**Retirement Planning   
(based on Powell and Baker p. 478)**

**Goal**

In this team case, you will learn:

1. How to set up a non-trivial workbook following the principles of chapter 5;
2. How to perform sensitivity analysis;
3. How to work with: tornado charts, break-even analysis, one-way charts and two-way charts.

**Purpose of the Workbook**

This workbook will help Bob plan for his retirement. Bob’s goal is to find his **zero-asset** age under different assumptions. The zero-asset age is the age at which Bob’s assets will have run out (i.e., will turn negative for the first time), given his life-time savings, returns, etc. Do not answer the questions in the book, but refer to the questions and clarifications below.

RETIREMENT PLANNING

Bob Davidson is a 46- year- old tenured professor of marketing at a small New England business school. He has a daughter, Sue, age 6, and a wife, Margaret, age 40. Margaret is a potter, a vocation from which she earns no appreciable income. Before she was married and for the first few years of her marriage to Bob (she was married once previously), she worked at a variety of jobs, mostly involving software programming and customer support. Bob’s grandfather died at age 42; Bob’s father died in 1980 at the age of 58. Both died from cancer, although unrelated instances of that disease. Bob’s health has been excellent; he is an active runner and skier. There are no inherited diseases in the family with the exception of glaucoma. Bob’s salary from the school where he works consists of a nine- month salary (currently $ 95,000), on which the school pays an additional 10 percent into a retirement fund. He also regularly receives support for his research, which consists of an additional two-ninths of his regular salary, although the college does not pay retirement benefits on that portion of his income. (Research support is additional income; it is not intended to cover the costs of research.) Over the 12 years he has been at the college his salary has increased by 4 to 15 percent per year, although faculty salaries are subject to severe compression, so he does not expect to receive such generous increases into the future. In addition to his salary, Bob typically earns $ 10,000 to 20,000 per year from consulting, executive education, and other activities. In addition to the 10 percent regular contribution the school makes to Bob’s retirement savings, Bob also contributes a substantial amount. He is currently setting aside $ 7,500 per year (before taxes). All of Bob’s retirement savings are invested with TIAA–CREF (Teachers Insurance and Annuity Association- College Retirement Equities Fund; home page: www.tiaa-cref.org), which provides various retirement, investment, and insurance services to university professors and researchers. Bob has contributed to Social Security for many years as required by law, but in light of the problems with the Social Security trust fund he is uncertain as to the level of benefits that he will actually receive upon retirement and he thinks it is prudent to ignore any potential income from Social Security.

Bob’s TIAA-CREF holdings currently amount to $ 137,000. These are invested in the TIAA long-term bond fund (20 percent) and the Global Equity Fund (80 per-cent). The Global Equity Fund is invested roughly 40 percent in U. S. equities and 60 percent in non-U.S. equities. New contributions are also allocated in these same proportions. After retirement, Bob will transfer all the money into the long-term bond fund in order to reduce the volatility of his returns. In addition to his retirement assets, Bob’s net worth consists of his home (purchase price $ 140,000 in 1987; Bob’s current equity is $ 40,000); $ 50,000 in a rainy-day fund (invested in a short- term money market mutual fund with Fidelity Investments); and $ 24,000 in a Fidelity Growth and Income Fund for his daughter’s college tuition. Bob’s mother is 72 and in good health. She is retired and living in a co-op apartment in Manhattan. Her net worth is on the order of $ 300,000. His mother-in-law, who is 70, lives with her second husband. Her husband is 87 and has sufficient assets to pay for nursing home care, if needed, for his likely remaining lifetime. Upon her husband’s death, Bob’s mother- in- law will receive ownership of their house in Newton, Massachusetts, as well as one-third of his estate (the remaining two- thirds will go to his two children). Her net worth at that point is expected to be in the $ 300,000 – 400,000 range. Bob’s goal is to work until he is 60 or 65. He and his wife would like to travel, and do so now as much as his job and their family responsibilities permit. Upon retirement he would like to be able to travel extensively, although he would be able to live quite modestly otherwise. He does not foresee moving from the small town where he now lives. How can you help Bob figure out the amount to set aside for his retirement? How will his retirement savings be impacted by Bob’s assumptions about inflation rate, bond yields, etc.?

*Note:* In your model, you may ignore the rainy-day fund and the savings for his daughter’s tuition for Bob’s retirement: he will not add significantly or rely on these funds. The same holds for the equity in his house: Bob plans to live there for the remainder of his life and hence will not touch the equity in his house.

Questions for the Retirement Planning Case

Refer to the “Retirement Planning” Case attached at the end of this document. Set up a workbook to answer the questions below.

1. Develop a Base Case scenario. Use the following parameters.
   1. Currently, Bob’s annual expenses amount to roughly $75,000. This amount will grow annually with inflation. Do **not** include the extra income Bob generates from consulting, etc., but **do** include the Research support (equal to two ninths of Bob’s base salary).
   2. The annual increase in salary is 2.5%.
   3. The money for expenses (i.e., after tax) needed in the first year of retirement is equal to 50% of the **previous year’s salary** (exclude the research 2/9 support) and from then on grows with inflation. This amount is needed to cover Bob’s daily expenses and are not available for savings. But, Bob’s withdrawals also have to account for the taxes post-retirement. E.g., if Bob wants to spend $10,000 but with a tax rate of 20%, he will need to withdraw $12,500 ($2,500 go to the tax man, $10,000 is his to spend).
   4. Because of the current problems with Social Security, do **not** include any income from Social Security.
   5. Investment return pre-retirement (bonds + global equities) equals 9%. After retirement the rate drops to 5% (bonds only).
   6. The rate of inflation is assumed to be 2%.
   7. Tax rate after retirement is 30%, tax rate before retirement 33%.
   8. In addition to the 10% contributions to retirement from the College, Bob puts in $7,500 of his income (before tax) towards retirement savings in the base case. However, his extra contributions cannot exceed his total **net** (i.e., after taxes and annual expenses are taken out) income for the year.
   9. Retirement age for the base case is 65 years.
   10. At what age do Bob’s retirement savings run out?
   11. **Other clarifications:**
       * 1. The “Rainy Day” fund can be ignored for bob’s retirement: if it was not needed for a “rainy day,” Bob will spend it on travel.
         2. The inheritance situation can be ignored: Bob expects neither a liability for his mother or mother-in-law (they seem to have enough assets so that Bob need not support them financially), nor an inheritance.
2. Create a *Tornado Chart* showing the sensitivity of Bob’s age at which retirement savings run out (Call this **Bob’s zero-asset age**) versus the various input parameters. Vary each input parameter with +/- 10%.
3. What are the *minimum additional savings* (currently $7,500, all before tax)Bob needs to contribute such that Bob’s retirement assets do not run out before age 90?
4. How do Bob’s *zero-asset age* vary when both pre- and post-retirement investment returns are varied? Provide a chart for each, varying pre-retirement investment between 2% and 15%, and post-retirement return between 1% and 9%. Then, provide a three-dimensional chart where both returns are varied at the same time.
5. How does Bob’s *zero-asset age* vary with the age at which he retires? Display a chart assuming a retirement age between 60 and 70 years.
6. How does Bob’s *zero-asset age* vary with post-retirement tax rate? Vary the tax rate from 20% to 40% in 2% steps.

**Deliverables:**

* Write-up with the answers to the above questions. Include the graphs/charts you generated to answer the question.
* A copy of the Excel spreadsheet you developed.
* Email the write-up and the Excel spreadsheet to [opim5641@gmail.com](mailto:opim5641@gmail.com) .