Estimate the Future Cash Flows of a Company using – Discounted Cash Flow Method (DCF)

DCF (Discounted Cash Flow) valuation is a popular approach in finance for determining the worth of an investment, usually a company or a project. The basic idea behind DCF valuation is to estimate the present value of future cash flows generated by the investment and then discount those cash flows back to their present value using a discount rate. Because of the time value of money and the uncertainty associated with future financial flows, a dollar obtained in the future is worth less than a dollar received now.

Here's an explanation of the DCF valuation procedure, complete with formulas:

1. **Forecast Future Cash Flows:** Begin by forecasting the expected future cash flows from the investment. Revenues, operational expenses, taxes, and capital expenditures are examples of these. It is normal to forecast these cash flows for a set length of time, often 5 to 10 years, depending on the industry and level of certainty.

2. **Calculate Terminal worth:** Following the first forecast period, you must estimate the investment's worth beyond the forecast term. This is accomplished using the terminal value, which reflects the present value of all future cash flows beyond the projection period. The perpetual growth approach and the exit multiple method are the two most widely used methods for computing terminal value.

- **Perpetuity Growth Method:**

  *Terminal Value = Final Year Cash Flow * (1 + Growth Rate) / (Discount Rate - Growth Rate)*

- **Exit Multiple Method:**
  *Terminal Value = EBITDA (or other relevant metric) in the last forecasted year * Selected Multiple (e.g., industry average EV/EBITDA multiple)*

3. **Select a proper discount rate:** The discount rate, also known as the needed rate of return or cost of capital, compensates for the risk of the investment. It considers the time worth of money as well as the risk profile of the investment. The Weighted Average Cost of Capital (WACC) calculation may be used to calculate the discount rate:

*WACC = (E/V) * Re + (D/V) * Rd * (1 - Tax Rate)*

Where:

- E/V is the equity value ratio (equity market value / total enterprise value)

- Re is the cost of equity
- D/V is the debt value ratio (debt / total enterprise value)
- Rd is the cost of debt
- Tax Rate is the corporate tax rate

4. **Discount Future Cash Flows:** Using the set discount rate, reduce each predicted cash flow and terminal value to their present value. This is accomplished by employing the following method for determining the present value of a future cash flow:

Present Value = Future Cash Flow / (1 + Discount Rate) ^n

Where n is the number of years in the future

5. **Sum of Present Values:** Add the present values of all expected cash flows and the terminal value to get the investment's total present value.

   Total Present Value = Sum of Present Values of Cash Flows + Present Value of Terminal Value

6. **Calculate the Intrinsic Value:** The estimated total present value indicates the investment's intrinsic worth. This is the investment's estimated fair value based on predicted future cash flows and the discount rate.

The DCF valuation approach has various advantages. It offers a methodical methodology to determine an investment's intrinsic worth. Incorporating the time value of money allows for a more accurate estimate of future cash flows, which are then adjusted to their present value. This enables investors to evaluate and make educated selections between different investment possibilities based on their present worth.

Stock price prediction using Monte Carlo

The Monte Carlo simulation is used to represent the likelihood of various outcomes in a process that cannot be easily anticipated due to the presence of random factors. It is a technique for determining the impact of risk and uncertainty. To determine the value at risk (VaR) of a portfolio, for example, we can conduct a Monte Carlo simulation that attempts to estimate the portfolio's worst potential loss given a confidence interval over a set time horizon

A Monte Carlo simulation is an attempt to predict the future many times over. At the end of the simulation, thousands or millions of "random trials" produce a distribution of outcomes that can be analyzed. The basics steps for the Monte Carlo Simulation are as follows:

The Model:

We shall employ geometric Brownian motion (GBM), which is a Markov process. This implies that the stock price follows a random walk and is compatible with the weak form of the efficient market hypothesis (EMH)—past price information has already been assimilated, and the upcoming price movement is "conditionally independent" of previous price movements.

