust your portfolio to the requirements of the new equation, we will convert 13 percent of your portfolio from stocks to intermediate-term government bonds. Let us say, for example, that you decide to make this change at age 80. Your asset allocation for stocks during retirement would look like this graph (Figure 4).

Wendy: Thanks for assuming we will live to age 100.

Bengen: I believe in long-term relationships with my clients!

Taxable Portfolios

John: Bill, your research was based on withdrawing money from a tax-deferred account. How much can we afford to withdraw annually from our taxable

account during retirement?

Bengen: That's a bit more complex. In doing so, I assumed that all income taxes arising from portfolio interest and dividends would be paid from the portfolio itself. This allows us to compare taxable and tax-deferred portfolios on an equal footing; in effect, I treat a tax-deferred portfolio as a taxable portfolio with a zero tax rate on portfolio income.

Wendy: Sounds reasonable.

Bengen: Unfortunately, there are some new problems that arise when analyzing taxable accounts. For one, assumptions must be made about income tax rates far into the future. Because I am not a seer, I assumed they would remain the same as they are today. In addition, it is difficult to estimate the capital gains taxes that would have to be paid year to year as a result of buying and selling in the portfolio. These taxes, of course, would have to be charged to the portfolio. In the end, I decided to ignore them. I assumed we would minimize any buying or selling, or use index or other tax-advantaged mutual funds to control that aspect. Assuming such annual tax losses are small, they can be offset in the analysis by assuming a slightly higher rate of income taxes than you expect likely to occur.

Another significant point is that dividend yields on large-company stocks generally were much higher before 1959 than they have been since then. By way of illustration, the average dividend yield on large-company stocks in the years 1926 through 1958 was about 5.5 percent; since 1959, it has averaged only 3.8 percent. Thus, a lot more of the total return of stocks in the earlier years came from dividends, as opposed to capital appreciation. Thus, when I reconstruct the investment performance of those older portfolios, using current income tax rates, it tends to overstate the income taxes that probably would be paid on similar total return performance in the future. This makes my "safe withdrawal" numbers a little bit more conservative.

John: So it's really impossible to compare performance in two different

cras—too many things change.

Bengen: Unfortunately, that's true. A limitation of my analysis is that we can never be sure how closely the future will resemble the past. Just the same, the past is all we have to guide us. I've prepared the results of my analysis in a chart for your review (Figure 5).

For each of a representative group of income tax brackets, I've computed in this chart the maximum first-year withdrawal that could be taken to be assured that your taxable portfolio will last at least 30 years, based on past conditions. As in my earlier analyses, withdrawals are increased by the Consumer Price Index (CPI) percentage during the year.

Note that the top line of the chart, for zero-percent tax rate, is the result I gave in my earlier research for tax-deferred accounts. It maxes out at about 4.1 percent for a stock allocation of about 55 percent. It is clear from the chart that as the tax rate is increased, the maximum withdrawal rate declines. This matches expectations, because the portfolio is earning ever lower after-tax rates of return as the tax rate climbs. Withdrawals must thus be reduced to preserve portfolio capital.

Investors in the 20-percent tax bracket (combined state and federal)

should withdraw roughly 7 percent less out of a taxable account than out of their tax-deferred accounts, while folks such as yourself in the 35-percent combined bracket will have to take about 12-percent less. Withdrawals are further diminished at yet higher tax brackets.

Let's apply the percentages in the table to your actual situation. You have approximately \$300,000 in a taxable account, and about the same amount in a rollover IRA. I estimate that you will be in the 35-percent tax bracket throughout retirement. Thus, to be "safe," you can withdraw a maximum of 4.1 percent from your IRA, or about \$12,300, during the first year of retirement. You will have to settle for less from your taxable account: 3.6 percent, or slightly more than \$10,800. Combined, your first annual withdrawal will be \$23,100, before payment of any income taxes arising from the withdrawals.

