We use the adjusted net present value approach to determine the value international projects.

We begin by looking at the present discounted value of cash flows.

But we make some adjustments.

Step 1: Calculate the net present value of the project's cash flow under the scenario that all projects are financed through equity.

This is the sum of all discounted expected future revenues minus the sum of current and discounted expected future costs.

Revenues and costs are measured on an after-tax cash-flow basis.

They are measured in the same currency.

They are discounted by a rate that reflects the time value of money (the riskless interest rate) and the risk premium demanded by the firm's equity holders.

Step 2: Add the value of financial side effects.

Costs of issuing securities.

Taxes or tax deductions associated with different types of financing.

Costs of financial distress.

Subsidized financing from government.

Step 3: Value the growth options.

Undertaking a project may open an option to do further profitable projects.

Could be included in Net Present Value, but we separate it because:

1. It is hard to value.
2. It is always positive, so if the project is valuable just based on steps 1 and 2, it is also worthwhile once we add in the value of the growth options.

Deriving the NPV of Free Cash Flow

There are several steps in this derivation. One of the trickier steps involves properly valuing the present value of taxes on the project.

We want to measure the present value of incremental profits from the project. The point here is that we want to count the incremental increase in the firm's revenue from undertaking a project. A new project might cannibalize a previous operation of the firm. We care about the net addition to the firm's profit.

Again, we are valuing the project first as if it were completely financed with equity. So we don't want to consider at this stage any tax benefits or costs from financing by borrowing.

Revenues: Estimate the future revenues from a project. Include projections of the exchange rate, so that we get the revenues in dollar terms.

Subtract costs. These costs include the costs of the raw materials and the labor costs. These are called costs of goods sold (CGS). Also we need to subtract off managerial expenses, advertising and fixed costs of the project. These are called selling and administrative expenses (SGA).

Finally, we subtract off the accounting cost of depreciation expense. This is not a true cost, but we are doing this to get our measure of expected earnings before interest and taxes (EBIT), which will form the basis upon which taxes are levied.

So

EBIT = Revenue – CGS – SGA – Accounting depreciation

Then we calculate taxes and subtract them from EBIT to get “net operating profit less adjusted taxes” (NOPLAT).

So NOPLAT = EBIT – Taxes on EBIT

But then we add back in the accounting depreciation, which wasn't a true cost, to get Gross Cash Flow (GCF).

So GCF = NOPLAT + Accounting depreciation

Then to get Free Cash Flow (FCF), we need to subtract off actual investment expenses. These are capital expenditure (CAPX) and the change in net working capital (ΔNWC). CAPX includes the firm's purchases of additional property, plant, or equipment that is required for the project.

FCF = GCF – CAPX - ΔNWC

We then use the Net Present Value (NPV) formula:

$$NPV(t) = \sum_{k=0}^{\infty} \frac{E_t\left[FCF(t+k)\right]}{(1+r)^t}.$$

This formula assumes a constant discount rate, but in general we may want to let the discount rate vary from period to period.

The present value formula goes on to infinity, but obviously we are not going to calculate FCF for an infinite number of periods. Instead, we will calculate a Terminal Value for the project. Suppose year T is the last year that we calculate an expected FCF. We can then calculate the terminal value in year T using the perpetual cash flow formula.

Terminal value in year T = $\frac{E\left[FCF(T)\right](1+g)}{r-g}$.

Then to get the expected terminal value at time t, we need to discount the terminal value at time T back to time t:

Terminal value at time t: $\frac{E\left[FCF(T)\right](1+g)}{r-g} \cdot \frac{1}{(1+r)^{T-t}}$.

Financial Side Effects

We need to consider the effects that arise from the costs of issuing securities, from tax deductions that financing might provide, the costs of financial distress associated with issuing debt, and the value from government-subsidized financing.

Cost of issuing securities – typically firms pay a fee and an underwriting discount. The latter refers to the difference between what the corporation receives from issuing securities and what the public pays for the securities, which goes to the investment bank underwriting the security issuance.

Tax Shields for certain securities – if firms issue debt, interest paid is tax deductible. If τ is the corporate income tax rate, and r_D is the interest rate on the loan, and D is the amount borrowed, then the tax deduction is $\tau r_D D$.

The value of the tax shield is the discounted stream of tax deductions, discounting at the market rate.

Why are we discounting at the market rate and not the risk-adjusted rate we used to discount free cash flow? Because we want to discount by the rate that reflects the riskiness of the cash flows. In this case, there is no covariance risk, so we use r_D.

r_D might incorporate default risk, but the textbook shows why it is equivalent to discount $\tau r_D D$ using r_D, and to discount expected $\tau r_D D$ using the risk free rate.

Costs of financial distress – If a firm takes on too much debt, it runs the risk of going bankrupt. Bankruptcy proceedings are costly, and even the threat of bankruptcy can be costly. So, if the firm takes on too much additional debt, we need to value the potential costs.

Interest subsidies – Some governments will offer loans at a subsidized rate, r_S. There is a subsidy to the firm of $(r_D - r_S)D$. In addition, the firm still gets a tax break on interest payments worth $\tau r_S D$.

We want to add the present discounted value of these subsidies. What rate do we use to discount? The subsidized rate? No, the appropriate rate of return is the market's required rate of return on the debt of the corporation, which determines the market value of the subsidy.

Growth option – Finally, we need to value the option to do another project that arises when a firm undertakes a new project. The key thing here is that this is an option. For example, if a movie is a hit, there is a positive value to the option because we can make a sequel. But if the movie is a flop, we can simply not make a sequel. So the growth option cannot have negative value.