2013 FRM Level II

百题巅峰班讲义

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Part 2: Credit Risk Measurement and Management

Key Point: Default Probability Calculation

1. Mike Merton is the head of credit derivatives trading at an investment bank. He is monitoring a new credit default swap basket that is made up of 20 bonds, each with a 1% annual probability of default. Assuming the probability of any one bond defaulting is completely independent of what happens to other bonds in the basket, what is the probability that exactly one bond defaults in the first year?

    A. 2.06%
    B. 3.01%
    C. 16.5%
    D. 30.1%

Answer: C

Explanation: $C_{20}^1 p^1 (1-p)^{19} = 20 \times 0.01 \times (1-0.01)^{19} = 0.1652$

2. A portfolio consists of 17 uncorrelated bonds, each rated B. The 1-year marginal default probability of each bond is 5.93%. Assuming an even spread of default probability over the year for each of the bonds, what is the probability of exactly 2 bonds defaulting in the first month?

    A. 0.0325%
    B. 0.325%
    C. 0.024%
    D. 0.24%

Answer: B

Given a 1-year marginal default rate of 5.93%, the 1-month marginal default rate is = 0.00508.

$P(X = 2) = C_{17}^2 \times (0.00508)^2 \times (1-0.00508)^{15} = 0.325\%$

3. A corporate bond will mature in three years. The marginal probability of default in year one is 3%. The marginal probability of default in year two is 4%. The marginal probability of default in year three is 6%. What is the cumulative probability that default will occur during the three-year period?

    A. 12.47%

B.   12.76%

C.   13%

D.   13.55%

Answer: A

This is one minus the survival rate over three years: $S3(R) = (1 − d1)(1 − d2)(1 − d3) = (1 − 0.03)(1 − 0.04)(1 − 0.06) = 0.8753$. Hence, the cumulative default rate is 0.1247.

4.   You are the risk manager at Vision, a small fixed-income hedge fund that specializes in bank debt. Vision's strategy utilizes both relative value and long-only trades using credit default swaps (CDS) and bonds. One of the new traders has the positions described in the table below.

Bank	Position	Credit Rating
SBU	Long USD 10 million CDS	A
Stanos	Long USD 5 million bond	BB+
CAB	Short USD 10 million CDS	A

Some of Vision's newest clients are restricted from withdrawing their funds for three years. You are currently evaluating the impact of various default scenarios to estimate future asset liquidity. You have estimated that the marginal probability of default of the Stanos bond is 5% in Year 1, 10% in Year 2, and 15% in Year 3. What is the probability that the bond makes coupon payments for 3 years and then defaults at the end of Year 3?

A.   13%

B.   15%

C.   27%

D.   73%

Correct answer: A

Explanation: The probability that the bond defaults in year 3 can be modeled as a Bernoulli trial given by the following equation where MP stands for marginal probability:

P (Default at end of year 3) = (1-MP$_{\text{year 1 default}}$)* $(1 − MP_{\text{year 2 default}})$ * MP$_{\text{year 3 default}}$

   = (1- 0.05) * (1 - 0.10) * 0.15 = 0.1283 or 12.83%.

Key Point: Joint Default Probability

Joint Default Probability

$$P(A \text{ and } B) = Corr(A,B)\sqrt{p(A)[1 − p(A)]}\sqrt{p(B)[1 − p(B)]} + p(A)p(B)$$

5.   Consider an A-rated bond and a BBB-rated bond. Assume that the one-year probabilities of default for the A- and BBB-rated bonds are 2% and 4%, respectively, and that the joint

probability of default of the two bonds is 0.15%. What is the default correlation between the two bonds?

A. 0.07%
B. 2.6%
C. 93.0%
D. The default correlation cannot be calculated with the information provided.

Answer: B

Key Point: Poisson distribution and Exponential distribution

Poisson distribution: $P(X = x) = \dfrac{\lambda^x e^{-\lambda}}{x!}$ ，用来刻画违约个数的概率分布