Note that I have rounded off the withdrawal percentages in using them in computation. I never want to give the impression that there is a high degree of precision in these kinds of analysis. My conclusions are based on empirical data for the last 70 years, which could differ significantly from data for the next 70 years. We are practicing more art than

FIGURE 4

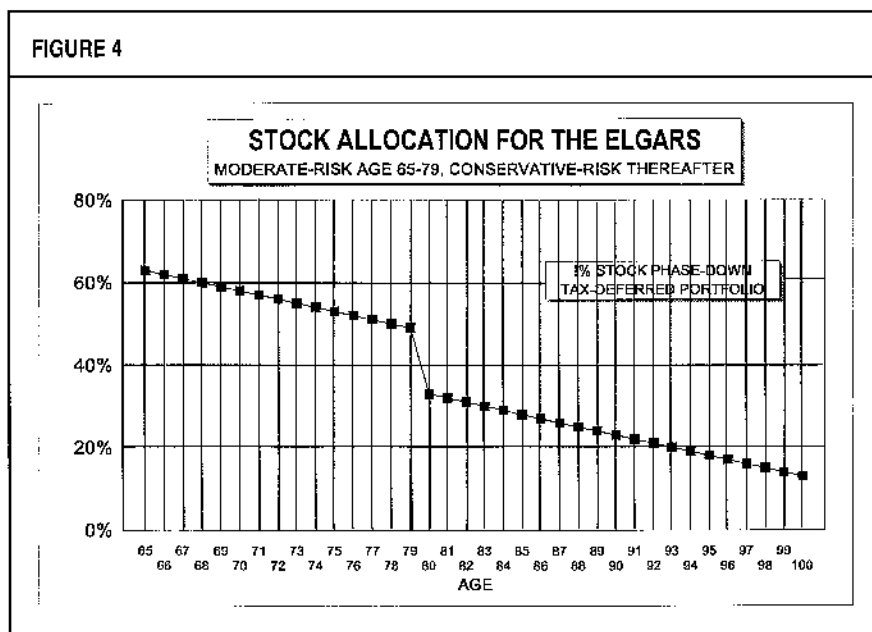
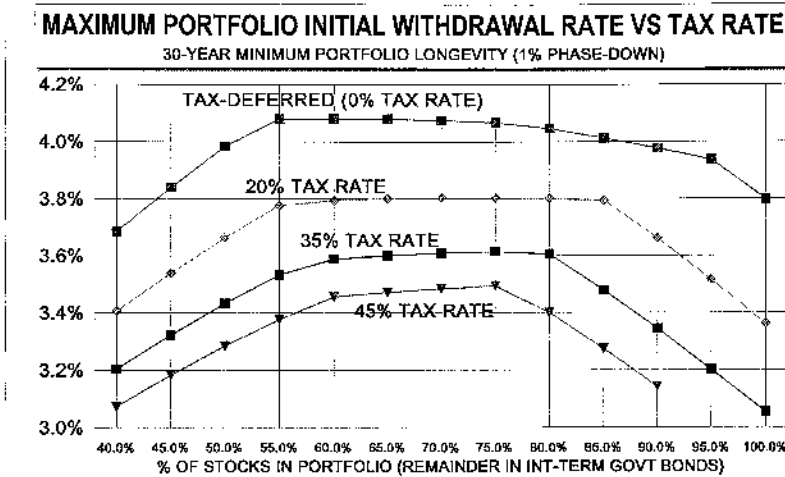


FIGURE 5



stock allocations is about five percent higher than for tax-deferred accounts. This is no doubt a consequence of the need for more of a higher-return asset in the portfolio to offset the depletion caused by taxes.

The asset allocation formula for your taxable account would be

$$\% \text{ of portfolio in stocks} = 133 \text{ minus your age}$$

Plugging in your age of 65 yields an asset allocation for stocks of 68 percent—5 percent higher than for your tax-deferred account. That is the allocation I would recommend.

