

## Corporate Finance, Module 1: "Present Values and Opportunity Cost of Capital"

### Homework Assignment

(The attached PDF file has better formatting.)

Answer either one of the following two homework exercises.

#### Homework Exercise 1.1: Net Present Value

An entrepreneur can buy a health club for \$500,000, add new fitness equipment for \$200,000, clean, repaint, and refurbish it for \$100,000, and sell the club one year later for \$950,000. Similar projects earn 12% returns.

- A. What is the expected return from this project? (The return is the profit in one year divided by the initial investment.)
- B. What is the present value of the refurbished health club? (The value of the refurbished health club after one year is \$950,000; the *present value* discounts at the capitalization rate for the project.)
- C. What is the net present value of the project? (The net present value subtracts the initial investment from the present value of the refurbished health club. Assume all refurbishing payments occur immediately.)

*Question:* Why don't we use a discounted cash flow analysis to determine the value of the club after one year? Shouldn't we estimate the expected income and expected expenses of the health club in future years?

*Answer:* The best measure of value is market value (purchase or sale price). The discounted cash flow analysis should give the same value. If the discounted cash flow value does not equal the market value, we have mis-estimated the cash flows or the capitalization rate.

*Question:* The opportunity cost of capital is the return on the next best use of capital. If this investor's other possible projects yield 10%, but health clubs by other investors yield 15%, what is the opportunity cost of capital?

*Answer:* The opportunity cost of capital reflects the risk of the investment, not the abilities of the investor. If this investor has no abilities for other high-yielding projects, but similar health club projects yield 15%, the capitalization rate for this health club project is 15%.

*Question:* If demand for health club memberships rises because a body-builder becomes governor of the state, the yield on these projects rises but their risk does not change. If demand for health club memberships falls, the yield on these projects falls as well. Why do we say that the yield reflects the risk?

*Answer:* We assume a competitive market in a steady state. If the yield on health clubs were 20% and projects of similar risk yielded 15%, more health clubs would be opened until their yield fell to 15%.

In the *short run*, the yield on a project may differ from its capitalization rate, even if the market is competitive. If the market is also efficient, even the short-run yield should equal the capitalization rate.

*Question:* What would be an efficient market for health clubs?

*Answer:* Suppose health clubs were traded in a liquid market, and all investors estimated future income. If a body-builder becomes governor of the state and investors expect demand for health club memberships to rise, the market value of health clubs would rise *immediately*, and the expected return would be the opportunity cost of capital (except for the one instant when the market value rises).

*Question:* Don't health clubs have shares? And aren't shares traded in an efficient market?

*Answer:* Health clubs are similar to sports teams. Most health clubs and sports teams are not owned by shareholders. Many are owned by people who love baseball or love fitness. The owners are not focused only on the profit margin, though they try to make money.

## Homework Exercise 1.2: Borrowing and Lending

Firms W, Y, and Z have cash and investment projects, each of which costs \$10 million.

- ! W has \$20 million and *two* projects: one yields 11% and one yields 8%.
- ! Y has \$10 million and projects yielding 11% and 7%.
- ! Z has \$10 million and projects yielding 15% and 12%.

- A. What projects will be undertaken if there is no borrowing or lending?
- B. If the firms can borrow and lend to each other, what projects will be undertaken and what will the interest rate be? (The interest rate be a range.) Assume the firms have no other investment opportunities for their cash.

*Question:* Can a firm invest in one project this year and the other project next year?

*Answer:* The projects are available now. A project can be assumed now; it may not be around a year from now or even a month from now. The firm may be a contractor, and the project is to construct a building. If the firm does not accept the project, another contractor will construct the building.

Next year, the firm has another set of possible projects. It takes the cash it has next year and chooses the best projects.

*Question:* What does it mean that the project costs money? The contractor gets paid for the construction; it doesn't pay the client.

*Answer:* The contractor must buy equipment to construct the building. The contractor has cash and expertise. If it accepts a project, it must buy equipment, hire workers, and use cash for net working capital. At the end of the project, it sells the equipment and dismisses the workers. In practice, the contractor has equipment and workers. To evaluate if a project is profitable, we conceive of the contractor buying and selling equipment.

*Question:* Can one contractor accept a project that another contractor has? Can Firm W do a project that Firm Y or Z has?

*Answer:* Suppose the three firms are a life insurer, a property-casualty insurer, and a health insurer. Each firm has two projects: (i) build a branch office in Chicago and (ii) build a branch office in New Jersey.

Each firm is restricted to its own products. The life insurer can not sell property-casualty or health insurance products, and the same for the other insurers.

*Question:* Must a firm spend all its cash? Can it put its cash into a bank? And can it borrow from a bank?

*Answer:* These are the only six projects in the economy and the only cash available. If a firm does not invest in a project, its cash is idle and earns no income. In practice, there are thousands of firms, thousands of projects, and savings from thousands of households. This homework assignment simplifies the economy to make the intuition clear.

*Question:* How does this relate to a real economy?

*Answer:* In a modern economy, households with few good investment opportunities put their money in banks (or bonds or other financial assets). The banks lend the money to firms who have better investment opportunities. This homework assignment assumes the economy has only three firms.

*Question:* What do we learn from this homework assignment?

*Answer:* A common view is that a firm's investments depend on the cash it has. A firm with much cash will invest in many projects; a firm with little cash invests in few projects.

This is true if capital markets are imperfect: expenses, taxes, and adverse selection may prevent firms from borrowing and lending efficiently. If firms had perfect knowledge, and capital markets had no imperfections, capital would flow to the projects with the highest expected returns. The investment projects undertaken would depend on the expected returns, even if the entrepreneur has no cash of his or her own.

*Question:* In practice, capital doesn't flow to the projects with the highest expected returns. Suppose I want to sell insurance, and I expect a return of 25%. Who would give me capital to set up an insurance company?

*Answer:* Your example is shows this point. If you have a good business plan that shows you will make a return of 25%, and if you can demonstrate expertise in running an insurance company, investors will give you the capital. Entrepreneurs with good business plans and suitable expertise get venture capital of millions of dollars. If your total expertise is half a year's work with an insurer and passing one actuarial exam, and if your business plan is not serious, investors don't expect a 25% return, so they don't give you capital.

*Question:* This question assumes that all cash is used for investment projects, even if they are projects undertaken by other firms. But this is not true in practice. Many firms have large sums of cash that they are not using for any investment project.

*Answer:* These "sums of cash" are being used for investment projects. Suppose a firm has \$100 million of extra cash.

- ! It may use the cash for its own investment project.
- ! It may buy bonds, thereby lending the cash to other firms with higher yielding projects.
- ! It may deposit the cash at a bank, and the bank lends the cash to firms with higher yielding projects.

Unless the cash is hidden under a mattress collecting dust, it is not sitting idle.