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Retirement Planning

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How Much Is Too Much? The Dilemma of Consuming Assets in Retirement

By
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Yogi Thambiah and
Eric Stubbs

Francis Gupta, Yogi Thambiah and Eric Stubbs analyze the amount of assets needed from the beginning of retirement to the end while accounting for risk tolerance.

Introduction

In this article we analyze a common problem faced by individuals at retirement: Given a pool of assets, how much should a retiree plan to spend each year? The optimal spending rate per dollar of retirement assets is called the “real target spending rate.”¹ The solution to the problem described above is important for two reasons. First, in the near future, an increasing number of baby boomers will phase into retirement and, therefore, be faced with this exact problem. Second, given the uncertainty of the future rates of inflation, return on assets during the accumulation period, and life spans, it is a difficult problem for most individuals to solve. However, getting it wrong in either direction can have serious consequences for a person’s retirement.

At the time of retirement, an individual has accumulated a certain pool of assets. In ideal circumstances, the individual incorporated his or her desired real tar-

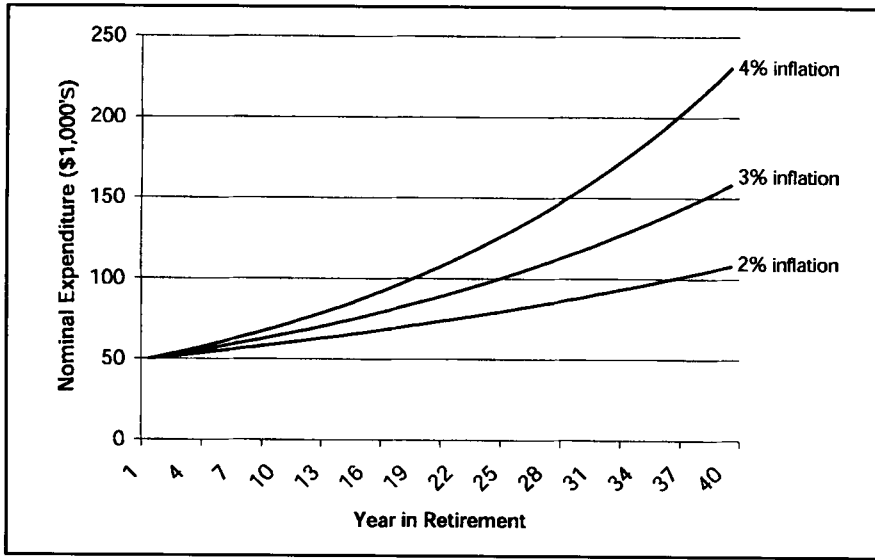
get spending rate during retirement while building his or her nest egg and achieved the desired result. In this best case scenario, the individual just consumes his or her assets at the desired real target rate. However, a more realistic scenario is one in which the individual entirely ignored the problem of spending during retirement or, because of market uncertainty, the desired nest egg was not realized. An unanticipated change in personal circumstances may also result in reevaluating the real target spending rate in retirement.

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Chart 1
A Real \$50,000 Expenditure Expressed in Nominal Dollars



The Real Target Spending Rate

Throughout this analysis we deal with real expenditures; therefore, Chart 1 presents the impact of inflation on a real annual cash flow of \$50,000. It is evident that inflation has a very significant impact on nominal spending. For annual inflation rates of 2%, 3% and 4%, a real \$50,000 expenditure translates into a nominal expenditure of \$80,000, \$102,000 and \$128,000 in the 25th year of retirement, respectively.² To be able to spend at the same inflation-adjusted level throughout retirement requires a substantial increase in the outflow of nominal dollars. Inflation, by itself, can reduce the value of a nest egg dramatically.

To determine how long an asset base will fund retirement, you need to know both the dollar amount of expenditures and the size of the nest egg. These two variables are summarized in the real target spending rate—the initial year expenditures per dollar of initial assets. This simplifies the problem by allowing us

to consider one variable (the real target rate) instead of two (expenditures and assets). We assume also that once the target rate is set relative to initial assets, each year's desired consumption is simply the initial year's dollar value increased by inflation.