Exponential distribution： $f(x) = \lambda \times e^{-\lambda x},\ \mathrm{x} \geq 0$ ，用来刻画到下一次违约所用时间的概率分布
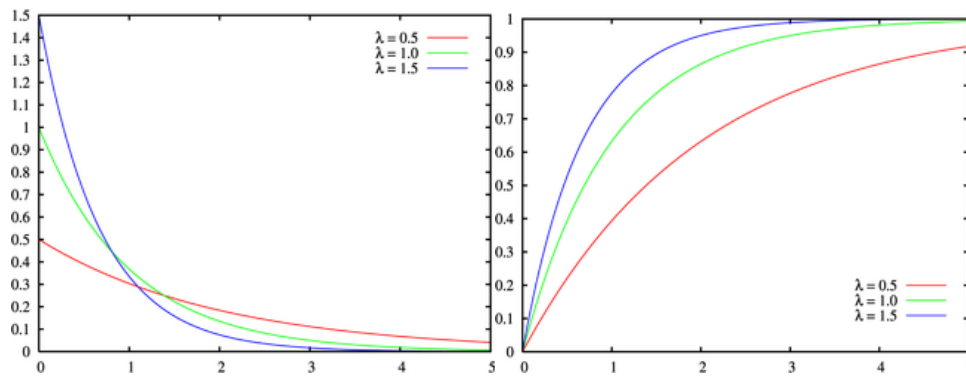
Hazard Rates

The hazard rate (default intensity) is represented by the (constant) parameter λ and the probability of default over the next, small time interval, *dt*, is *λdt*.

Cumulative PD

If the time of the default event is denoted t*, the cumulative default time distribution *F(t)* represents the probability of default over (0, t):

$$P(t^* < t) = F(t) = 1 - e^{-\lambda t}$$

The survival distribution is:

$$P(t^* \geq t) = 1 - F(t) = e^{-\lambda t}$$

6. An analyst has noted that the default frequency in the pharmaceutical industry has been constant at 8% for an extended period of time. Based on this information, which of the following statements is most likely correct for a randomly selected firm following a Bernoulli distribution?

I. The cumulative probability that a randomly selected firm in the pharmaceutical industry will default is constant.

II. The probability that the firm survives for the next 6 years without default is approximately 60%.

A. I only
B. II only
C. Both I and II
D. Neither I nor II

Answer: B

Statement I is false because the cumulative probability of default increases (i.e., even the highest rated companies will eventually fail over a long enough period). Statement II is true since the probability the firm survives over the next 6 years without default is: $(1-0.08)^6=60.6\%$

Key Point: Loss Given Default and Recovery Rate

Loss Given Default

Factors that affect die recovery rate of traded bonds:

• *Seniority:* more senior claimants will generally have a higher recovery rate.

• *Collateralization:* allocation, value, and liquidity of the assets will determine the recovery rare.

• *Jurisdiction (*司法权; 裁判权)*:* Defines default and options for a firm in default.

• *Industry:* some industries have a large amount of capital that can be sold in the event of default.

• *Business cycle* default probabilities will vary throughout the cycle.

Recovery Rate Functions

Modeling the loss given default is also called fitting the recovery function. Three functions estimate how much the holder of the debt will get in the event of default.

• *The **beta** distribution:* parametric statistical distribution that uses the mean and variance of recovery rates. It is the assumed distribution of recovery for credit risk portfolio models like CreditMetrics.

Beta Distribution (a,b)=(5,2)

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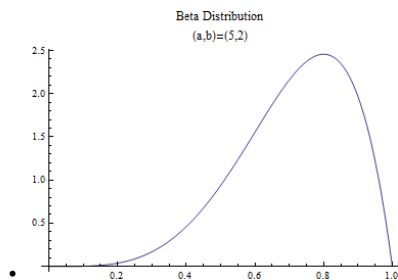
7. Which of the following statement is incorrect?

A. Recovery rates are negatively related to default rates.
B. The distribution of recovery rates is often modeled with a gamma distribution.
C. The legal environment is also a main driver of recovery rates.
D. Recovery rate is equal to one minus loss given default.

Answer: B

The distribution of recovery rates is often modeled with a beta distribution.

Key Point: Using Spread to price Default Risk

$$P^* = \frac{\$100}{(1+y^*)} = \left[\frac{\$100}{(1+y)}\right] \times (1-\pi) + \left[\frac{f \times \$100}{(1+y)}\right] \times \pi \Rightarrow \pi = \frac{1}{(1-f)}\left[1 - \frac{(1+y)}{(1+y^*)}\right]$$

$$\Rightarrow y^* \approx y + \pi(1-f) \text{, or } \pi = \frac{y^*-y}{(1-f)} \text{, or } \pi = \frac{\text{Spread}}{\text{LGD}}$$

8. Consider a 1-year maturity zero-coupon bond with a face value of USD 1,000,000 and a 0% recovery rate issued by Company A. The bond is currently trading at 80% of face value. Assuming the excess spread only captures credit risk and that the risk-free rate is 5% per annum, the risk-neutral 1-year probability of default on Company A is closest to which of the following?

