Credit Risk Management in Life Insurance Companies

R. Kannan
Appointed Actuary,
SBI Life Insurance Company Ltd.,
Mumbai 400 021

7th Global Conference of Actuaries, Feb 2005

A. Issues for Life Insurance Companies

- The following issues need to be addressed on a continuous basis:
- What is the risk and return of the investment portfolio ?
- What are the most / least attractive exposures from the above view point ?
- What is the range and likelihood of portfolio values ?
- Given the profile of the above and other guarantees in the products sold, what is the capital required ?
- Is the capital earn enough return ?
- What are the major sources of concentration and diversification ?
- How the portfolio could be improved ?

The above issues could be reasonably answered through active credit risk portfolio management and this would also result in substantial improvement in return per unit of risk.

B. The nature of credit risk

- Risk of loss from obligor / counterparty default
- Credit risk is a function of

❖ Asset value

❖ Asset value volatility

❖ Leverage

❖ Liquidity

- Default is likely when the value of a firm's assets falls below its liabilities

C. Credit risk--composition

- Credit risk is best described by two measures:

❖ Expected loss : Average anticipated loss within a risk category through time, measured as

✓ Anticipated average annual loss rate

✓ foreclosable cost of doing business

✓ not ‘risk’, as investors think of it, but rather a charge which affects anticipated yield

❖ Unexpected loss: variance of actual loss over time (say 1 SD)

✓ Results in volatility of return over time

✓ Unanticipated and inevitable

✓ Requires a balance sheet cushion of “economic capital”

C (i). Expected loss

- Expected loss (EL) = { Expected default frequency } x { exposure at default (ED) } x {loss given default }
- Expected default frequency (EDF) is the probability that the borrower will default --- derived from companies borrower risk rating

  --- depends on the term of the facility

Loss given default (LGD) is the percentage of exposure at default that is expected to be lost in case of default by the borrower—depends on the seniority and the type, quantity and quality of the cover

