Asset Management, Lifecycle Investing & Retirement Finance 15.467
Spring 2021
Homework 3
Due March 28, 2021

1. Portfolio Optimization with Personal Bequest Constraint
The market consists of a riskless asset with a return of 4%, and five risky assets with returns that are uncorrelated with each other, each with 20% standard deviation in return, and the expected returns are 8%, 9%, 10%, 11% and 12%, respectively, for securities A, B, C, D, and E. Get familiar with the Excel spreadsheet (Portfolio Optimizer.xls) to answer the following questions:

(a) Jane is currently 25 years old and has $100,000 in cash to invest. If she invests in the OCRA, how much will she invest in each security?

(b) Jane's great-grandfather was the founder of Company A. He has bequeathed 100,000 shares (the price is $10 per share) to Jane, which will be transferred to her upon her 35th birthday. Jane cannot short sell any securities including cash. What will be Jane's effective dollar investments if she maintained her allocations from (a)? What would her refined optimal dollar investment be in each security, taking into account her inheritance and assuming she is targeting an 8.25% expected return?

(c) Although Jane cannot short sell Company A shares, is there any way for her to invest her total wealth in the OCRA? Explain.

2. Portfolio Optimization with Human Capital Constraint
Jane is an investment banker, and John is a doctor. Both have savings worth $2 million, and both have income streams with present value worth $1 million. Assume Jane's human capital is 100% correlated to the Financial Sector's return, and John's human capital is 100% correlated to the Healthcare sector's return. Both have the same potential investments available, as shown below, in addition to a riskfree security which pays a rate of 2% per annum. All sector fund returns are uncorrelated, and short selling is not allowed.

Sector Fund	Expected Return (%)	Standard Deviation (%)
Energy	4	12
Entertainment	6	14
Financial	9	18
Food	4	9
Healthcare	7	15
Retail	6	12
Technology	11	25

(a) What is the Optimal Combination of Risky Assets given no constraints?

(b) Jane wants a target expected return of 10% for her total wealth. What dollar investments will she make in each fund and in the riskfree asset?

(c) John wants a target expected return of 5% on his total wealth. What dollar investments will he make in each fund and in the riskfree asset?