Chapter 18

Valuation of Financial Guarantees – Increasing Complexities under IND AS 109 Decoded

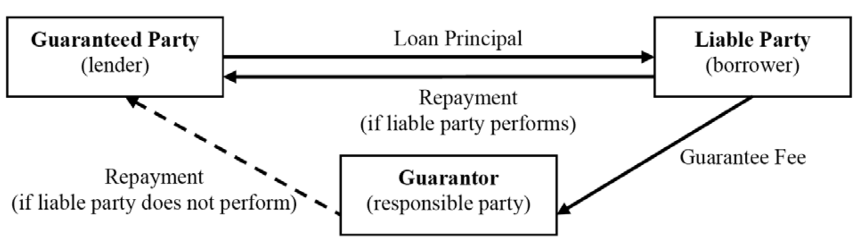
With an introduction of the Indian Accounting Standards ("Ind AS") in India the requirement of fair value has increased for financial reporting purposes. The expanded financial use of fair value measurements has resulted in the need for relatively complex calculations to be captured in the financial statements.

An example of this increasing complexity is evident in Ind AS 109 'Financial Instruments', which requires the fair value of certain financial guarantees be disclosed by the guarantor in its financial statements. This article provides background information on financial guarantees and outlines procedures for the valuation of financial guarantees.

Definition of 'Financial Guarantee'

"Ind AS 109 defines a financial guarantee contract as a contract that requires the issuer to make specified payments to reimburse the holder for a loss it incurs because a specified debtor fails to make payment when due in accordance with the original or modified terms of a debt instrument."

In other words, a guarantee is the assumption of responsibility for payment of a debt or performance of an obligation if the liable party fails to perform to expectations. Below is an illustration of a guarantee that supports a loan.



A guarantee reduces the risk to the guaranteed party and creates a contingent liability for the guarantor. Ind AS 109 requires the guarantor to recognize the fair value of the financial guarantee contract on the transaction date.

Valuation of Financial Guarantees (Underlying Principles)

Two underlying principles in guarantee valuation are:

First, the value of a risk-free transaction is equal to the value of a risky transaction plus the value of the guarantee. This relationship, which combines the risky transaction with the guarantee results in a synthetic risk-free transaction, can be stated as

(1) Value of Guarantee = Value of Risk-Free Transaction - Value of Risky Transaction

Second, the second basic valuation principle is that the value of any contingent liability, including guarantees, equals its expected present value.

(2) Value of Guarantee = Present Value of the Probability-Weighted Estimated Cash Flows

Fair Value Hierarchy

The valuation methodologies discussed in this article also consider the fair value hierarchy as prescribed in Ind AS 113 which are:

Level 1: Models and values based on external, quoted prices in active markets for identical assets/liabilities.

Level 2: Models and values based on external, quoted prices for similar assets/liabilities (with adjustments).

Level 3: Models and values based on internal inputs.

Valuation Methodologies

A. Market Value Method

The market value method is the simplest to apply, but the required inputs are seldom available. It is consistent with Level 1 of the fair value hierarchy. Generally, it can be applied in two cases.

In the first case, the comparable risk-free (guaranteed) and risky (non-guaranteed) instruments exist with the liable party, the market values of these instruments are known and the value of the guarantee is simply the difference in the value of the risky and risk-free instruments. This could be applied to a guarantee on an entity that has both typical (risky) debt and guaranteed debt.

In the second case, a fee is received for providing the guarantee and the guarantee's value is equal to the fee.

B. Credit Spread Method

The credit spread method is consistent with Level 2 of the fair value hierarchy. This method is based on the first valuation principle i.e.

Value of Guarantee = Value of Risk-Free Transaction - Value of Risky Transaction

The value of the guarantee calculated this way is valid only when the guarantor's probability of default is zero.

Alternatively, we may calculate the approximate value of guarantee when the guarantor is not default-free by applying the below mentioned relationship,

Value of Guarantee = Value of Guaranteed Transaction - Value of Risky Transaction

The credit spread is the difference in the risky rate (i.e. non-guaranteed rate) and the rate with a guarantee. The value of the guaranteed obligation/loan is calculated by discounting the expected cash flows (principal and coupon payments under the risky rate) at the guaranteed rate, while the value of the non-guaranteed loan is discounted at the risky rate. **The difference between the guaranteed and non-guaranteed values of the loan is the value of the guarantee.**

In general, discounting a risky loan at the risky rate for that loan should equal the initial amount lent, i.e., the value of the risky (non-guaranteed) loan is equal to the principal. Thus, in reality, the discounted cash flows at the guaranteed rate are being compared with the amount lent.

In most cases (the standard approach), the true/market discount rate of the guaranteed transaction is not known. In such instances, one can assume that the discount rate of the guaranteed transaction is the risk-free rate. This is a conservative assumption that will overstate the guarantee's value. The higher the creditworthiness of the guarantor, the lower the deviation from the true value of the guarantee in the future. The below mentioned alternatives could be applied to value the guarantee more precisely.