   A. 2%
   B. 14%
   C. 16%
   D. 20%

Correct answer: C

Explanation: This can be calculated by using the formula which equates the future value of a risky bond with yield (y) and default probability (π) to a risk free asset with yield (r):

   $1+r = (1-\pi) \times (1+y) + \pi R$

   π = Probability of default; R = Recovery rate

In the situation where the recovery rate is assumed to be zero, the risk-neutral probability of default can be derived from the following equation: $1+r = (1-\pi) \times (1+y) = (1-\pi) \times (FV/MV)$

Where MV = market value and FV = face value.

Inputting the data into this equation yield π = 1 - (800,000*1.05)/1,000,000 =0.16.

9. Given the following information, what is the probability of default for this zero- coupon bond that matures in one year?

Face value of bond	$100
Market price of bond	$86
Risk-free rate	5%

A. 9.70%.
B. 30.71%.
C. 10.74%.
D. 35.21%.

Answer: A

First back out the yield for the bond: $=\dfrac{\$100}{\$86}-1=16.28\%$

The probability of default is then calculated as: $=1-\left(\dfrac{1.05}{1.1628}\right)=9.70\%$

Alternatively, it can be calculated as: $=1-\dfrac{\$86\times1.05}{\$100}=9.70\%$

10. A loan of $10 million is made to a counterparty whose expected default rate is 2% per annum and whose expected recovery rate is 40%. Assuming an all-in cost of funds of LIBOR for the lender, what would be the fair price for the loan?

A. LIBOR + 120bp
B. LIBOR + 240bp
C. LIBOR − 120bp
D. LIBOR + 160bp

Answer: A

11. The zero coupon bond of an A-rated company maturing in five years is trading at a spread of 1% over the zero-coupon bond of a AAA-rated company maturing at the same time. The spread can be explained by:

I. Credit risk
II. Liquidity risk
III. Tax differentials

A. I only
B. I and II only

C.   I and III only

D.   I, II, and III

Answer: B

Tax differentials cannot explain the difference because both bonds are corporate bonds and subject to taxes. By contrast, the A-rated bond has higher credit risk and possibly lower liquidity, implying a higher yield.

12. Suppose XYZ Corp. has two bonds paying semiannually according to the following table. The recovery rate for each in the event of default is 50%. For simplicity, assume that each bond will default only at the end of a coupon period. The market-implied risk-neutral probability of default for XYZ Corp. is
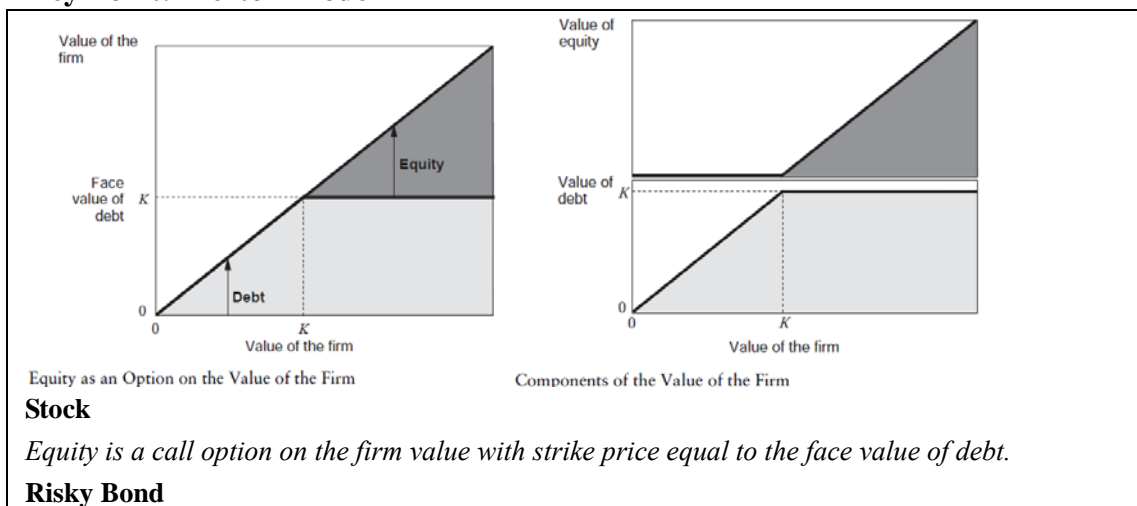
Remaining Maturity	Coupon(30/360)	Price	T-bill rate
6 months	8%	99	5.5%
1 year	9%	100	6%

A.   Greater in the first six-month period than in the second

B.   Equal between the two coupon periods

C.   Greater in the second six-month period than in the first

D.   Cannot be determined from the information provided

Answer: A

First, we compute the current yield on the six-month bond, which is selling at a discount. We solve for $y*$ such that $99 = 104/(1 + y*/2)$ and find $y* = 10.10\%$. Thus, the yield spread for the first bond is $10.1 - 5.5 = 4.6\%$. The second bond is at par, so the yield is $y* = 9\%$. The spread for the second bond is $9 - 6 = 3\%$. The default rate for the first period must be greater. The recovery rate is the same for the two periods, so it does not matter for this problem.

