Starters' CFO
Catalysing Business Growth

ESOP

- A Valuation Perspective

Contents

Introduction

Indian Start-up's are increasingly offering ESOP's as part of the packages to attract and retain talent. Instead of variable bonus payable in cash, ESOP's gives a feeling of ownership to the employee in the long run. With average life of 4 years, option holder gets equity shares or cash in lieu of options from the founders.

Employee Stock Option Plan (ESOP) is an arrangement through which a company awards Stock Options to the employee's based on their performance. An employee stock option is a call (put) option meaning that under an option plan the employees have the right and not an obligation to buy (sell) the shares of the company on a predetermined date at a predetermined price.

The objective of ESOP is to motivate the employees to perform better which creates a sense of belonging and ownership amongst the employees, apart from giving financial gains to the employees.

Date of:	Grant		Vesting		Expiry
	Service Period			Exercise Term	

Fair value is the amount for which stock option granted or a share offered for purchase could be exchanges between knowledgeable, willing parties in an arm's length transaction.

Accounting & Tax Treatment

Under ESOP arrangements, employer will recognize the cost of service over the service period. The accounting value can be determined by finding either fair value of the option or intrinsic value of the option. Fair value of an option means what an active market is ready to pay, if it had been traded. Whereas the intrinsic value means the surplus over the exercise of option compared to its fair value of share at the date of grant of option. Following new accounts come into existence:

- Employee compensation expense account

- Deferred employee compensation expense

- Employee Stock Options Outstanding account

ESOP received by the employee shall be taxable as perquisite on the date of allotment of shares, which indeed shall be the difference between the Fair Market Value (FMV) and the exercise price as on the date of exercise.

While the employer can claim deduction in the year in which the option is exercised by the employee i.e. liability to issue shares becomes certain. Therefore proportionate deduction of option expense cannot be booked over the vesting period.

Methods of fair valuation

For undertaking fair valuation of ESOPs, a lattice model (Binomial Option Pricing Model) and closed form model (Black-Scholes Option Pricing Model) is used. These models compute the value of option as difference between:

(a) Likely value of share at the time of exercise of option as discounted to present value; and
(b) The present value of paying the exercise price.

Black-Scholes Model

The Black-Scholes model is a pricing algorithm, used to calculate the theoretical price of European put and call options.

$$c = S_0\,N(d_1) - K\,e^{-rT}\,N(d_2)$$

$$p = K\,e^{-rT}\,N(-d_2) - S_0\,N(-d_1)$$

$$\text{where}\quad d_1 = \frac{\ln(S_0/K) + (r + \sigma^2/2)T}{\sigma\sqrt{T}}$$

$$d_2 = \frac{\ln(S_0/K) + (r - \sigma^2/2)T}{\sigma\sqrt{T}} = d_1 - \sigma\sqrt{T}$$

The model is essentially divided into two parts:

1. The first part, $S_0 N(d_1)$, multiplies the price by the change in the call premium in relation to a change in the underlying price. This part of the formula shows the expected benefit of purchasing the underlying outright.

2. The second part, $Ke^{-rt}N(d2)$, provides the current value of paying the exercise price upon expiration.

The value of the option is calculated by taking the difference between the two parts, as shown in the equation. **The Black-Scholes model applies to European options, which are exercisable only on expiration day.**

The Black Scholes model has the advantages of simplicity and widespread acceptability. While the formula cannot be modified, the life of the option can be changed to incorporate the effect of factors such as early exercise and vesting cliffs.

Lattice Binomial Model

An option pricing model that involves the construction of a binomial tree to show the different paths that the underlying asset may take over the option's life. A lattice model considers expected changes in various parameters which determine an ESOP's fair value:

- The Exercise price of the option,
- The expected term of the option,
- The current price of the underlying share,
- The expected volatility,
- The expected dividend yield,
- The risk-free interest rate(s) for the expected term of the option.

To value the ESOPs, 3 binomial trees are developed:

1. The **First binomial tree traces the expected stock price movement for the ESOP over the expected life** of the ESOP based on the volatility of the stock price and the probability of up and down movement. The stock price is capped on the basis of the early exercise multiple, which implies that the ESOP holder will exercise the ESOP when he achieves the desired return.

2. The **Second tree calculates the payoff to the ESOP holder based on the per share equity value** in the first tree and the exercise price of the ESOP except for the period during which the options remain unvested.

3. The **Third tree named as roll back tree calculates the value of the ESOP at each node** from the inception till maturity and compares whether it is ideal for the employee to exercise at that time or hold it for future.