EDF—borrower related

ED and LGD—facility related

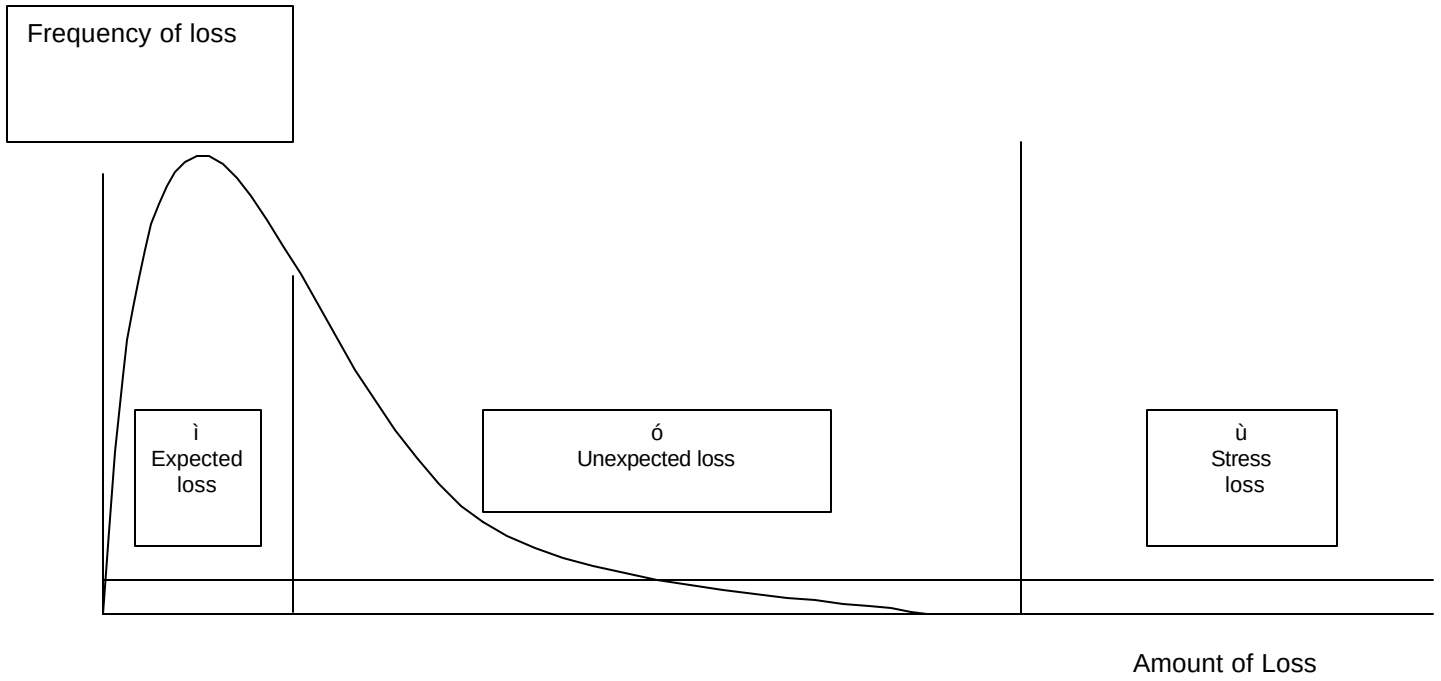
C (ii). Loss given default

- LGD consists of 3 components
- Principal loss { collateral type, collateral quality and collateral amount tier position }

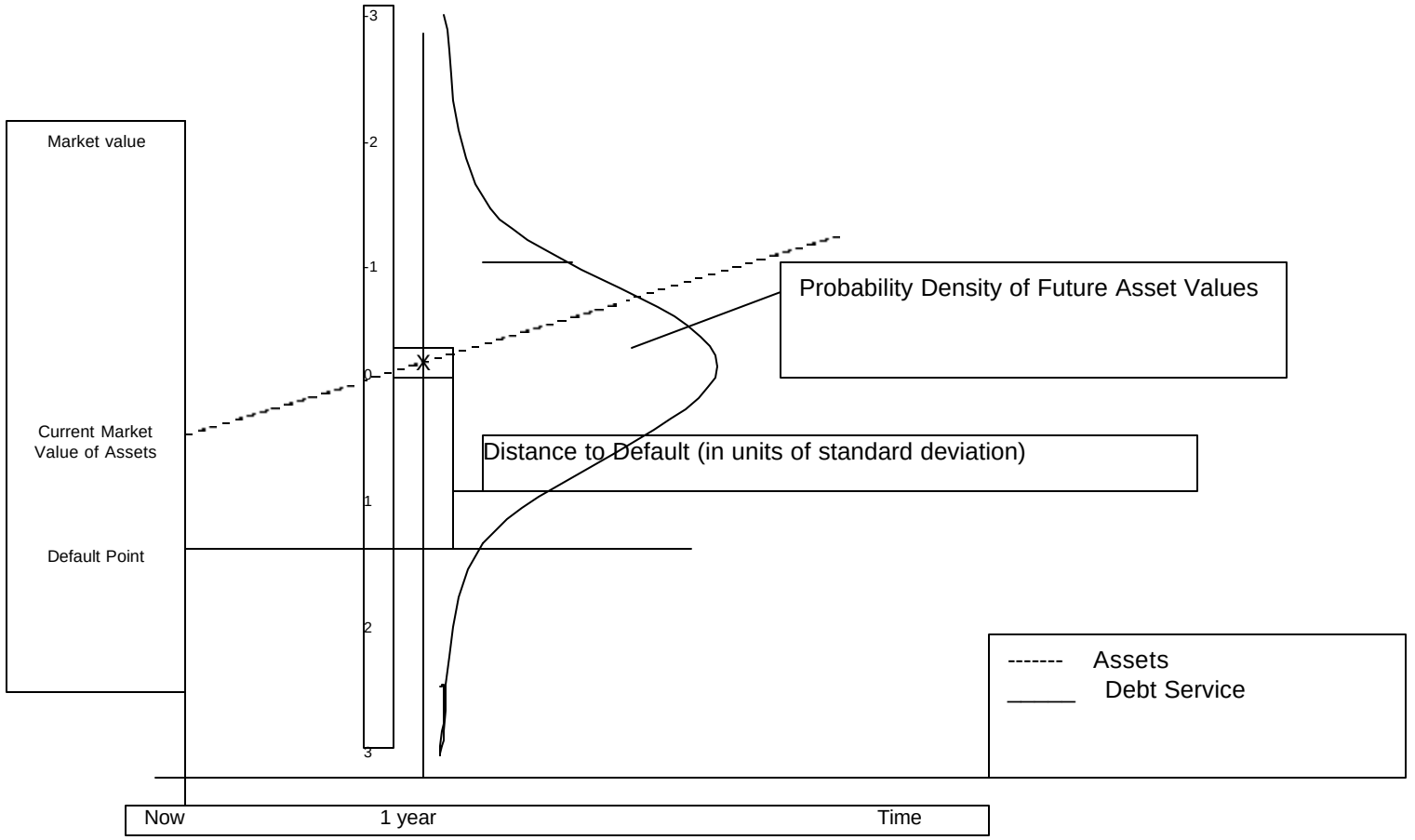
  + cost of carry { workout time / funding assumption }

