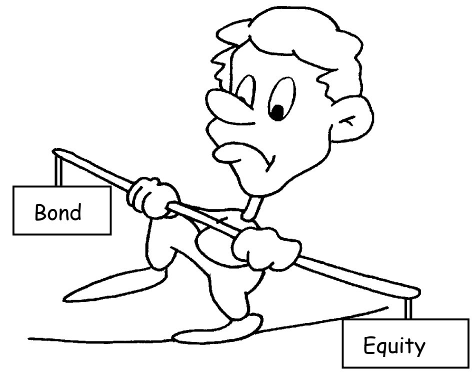
Optimizing Asset Allocation:



This is definitely not your typical day: Brad, 55, who made a lot of money in the high-tech boom of the 90's, calls you up. He got your number from a friend. He wants to open an account with you, deposit $3 million, and retire. He needs to withdraw $90,000 annually for the rest of his life, indexed to inflation.

You meet with him. During the interview, you ask him questions about his risk tolerance. Brad tells you that he made all his money taking risks. He recently read a book called "Stocks for the Long Run". He wants to invest all his money into stocks. "No thanks" he says, "I don't want any bonds! I expect to live until age 95 and I'd like to leave a large estate by investing in stock only. By the way, I don't want mutual funds, just buy me an index fund!"

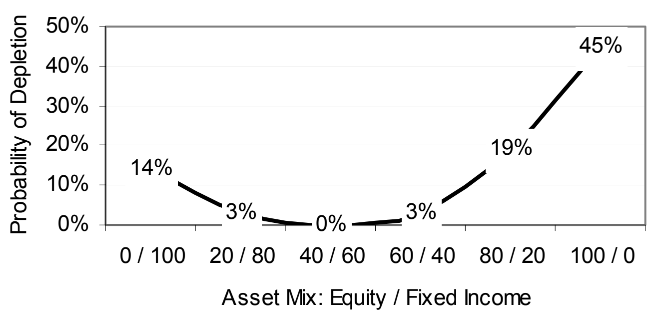
Using historic performance data for the Dow Jones Industrial Average (DJIA) and the historic inflation rates, I calculated the value of Brad's portfolio during his retirement. I assumed that he started his retirement in 1900, then 1901, and so on, for each year between 1900 and 1999. Here is how it looks:

At worst, Brad runs out of money in 15 years, at age 70. His probability of running out of money after 20, 30, and 40 years is 7%, 39%, and 47% respectively. The median portfolio value at age 95 is $317,000 –based on market history since 1900 (median is the line where ½ of portfolios has higher value and ½ lower).

Could Brad have done better? Sure. Instead of insisting on equities, he could have allowed you to implement an *optimum asset mix*. Then his portfolio would have lasted a lot longer and with much larger estate value. The optimum asset mix for Brad happens to be 40% equity and 60% fixed income[1]. When we recalculate his portfolio value retiring in each of the years since 1900 with this optimum asset mix, then the picture looks much different:

With this optimum asset mix, based on market history since 1900, Brad's portfolio would never have ran out of money before 37 years. His portfolio's probability of depletion after 20, 30, and 40 years is 0%, 0% and 5% respectively. As for the estate value at age 95, he would have had 24 *times* more money, or about $7.5 million (median value), had he chosen the optimum asset mix instead of 100% equities.