S_0 : Current Stock Price
p : Increase in Probability
1-p: Decrease in Probability
n : Life of Options
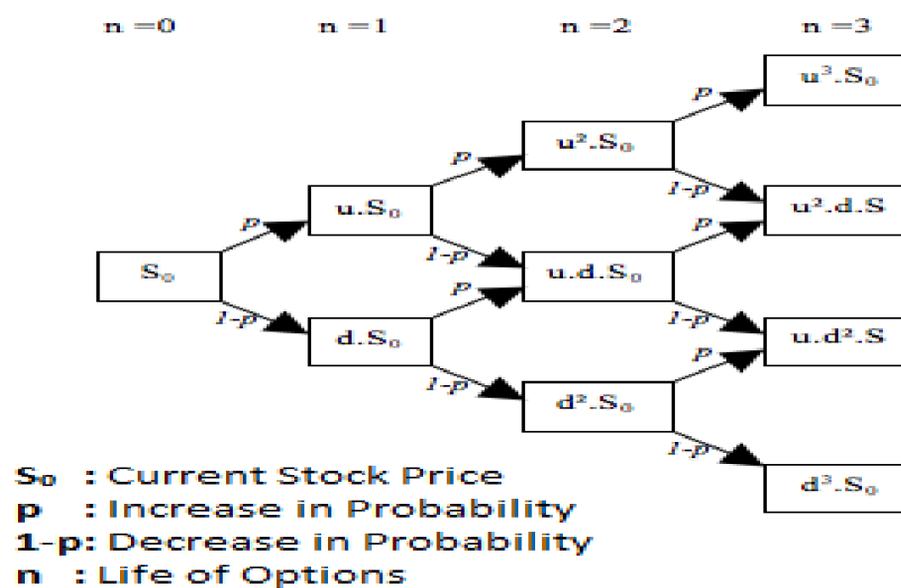
Monte-Carlo Simulation
A very less used model, is useful, and is required for share option valuations in case of presence of Uncertainties. Monte-Carlo uses a different option pricing theory to arrive at the option value. It is the most difficult and complex method among the other option pricing model.

The basic idea behind this approach is to value options by averaging the discounted value of the option payoff of a large number of randomly tested independent paths. In common paralance, the Geometric-Brownian Motion formula along with Wiener process is usually applied. Specific terms and conditions can be combined into the model on a case-to-case basis. The key formulae and valuation inputs are as follows:

$$dS_t = S_t\mu d_t + S_t\sigma dW_t$$

S_t = Stock Price
dS_t = Change in Stock Price
μ = Drift
d_t = Time Node
σ = Volatility
dW_t = Wiener Brownian Motion

Monte-Carlo is much more complicated and resource-intensive model that's because of uncertainties can be built-in this model and there are situations where Monte-Carlo is the preferred methodology. This can include structured options that allows exercise rights when company KPIs fall within a range of rankings of listed peers or go beyond previous years' averages by a certain percentage, or complex structured options, such as Knock-in or Barrier terms.

Black-Scholes Vs. Lattice Binomial Vs. Monte-Carlo

In theory, these three models should yield the same valuation results. However, there are differences in their applicability in different situations, which are summarized as below:

Particulars	Black-Scholes	Lattice Binomial	Monte-Carlo
Short Length	✓		
Long Length		✓	✓
Early Excerise		✓	
Exit Rate		✓	
Uncertainities			✓
Complex & Difficult		✓	✓
American Options		✓	
Eureopean Options	✓		
Asian Options		✓	✓

Constraints with ESOP Valuation:

- The ESOP may not be traded, which makes it difficult to estimate value and variance.
- The price of the stock may not follow a continuous process, which makes it difficult to apply option pricing models (like the Black Scholes) that use this assumption.
- The variance may not be known and may change over the life of the option, which can make the option valuation more complex.
- Exercise may not be instantaneous, which will affect the value of the option.
- Some real options are complex, and their exercise creates other options (compound).

Inference:

Valuation of employee stock options should be carried out with the right tools and inputs to capture the correct impact on financials. For private companies, where one of the key input i.e. equity price is not known and has to be estimated. All such inputs as the size premium, lack of marketability and company specific risk should be carefully evaluated and applied in accordance with applicable standards and guidelines.

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About Starters' CFO:

Starters' CFO is a professional firm that offers peer-to-peer solutions on a wide range of services including - Accounting services, Business tax and financial planning services, Market Analysis, Valuation, Investor agreements and negotiations to business setup and merger & acquisition. The purpose is to change the way organizations interact with the financial landscape and help them in gaining an advantage second to none.

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