  + administrative cost { workout process, cost structure }

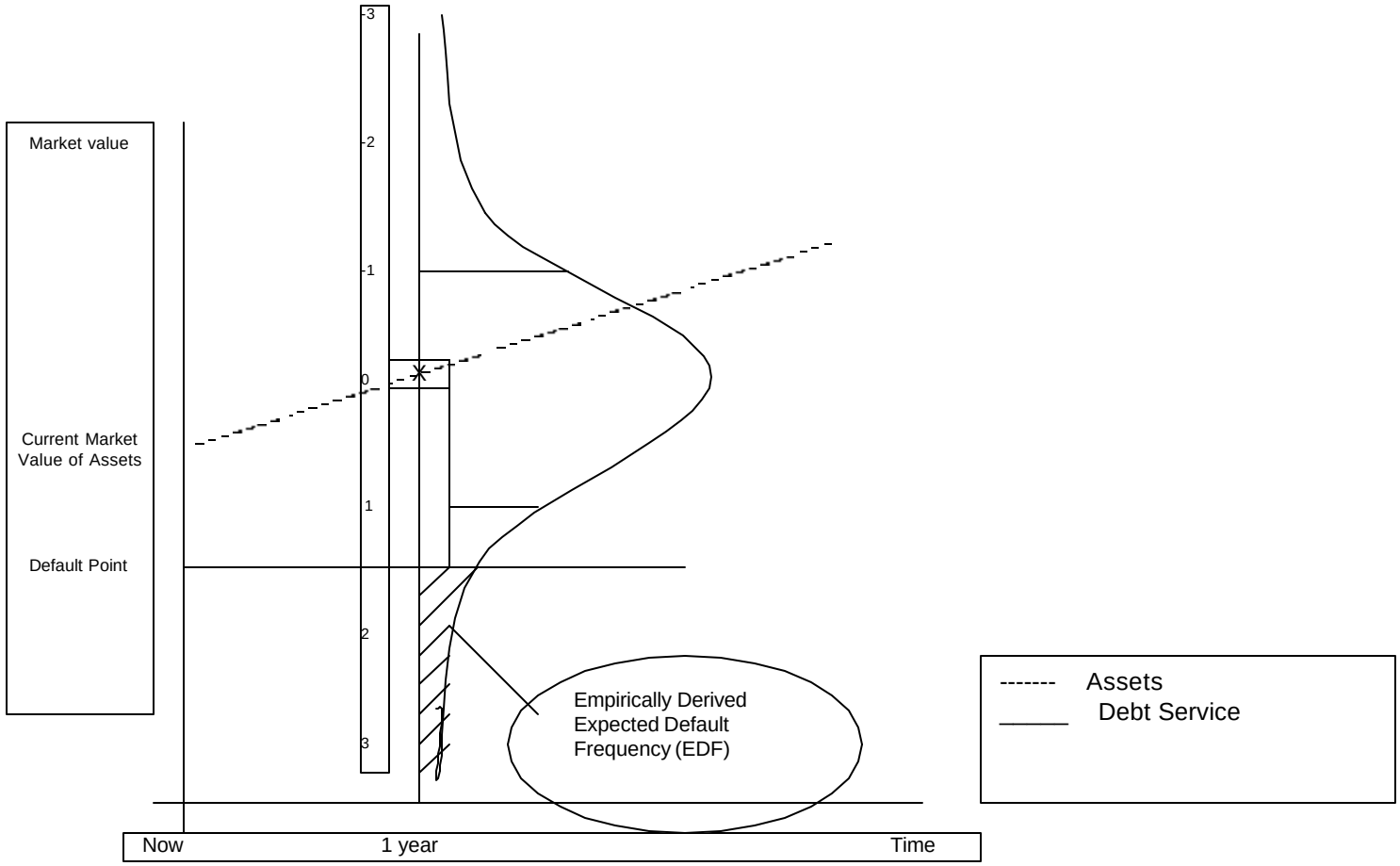
C (ii) – contd., Risk Distribution



C (ii) – contd., KMV approach to Estimating Default Risk