Then, assuming that an individual has \$1 million in retirement assets and annual inflation

is 3%, Chart 2 shows the nominal cash expenditures for real target rates of 4%, 5% and 6%, respectively. In other words, the real annual cash expenditures during retirement are constant at \$40,000, \$50,000 and \$60,000, respectively.

It is more than evident from Chart 2 that the total funds required to meet retirement needs increases substantially with an increase in the real target rate. In fact, in this example, increasing the target rate by one percent increases the total nominal assets required over the 40-year period by about \$75,000. The total nominal assets required to fund a 5% real target rate over 40 years of retirement is about \$3.77 million!

Uncertainty in Investment Returns and Retirement Funding

It is now clear why trying to meet retirement goals with certainty is

Chart 2
Nominal Expenditures for Different Real Target Rates

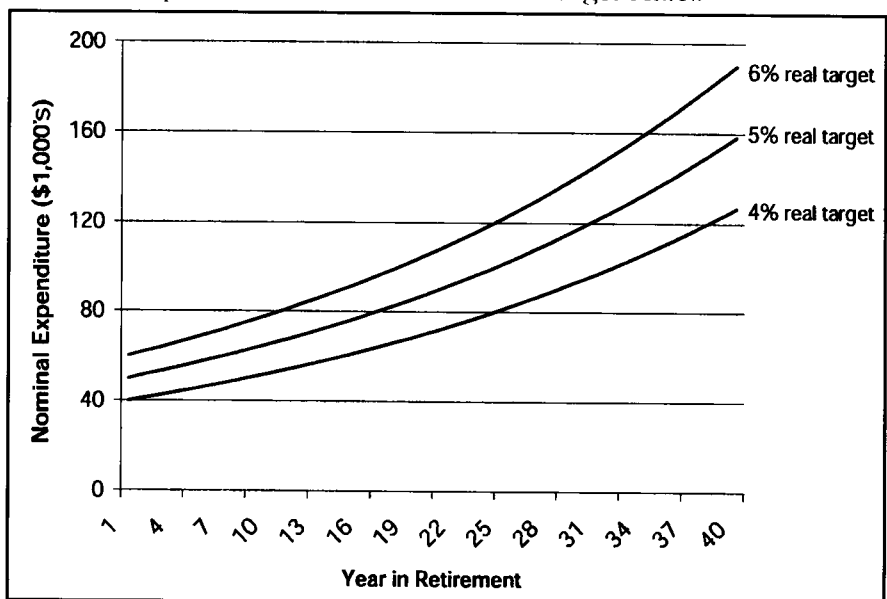
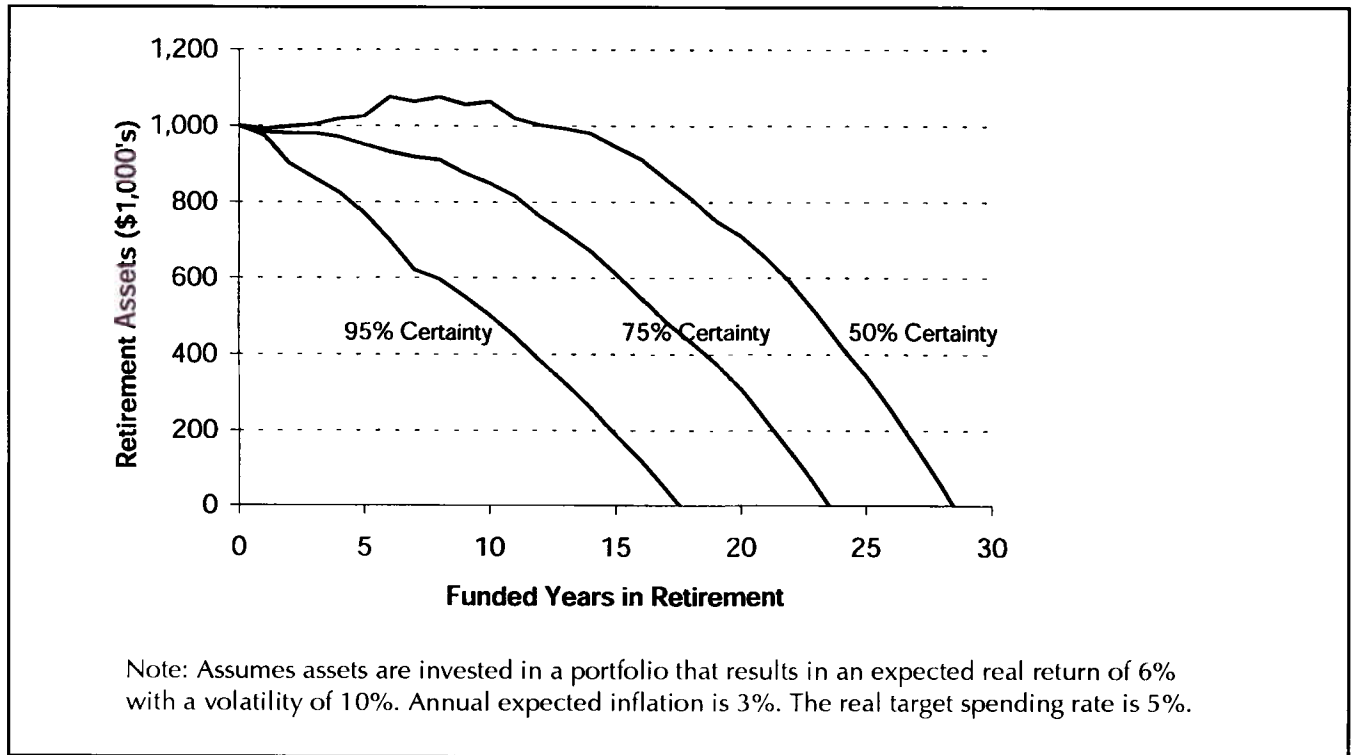