Key Point: Merton Model

Equity as an Option on the Value of the Firm   Components of the Value of the Firm

Stock

Equity is a call option on the firm value with strike price equal to the face value of debt.

Risky Bond

Long bond$_{risk}$ = long bond$_{risk-free}$ + short put Option on the firm value

Merton Model

$$S = call = VN(d_1) - Ke^{-r\tau}N(d_2)$$

$$d_1 = \frac{\ln(V/Ke^{-r\tau})}{\sigma\sqrt{\tau}} + \frac{\sigma\sqrt{\tau}}{2}$$

$$d_2 = d_1 - \sigma\sqrt{\tau}$$

$$(\sigma_S S) = \Delta(\sigma_V V)$$

$$B = Ke^{-r\tau}N(d_2) + V[1 - N(d_1)]$$

$$RN\ Default\ probability = 1 - N(d_2) = N(-d_2)$$

13. According to the Merton model, if the firm's debt has a face value of $60 and the value of the firm is $50 when the debt matures, what is the payoff to the debt holders and to the shareholders?

	Payoff to Debt Holders	Payoff to Share Holders
A.	$50	$10
B.	$10	$0
C.	$10	$10
D.	$50	$0

Answer: D

The payment to debt holders = Dm - max (Dm - Vm, 0) = 60 - max (60 - 50, 0) = $50

The payment to the firm's stock holders = max (Vm - Dm, 0) = max (50-60, 0) = $0

At maturity of the debt, if the value of the firm's assets is less than the value of the firm's debt, then the firm goes into default.

14. Suppose a firm has two debt issues outstanding. One is a senior debt issue that matures in three years with a principal amount of $100 million. The other is a subordinate debt issue that also matures in three years with a principal amount of $50 million. The annual interest rate is 5%, and the volatility of the firm value is estimated to be 15%. If interest rates decline in the Merton model, then which of the following is true?

A. If the firm is experiencing financial distress (low firm value), then the value of senior debt will increase while the values of subordinate debt and equity will both decline.

B. If the firm is not experiencing financial distress (high firm value), then the value of senior debt and subordinate debt and equity will increase.

C. If the firm is experiencing financial distress (low firm value), then the value of senior debt and subordinate debt will increase while equity values will decline.

D. If the firm is not experiencing financial distress (high firm value), then the value of senior debt will increase while the values of subordinate debt and equity will both decline.

Answer: A

When firms with subordinate debt are experiencing financial distress (low firm values), changes in the value of subordinate debt will react to changes in the model parameters in the same way as equity. Since equity is valued as a call option in the Merton model, a decline in interest rates will reduce the value of equity (and subordinate debt). When firms with subordinate debt are not experiencing financial distress (high firm values), changes in the value of subordinate debt will react to changes in the model parameters in the same way as senior debt. Since senior debt is valued as the difference in firm value less equity valued as a call option in the Merton model, a decline in interest rates will increase the value of senior debt and subordinate debt.

15. A digital call pays a fixed amount to the buyer if the asset finishes above the strike price. Assume that at the end of a 1-year investment horizon, the stock is equal to $48, the fixed payment amount is equal to $50, and $N(d_1)$ and $N(d_2)$ from the Black-Scholes-Merton model are equal to 0.96 and 0.98, respectively. The value of this digital call when the continuously compounding risk-free rate equals 5% is closest to:
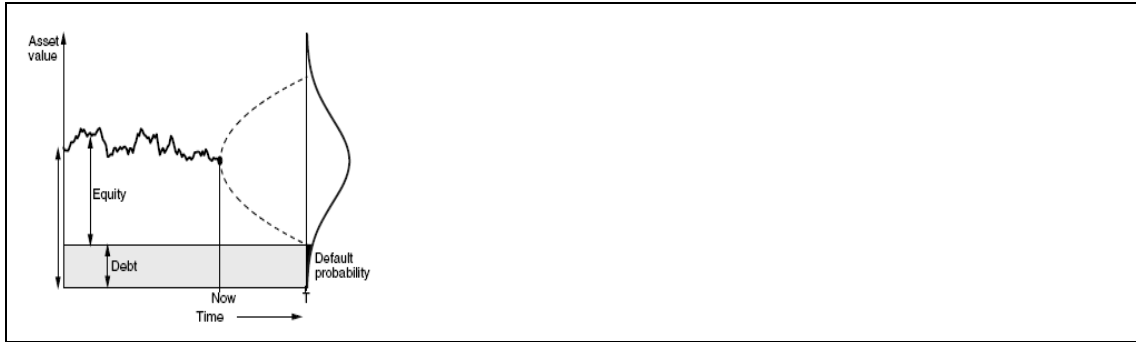
A. $45.4
B. $46.6
C. $47.5
D. $48.6

