

Homework — Time Value of Money

Optional. Worked solutions are on the website

Practice problems

6.1

1. For each, state which of the three reasons for why cash is worth more today than in the future dominates: (a) a government bond in a country with 2% inflation; (b) a promise from a start-up with no revenue; (c) cash held under a mattress in a country with 40% inflation.
2. Explain in three sentences why a discount rate would still be positive in a world with zero inflation and zero risk.
3. Two firms both promise KSh 500,000 in two years. One is a listed bank; the other is a two-year-old logistics start-up. Explain why the two promises have different values today, and say which you would discount at a higher rate.

6.2

1. Compute the present value of KSh 4,000,000 receivable in 6 years at 15%.
2. A loan is quoted at 24% per annum, charged monthly. Compute the effective annual rate, and explain why it exceeds 24%.
3. An investment doubles in 6 years. What annual rate did it earn? Show your working. Then use your answer to estimate roughly how many years it takes to double at 12%.

6.3

1. Recompute the NPV of the same project at 8% and at 20%. Roughly where does the NPV cross zero?
2. Explain, in three sentences, what a positive NPV of KSh 500,000 actually means — being precise about what has already been accounted for.
3. A colleague evaluates a machine by adding up seven years of savings and comparing the total to the purchase price. Explain what is wrong, and estimate the direction and rough size of the error at a 15% discount rate.

6.4

1. Compute the present value of KSh 400,000 per year for 8 years at 11%, using the annuity formula.
2. A borrower repays a loan in 5 equal annual instalments of KSh 620,000 at an interest rate of 16%. How much was borrowed?
3. Explain why r must exceed g in the growing-perpetuity formula, giving both the mathematical reason and the economic one.

6.5

1. A country has 8% inflation and a real risk-free rate of 3%. Compute the nominal risk-free rate. A local company borrows at 17% — what is its risk premium?
2. Compute the present value of KSh 2,000,000 receivable in 7 years at each of 5%, 11%, 16%, and 24%. Comment on the spread.
3. A Ghanaian Treasury bill yields 23%. A colleague says this is "a fantastic risk-free return." Explain what is wrong with the statement, and compute the real return if inflation is 20%.

6.6

1. A firm's overall cost of capital is 15%. It is evaluating (i) replacing existing machinery with an identical newer model, and (ii) launching a mobile app in a market it has never entered. Argue for a rate for each, and explain the consequence of using 15% for both.
2. An office investment produces 10 years of contracted rent plus a sale in year 10. Explain why the two components deserve different rates, and state which is higher.
3. A project manager argues that a project should get a lower discount rate because "it is critical to our strategy." Respond in three sentences.
4. A project has an NPV of KSh 3.1M at 12%, KSh 1.4M at 15%, and negative KSh 0.6M at 18%. Write two sentences describing what you would tell the client, and say what additional work you would do before recommending.