6th Capacity Building Seminar on Retirement Benefits

Venue Gurgaon

Date 14th March 2019

Asset Regulations and ALM

K.Sriram

Consulting Actuary

Institute of Actuaries of India

Agenda

- Asset Regulations
- Risk Assessment of Asset Regulations
- Assessing Interest Rate Risk –Current Practices
- Assessing Overall Exposure to Interest Rate Risk
- Assessing Credit Risk-Why and How
- Structural Approach for Assessing Credit Risk
- Credit Migration Approach for Assessing Credit Risk
- Interpretation of “Reimbursement Rights” Under INDAS19
- Asset Regulations- Revisited

Mandated Asset Allocation Pattern - Gratuity Funds / Superannuation Funds

Asset Class	Minimum %	Maximum %
Government Securities & Related Instruments	45%	50%
Debt Instruments & Related Investments	35%	45%
Equities & Related Investment	5%	15%
Short term debt instruments & related Investments	0%	5%
Asset Backed Securities & Miscellaneous Investments	0%	5%

Comments on the Asset Allocation Pattern of the Gratuity Plan of XYZ Limited vis-à-vis Mandated Pattern

- Overweight on Government Securities

- Underweight on Corporate LT Debt

Comments on Interest Rate Risk Exposure of the Gratuity Plan of XYZ

- Significant underfunding
- Rate Sensitive Net Liability Position
- Duration of Expected benefit outgo is greater than duration of asset portfolio cash flows
- Convexity of Expected benefit outgo is greater than convexity of asset portfolio cash flows
- Significant Exposure to Interest Rate Risk

Immunization: Concept and Conditions

- PV(Assets) = PV (Liabilities)

- Duration (Assets) = Duration(Liabilities)

(or)

- DMT(Assets) = DMT (Liabilities)

- Convexity (Assets) > Convexity (Liabilities)

Mandated Asset Allocation Pattern and Financial Risk Management

- Lack of duration matching assets
- Corporate Bonds have a lower duration than that of Government Bonds
- Default Risk of Corporate Bonds
- Concentration Risk in Corporate Bond Portfolio
- Correlated Defaults?
- Correlation between bond returns & equity returns – Diversification Benefits?

Overall Exposure of XYZ Limited to Interest Rate Risk

- Business Portfolio
  - Duration of Asset is greater than duration of liabilities – exposed to downside risk when interest rates increase
- Gratuity Fund
  - Duration of expected benefit outgo is greater than duration of asset cash flows – exposed to downside risk when interest rates decreases
- Significant of Negative Correlation between the two exposures
- Only the net exposure needs to be hedged from an Enterprise Risk Management [ERM] standpoint

DURATION - INTEREST RATE MATRIX

In the following table D(A) represents Duration of Assets and D(L) represents Duration of Liabilities. V(A) represents Value of Assets and V(L) represents Value of Liabilities.

A typical situation will be one where Duration of Assets is less than the Duration of Liabilities and is therefore exposed to downside Interest rate risk when interest rates are expected to decline.

Relative Durations	i ↑	i ↓
D(A)>D(L)	% ↓ in V(A) >% ↓ in V(L)	% ↑ in V(A) > % ↑ in V(L)
D(A) < D(L)	% ↓ in V(A) < % ↓ in V(L)	% ↑ in V(A) < % ↑ in V(L)

Measuring Sensitivity of PVO to Interest Rate Changes using Duration & Convexity

- Change in PVO [delta PVO] for a given change in discount rate

  =(-) PVO * [Modified Duration * Change in Discount Rate + 0.5* Convexity * (Change in Discount Rate) ^ 2]

- Modified Duration = 7.6/1.077 = 7.05664 –INDAS19 Disclosure
- Convexity = 87
- Change in Discount Rate = (-)1%
- Change in PVO = -350*7.05664*(-.01)+0.5*87*(-0.01)^2
- = 24.7+1.5 =26.2
- Impact of Convexity – Liability Cash flows and Asset Cash flows
- Liability based Benchmark

Assessing Credit Risk

- Structural Models : Merton Model & KMV
- Credit Migration Models
- Application in the context of IFRS 9?
- Assessing Strength of Sponsor’s Covenant
- Credit Metrics