Answer: B

call $= $ fixed amount $\times e^{-rT} N(d_2) = 50 \times e^{-5\%} \times 0.98 = 46.6$

Key Point: KMV Model

The normalized distance to default (DD) $z = \dfrac{A - K}{\sigma_A}$
Where: K is the value of liabilities,
K = short-term liabilities $+ 0.5 \times$ long-term liabilities.

16. An analyst is using Moody's KMV model to estimate the distance to default of a large public firm, Shoos Inc., a firm that designs, manufactures and sells athletic shoes. The firm's capital structure consists of USD 40 million in short-term debt, USD 20 million in long-term debt, and there are one million shares of stock currently trading at USD 10 per share. The asset volatility is 20% per year. What is the normalized distance to default for Shoos Inc.?

    A.　0.714
    B.　1.430
    C.　2.240
    D.　5.000

Answer: B

Explanation: Moody's KMV model is a model for predicting private company defaults. It covers many geographic specific models, and each model reflects the unique lending, regulatory, and accounting practices of that region. Moody's KMV computes the normalized distance to default as:

$$DD = \frac{A-K}{A\sigma_A}$$, where: "K" (floor) is defined as the value of all short term liabilities (one year

and under) plus one half of the book value of all long term debt: 40 million + 0.5×20 million = 50 million. 'A" is the value of assets: Market value of equity (1 million shares×10/share = 10 million) plus the book value of all debt (60 million) = 70 million. Thus $A\sigma_A$ = 20% × 70 million = 14 million. DD = (70 million - 50 million) / 14 million = 1.429 standard deviations

17. You are given the following information about firm A:

    · Market value of asset at time 0 = 1000
    · Market value of asset at time 1 = 1200
    · Short-term debt = 500
    · Long-term debt = 300
    · Annualized asset volatility = 10%

    According to the KMV model, what are the default point and the distance to default at time 1?

	Default Point	Distance to Default
A.	800	3.33
B.	650	7.50
C.	650	4.58
D.	500	5.83

Answer: C

Default Point$=\left(500+\dfrac{1}{2}\times300\right)=650$, Distant to Default$=\dfrac{1200-\left(500+\dfrac{1}{2}\times300\right)}{1200\times10\%}=4.58$

Key Point: Credit Spread

Credit spread is the difference between the yield on a risky bond (e.g., corporate bond) and the yield on a risk-free bond (e.g., T-bond) given that the two instruments have the same maturity.

$$\text{Credit Spread}=-\left[\frac{1}{T\text{-}t}\times\ln\left(\frac{D}{F}\right)\right]-R_{F}$$

where:

D = current value of debt

F = face value of debt

Key Point: Expected and Unexpected Loss

- *Expected loss* (EL) represents the average loss in value from a risky asset over a specified time horizon.
  $$EL = AE \times LGD \times EDF$$

- The variation in expected loss is called the *unexpected loss* (UL). $UL=AE\times\sqrt{EDF\times\sigma_{LGD}^{2}+LGD^{2}\times\sigma_{EDF}^{2}}$

- The **expected loss of a portfolio** is the sum of the expected losses of the individual assets.
  $$EL_{P}=AE_{1}\times LGD_{1}\times EDF_{1}+AE_{2}\times LGD_{2}\times EDF_{2}$$

- The **unexpected loss of the portfolio** will be less than a simple sum of the individual asset unexpected losses. This reflects the diversification benefits of an asset pool.

