

1. **5 points** You hope to have \$2,000,000 when you retire in 20 years. You expect to earn 10% on your investments. How much must you save each year starting today (i.e., at dates 0, 1, . . . , 19) to reach your target?
2. **5 points** A five-year bond with \$1,000 face value pays coupons of \$30 every six months (the first of ten coupons will be six months from today). It is selling for \$1,100. What is its yield (expressed as an annual rate)?
3. **20 points** You are considering launching a new product. It requires spending \$40 million on new equipment that would be depreciated straight line to zero over 4 years. The equipment is not expected to have any salvage value after 4 years. You would also have to make an upfront investment of \$5 million in working capital. Afterwards, net working capital would be 50% of sales, with recovery at the end of 4 years. Anticipated sales are \$20 million in year 1, \$25 million in year 2, \$20 million in year 3, and \$15 million in year 4. Costs of goods sold is projected to be 30% of sales, and SG&A expenses are projected to be 10% of sales. Your tax rate is 40%, and your cost of capital is 10%. What is the NPV of the project?
4. **20 points** In connection with the previous problem, it occurred to you that perhaps you should plan to abandon the project after 3 years, because projected sales are so low in year 4. You think you could sell the equipment for \$5 million at the end of year 3. Does the revised project look better or worse than the original?
5. **10 points** A company's EBIAT in the past year was \$50 million. It had capital expenditures of \$40 million and depreciation of \$20 million. Its net working capital at the end of the past year was \$100 million. You project that everything (EBIAT, capital expenditures, depreciation, and net working capital) will grow at 4% forever. The appropriate discount rate is 10%. What is the value of the company?
6. **20 points** Stock A has an expected return of 10% and a standard deviation of 20%. Stock B has an expected return of 14% and a standard deviation of 25%. The correlation of the two stock returns is 50%.
 - (a) What is the expected return of a portfolio that is 50% in stock A and 50% in stock B?
 - (b) What is the standard deviation of a portfolio that is 50% in stock A and 50% in stock B?
 - (c) Plot the expected returns and standard deviations of all portfolios of stock A and stock B in which the weights on both stocks are nonnegative (no short sales).
 - (d) Suppose the risk-free rate is 2%. What is the maximum Sharpe ratio (tangency) portfolio of the two stocks? What is its Sharpe ratio?

7. **10 points** A firm's beta is 1.25. The market risk premium is 8%. The risk-free rate is 2%. The value of the firm's equity is \$3 billion, and the value of its debt is \$1 billion. Its borrowing rate is 5% and its tax rate is 40%.
- (a) What is its cost of equity capital?
 - (b) What is its weighted average cost of capital?