Chart 3
The Distribution of Funded Years in Retirement
Resulting from Portfolio Risk



a formidable task and requires a substantial pool of assets at retirement. However, since 40 years is a long enough horizon, an individual with less than the required nest egg may make use of a diversified portfolio to grow assets at a rate over and above that of inflation. The higher expected return may enable the assets to fund more years of retirement. The problem is that investing in a portfolio that results in return over and above that of the risk-free rate also comes with some risk. This risk introduces an element of uncertainty to the number of years in retirement that are funded. This uncertainty stems from the uncertainty in the accumulation of assets in the risky portfolio.

To see how a risky portfolio introduces uncertainty in the number of years in retirement that are funded, consider Chart 3. The \$1

million in assets at retirement are assumed to be invested in a portfolio that has an expected real return of 3% with a volatility of 10%. The real target spending rate is 5% with an inflation of 3%. Simulating the returns of a portfolio with the assumed risk/return characteristics results in a distribution of return streams. This distribution of return streams results in a distribution of the number of years in retire-

ment that can be fully funded. The median of the funded years is the number of years that will be funded with at least a 50% certainty, while the 25th and 5th percentile of the funded years' distribution are the number of years that are funded with 75% and 95% certainty, respectively.

In Chart 3, there is a significant spread between the number of years of funding in the median case (28) and in the 75% and

Chart 4
Impact of the Real Target Spending Rate on
Number of Funded Retirement Years

Number of Funded Years	Real Target Spending Rate				
	3%	4%	5%	6%	7%
Median	60	40	28	22	18
25 th percentile	44	30	23	18	15
5 th percentile	30	22	17	14	12

Note: Assumes assets are invested in a portfolio that results in an expected real return of 6% with a volatility of 10%. Annual expected inflation is 3%.

Chart 5
Impact of Inflation on Number of Funded Retirement Years

Number of Funded Years	Inflation Rate				
	1%	2%	3%	4%	5%
Median	50	34	28	24	22
25 th percentile	31	26	23	20	18
5 th percentile	21	19	17	16	15

Note: Assumes assets are invested in a portfolio that results in an expected real return of 6% with a volatility of 10%. The real target rate is set at 5%.