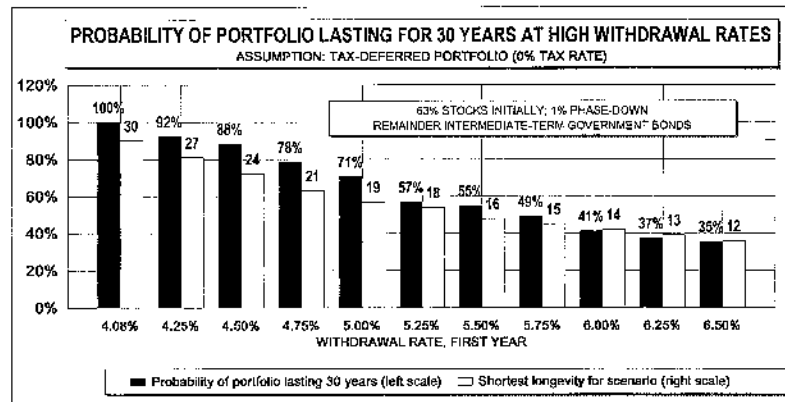
Withdrawals Above the 'Safe' Level

Wendy: Bill, we're not sure we can get by as we'd like on just four-percent—or even less—withdrawals from our accounts. What if we wanted to make larger withdrawals, such as five percent?

Bengen: Consider Figure 6. This chart applies to tax-deferred accounts, such as your IRAs, using the one-percent phased approach to stock allocation. It depicts what happens to the longevity of your investment portfolio as you increase the amount you withdraw the first year (as well as succeeding years). The pair of bars on the far left of the graph represents a withdrawal rate of 4.08 percent, which is the maximum "safe" withdrawal rate, in that it "assures" that your portfolio will last 30 years under all conditions, as experienced in the past. The left bar of the pair represents the probability that you will achieve the 30-year figure; since this is a "safe" scenario, it has a value of 100 percent. The right bar of the pair represents the shortest portfolio longevity you are predicted to experience. As expected, the bar is 30 years high.

As we move to the right on the chart, the initial portfolio withdrawal rate increases. As expected, the probability of a 30-year minimum longevity declines from left to right. At a withdrawal rate of 5 percent, for example, you have a 71-percent chance of having your portfolio last 30 years. That means almost 30 percent of the time, your port-

FIGURE 6



engineering here; there is considerable room for subjective judgment.

John: It's disappointing to learn we must take so much less out of taxable accounts.

Bengen: The silver lining is that, after taxes, you may get more out of your taxable account than out of your IRA. That's because the IRA withdrawal is fully taxable, at 35 percent for you, while there may be little or no income taxes to pay on withdrawals from your taxable account. This ignores the possibility that there may be some capital

gain taxes to pay on your taxable account if you sold an investment to facilitate your withdrawal.

Wendy: How about our initial stock allocation? Will that be 63 percent, the same as for our IRA?

Bengen: As you can see from the 35-percent tax rate line on the chart. That would place you near the maximum withdrawal rate, so that choice would be acceptable. However, having examined these and similar charts carefully for other longevity, it appears that for taxable accounts, the desirable range for

folio will last less than 30 years.

John: Those sound like pretty good odds. That would allow us to withdraw over 20 percent more money each year than in the "safe" scenario.

Bengen: Yes, but that's not the whole picture. Note that the five-percent withdrawal rate historically has produced a minimum portfolio longevity of only 19 years. In fact, if you look at the "portfolio longevity" chart for the five-percent scenario (Figure 7), you will see quite a few instances when the portfolio longevity slips into the low twenties. That might not get you through retirement! Using Figure 6, you can choose a withdrawal rate that matches your own comfort level, balancing the chances of success against the consequences if you fall short. As a further aid to your thinking, Figure 8 is a chart for your taxable portfolio that assumes a 35-percent tax rate and a 68-percent starting stock allocation (Figure 8).

Careful analysis of Figures 6 and 8 reveals that taxable portfolios perform about the same as tax-deferred portfolios. For example, as we noted earlier, an increase of the initial withdrawal rate on the tax-deferred portfolio from 4.08 percent to 5 percent (about a 22-percent increase in withdrawals) corresponds to a 71-percent "success" rate. For a taxable portfolio with a 35-percent tax rate, a 22-percent increase in withdrawals from the "safe" rate of 3.61 percent would be 4.42 percent. Interpolating on the chart, that matches a 71-percent "success" rate—the same as for the tax-deferred portfolio. The corresponding minimum longevitys are also about the same.

