

1. Present value:

Consider a claim that pays you \$100 each October 7 starting October 7 2014 and ending October 7 2023.

1.A. If the annual interest rate is 3% what is the value of the claim?

1.B. If individuals were perfectly patient what would be the value of the claim?

1.C. What is the implied interest rate that validates a price of \$400 for the claim?

2. Present value and prices

Suppose there are two bonds in the market. Both are 5 year maturity and have a face value of 100. Bond 1 has a coupon of 7% Bond 2 has a coupon of 4%.

2.A If the price of Bond-1 is 102, what is the price of Bond 2?

2.B Suppose the current interest rate is 5% what are the price of Bond 1 and Bond 2?

2.C. Now suppose the bond has a 1 year maturity and the interest rate is 5% what are the price of Bond 1 and Bond 2?

3. Present value and project selection

A company that is cash constrained has 1 million dollars and can invest in one of two projects
Project 1 involves an expansion of the core business and is expected to yield a \$100,000 in additional profits a year and expires at T after which the \$100,000 annual profits will disappear.

Project 2 involves the development of a new technology that it expected to sell for 1.5 Million dollars.

3.A is this enough information such that you can decide at what time t^* the new technology (project 2) will mature such that project 1 is preferred if $t > t^*$ and project 2 is preferred if $t \leq t^*$? if not what is missing? (in other words what additional variables should be specified)

3.B. Now suppose project 1 has a life time of 20 years ($T=20$) and project 2 matures in 5 years, what discount rate d^* is such that if and only if $d > d^*$ project 1 is preferred to project 2?

3.C. Suppose $T=20$ and project 2 matures after 5 years, the firm can borrow an additional million dollars at an interest rate of 10% (and it could also lend out its money at 10% a year). What project(s) does it carry out if any?

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4. Going to business school

Jane, a freshman in college, needs 55000 in 4 years to start studying for an MBA. Her investments earn 5% interest per year.

4.A. How much must she invest today to have that amount at graduation from college?

4.B If she invested once a year for four years beginning today until the end of the 4 years how much must she invest?

5. Machines

A company is considering its options for a machine that it needs. At a cost of 47 the can make small repairs to their machine which will last two years. At a cost of 90 they can make repairs that will last four years. A new machine costs 300 and will last 8 years. The company faces an interest rate of 10%.

5. A. What should it do?

5. B. Suppose 47 allows you to produce 1 million units and 90 allows you to produce 2 million units while the new machine is good for 4 million units. The economy is in a slump so output will be half a million units, for the next two years, before returning to 1 million units a year. What do you do (note if you repair now you can always buy the new machine later).

5.C. Suppose the economy is in a boom (out 2 million units for the next two years before reverting to trend a 1 million units) what should be done?

6. Another machine

The C&C company recently installed a new bottling machine. The machine's initial cost is 2000, and can be depreciated on a straight-line basis to a zero salvage in 5 years. The machine's per year fixed cost is 1500, and its variable cost is 0.50 per unit. The selling price per unit is 1.50. C&C's tax rate is 34%, and it uses a 16% discount rate. Calculate the machine's accounting break-even point on the new machine (i.e., the production rate such that the accounting profits are zero), as well as the present value break-even point (i.e., the production rate such that the NPV is zero).

7. Pharma

After extensive medical and marketing research, PillAdvent Inc, believes it can penetrate the pain reliever market. It can follow one of two strategies. The first is to manufacture a medication aimed at relieving headache pain. The second strategy is to make a pill designed to relieve headache and arthritis pain. Both products would be introduced at a price of 4 per package in real terms. The broader remedy would probably sell 10 million packages a year. This is twice the sales rate for the headache-only medication.

Cash costs of production in the first year are expected to be 1.50 per package in real terms for the headache-only brand. Production costs are expected to be 1.70 in real terms for the more general pill. All prices and costs are expected to rise at the general inflation rate of 5%.

Either strategy would require further investment in plant.

The headache-only pill could be produced using equipment that would cost 10.2 million, last three years, and have no resale value.

The machinery required to produce the broader remedy would cost 12 million and last three years. At this time the firm would be able to sell it for 1 million in real terms. The production machinery would need to be replaced every three years at constant real costs. For both projects the firm will dace a straight line depreciation, it faces tax rates 34% (on profits and capital gains) and it believe the appropriate discount rate is 13%

7.A What product should the firm produce?

7.B Suppose Congress abolishes all corporate taxes what product should the firm produce?