95% cases (24 and 17, respectively). Put differently, there is a 50% chance that the \$1 million will fund 28 years of retirement (at \$50,000 of real consumption), and a 75% chance that it will last 24 years. However, increasing the certainty to 95% drops the period funded to 17 years!

In the rest of the article, we make use of simulated returns to analyze how a pool of assets invested in a risky fund will perform while varying the three parameters of interest: the real target funding rate, the annual expected rate of inflation and the level of aggressiveness.

Impact of Real Target Spending Rate on Funding Retirement

Chart 4 presents the impact of a change in the real target rate on the median number of years, the 25th percentile and the 5th percentile³ number of years funded in retirement.

As expected, the median number of funded years in retirement decreases with an increase in the real target rate. Doubling the real target spending rate from 3% of retirement assets to 6% decreases the median number of funded years by about two-thirds (from 60 to 22 years). However, notice

that the impact of the real target spending rate reduces with the target rate. In other words, whereas an increase in the spending rate from 3% to 4% reduces the number of years funded by 33% (from 60 to 40 years), increasing the spending rate from 6% to 7% only decreases the funded years by about 17% (from 22 to 18 years). The differences between spending 4% to 5% of retirement assets annually can be substantial. In our example, this can translate into a 12-year difference in the number of years of retirement that is funded by assets.

A more risk-averse investor may be more concerned about funding a specific number of years with more certainty than 50%. In this case, the focus might be on the 25th percentile or the 5th percentile statistic. The chart reveals that at a 3% real target spending

rate, an individual can fund 44 years with 75% certainty and 30 years with 95% certainty. Those numbers fall to 18 and 14 years, respectively, if the target spending rate is doubled to 6% of retirement assets.

Impact of Inflation on Funding Retirement

The impact of inflation on funding retirement when return on assets is volatile is presented in Chart 5. What is revealing about this chart is that although the nominal return on assets does increase with inflation (we have held the real return constant at 6%), it is not enough to mitigate the impact of inflation on the outflow of nominal dollars annually. As a result, the number of funded years declines.

A decrease in expected inflation from 3% to 2% increases the median number of funded retirement years by six (from 28 to 34 years), while an increase in expected inflation from 3% to 4% decreases the median number of funded retirement years by four (from 28 to 24 years).

Although these impacts are significant for the median number of retirement years funded, it

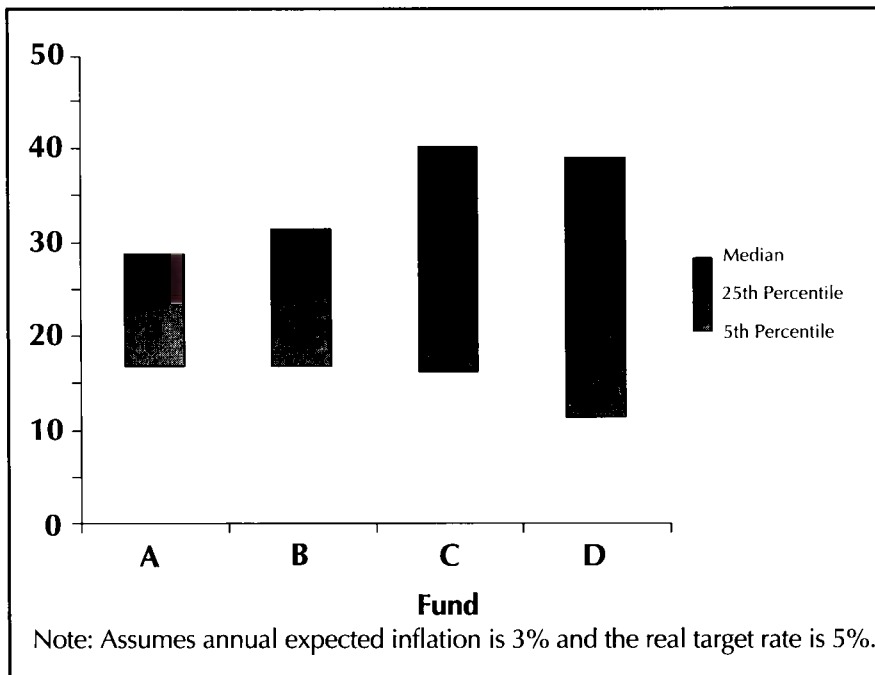
Chart 6
Four Fund Options for Retirement Assets