Alternative one, the discount rate (bank lending rate) of the guarantor may be assumed as the discount rate of the guaranteed transaction. In effect, this says that the guaranteed transaction's "risk" is equal to the risk that the guarantor will not perform. In reality, the guaranteed transaction is slightly less risky than this, because its “risk” actually occurs only when both the liable party and the guarantor fail to perform. Consequently, this approach will also tend to overstate the value, *albeit* slightly.

A second alternative is a theoretically correct method that accounts for the joint probability that both the liable party and the guarantor fail to perform. This method is the most accurate, but can be more complicated than the other methods.

If the standard approach is applied, the value of a particular guarantee will be the same regardless of the creditworthiness of the guarantor. If the first or second alternative approaches are used, the value (i.e., liability recognized) of a particular guarantee will be increased (decreased) as the credit worthiness of the guarantor increases (decreases).

The risky rate can be obtained or estimated in a number of ways, including a review of the known cost of debt (or borrowing rate), the applicable corporate bond yields and the cost of debt of entities with comparable credit ratings (or from comparable project financing rates).

C. Contingent Claims Valuation Methods

Guarantee contracts represent contingent claims into the future. Consequently, the methodology for pricing contingent claims could be applied to estimate the value of guarantees. This valuation approach can be used to value almost any type of guarantee.

The contingent claims method is consistent with Level 3 of the fair value hierarchy, and it is based on the second valuation principle described earlier:

Value of Guarantee = Present Value of the Probability - Weighted Estimated Cash Flows

There are various valuation methodologies within the Contingent Claims Valuation methods which can be applied to determine the fair value of a financial guarantee depending upon the availability of relevant inputs for the application of these methodologies. Some of the methods are:

(a) Loan Guarantee as a Put Option

(b) Binomial Tree with the Actual Probabilities of Default

(c) Binomial Tree with Given Risk-Neutral Probabilities of Default

(d) Monte Carlo Simulation Method

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Based on the availability of relevant inputs, the put option method is one of the most practical methods to apply to determine the fair value of financial guarantee in Indian context. Accordingly, in this article, we have explained in detail the computation of fair value of financial guarantee as a put option

Guarantee as a put option

A risk-free loan is equivalent to a risky loan and a guarantee, is also equivalent to a portfolio of a risky loan and a put option. A put option gives the owner the right, but not the obligation, to sell an asset for a pre-specified price (the exercise price) on or before a certain maturity date.

A guarantee is a put option on the assets of the firm with an exercise price equal to the face value of the debt.

Consider the following:

Let 'V' be the value of a firm and 'F' be the face value of its debt. For simplicity, assume there are no coupon payments and all the debt mature on a specified date. Also consider a put option purchased by the lender on the assets of the firm, with an exercise price F.

Two scenarios are possible at maturity, one where the value of the firm is less than F and the other where it is greater than F. When V is greater than F, full repayment of debt can be expected and the put option is not exercised so its value is zero. However, when V is less than F, then the put option is exercised and has a net value of F-V, with the lender receiving the exercise price, F, for assets which are worth V.

Thus, when V is greater than F, the value of the risky bond is F. But, when V is less than F, the value of the bond is V since debt holders are priority claimants on assets of the firm. The value of the risk-free bond is always F, by definition. The difference between the value of the risky bond and the risk-free bond is also the value of the put option.

Therefore, from the above analysis it follows that:

Value of Risky Loan = *Value of Risk-free Loan - Value of Put Option.*

In other words,

Value of Risky Loan = *Value of Risk-free Loan - Value of Loan Guarantee.*

A comparison of the above two equations indicates that the value of the guarantee can be estimated by computing the value of the put option.

The guarantee, or option, value is sensitive to factors such as the time to maturity, the volatility of the underlying asset, the value of the underlying asset, and the claims of other debt and equity holders. To capture the time-varying effects of these and other parameters, a fully specified dynamic model is needed, as in contingent claims, or option pricing, analysis.

As shown by Merton (1977), a loan guarantee for a single, homogenous term discount debt is equivalent to a put option written on the assets of the borrower, with:

- An exercise price equal to the maturity value of the debt obligation,
- Maturity corresponding to that of the loan and;
- The value of the firm's assets as the underlying.

Observe that at any point of time there are two possible outcomes: the liable party is either solvent or bankrupt.

In the first case, the guarantor is not called upon, because the firm has sufficient funds to honour its commitments. In the second case, the value of debt (D_t) is higher than the value of the firm (V_t), and the guarantor has to cover the difference (D_t - V_t). Thus, the payoff of the guarantee is either 0 (when $V_t \geq D_t$; i.e., the firm is solvent), or D_t - V_t (when $V_t < D_t$).

As a result, Guarantee Payoff = max {0, D_t - V_t}. For computing the fair value of guarantee, the Black-Scholes option pricing formula can be applied. Giving the value of guarantee (G) as

$$G = -V_0 \times N(-d_1) + D \times e^{-rt} \times N(-d_2)$$

where

$$d_1 = \frac{\ln\left(\frac{V_0}{D}\right) + \left(r + \frac{\sigma_v^2}{2}\right)t}{\sigma_v\sqrt{t}}$$

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

N(.) is the cumulative standard normal density function; σ_v is the volatility of the returns on the borrower's assets ("Asset Volatility"); D is the amount of debt interest and principal due to be repaid at time t; and V_0 is the value of the borrower's assets today. Notice that N(-d_2) is just the risk-neutral probability of default.