  $$UL_{P}=\sqrt{UL_{1}^{2}+UL_{2}^{2}+2\rho UL_{1}UL_{2}}$$

- **Risk Contributions**

Each asset within a portfolio contributes to only a portion of its unexpected loss. This effect is captured by the risk contribution (RC) measure. For a two-asset portfolio:

$$RC_{1}=\times\frac{UL_{1}^{2}+(\rho_{1,2}\times UL_{1}\times UL_{2})}{UL_{P}}$$

$$RC_{2}=\times\frac{UL_{2}^{2}+(\rho_{1,2}\times UL_{1}\times UL_{2})}{UL_{P}}$$

Together, the two risk contributions will equal the unexpected loss on the portfolio: $RC_{1}+RC_{2}=UL_{P}$

18. You are evaluating the credit risk in a portfolio comprised of Loan A and Loan B. In particular, you are interested in the risk contribution of each of the loans to the unexpected loss of the portfolio. Given the information in the table below, and assuming that the

correlation of default between Loan A and Loan B is 20%, what is the risk contribution of Loan A to the risk of the portfolio?

	Adjusted Exposure	Expected Default Frequency	Volatility of Expected Default Frequency	Loss Given Default	Volatility of Loss Given Default
Loan A	USD 3,000,000	1.50%	7.00%	30%	20%
Loan B	USD 2,000,000	3.50%	12.00%	45%	30%

A. USD 39,587
B. USD 62,184
C. USD 96,794
D. USD 120,285

Answer: B

Explanation: Risk contribution is a critical risk measure for assessing credit risk. The risk contribution of a risky assets "RC" to the portfolio unexpected loss, is defined as the incremental risk that the exposure of a single asset contributes to the portfolio's total risk. Mathematically:

$RC_A = (UL_A^2 + p \times UL_A \times UL_B)/UL_p$

$UL = AE \times sqrt(EDF \times VAR_{LGD} + LGD^2 \times VAR_{EDF})$. Therefore:

$UL_A = 3,000,000 \times sqrt(1.5\% \times 20\%^2 + 30\%^2 \times 7\%^2) = 96,793.59$

$UL_B = 2,000,000 \times sqrt(3.5\% \times 30\%^2 + 45\%^2 \times 12\%^2) = 155,769.06$

$UL_P = sqrt(96793.59^2 + 155,769.06^2 + 2 \times 20\% \times 96,793.59 \times 155,769.06) = 199,158.17$

$RC_A = (96,793.59^2 + 20\% \times 96,793.59 \times 155,769.06) / 199,158.17 = 62,184.19$

19. Bigger bank has two assets outstanding. The features of the loans are summarized in the table below. Assuming a correlation of 0.2 between the assets, what is the value of UL_P?

	Asset A	Asset B
COM	$6,000,000	$4,000,000
OS	$4,000,000	$2,000,000
UGD	55.00%	80.00%
EDF	2.00%	1.00%
LGD	50.00%	40.00%
σ_{EDF}	2.00%	5.00%
σ_{LGD}	25.00%	20.00%

A. Less than $100,000
B. Between $100,000 and $200,000
C. Between $200,000 and $300,000
D. Greater than $300,000

Answer: C

C   The calculations below describe the steps to compute the unexpected loss of a portfolio.

Step 1:   Compute AE for both assets.

$$AE_A = OS + (COM - OS) \times UGD$$
$$= \$4,000,000 + (\$2,000,000 \times 0.55)$$
$$= \$5,100,000$$

$$AE_B = OS + (COM - OS) \times UGD$$
$$= \$2,000,000 + (\$2,000,000 \times 0.8)$$
$$= \$3,600,000$$

Step 2:   Compute UL for both assets.

$$UL = AE \times \sqrt{EDF \times \sigma^2_{LGD} + LGD^2 \times \sigma^2_{EDF}}$$

$$UL_A = \$5,100,000 \times \sqrt{0.02 \times 0.25^2 + 0.5^2 \times 0.02^2} = \$187,386$$

$$UL_B = \$3,600,000 \times \sqrt{0.01 \times 0.2^2 + 0.4^2 \times 0.05^2} = \$101,823$$

Step 3:   Compute UL_P.

$$UL_P = \sqrt{(187,386)^2 + (101,823)^2 + (2)(0.2)(187,386)(101,823)} = \$230,464$$

Key Point: Counterparty Risk

Definition: The risk that a counterparty is unable or unwilling to live up to its contractual obligations.

Right-way exposures: exposures that are positively correlated with the counterparty's credit quality. They reduce expected credit losses.

Wrong-way exposures: exposures that are negatively correlated with the counterparty's credit quality. They increase expected credit losses.