Thus, for the purpose of deciding by what percentage to exceed the "safe" withdrawal rate, the probabilities of making it through retirement are about the same for tax-deferred and taxable portfolios. You can choose from these charts the odds you feel comfortable with, and we can adjust your initial withdrawal rate accordingly. I would advise you to be careful with any withdrawal rates having a probability of "success" much less than 85 percent, which corresponds to an increase in with-

drawals above the "safe" level of about 11 percent, and a minimum portfolio longevity of about 24 years (age 89 for you). That's a personal bias. I hate to see people run out of money—particularly if they're my clients!

Early Retirement: Tax-Deferred Portfolios

Ben and Suzy Cohen also are new clients of mine. Both are about age 50. Ben has had great business success, has accumulated considerable capital, and wants to sell his business soon and "live the good life." They

are familiar with my earlier article, as well as the additional research I have done for the Elgars. They both are quite conservative, and have normal life expectancies.

Ben: Bill, does the fact that we are retiring so much earlier than the Elgars affect how much money we can withdraw from our savings?

Bengen: Yes, it does. The analysis of your situation is very similar to what I did for the Elgars, except that you need an additional 15 years of portfolio longevity, as you are 15 years younger. Therefore, we need to find withdrawal

FIGURE 7

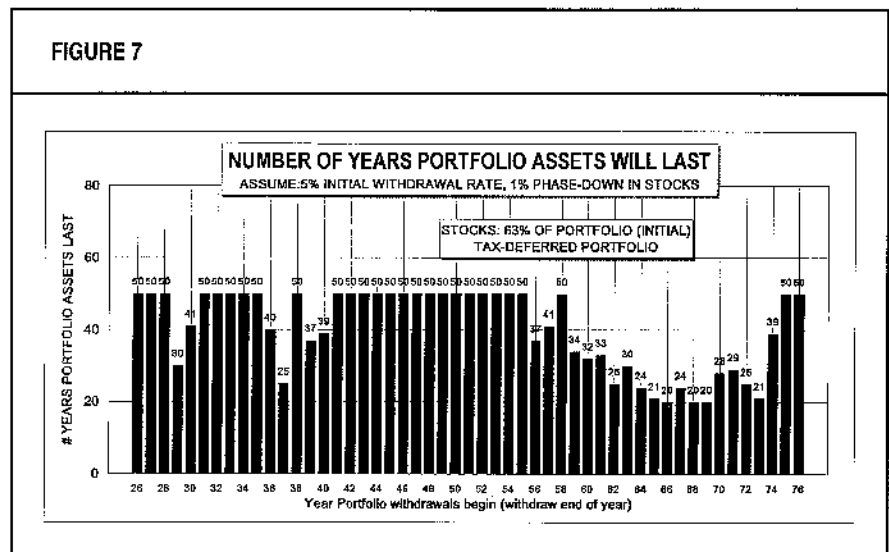


FIGURE 8

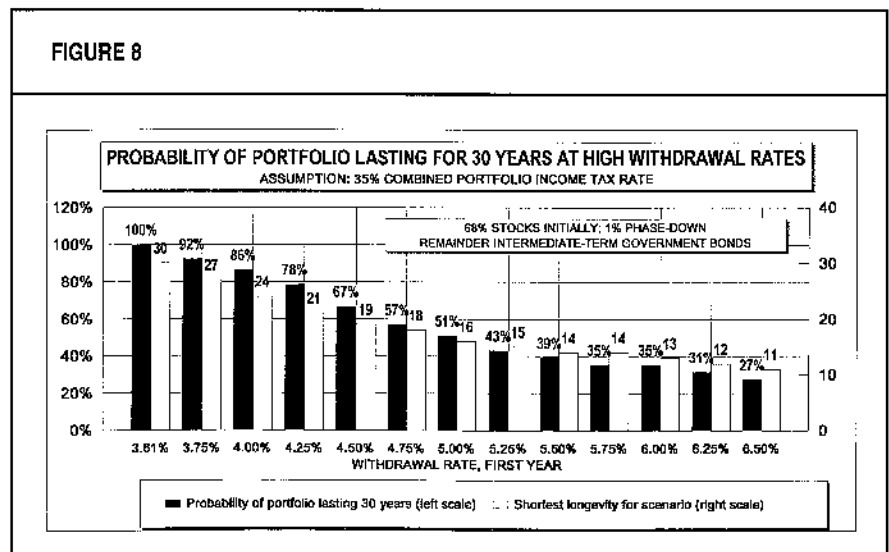


FIGURE 9

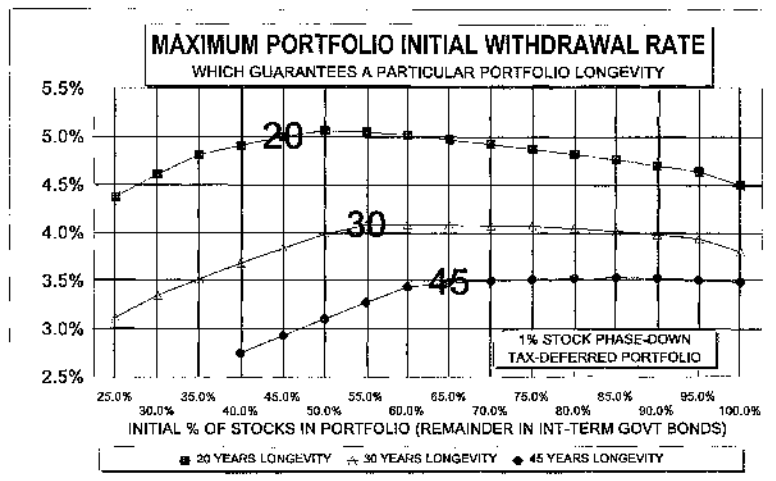
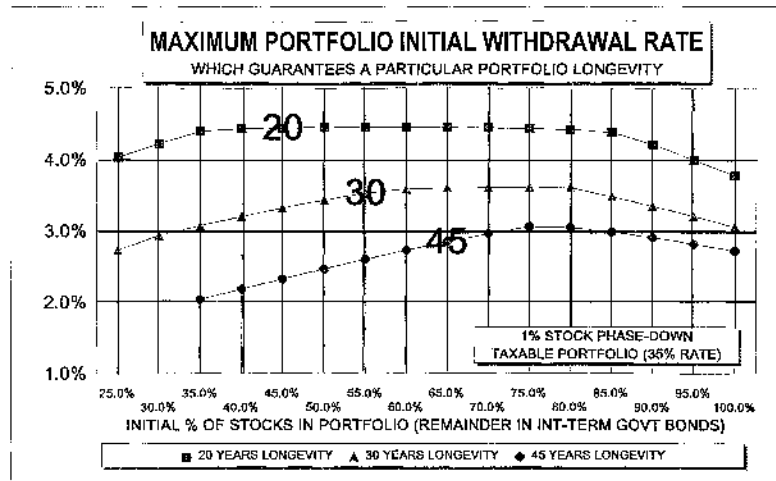


FIGURE 10



solutions that will satisfy a minimum portfolio longevity of 45 years. Please study Figure 9.

This graph relates withdrawal rate to stock allocation for each of three minimum portfolio longevitys: 20, 30 and 45 years (equivalent to ages at retirement of 75, 65 and 50, respectively). The portfolios all are tax-deferred, and they all

employ the one-percent stock phase-down. There are several patterns to note here. A casual examination of the chart, looking from top to bottom, reveals that maximum withdrawal rates decline with increasing portfolio longevity. This is not unexpected, since long-lasting portfolios need less pressure from withdrawals in order to survive stock market events.

A subtler pattern, which emerges when examining the graph from left to right, is that as the portfolio longevity increases, the point of maximum withdrawal rate is reached at higher levels of stock allocation. This is another way of saying the younger you are, the more stocks you need in your portfolio in order to make it last.