INTRODUCTION TO STRUCTURAL MODELS

- Consider a firm with total assets of 150 funded by equity of 50 and debt of 100 which is due to mature in say two years' time
- Let us now consider the following terminologies related to financial options
- The buyer of a call option has the right but not the obligation to buy a specified underlying asset at a specified price [exercise price] on or before a specified date. Therefore the buyer of a call option will exercise the right to buy only if the market price of the asset is more than the exercise price on or before the specified date. For getting this right he pays a call premium.
- The buyer of a put option has the right but not the obligation to sell a specified underlying asset at a specified price [exercise price] on or before a specified date. Therefore the buyer of a put option will exercise the right to sell only if the market price of the asset is less than the exercise price on or before the specified date. For getting this right he pays a put premium

INTRODUCTION TO STRUCTURAL MODELS

- Consider a firm with total assets of 150 funded by equity of 50 and debt of 100 which is due to mature in say two years' time
- Let us now consider the following additional terminologies related to financial options
- The seller of a call option has the obligation to sell the specified underlying asset at a specified price [exercise price] if the buyer of a call option exercises the right to buy. only For providing this right he receives a call premium.
- The seller of a put option has the obligation to buy the specified underlying asset at a specified price [exercise price] if the buyer of a put option exercises the right to sell. only For providing this right he receives a put premium.
- Now if we do a role play in our context is the shareholder a call buyer /call seller / put buyer/ put seller? Is the debtholder a call buyer/ call seller/ put buyer/ put seller?
- How is the put premium reflected in our context ?

Structural Models

- Debt holders have written a put option on the assets of a company
- Value of the put option (Merton Model)

  $P = B \exp(-rT) N(-d2) - X(0) N(-d1)$
- Probability of default on maturity of the debt obligation = N (-d2)
- Finding X(0) and Volatility of X(0)
- KMV Approach : Distance to Default (DD)
- DD = [X(0) – B] divided by [X(0) multiplied by sigma X(0)]

Default Probability & Distance to Default is XYZ Limited – Structural Approach

- X(0) = 3600
- B = 2160
- r = 0.075
- T = 2
- Sigma X(0) = 0.15
- d2 = -3.009
- N(-d2) = N(-3.009)= 0.13%= Probability of Default
- DD = (3600 -2160)/(3600 *0.15) = 1440/540 = 2.67
- N(-d2) with sigma of 20% = N(-2.195)= 1.41%= Probability of Default
- DD with sigma of 20%= (3600-2160)/(3600*0.2)=1440/720 = 2.00
- Default Probability of Connected Entities –Need to Model Dependence –for example using an appropriate copula

Credit Migration Models

- how ratings change over time
- can help to assess likelihood of default at some future point of time
- Extreme Events (ILFS?)
- Rating Migration Matrices are available in the public domain

Default Likelihood of XYZ Limited using Credit Migration Approach

- the probability that XYZ migrates to AAA and then defaults = (0.04% / (1-4.83%) x (0.00% / (1-3.31%) = 0.00%;
- the probability that XYZ migrates to AA and then defaults = (1.95% / (1-4.83%) x (0.00% / (1-4.00%) = 0.00%;
- the probability that XYZ remains at A and then defaults = (87.05% / (1-4.83%) x (0.08% / (1-4.83%) = 0.08%;
- the probability that XYZ migrates to BBB and then defaults = (5.47% / (1-4.83%) x (0.26% / (1-6.68%) = 0.02%;
- the probability that XYZ migrates to BB and then defaults = (0.40% / (1-4.83%) x (0.97% / (1-9.82%) = 0.00%;
- the probability that XYZ migrates to B and then defaults = (0.16% / (1-4.83%) x (4.93% / (1-11.83%) = 0.01%; and
- the probability that XYZ migrates to CCC-C and then defaults = (0.02% / (1-4.83%) x (27.98% / (1-14.37%) = 0.01%;

Hence default probability over two years is 0.20%.

Reimbursement Right Explained-Ind AS19- Paragraphs 116 to 119

When, and only when, it is virtually certain that another party will reimburse some or all of the expenditure required to settle a defined benefit obligation, an entity shall:

(a) recognise its right to reimbursement as a separate asset. The entity shall measure the asset at fair value.

(b) Disaggregate and recognise changes in the fair value of its right to reimbursement in the same way as for changes in the fair value of plan assets (see paragraph 124 and 125). The components of defined benefit cost recognized in accordance with paragraph 120 may be recognized net of amounts relating to changes in the carrying amount of the right to reimbursement.

When an insurance policy held by an entity is not a qualifying insurance policy, that insurance policy is not a plan asset. Paragraph 116 is relevant to such cases: the entity recognizes its right to reimbursement under the insurance policy as a separate asset, rather than as a deduction in determining the defined benefit deficit or surplus. Paragraph 140(b) requires the entity to disclose a brief description of the link between the reimbursement right and the related obligation.