20. A Mexican retailer buys its goods from global suppliers. The contracts are priced in U.S. dollars. The retailer sells its goods to Mexican consumers and receives pesos from the sales. The firm enters a currency swap in which they will pay dollars and receive Brazilian real. They use Monte Carlo simulation to model their potential future exposure (PFE) to the real. Which of the following is most consistent with the retailer's circumstances?

A.   The retailer has wrong-way exposure in the swap and should use a lognormal distribution to model the PFE to the real.

B.   The retailer has right-way exposure in the swap and should use a distribution that allows for jumps to model the PFE to the real.

C.   The retailer has right-way exposure in the swap and should use a lognormal distribution to model the PFE to the real.

D.   The retailer has wrong-way exposure in the swap and should use a distribution that allows for jumps to model the PFE to the real.

Answer: D

The retailer has wrong-way exposure in the swap. They are paying dollars in their underlying business and paying dollars in the swap. If the dollar increases in value, their losses increase in both their business and the swap (i.e., the swap increases their expected losses).

The retailer should use a distribution that allows for jumps to model the PFE to the real because emerging country currencies are subject to extreme volatility.

A lognormal distribution would be used for major currencies, so choices A and C are incorrect.

21. Which of the following two transactions increases counterparty credit exposure?

I. Selling a forward contract to the counterparty

II. Selling a call option to the counterparty

A. I only

B. I only

C. Both

D. Neither

Answer: A

Explanation:

I. Selling of forward contract creates credit risk exposure to the counterparty as it is subject to the performance of the counterparty, which may default to pay at expiry date,

II. Selling an option (for both call and put) does not create credit risk as it is not subject to the performance of the counterparty. The option premium has already been collected when the transaction is made and default of the counterparty will have no negative impact on the seller.

22. Sacks Bank has many open derivative positions with Lake Investments. A description and current market values are displayed in the table below:

Positions	Market Price (USD)
Long swaptions	10 million
Long credit default swaps	-25 million
Short currency derivatives	25 million

In the event that Lake defaults, what would be the loss to Sacks if netting is used?

A. USD 5 million

B. USD 10 million

C. USD 25 million

D. USD 35 million

Answer: B

Explanation: Netting means that the payments between the two counterparties are netted out, so that only a net payment has to be made. With netting, Sacks is not required to make the payout of 25 million. Hence the loss will be reduced to: 35 million -25 million = 10 million

Key Point: Credit Value Adjustment (CVA)

15-63

CVA is the expected value or price of counterparty credit risk. A positive value represents a cost to the counterparty that bears a greater propensity to default.

A risky security transaction has a risk-free price with no counterparty risk and an adjustment for counterparty risk (i.e., risky MtM = risk-free MtM - CVA)

$$CVA \approx LGD \times \sum EE(t) \times PD(t\text{-}1,t) \times d(t)$$

Where: d(t) = discount factors

Incremental and Marginal CVA

Incremental CVA calculates the cost of a new trade versus an existing one to determine the effect that the new trade has on CVA. The formula is identical to stand-alone CVA, except for the use incremental expected exposure.

Marginal CVA is used for trade level attribution. The formula is identical to stand-alone CVA, except for the use of marginal expected exposure.

23. With respect to the CVA calculation, which of the following statement is correct when a risk manager wishes to understand which trades have the greatest impact on a counterparty's CVA? The manager would use:

A. Incremental CVA because it accounts for the change in CVA once the new trade is priced, accounting for netting.
B. Marginal CVA because he could break down netted trades into trade level contributions.
C. Incremental CVA because he could break down netted trades into trade level contributions.
D. Marginal CVA because it accounts for the change in CVA once the new trade is priced, accounting for netting.

Answer: B

Understanding which trades have the greatest impact on a counterparty's credit value adjustment requires use of the marginal CVA. Incremental CVA, by contrast, is useful for pricing a new trade with respect to an existing one.

Key Point: Credit Exposure

24. If a counterparty defaults before maturity, which of the following situations will cause a credit loss?

A. You are short Euros in a one-year euro/USD forward FX contract, and the euro has appreciated.
B. You are short Euros in a one-year euro/USD forward FX contract, and the euro has depreciated.
C. You sold a one-year OTC euro call option, and the euro has appreciated.

D. You sold a one-year OTC euro call option, and the euro has depreciated.

Answer: B

25. Consider a long position of the up-out call option with the cap price 120 and strike price 100. When the stock price increases from 80 to 130 and decreases back to 110, which of the following positions have the credit exposure?