C (ii) – (contd.) KMV Approach for Estimating Default Risk



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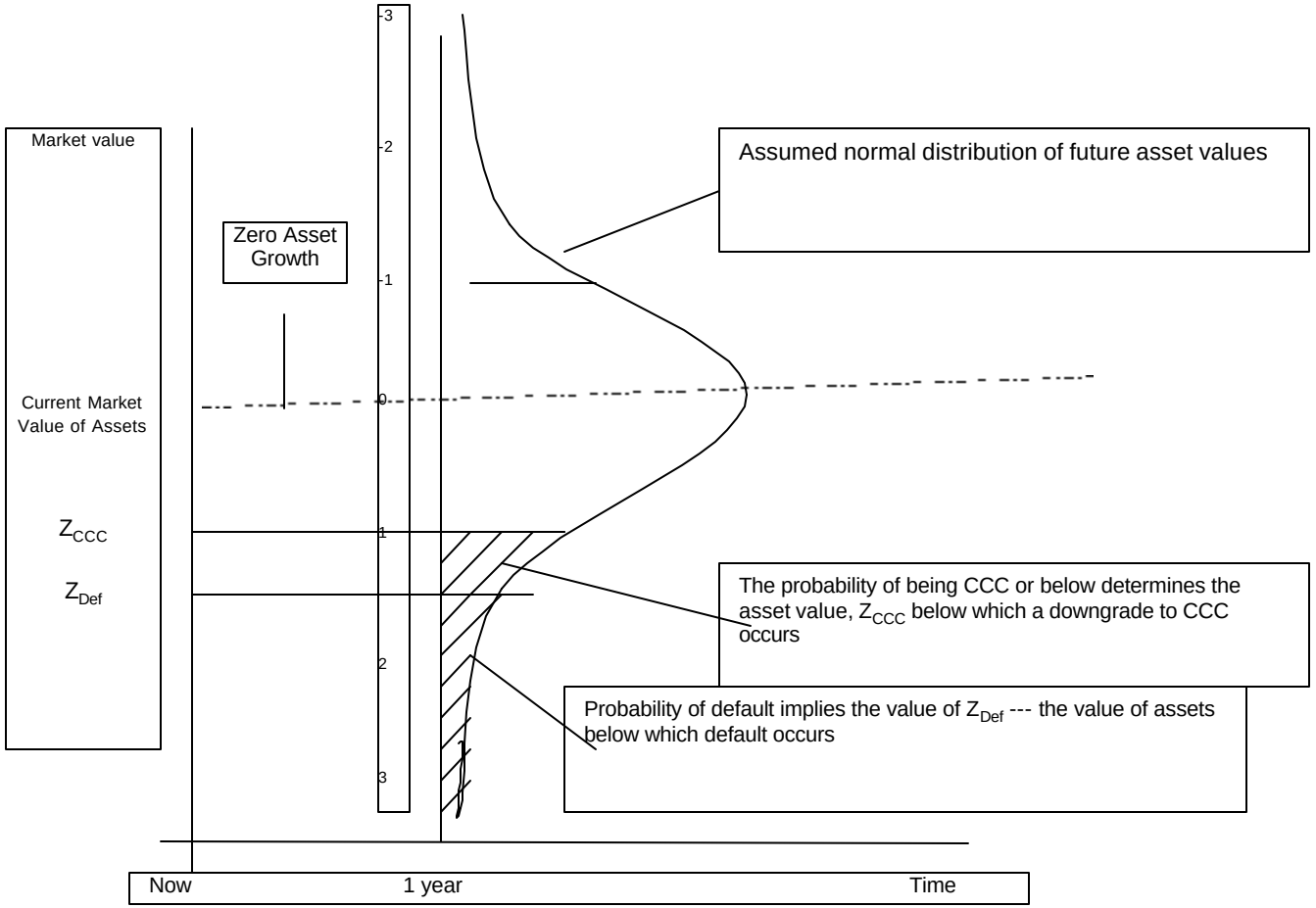
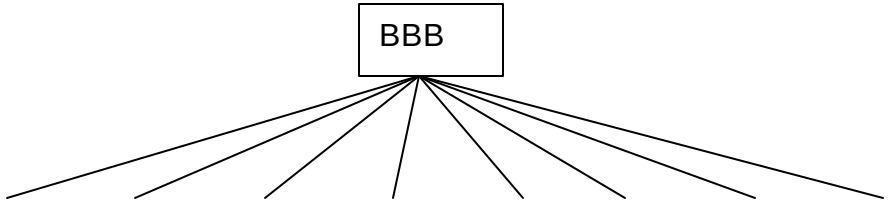