The above solution for the value of the guarantee requires estimates of both the market value of the borrower's assets, V, and the volatility of their returns,

σ_v . Both of these variables cannot be observed. However, if the liable party is a publicly traded company, we can observe the company's equity value today, E_0, and its volatility, σ_E. Black and Scholes (1973) demonstrated that a firm's equity at maturity of the debt can be interpreted as the value of a call option on its own assets, i.e.: $E_t = \max\{0, V_t - D\}$

Thus, using the Black-Scholes call option formula gives us the value of the equity today:

$$E_0 = V_0 \times N(d_1) - D \times e^{-rt} \times N(d_2)$$

where N(.), d1 and d2 are as before.

By applying Ito's lemma to dE(V ,t), we can get the following relationship:

$$\sigma_E = \frac{N(d_1)\, \sigma_v\, V_0}{E_0}$$

Accordingly, we have two equations that have to be solved for the two unknowns, V_0 and σ_v. By applying the concept of Merton theory and using solver function in excel, we can calculate V_0 and σ_v. Together with the other known variables, D and t, they can be inserted in the previously described formula for the loan guarantee (G) and thus obtain the value of the guarantee.

Illustration: Determination of fair value of financial guarantee by the Contingent Claim Method (as a Put Option).

Key Facts:

A Holding Company "H" has given a financial guarantee for a loan taken by its Subsidiary Company "S" having the following terms:

- Term Loan Amount: INR 1,00,000
- Tenure: 1 year

Other points for consideration

- Subsidiary Company is a listed company having market capitalization of INR 25,000 as of the valuation date
- Subsidiary Company has no loan other than the term loan of INR 1,00,000
- Equity Volatility (1-year) on the equity stock of "S": 60%
- Corporate Guarantee has been given for the entire loan amount of INR 1,00,000

Valuation of the Financial Guarantee

As previously mentioned, for the purpose of computation of financial guarantee as a put option by applying Black Scholes model we need the following inputs:

- Fair value of underlying assets
- Exercise price
- Asset volatility
- Maturity period
- Risk-free rate

The fair value of underlying assets and asset volatility will be computed by applying the Merton Theory as presented in Exhibit 1:

Calculation of Asset Value and Asset Volatility
(Figures in INR)

Time to Expiration	1 Year
Fair Value of Equity - [A] (1)	25,000
Debt (as of the valuation date) - [B]	100,000
Market Value of Invested Capital - [(A+B) = C]	125,000
Debt to invested capital - [B/C]	80.00%
Equity Volatility (2)	60.00%
Risk Free Rate (3)	7.00%
Implied Asset Value (4)	118,042
Asset Volatility (5)	13.12%
Call Option Value (6)	25,000
Merton Equity Volatility (7)	60.00%
Black Scholes Calculation	
Present Value of Exercise Price (PV(EX))	93,239
s*t^.5	0.13
d1	1.86
d2	1.73
Delta N(d1) Normal Cumulative Density Function	0.97
Bank Loan N(d2)*PV(EX)	89,364
Call Option Price	**25,000**

Notes:
(1) Market Capitalization as on the valuation date
(2) Historical volatility estimates
(3) Yield on 1-year Government Bond
(4) Asset Value is similar to business enterprise value ("BEV").
(5) Asset Value and Asset Volatility are solved for such that the following equations hold:
(I) The Market Cap and the Call Option Value are equal.
(II) The initial Equity Volatility and Merton Equity Volatility are equal.
(6) The value of equity is estimated as a call option on the Asset Value with a strike price equal to the Net Debt.
(7) Merton Equity Volatility is estimated as the product of Asset Value, Asset Volatility and N(d1) divided by Market Cap.

Accordingly by using the following inputs in the Black-Scholes Model, the fair value of the financial guarantee will be computed as presented in Exhibit 2:

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- Fair value of underlying assets: INR 1,18,042
- Exercise price: INR 1,00,000
- Asset volatility: 13.12%
- Maturity period: 1 year
- Risk free rate: 7% (based on 1-year Indian Government Bond)

Calculation of Financial Guarantee
(Figures in INR)

Particulats	1 Years
Fair Value of Assets (S)	118,042
Guaranteed Loan Amount (E)	100,000
Number of periods to Exercise in years (t)	1
Compounded Risk-Free Interest Rate (rf)	7.00%
Standard Deviation (annualized s)	13.12%
Present Value of Exercise Price (PV(EX))	93,239
s*t^.5	0.13
d1	1.86
d2	1.73
Delta N(d1) Normal Cumulative Density Function	0.97
Bank Loan N(d2)*PV(EX)	89,364
Value of Call	25,000
Value of Put	197
Value of Financial Guarantee (Value of Put Option)	**197**