Step 1:

To construct a series of periodic daily returns using the natural logarithm (notice that this equation differs from the typical % change method), utilize the asset's historical price data to generate a series of periodic daily returns:

Periodic Daily Return=ln (Day’s Price / Previous Day’s Price)

Step 2:

Then, on the full resultant series, use the AVERAGE, STDEV.P, and VAR.P functions to get the average daily return, standard deviation, and variance inputs, respectively. The drift is equivalent to:

Drift = Average Daily Return − Variance / 2

Where:
Average Daily Return = Produced from Excel’s AVERAGE function from periodic daily returns series
Variance = Produced from Excel’s VAR.P function from periodic daily returns series

Step 3:

Next, obtain a random input:

Random Value = σ x NORMSINV (RAND ())

Where:

σ = Standard deviation, produced from Excel's STDEV.P function from periodic daily returns series
NORMSINV and RAND=Excel functions

The equation for the following day's price is:

Next Day's Price = Today's Price x e ^ (Drift + Random Value)

Step 4:

In Excel, use the EXP function to raise e to a specified power x: EXP(x). Repeat this computation as many times as necessary (Each iteration corresponds to one day). The result is a model of the equity's future price movement.

The frequencies of the various events produced by this simulation will form a normal distribution, or a bell curve. The **most likely return is in the middle of the curve**, implying that the actual return has an equal probability of being greater or lower.

Importantly, a Monte Carlo simulation disregards anything that is not incorporated into price movement (for example, macro trends, a company's leadership, market hype, and cyclical elements).

To put it another way, it implies a fully efficient market.

$$Drift = \mu - \frac{1}{2}\sigma^2$$

$$Volatility = \sigma Z[Rand(0; 1)]$$

$$r = \left(\mu - \frac{1}{2}\sigma^2\right) + \sigma Z[Rand(0; 1)]$$

$$S_t = S_{t-1} * e^{\left(\mu - \frac{1}{2}\sigma^2\right) + \sigma Z[Rand(0;1)]}$$

Option Pricing using Black Scholes

This is one of the most fundamental concepts in current financial theory commonly known as the Black-Scholes-Merton (BSM) model. This mathematical equation assesses the potential value of derivatives based on other investment instruments, taking time and other risk variables into consideration. It was created in 1973 and is currently recognized as one of the finest methods for pricing an options contract.

According to Black-Scholes, instruments such as stock shares or futures contracts will have a lognormal price distribution based on a random walk with continual drift and volatility. The price of a European-style call option (exercised at expiration) is calculated using this assumption and other significant variables.

The Black-Scholes equation uses five variables. *Volatility, the price of the underlying asset, the strike price of the option, the period until the option expires, and the risk-free interest rate are the inputs*.

It is theoretically conceivable for options dealers to determine logical pricing for the options they are selling using these factors. In addition, the model predicts that the price of highly traded assets would follow a geometric Brownian motion with continual drift and volatility. When applied to a stock option, the model considers the stock's constant price movement, the time value of money, the option's strike price, and the time until the option expires.

$$C = SN(d_1) - Ke^{-rt}N(d_2)$$

where:

$$d_1 = \frac{ln\frac{S}{K} + (r + \frac{\sigma_v^2}{2})t}{\sigma_s\sqrt{t}}$$

and

$$d_2 = d_1 - \sigma_s\sqrt{t}$$

and where:

$C =$ Call option price

$S =$ Current stock (or other underlying) price

$K =$ Strike price

$r =$ Risk-free interest rate

$t =$ Time to maturity

$N =$ A normal distribution

The Black-Scholes model makes certain assumptions:

- No dividends are paid out during the life of the option.
- Markets are random (i.e., market movements cannot be predicted).
- There are no transaction costs in buying the option.
- The risk-free rate and volatility of the underlying asset are known and constant.
- The returns of the underlying asset are normally distributed.
- The option is European and can only be exercised at expiration.

Since asset values cannot be negative (they are confined by zero), Black-Scholes implies stock prices follow a lognormal distribution.

Asset prices frequently exhibit strong right skewness and some degree of kurtosis (also called fat tails). This indicates that high-risk negative swings in the market occur more frequently than a normal distribution would anticipate.