Lecture 3

This week's lecture started with the material from chapter 8 and 9 about capital budgeting followed by an introduction to the group assignment for which you have to provide an investment recommendation to a CEO.

Capital budgeting

Introduction

A few years ago Google made a 600 million investment to build a new data center in the Eemshaven in the Netherlands. As an introduction the question why Google build such a large facility in the Netherlands was assessed. To answer this question we have think about what they get in return, what are the benefits they have after building a new building at this spot. The first benefit is that Google will gain the capacity it needs to grow further in Europe. On top of that they might be able to close another, more expensive, facility.

There are two types of markets in which firms operate, the financial markets and the product markets. Today we will talk about the product market, this is where the capital budgeting decisions are made to create value. Furthermore, we will take a micro economic approach and take the balance sheet in consideration. Investment decision making (capital budgeting) changes on the asset side of the balance side.

There are three main issues in investment decision making:

- What discounting approach to use? There are four methods that you have to be able to use; these are NPV, PI, EAA and IRF. These abbreviation will be discussed later on.

- What to discount? This involves cash, unlike the discounting approaches which are partly open to interpretation cash is a fact.

- At what discount rate? Today we assume it is embedded but later in this course we will learn how to determine the discount rate.

For simple like investment projects there are two typical cash flow schemes. For investments this is a loss at the start, t=0, and positive cash flows in the remaining time periods. It is necessary to calculate whether the discounted benefits outweigh the cost of investment before the project is started. For financing it is the other way around. At the start you will have a positive cash flow and in the remaining time periods a negative cash flow. An example of the last case is a loan which you have to pay back at interest.

Investment criteria

These are the four major methods for discounting the best criteria is the NPV (Net Present Value). Two citeria also frequently used are the Pay Back Rule and IIR. These criteria are all used in practice for decision making. The most dominant criteria are IRR and NPV. NPV is theoretically most sound, others have serious drawbacks.

The NPV is equal to the present value of all future cash flows (PV) minus the investment (INV).

Formula: $N\,P\,V = -I\,N\,V_0 + \dfrac{C\,F_1}{(1+r)} + \dfrac{C\,F_2}{(1+r)^2} + \dfrac{C\,F_n}{(1+r)^n}$ which is in short:

$$N\,P\,V = \frac{\sum\limits_{n=0}^{N} C\,F_n}{(1+r)^n}$$

We accept the project if NPV>0. For this method we use a discount rate that is equal to the opportunity cost of capital. When NPV is positive, this is an indicator for a good decision because value is added for the company. However, the difficulty is in finding the numbers, benefits in the future are hard to determine.

There are two ways to adjust the NPV:

- We use the Profitability Index (PI) when facing capital constraints for the project. The firm might have not enough money to finance all profitable projects. In this situation, the best projects should be chosen, you can rang them by help of a profitability Index

  Formula: $P\,I = \dfrac{N\,P\,V}{I\,N\,V_0}$

- The Equivalent Annual Annuity (EAA) is used when comparing projects with unequal lives. You have to adjust for the fact that a project might bring benefits for a longer time period than another. For this method we will transform the NPV into an annuity.

  Formula: $E\,A\,A = \dfrac{N\,P\,V}{A\,F_{r,n}}$

The first alternative to NPV is the Pay Back Rule, for this method we determine the N for which: We will accept the project if N<prespecified period, the period in which the firm wants to have earned the money back.

The second alternative is the Internal Rate of Return (IRR). This method is used a lot because it answers the question how soon a firm will get their investment back. Intuitive is makes a lot of sense, therefore it is used a lot. Formula: The project will be accepted when IRR>cost of capital.

However, these last two alternatives have their drawbacks.

Pay back rule:

- Ignores the time value of money, 2000 yearned next year is not the same as 2000 earned two years from now.

- Ignores cash flows after pay back, projects might differ in their benefits after the pay back of the costs.

- It is hard to determine what a good N to use as a reference is.

IRR:

- Scale independent, it does not tell how much money you earn but only the percentage of return.

- IRR may have multiple solutions so it will not always give a clear solution.

Free Cash Flow Determination

The second important part is how cash flows are determined. There are two main differences between Financial Accounting and how it is done for this course. The first one is that we ignore depreciation because there is no cash outflow. Secondly, interest payments are results of financial decisions and costs are transferred to a financing cash flow. However, for finance we do as if there is no debt because we want to know how much we earn on an investment, regardless how we finance it. This last difference is called All Equity Fiction: ignore financing cash flows.

Operating Cash Flow, these are the earnings before interest and tax:

$$CFop = EBIT(1 - Tc) + DEP \quad \text{(notice that interest expenses are ignored)}$$

Investment Cash Flow: $\quad CFinv = -CapEx - \Delta NWC$

The project's investment in Net Working Capital: $\Delta NWC_t = NWC_t - NWC_{t-1}$

From these two formulas we can compute the FCF:

$$FCFt = EBITt - Tc + DEPt - CapExt - \Delta NWCt$$

An important consideriation for FCF's is to think incremental, how will our financial situation look with or without the project? Only cash flows that are affected by our decision are included. Practically this means that we have to include externalities, like for example cannibalization, is the new facility not taking sales from another facility nearby? Also, we have to take a look at the opportunity the cost, you have to take in consideration the value of an alternative resource use. Often sunk costs are ignored. Because go cannot get the money back, you have to ignore them. Otherwise you might make a faulty decision. Lastly, overhead costs should be ignored. The when the costs do not change, the already existing costs should not be at the project.

Furthermore, you should include tax effects. After-tax benefits and costs should be used. Something to take in consideriation is the Depreciation tax shield. The depreciation tax shield has a positive effect on FCF, because although depreciation is not a cash flow, but it is a cost and thus lowers the taxes that have to be paid. The depreciation tax shield can be accounted for in two ways that both yield the same FCF:

Implicitly: $\quad FCFt = EBITt \; (1 - Tc) + DEPt - CapExt - \Delta NWCt$

EBIT = Revenues – costs – deprecation

Explicitly:

$$FCFt = (Revenuest - Costt) \times (1 - Tc) - CapExt - \Delta NWCt + DEPt \times Tc$$

The second tax effect is that assets may be disposed at some point in the future. When this happens the assets will be sold and tax must be paid on the salvage value of the asset.

Useful Tools

The NPV Profile is a downward sloping line that shows how sensitive the NPV is to changes in the discount rate. When your IRR is on the left of the curve, your project is relatively safe. Another useful tool is the sensitivity analysis, this shows how the NPV changes with a change in either the money invested or the discount rate. With this tool you can find out how safe you are with your investment when one of the variables turns out to be different than expected. The last useful tool is the Scenario Analysis.

This analysis shows how the NPV is affected when multiple variables are changing simultaneously. With help of this tool you can find out what the most likely, best case and worst case scenario are for your investment. However, these tools are estimates, the future is always unsure.