Perhaps the subtlest pattern of all is that the "plateau" areas of each line on the graph are about the same width. This means that one's selection of stock allocation is restricted to about a 25-percent range, independent of the portfolio longevity selected. The range may be shifted left or right on the chart, but will be the same width. Furthermore, the amount of shifting is linear: Ten additional years of longevity shifts the stock allocation range by ten percent to the right. Together, these will permit the use of a dramatically simple method of selecting asset allocation for a tax-deferred portfolio.

Examining your particular line on the chart, the 45-year longevity, it yields a stock allocation of 65 percent to 90 percent. We might have included 95 percent and 100 percent as well, as their withdrawals are not significantly different from the others, but such stock allocations are not appropriate, in my judgment, for the same reasons I stated for restricting the upper end of the Elgars' stock allocation range.

You have defined yourselves as conservative-risk clients. Thus, I will recommend that you choose the stock allocation at the low end of the range, or 65 percent. I will reduce your stock by one percent a year, according to the following formula:

$$\% \text{ of portfolio in stocks} = 115 \text{ minus your age}$$

The corresponding formula for a moderate-risk client is

$$\% \text{ of portfolio in stocks} = 128 \text{ minus your age}$$

For an aggressive client the formula is

$$\% \text{ of portfolio in stocks} = 140 \text{ minus your age}$$

Finally, we can combine all three equations into one:

$$\% \text{ of portfolio in stocks} = (115 \text{ to } 140) \text{ minus your age}$$

This consolidated formula encompasses the range of choices I recommend to my clients in the way of stock allocation in tax-deferred accounts at retirement. The constant in the equation may be set at any value from 115 to 140 to reflect the particular "risk profile" of the client. Regardless of which number is chosen in the 25-digit range, the resulting portfolio is designed to last until at least age 95. Furthermore, the "safe" initial withdrawal rate is virtually the same for any choice made by the client within this range.

This formula will be appropriate for any retirement client, at any age, with a tax-deferred portfolio, whether or not he or she chooses to phase down.

Early Retirement: Taxable Portfolios

Ben: Most of our money will be in a taxable portfolio upon the sale of my business. Are there simple formulas like that for taxable portfolios, as well?

Bengen: Let's explore that with the aid of Figure 10. It depicts portfolios subject to a 35-percent tax rate. If you compare it with Figure 9, which concerns itself only with tax-deferred portfolios, you will find many similarities.

However, there are significant differences. First, all withdrawal rates are about half a percentage point-or-more lower than on the tax-deferred chart. This is to be expected, as taxes are draining money from the portfolio; to preserve longevity, withdrawal rates must be lowered. Furthermore, the peak range of withdrawal rates for each curve appears shifted to the right (relative to Figure 9) about five percentage points of stock allocation, a phenomenon we observed earlier.

These observations can be summarized in a formula just for taxable portfolios:

$$\% \text{ of portfolio in stocks} = (120 \text{ to } 145) \text{ minus your age}$$

This formula applies to taxable portfolios for retired investors of all ages who wish to maximize their withdrawals during retirement, and who want assurance,

based on historical precedent, that their portfolio will not run out before age 95. It applies both to phased and non-phased portfolios.

As conservative investors, you will use 120 in the above formula, yielding a stock allocation of 70 percent at your age of 50. Identifying this point on the "45" curve in the chart, we find it corresponds to a withdrawal rate of about 3.0 percent. This is very close to the peak withdrawal rate on the curve. Applying this percentage to your estimated taxable portfolio of \$3.8 million, you should be able to enjoy withdrawals of \$114,000 a year. Remember that the portfolio will pay any taxes on ordinary income, so the withdrawal will not be diminished by taxes.

Pre-retirement Asset Allocation

Charlie Kono is a brilliant systems engineer with a local high-tech firm. He is only 32 years old, but is interested in saving for retirement, and contributes the full annual limit to his 401(k) plan. He came to me for guidance on his asset allocation.

Charlie: I read your article, as well as the material you prepared for the Elgars and the Cohens. How does it all apply to me? I'm not planning to withdraw any money for many years.