Distribution of Market Values at horizon

Current state

BBB



AAA	AA	A	BBB	BB	B	CCC	Default
0.02%	0.33%	5.95%	86.93%	5.30%	1.17%	0.12%	0.18%
X							
109.37	109.19	108.66	107.55	102.02	98.10	83.64	51.13

8 possible states one year hence

Transition probabilities

Bond price using forward spreads by rating

EXPECTED VALUE

$$m_T = \sum_{i=1}^{s} p_i m_i = \quad 107.09$$

STANDARD DEVIATION OF VALUE

$$s_T = \sqrt{\sum p_i (V_i - m_T)^2} \quad = 299$$

Standard and Poors' Cumulative Default Rates (Percent)

	Year									
Rating	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
AAA	**0.00**	**0.00**	**0.05**	**0.11**	**0.17**	**0.31**	**0.47**	**0.76**	**0.87**	**1.00**
AA	**0.00**	**0.02**	**0.07**	**0.15**	**0.27**	**0.43**	**0.62**	**0.77**	**0.85**	**0.96**
A	**0.04**	**0.12**	**0.21**	**0.36**	**0.56**	**0.76**	**1.01**	**1.34**	**1.69**	**2.06**
BBB	**0.24**	**0.54**	**0.85**	**1.52**	**2.19**	**2.91**	**3.52**	**4.09**	**4.55**	**5.03**
BB	**1.01**	**3.40**	**6.32**	**9.38**	**12.38**	**15.72**	**17.77**	**20.03**	**22.05**	**23.69**
B	**5.45**	**12.36**	**19.03**	**24.28**	**28.38**	**31.66**	**34.73**	**37.58**	**40.02**	**42.24**
CCC	**23.69**	**33.52**	**41.13**	**47.43**	**54.25**	**56.37**	**57.94**	**58.40**	**59.52**	**60.91**