Fund	Expected Real Return	Expected Nominal Return	Standard Deviation	Real Return/Risk
A	6%	9.2%	10%	0.60
B	7%	10.2%	12%	0.58
C	8%	11.2%	15%	0.53
D	9%	12.3%	20%	0.45

Note: The four funds lie on an efficient frontier that is generated using CSAM's risk/return forward looking assumptions. Expected nominal returns assume an annual expected inflation of 3%.

Chart 7

Impact of the **Aggressiveness** on Number of Funded Retirement Years



may come as a pleasant surprise for the risk-averse investor that the impact of inflation is smaller on the 25th percentile and miniscule on the 5th percentile. Increasing inflation from 3% to 4%, the number of years funded with a 75% certainty declines from 23 to 20 years, while the number of years funded with a 95% certainty declines from 17 to 16 years.

Impact of Aggressiveness on Funding Retirement

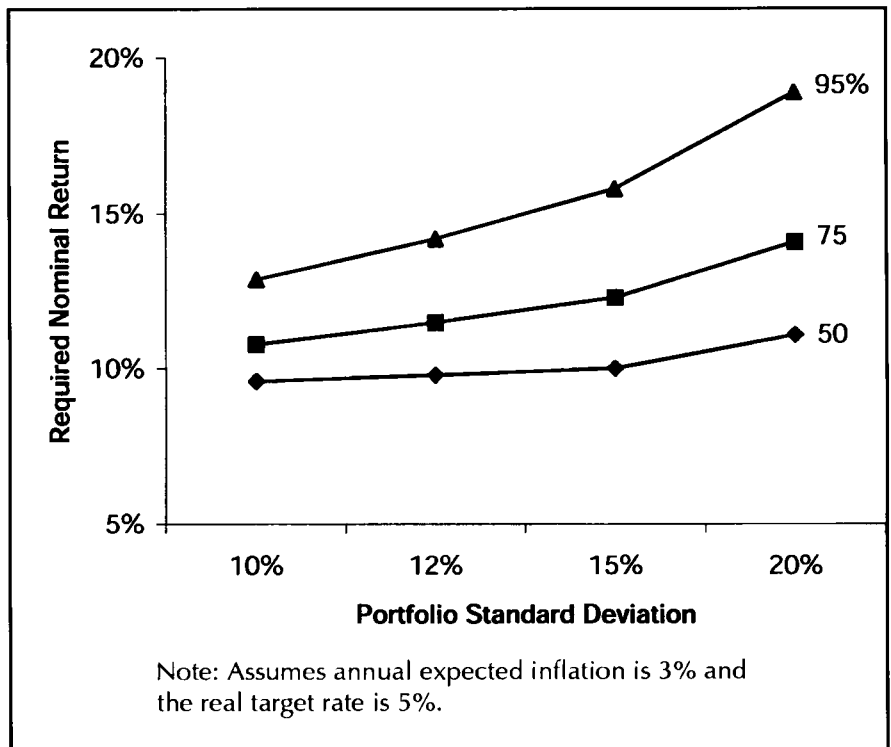
Up to this point we have assumed that retirement funds are invested in a portfolio that results in an annual expected real return of 6% with a volatility of 10%. However, an individual may choose to be more aggressive with his or her retirement assets in order to aim for a higher real return. However, we also know that additional return is generally accom-

panied by additional risk. In other words, there is no free lunch.