Bengen: Charlie, your goal is to maximize the growth of your wealth over the next 30-or-so years. You wish to be aggressive in your allocation to stocks. If I plug those parameters into my models, I come back with the answer: invest your money 100 percent in stocks until the day you retire. Under all scenarios that have occurred over the last 70 years, this will result in the greatest accumulation of wealth in a tax-deferred portfolio over a 30-year period.

Charlie: Let's do it, then!

Bengen: Not so fast! My approach computes the withdrawal rate from the value of your portfolio at the time of retirement. What if a stock market crash occurs just before you retire? Let us say, before the crash, you had accumulated \$3 million and were planning to withdraw four percent, or \$120,000 a year.

Suddenly, your portfolio is worth 40 percent less and your withdrawal rate is lower by 40 percent also, or \$72,000. How would you feel?

Charlie: Pretty disappointed, I guess. That would be a real hit to take.

Bengen: Yes, it would. Under those circumstances, it might be hard to appreciate that even after a 40-percent loss, you still had accumulated more money than you would have under any other asset allocation scheme. Inflated market values before the crash gave you the impression of possessing greater wealth than you really had. Your expectations were inflated by paper profits. It would be hard to shake off a feeling of real loss.

Charlie: Perhaps we should reduce our stock allocation a few years before retirement to prevent that disaster from happening.

Bengen: Sounds good on paper. Let's say that three years before retirement, you reduce your stock allocation from 100 percent to 63 percent, your planned asset allocation at retirement. Over the next three years, stock prices rise almost 50 percent. How would you feel then?

Charlie: Like I missed the boat.

Bengen: Exactly. In both situations, you've been trapped by the old market emotions, fear and greed. Market timing, which is what you unwittingly suggested, is not a solution I recommend. It's proved far too unreliable. Instead, I recommend that we employ the same phased approach in your stock allocation as did my retired clients.

Charlie: But won't that cost me considerable wealth?

Bengen: It will cost you some wealth. But in the long run, I believe the one-percent phased approach will help you accumulate more wealth than otherwise, because it imposes a strict discipline with respect to your asset allocation, and eliminates emotions from decisions about your investments.

Charlie: How do we determine what stock allocation to start with?

Bengen: You've classified yourself as an aggressive-risk investor. Thus, the applicable formula for your 401(k)

Appendix A: Assumptions of Computations of Portfolio Longevity

Some assumptions were necessary for preparation of the "portfolio longevity" charts in this article. For 1946 and later years, there is insufficient data at this time to generate 50 years of portfolio performance (my data includes the years through 1994). Therefore, I extrapolated the missing years at the average return rates of 10.3 percent for stocks, 5.2 percent for bonds and 3.0 percent for inflation—a concession to the "averaging" approach, but one that was unavoidable. Although this will probably not have a major effect on older portfolios, since most of their data is real, it points up that we really do not know how the retirement portfolios of the 1980s will ultimately play out. Hence, I have elected to end the charts arbitrarily at 1976, for which we have a solid 18 years of actual data.

Second, changes in portfolio values were computed as follows: assume a portfolio had an initial value of \$1 million, consisting of \$500,000 in stocks and \$500,000 in Treasuries (50/50 allocation). During the first year, according to Ibbotson data, stocks returned ten percent, and bonds returned five percent. Therefore, stocks increased in value to \$550,000 during the year and bonds to \$525,000, giving a new portfolio value of \$1,075,000. The initial withdrawal rate is assumed to be four percent, which is multiplied by \$1 million to give a preliminary withdrawal amount of \$40,000. However, inflation during the year (also according to Ibbotson) was three percent, so the withdrawal amount is increased by three percent to \$41,200. This leaves \$1,033,800 in the portfolio. Note that withdrawals are assumed to occur at the end of each calendar year.

At the beginning of the second year, the portfolio is rebalanced to the 50/50 allocation; stocks begin the year with a value of \$516,900, as do bonds. Assuming a 12-percent rate of return for stocks during the second year, and a six-percent rate of return for Treasuries, stocks grow to \$578,928 and bonds grow to \$547,914. This gives a new portfolio value of \$1,126,842. The previous year's withdrawal of \$41,200 is increased by the inflation rate of two percent during the second year, giving a withdrawal amount of \$42,024 and a final portfolio value of \$1,084,818. This process is repeated for each succeeding year. Observe that the second year's withdrawal of \$42,024 is approximately 4.1 percent of the year's starting portfolio value of \$1,033,800.