Source : Standard & Poors' Report 2005

Comparison of Credit Risk Models

	Credit Metrics	Credit Risk +	Credit Portfolio View
Originator	J.P. Morgan	Credit Suisse	McKinsey
Philosophy	Merton model, microeconomic casusal	Actuarial top-down, no causality	Econometric, macroeconomic causal
Risk definition	Market value	Default losses	Market value
Risk drivers	Assset values	Default rates	Macro factors
Correlation	From equities	Default process	Factor model
Solution	Simulation/ analytical	Analytical	Simulation

Source:"Value at Risk" by Philippe Jorion, 2000, Page 337

D. Credit Risk and Market Risk Comparison
(i) Expected Loss

- "Expected Loss" in Market Risk is directly observable from the movement in market prices of liquid instruments.
  - At any given time, the Market Risk distribution is centered near zero
  - Some adjustments must be made for illiquid instruments

- "Expected Loss" in Credit Risk is generally not observable until an asset becomes impaired or restructured

Credit Risk and Market Risk Comparison
(ii) Unexpected loss

- Market Risk distributions are approximated by the bell-curve (normal distribution)
  - For most liquid instruments, there is very good historical data from which to calculated a distribution
  - Normal distributions are very well-behaved mathematically, so it is easy to do computations on a whole portfolio

- Credit Risk distributions are skewed and have very long loss “tail”, which displays itself only over a long time period
  - Very little historical data from which to estimate a distribution
  - Computations with skewed, fat-tailed distributions are challenging

Credit Risk and Market Risk Comparison
(iii) Stress Loss

- Stress Loss for Market Risk requires the selections of a ‘market shock scenario” and a simulation of the portfolio’s performance during such a market shock
  - Doing the simulation is possible with current risk systems, but choosing the scenario takes subtle insight

- Stress Loss for Credit Risk is much easier

E. Limitations of Credit Risk

- While discussing credit risk the following limitations are to be recognized. Credit risk is a combination of spread risk and default risk. But the spread risk is related to credit risk and also to market risk. The conditions prevailing in the capital market could vary which will affect credit spreads for all credit ratings or due to improvement or deterioration in the credit quality of the obligor. There are occasions where both have occurred simultaneously. Downgrade risk is nothing but credit risk. When the credit quality deteriorates then the spread relative to the no-risk yield curve increase. Hence adding spread risk to downgrade risk could lead to doubt counting.

- Secondly, market participants anticipate the evolving credit developments before they actually happen. Hence spread to a greater extent contains the expectation of new status. Hence spread risk is by-product of market risk and credit risk.

- Thirdly, default is a special case of downgrading, as the credit quality deteriorates to a point where the obligor cannot service anymore its debt obligations. Hence credit – VaR model should address both migration risk and default risk in a consistent and integrated framework.

- Finally changes in economic condition, through the changes in important variable such as interest rate, output growth rate, unemployment rate etc., affect overall profitability of obligors. This considerably affects the probabilities of default and the probabilities of migration from one credit rating to another. This underscores the integrated nature of credit risk and market risk.

F. Economic Capital

1. Loss given default

= Principal Loss (50%)

+

Cost of carry (7%)

+

Administrative cost (3%)

= 60%

2. i) Expected Loss = EDF X Exposure at default X LGD

= 0.10% X Rs. 10 crore X 60%

= 60,000

ii) Unexpected loss is defined as the SD of actual loss and depends on the same variable as "expected loss".

$$UL = EAD \times \sqrt{EDF \times (LGD - LGD^2) \times 0.25 + LFG^2 \times (EDF - EDF^2)}$$

= Rs.2.05 crore

Economic capital = Unexpected Loss X Correlation factor X Capital multiple

(2.05 X 0.15 X 7) = 2.14 cr.

Thank you