Increasing only the expected real return on assets (holding every-

Chart 8

Desired Nominal Return to Fund 30 Years of Retirement



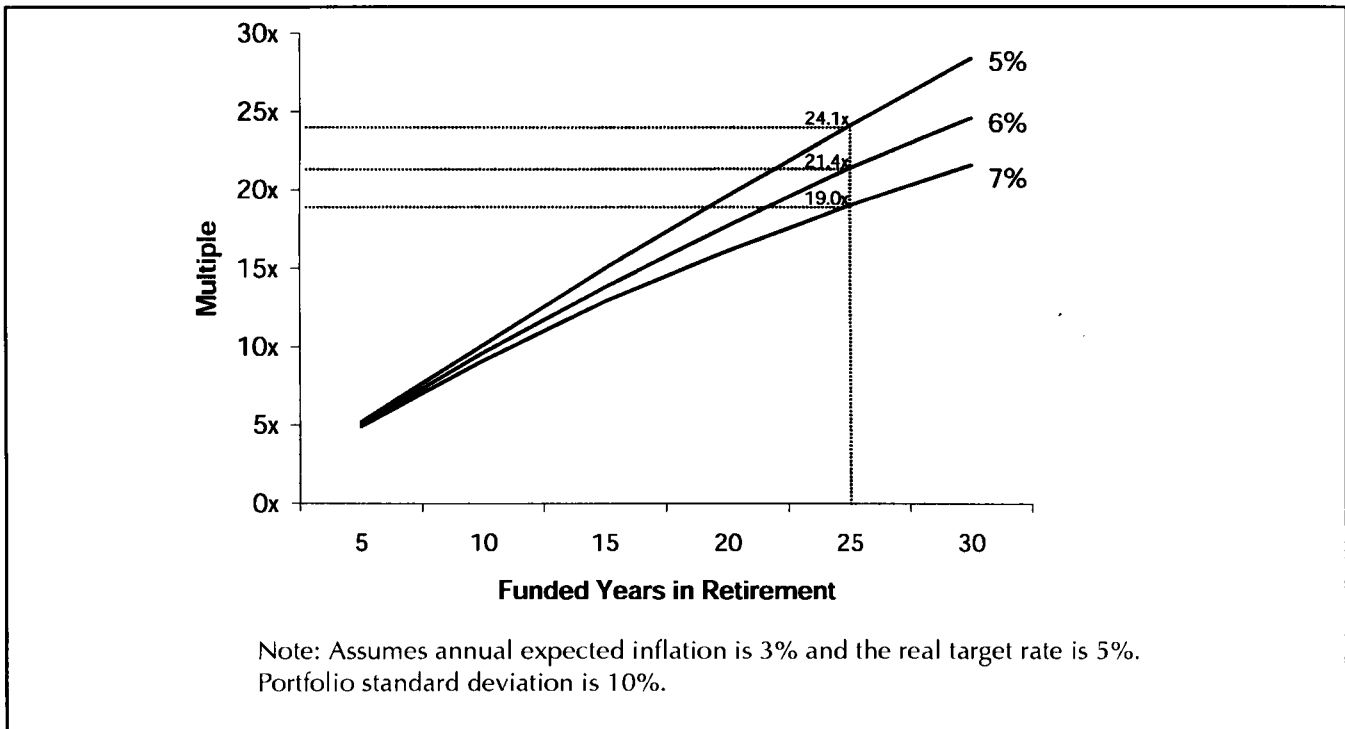
thing else constant) will, generally, increase the median number of funded retirement years. But, because we also increase the volatility, the distribution of the funded years of retirement is widening. Therefore, the 25th percentile and, in particular, the 5th percentile may actually decline. As mentioned earlier, these two statistics (that capture the risk associated with a "bad" outcome of an aggressive portfolio) may be more relevant to the risk-averse investor.

To analyze the impact of the aggressiveness of the fund on the median and 25th percentile of the number of retirement years funded, consider the four alternative diversified funds with the following risk/return characteristics. These four funds capture the risk/return trade-off, assuming a reasonable set of expected asset class assumptions.

