Questions:

1. Malcolm, an aspiring chef, is intending to set up a catering business to sell vegan food from a van at festivals. The purchase price of the van is 20,000, and Malcolm estimates that he will incur costs of 3,000 monthly in arrears for 1 year from the date of purchase, as he fits out the van and develops his range of products. One year after purchasing the van, Malcolm expects to be able to launch his business and start selling food.  He estimates that his net income from his first year of sales will be 9,000, and that this figure will increase by 4% in each subsequent year.  He intends to work all year round, so assumes that this income will be received continuously. Ten years after purchasing the van, Malcolm wishes to retire, and he believes that he will be able to sell his business at that time for 25,000.
2. Calculate the net present value of the project’s cashflows, assuming an interest rate of 7.2% pa effective.
3. Calculate the project’s internal rate of return.
4. Anna, an aspiring fashion designer, is intending to set up a fashion business. The purchase price of the boutique is 50000, and she estimates that she will incur costs of 5000 quarterly in arrears for raw materials for the next 2 years till she has made a name for herself. She estimates that her net income from her first year of sales will be 25,000, and that this figure will increase by 4% in each subsequent year.  She intends to work all year round, so assumes that this income will be received continuously.

After 8 years, Anna expects her net income to increase by 7.5%.

After 14 years, Anna is considering retiring only if she can earn a 32% internal rate of return.

At what price must she sell her boutique to earn this return?

1. A company is considering investing in one of two projects, A and B.  The cashflows for the two projects are as follows:

Project A

• initial outgo of 1,000,000

• further outgo of 400,000 in the middle of Year 1

• income of 500,000 received at the end of Years 2 to 5 inclusive

Project B

• initial outgo of 800,000

• income of 200,000 received in the middle of Years 1 to 5 inclusive

• further income of 100,000 at the end of Year 5 After 5 years, both projects end and there are no further cashflows.

1. Calculate the net present value of each project for each annual effective interest rate from 0% to 15% (inclusive), using steps of 0.1%. (b) Hence plot a graph showing how the net present value of these projects varies with the interest rate used to discount the cashflows.
2. Determine the interval of width 0.1% in which: (a) the internal rate of return for Project A lies. (b) the internal rate of return for Project B lies. (c) the net present value of Project A is equal to the net present value of Project B.
3. An employer is considering sending an employee on a training course in order to develop new skills and so be more productive to the company.  However, the employer is concerned about the costs involved and, in particular, the risk that the employee will leave before the company has recouped these costs through additional income generated by the employee’s work. The training course lasts for 2 years and costs 3,000 per quarter, payable in advance to the training provider.  In addition, during the 2‐year course, the employer will need to allow the employee time off for study and exam leave, costing the employer 20,000 per year in lost productivity, incurred in equal instalments quarterly in arrears. In the first year after the course is completed, the employee will generate total additional revenue of 30,000, received in equal instalments quarterly in arrears.  This figure will increase by 4% in each subsequent year.    Once the employee has completed the course, the employer will need to increase the employee’s remuneration.  In the first year after the course is completed, the employer will need to pay the employee a total additional salary of 10,000, payable in equal instalments quarterly in arrears, and an additional bonus of 1,500 at the end of the year.  The additional salary and bonus are expected to increase by 2% in each subsequent year. Assuming that the employee remains with the company, calculate:
4. the discounted payback period of the cashflows associated with the employee attending the training course using an annual effective interest rate of 7%
5. the payback period.
6. You have been provided with a curve which contains the spot rates varying by duration. Calculate the annualised forward rate for each half year period as provided in the data.
7. A man invests INR 400,000 in a project. Once he makes this investment, he expects to start incurring costs which are accounted for at the end of each year, beginning with INR 20,000 at the end of the first year, increasing by INR 5,000 thereafter. He expects to start earning an annual income of INR 100,000, receivable half yearly, from the third year after his initial investment (to be modelled as end of half year periods). In subsequent years, the annual income is expected to grow at a rate of 20% p.a. for the first 5 years over which it is received and thereafter by 6% p.a. In all years, the annual income will be received each half-year and the growth rate will also apply on a half yearly basis. The project will close at the end of 12 years. Using the forward rates calculated above, calculate the present value of this project for the investor. Your solution should demonstrate calculations for each of the cash flows above.
8. For the project above, calculate the payback period and the discounted payback period.
9. The organisers of an international tennis tournament are planning to build a new stadium in their grounds to accommodate additional spectators and improve television coverage of the event. The stadium will take 3 years to build.  The building costs will be 6 million in the first year of construction, 9 million in the second year, and 12 million in the third year.  The construction costs are assumed to be incurred monthly in arrears. Construction is scheduled to begin on 1 July 2020, so that the new stadium will be completed and ready for use on 1 July 2023. The tennis tournament is held each year in July, and the additional net income received at the end of July 2023 as a result of the new stadium is estimated to be 5.75 million.  The additional net income received at the end of July 2024 is estimated to be 6.5 million, with an increase of 0.75 million expected in each subsequent year. In other months during the year, when the new stadium is not used for the tournament, the maintenance cost is assumed to be 0.05 million, incurred at the end of each month, with the first such cost incurred at the end of August 2023.    In order to fund the stadium’s construction, the tournament organisers intend to take out an interest‐only loan of 33 million.  At the end of each month, the organisers must pay interest on the loan amount, calculated using a monthly effective interest rate of 1%.  The loan must be repaid in full after 10 years, with no early repayment option. The 33 million from the loan will be received on 1 July 2020 and placed in a bank account that pays interest at a rate of 0.85% per month effective.  All cashflows associated with the project are paid into, or out of, this bank account. By projecting the balance of this bank account, calculate the accumulated profit of the new stadium for the tournament organisers on 1 July 2030, after the loan has been repaid.