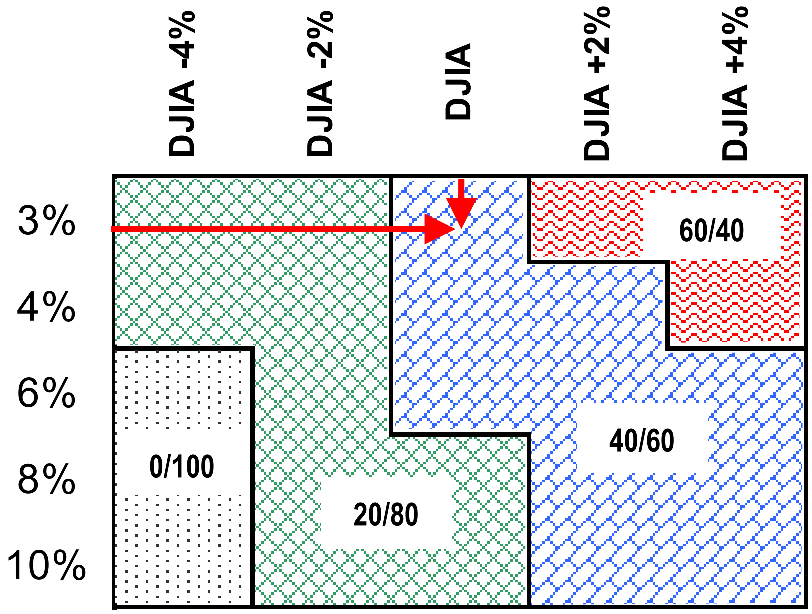
How do we establish the optimum asset mix? For retirement portfolios, we plot the probability of depletion on the vertical axis against the asset mix on the horizontal axis, as shown below. This particular chart is based on 3% initial withdrawal rate[2], and the numbers indicated are the probability of depletion for each asset mix by the 30th year.



We see on this chart that the probability of depletion is at its lowest level (it happens to be 0%) when the asset mix is 40% equity and 60% fixed income. We prepare similar charts for a range of different withdrawal rates.

The portfolio longevity also depends on how the equity portion is performing relative to the market index. If you can pick better mutual funds or portfolio managers who can consistently beat the index then the portfolio will have a longer life. Longer life means lower risk, and lower risk means more room for equities in the portfolio. We calculate the optimum asset mix for different relative performance levels as well.

We then summarize our findings in a diagram as shown below. This diagram indicates the optimum asset mix for a *retirement portfolio* for different initial withdrawal rates (the vertical axis on the left of the diagram) and relative performance levels (the horizontal axis on the top of the diagram). The optimum asset results in the longest portfolio life and the smallest probability of depletion:



Going back to your new client Brad, his initial withdrawal rate is 3% (see footnote 2) and his equities perform same as the index. Therefore, we read in the diagram above that his optimum asset mix is 40% equity and 60% fixed income, as indicated by the red arrows.

All of these findings apply to retirement portfolios, where periodic income is taken out of the portfolio. What about accumulation portfolios? How is the optimum asset allocation calculated for those who are still saving for retirement?

Well, for accumulation portfolios, instead of plotting the probability of depletion for different asset mixes, we plot the compounded annual growth of the median portfolio. Also, we use "years until retirement" as our time horizon instead of "years until death". Then we look for the asset mix where the compound annual growth is at its peak.

For accumulation portfolios, the optimum asset mix is very sensitive to the relative performance of equities in the portfolio. If they perform better than the index, then the equity percentage jumps up much more so than in retirement portfolios. If you are planning to retire in 10 years then here is your optimum asset mix:

Relative Performance of Equities	% Equity	% Fixed Income
Index (DJIA)	35%	65%
DJIA +2%	43%	57%
DJIA +4%	70%	30%
DJIA –2%	15%	85%
DJIA –4%	0%	100%

If you are planning to retire in 20 years then this is your optimum asset mix:

Relative Performance of Equities	% Equity	% Fixed Income
Index (DJIA)	36%	64%
DJIA +2%	63%	37%
DJIA +4%	74%	26%
DJIA –2%	7%	93%
DJIA –4%	0%	100%

Can we do better than the optimum asset mix? Sure we can. In future articles, we will look at optimizing the rebalancing frequency, as well as my favorite retirement portfolio asset class, the real return bonds.

Bio:
Jim C. Otar*, CFP, CMT, B.A.Sc., M. Eng., is a certified financial planner, financial writer, market technician and a professional engineer. He is the author of "High Expectations & False Dreams – One Hundred Years of Stock Market History Applied to Retirement Planning". His articles are published in various magazines in Canada, U.S. and Australia. He won the prestigious CFP-Board Award for 2001 and in 2002 for his articles, the first Canadian to win such a prestigious award.*

[1] the fixed income portfolio is split 1/3 in money market and 2/3 in a bond ladder, bond held to maturity and average duration 5-6 years.

[2] Initial Withdrawal Rate is calculated as the amount of withdrawal required divided by total retirement savings expressed as a percentage. In Brad's case, his initial withdrawal rate is 3%, calculated as $90,000 divided by $3million.