RE410 - Homework 1
Due September 17th

Presentation will count for 5 points.

Problem 1 (25 pts)

Consider an asset that costs $1,000, and pays a cash flow at the end of each of the next 10 years. Specifically, the first cash flow is 100, cash flows grow at rate $g > 0$ from year 1 to year 5, cash flows are then flat at their year-5 value until maturity. There is, however, a probability $p \in [0, 1]$ that no payments will be made after year 5 (default).

1. Use Excel's scenario analysis macro to calculate the asset's IRR under the following scenarios:

   (a) Baseline: $g = 2\%$, $p = 0$.

   (b) High-growth: $g = 5\%$, $p = 0$.

   (c) Low-growth: $g = 0\%$, $p = 0$.

   (d) High-default: $g = 2\%$, $p = 0.5$.

2. A client tells you that they are willing to invest in this project only provided the pay-back period is no more than 8 years. Assuming no default $(p = 0)$, how high must g be to meet that criterion?

Problem 2 (20 pts)

Find a publicly traded REIT for which at least 10 years of historical data exist, as well as publicly available estimates of the asset's beta. Throughout this problem, use data at a **monthly frequency**, which will give you 12 observations per year and will make computations easier.

1. Describe the company's portfolio in one paragraph.

2. Plot the asset's monthly close price (adjusted for dividends and splits) against the S&P500 index since January 2000. Find a way to plot both series on the same chart (two axes, normalization of both prices to be 1 in 2000 ..., find a way) so that they can be easily compared.

3. Find a definition of an asset's *beta*. Compute your REIT's beta where the S&P500 is assumed to be the market portfolio. Does you calculation come close to publicly available estimates of this statistic?

Problem 3 (30 pts)

A property buyer needs to finance a $100,000 purchase with a mortgage.

1. A bank offers a 10-year fixed-rate, fully amortizing contract with monthly payments at a yearly rate of 7% (a monthly contract rate of $r = \frac{7}{12}$ %). Use Excel to calculate payments, interest payments, payments toward principal, and the end-of-period balance over the life of the loan.

2. Assume that the buyer prefers a contract with a $30,000 balloon payment at the end of 10 years. Assuming that the yearly yield is 7% still, compute the new payment and principal schedule.

3. Assume now that the buyer prefers a contract such that payments increase by exactly g% every month, where $g > 0$. Assume a fixed rate of $r = \frac{7}{12}$%. Above what value of g does the loan begin to feature some negative amortization?

4. Holding r the same, find g so that over the course of the loan the maximum level of outstanding principal is $102,000.

Problem 4 (20 pts)

Consider a project that requires an initial equity injection of $1M. The managing owner will provide 10% of this investment, the rest will provided by a passive investor. Equity flows are 8% of the initial injection in year 1, grow by 10% every year after that. In year five, the property is sold and the reversion flow to equity is 10 times year 6 projected cash flow.

The managing owner gets 10% of net equity flows until a 10% hurdle IRR is reached by the passive investor (Tier 1), 20% of the remaining cash flows until a 15% IRR is reached by the passive investor (Tier 2) and 50% of equity flows thereafter (Tier 3.)

What are cash flows to both equity holders? What is the IRR of both equity holders?