A portfolio's "longevity" is the number of years until the portfolio's year-end value dips below zero dollars.

account is:

$$\% \text{ of portfolio in stocks} = 140 \text{ minus your age}$$

Charlie: At my age of 32, that yields a stock allocation of 108 percent. That doesn't leave much room for bonds, does it?

Bengen: An acute observation.

Naturally, we would cap your stock allocation at 100 percent for the next eight years, after which it would be reduced by 1 percent a year. This formula will last you your entire lifetime. You won't need to use pie charts to compute your asset allocation at different ages. When you retire, the only change will be that you will start to make withdrawals. The same formula will continue to operate.

Actually, perhaps the formula is sug-

gesting that you should buy some stocks on margin now, effectively raising your allocation to 108 percent.

Charlie: According to the formula, if I retire at age 65, I'll have 75 percent in stocks. What if I want less at that time? Or sometime before then?

Bengen: At any time, you can reclassify yourself as a moderate-risk or conservative-risk investor. We'll adjust the constant in your formula and rebalance your portfolio accordingly. However, I would caution you not to let normal market fluctuations influence you in this regard. Reclassifying your status as an investor should be a long-term commitment, ten years or more. Anything less will cause you to be whipsawed.

Charlie: How about money in a taxable account?

Bengen: We will employ the taxable version of the formula for an aggressive investor:

$$\% \text{ of portfolio in stocks} = 145 \text{ minus your age}$$

Thus you will be 100 percent in stocks in your taxable account until age 45, at which time we will begin phasing down. The two formulas I have developed can now be seen to apply to any investor, at the earliest age at which they consider themselves long-term investors. No more pie charts!

Conclusion

Lifetime asset allocation for virtually all clients can be managed through use of the following two asset allocation equations:

Tax-deferred accounts:

$$\% \text{ of portfolio in stocks} = (115 \text{ to } 140) \text{ minus your age}$$

Taxable accounts: % of portfolio in stocks = (120 to 145) minus your age

These equations result in a gradual phase-down of stocks during a client's lifetime. Conservative-risk clients, heavily interested in capital preservation, would use 115 and 120, respectively, as the constants in the above equations; aggressive-risk clients, interested in capital accumulation as well, should choose 140 and 145. All other clients can use some number in between. The vast majority of clients would be expected to use a number in the middle of the range, namely 128 and 133. Clients may change their risk preference and asset allocation equation at any time.

During retirement, the initial withdrawal rate is virtually independent of the asset allocation, as defined by the above formula. Therefore, conservative-risk investors do not suffer any immediate disadvantage versus other investors in terms of income. Moderate-risk and aggressive-risk investors, however, could enjoy much greater growth of wealth under favorable market conditions.

The initial withdrawal rates for taxable portfolios are lower than for tax-

deferred portfolios of the same portfolio longevity. For a taxpayer in the combined 35-percent bracket, that difference is about half a percentage point.

However, because taxes already have been paid on the investments in taxable portfolios, clients will get a greater after-tax yield from a taxable account of the same size as a tax-deferred account.

Clients who wish to withdraw more than the "safe" withdrawal level can be offered a continuum of choices in terms of the probability of their portfolio successfully lasting to age 95 at the higher withdrawal level. These probabilities are the same for taxable and tax-deferred portfolios, when they are computed in the same manner. The client also should take into consideration the shortest portfolio longevity experienced in the past at the desired higher withdrawal rate. I consider probabilities less than 85 percent quite risky for most individuals; these scenarios have portfolios that could be exhausted as early as age 89.

Finally, no special significance should be attached to numbers beyond the first decimal point in this analysis. The data base is limited in scope, and the next 70 years might be much different from the last 70 years. As a result, the parameters in any equations, or in any of the charts, may change with the passage of time. Terms such as "safe" and "guaranteed" should be viewed with the same caution and skepticism as they might in any other context. ■

Bibliography

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