Assuming that retirement assets are invested in one of the

Chart 9

Required Savings Multiples for Varying Asset Returns—75% Certainty



four funds in Chart 6, Chart 7 presents the expected number of retirement years funded in each one of the four cases. Increasing the aggressiveness of a fund increases the median number of funded years in retirement, except in the case of moving from fund C to fund D. In this case, the return increase (from 8% to 9%) is not enough to offset the sharp increase in volatility (from 15% to 20%). The 25th percentile also increases, except when moving from fund C to fund D. This means that up to a point, an individual interested in funding retirement with a 75% certainty will be better off with a more aggressive portfolio.

Even for the extremely risk-averse person who is looking for 95% certainty in retirement funding, the results indicate that aggressive investing may help him or her achieve his or her goals. No doubt, investing in portfolio

D instead of portfolio A increases volatility by about 10% (from 10% to 20%) and decreases the 5th percentile by five years (from 17 to 12 years), but most of this decline comes in the move from fund C to fund D. Therefore, it may be optimal for such an individual to be invested in a relatively aggressive portfolio (such as fund C), thereby increasing the median (50% certainty) of funded retirement to 40 years.

What Rate of Return Should an Individual Aim For?

If retirement assets are invested in a diversified portfolio with known expected risk/return characteristics, we can approach the problem from another angle. We can ask: Given a real target spending and anticipated inflation rate, what rate of return

should an individual's portfolio yield so that the assets fund a certain number of years in retirement with a certain likelihood? This is not a trivial exercise because, as mentioned earlier, the volatility of a portfolio will tend to change with a change in its expected return, thereby altering the different percentiles and, therefore, the degree of certainty. Nevertheless, it may be informative to obtain an idea of the desired return on assets to fund a predetermined number of years in retirement under varying portfolio volatilities. Chart 8 reports the results.

To fund 30 years of retirement with a 50% certainty, the required increase in the return with an increase in portfolio volatility is relatively small. If portfolio volatility is doubled (from 10% to 20%), then a 1.5% increase (from 9.6% to 11.1%) in nominal return should suffice. That

means that if inflation is fixed at 3%, a small increase in the real return will do. However, in reality, such an increase in the volatility of a portfolio should produce a significant increase in its real expected return.

To fund 30 years of retirement with a 95% certainty requires much larger increases in the required rate of return for increases in portfolio volatility. Doubling portfolio volatility from 10% to 20% requires an increase of 6% in the nominal rate of return (from 12.9% to 18.9%). To obtain a

portfolio return of 18.9% is quite difficult, if not impossible. To put this in context, the annualized nominal return on the S&P 500 (an asset class that has performed relatively well) has been 12.7% over the last 30 years.

Finally, using this methodology, we can also obtain estimates for total assets required for funding any number of years in retirement. Chart 9 presents the total value of a nest egg as a multiple of real spending in retirement.

Assuming that real spending in retirement is \$50,000 annually,

and if the expected return on retirement assets is 7%, a nest egg of \$950,000 (19 times \$50,000) is required to fund 25 years of retirement with 75% certainty. However, if the expected return is 6%, the nest egg required to fund the same number of years is \$1,070,000 (an additional \$120,000). Lastly, in the case that the expected return on assets is only 5%, a total nest egg of \$1,205,000 would fund 25 years of retirement with a 75% certainty.

ENDNOTES

¹ For instance, if an individual has a nest egg of \$1 million at retirement and plans to consume \$50,000 annually adjusting for inflation, then the individual's real target rate is 5%.

² Some people assume real expenditures in retirement decline with age. However, even

apart from medical expenditures, which generally rise, the evidence for this is meager. It should also be kept in mind that the inflation index for medical expenditures has historically increased faster than the CPI.

³ The 25th and 5th percentiles act as a measure of the "downside." This means that the

event will be realized with at least a 75% and 95% probability, respectively. It should be noted that the percentile of interest depends on the risk attitude of an individual. The more risk averse an individual, the more he or she would prefer to fund a given number of years with a greater certainty.