Comparing Projects

There are many ways to compare business projects including NPV, IRR, profitability index, payback period, average accounting return and others.

The best methods take into account:

- The time value of money;
- Risk; and
- The value of the project to the firm.

Net Present Value

Net Present Value (NPV) is the preferred method to value projects. It is the same as discounted cash flow (DCF) valuation.

$$NPV = V_0 = \sum_{t=0}^{T} \left(\frac{C_t}{(1+r)^t} \right)$$

$$= C_0 + \frac{C_1}{(1+r)^1} + \frac{C_2}{(1+r)^2} + \cdots + \frac{C_T}{(1+r)^T}$$

The decision criteria is that projects with positive NPV should be accepted.

Time value of money is incorporated in the discount rate.

Risk can be incorporated into NPV by increasing the discount rate (r) which generally decreases the NPV.

Positive-NPV projects add to a firm's asset value and share price.

NPV Terminology

Note that value, present value and net present value are often used interchangeably.

The value of an asset is its market value in dollars at some point in time ($ as at a certain date).

The present value (PV or V_0) is the value now (t=0), taking into account the time value of money.

Net present value (NPV) is the addition of the present values of all of the future cash flows. The NPV typically subtracts the price paid at the start from the positive cash flows received afterwards from owning the asset.

Question: A share currently trades at $10. We forecast that it:

- Will pay a $0.60 dividend in one year, after which it will be worth $11.50;
- Has a required total return of 10% pa.

Calculate the NPV of buying the share now and selling it one year later, just after the dividend is paid.

Answer: The present value of the $12.1 (=11.5+0.6) received in one year is $11 (=12.1/(1+0.1)^1).

The $10 current (t=0) market share price is already a present value.

So the NPV of buying the share would be $1 (= -10 + 11).

Calculation Example: NPV

Question: The mining firm has found a potential new gold mine on its property. The required return of the gold mine is 10% pa given as an effective annual rate. The after-tax cash flows are:

- $9m outflow to buy extra machinery needed to excavate the mine which will be delivered and paid for immediately (t=0).
- $6m inflow in one year (t=1) from gold sales.
- $5m inflow in two years (t=2) from gold sales.

Question: What is the NPV of the project and should it be accepted?

Answer:

$$NPV = V_0 = \sum_{t=0}^{T} \left(\frac{C_t}{(1+r)^t} \right)$$

$$= C_0 + \frac{C_1}{(1+r)^1} + \frac{C_2}{(1+r)^2}$$

$$= -9m + \frac{6m}{(1+0.1)^1} + \frac{5m}{(1+0.1)^2}$$

$$= 0.58677686m = \$586{,}776.86$$

Since the NPV is positive, the project should be accepted.

Question: A mining company has $10m of assets funded by 7,500 bonds priced at $800 each and 4 million shares priced at $1 each. All figures are market values.

Nobody knows about the new gold mine discovery except a few engineers and senior management who have kept it secret. The firm is about to publically announce the details of the new gold mine. What would you expect the new share price to be?

Answer: Accepting the new mining project will increase the market value of the firm's assets by the NPV: $0.586776m.

This increase in value will not be received by the bond holders since they will only be paid the promised interest and principal payments and no more.

Equity holders have a 'residual claim' on the firm's assets. They are entitled to the extra value created by the discovery of the new gold mine. To calculate the new share price:

$$V_{old} + V_{project} = D + E$$

$$\$10m + \$0.586776m = n_{bonds}.P_{bond} + n_{shares}.P_{share}$$

$$\$10.586776m = 0.0075m \times \$800 + 4m \times P_{share}$$

$$P_{share} = \frac{\$10.586776m - 0.0075m \times \$800}{4m}$$

$$= \$1.146694$$

If investors believe in the company's assessment of the positive NPV project, then this is the share price that we would expect to see in the market after the public announcement of

the new gold mine project. This corresponds to a 14.7% capital return on the shares which were previously worth $1.

Note that a quicker way to calculate the share price increase is to just divide the project's NPV by the number of shares:

$$\Delta P_{share} = \frac{V_{project}}{n_{shares}} = \frac{\$0.586776m}{4m} = \$0.146694$$