A. Long positions of the up-out call option when the stock price increases from 85 to 99.
B. Long positions of the up-out call option when the stock price increases from 103 to 119.
C. Long positions of the up-out call option when the stock price increases from 122 to 129.
D. Long positions of the up-out call option when the stock price decreases from 127 to 115.

Answer: B

Key Point: Credit Exposure of the Interest Rate Swap

$$dr_t = \kappa\left(\theta - r_t\right) dt + \sigma r_t^{\gamma} dz_t \qquad\qquad V_t = B(F, t, T, c, r_t) - B(F, FRN)$$
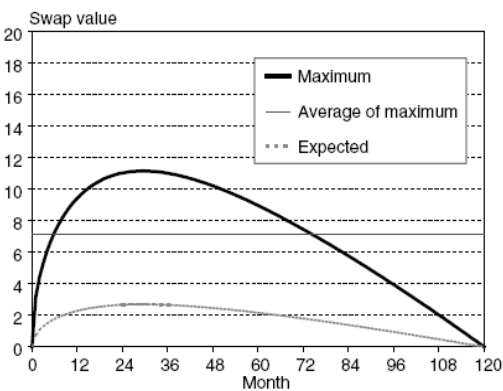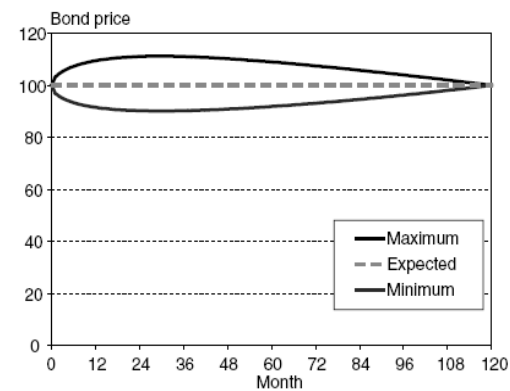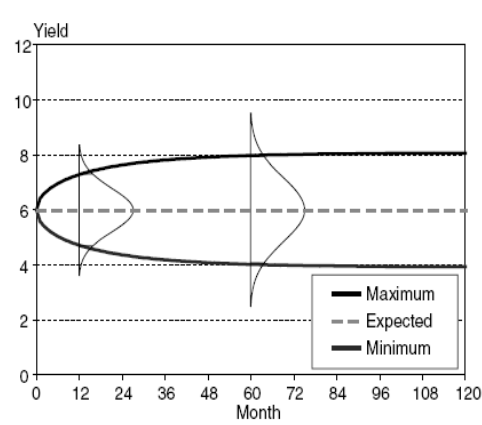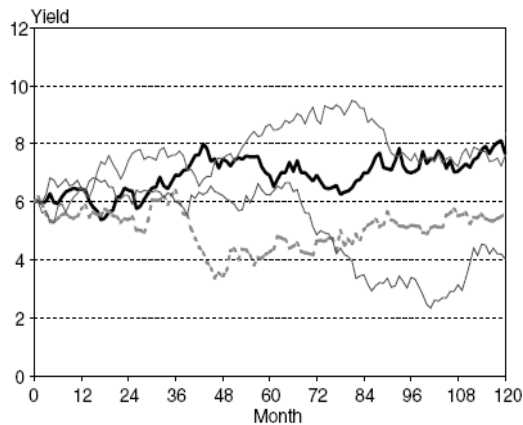
26. Assume that swap rates are identical for all swap tenors. A swap dealer entered into a plain-vanilla swap one year ago as the receive-fixed party, when the price of the swap was

7%. Today, this swap dealer will face credit risk exposure from this swap only if the value of the swap for the dealer is

A. Negative, which will occur if new swaps are being priced at 6%
B. Negative, which will occur if new swaps are being priced at 8%
C. Positive, which will occur if new swaps are being priced at 6%
D. Positive, which will occur if new swaps are being priced at 8%

Answer: C

27. Assume that the DV01 of an interest rate swap is proportional to its time to maturity (which at the initiation is equal to T). Assume that interest rate curve moves are parallel, stochastic with constant volatility, normally distributed, and independent. At what time will the maximum potential exposure be reached?

A. T/4
B. T/3
C. T/2
D. 3T/4

Answer: B

$$\sigma(V) = [k(T-t) \times \sigma\sqrt{t}]$$

28. Determine at what point in the future a derivatives portfolio will reach its maximum potential exposure. All the derivatives are on one underlying, which is assumed to move in a stochastic fashion (variance in the underling's value increases linearly with time passage). The derivatives portfolio's sensitivity to the underlying is expected to drop off as $(T - t)^2$, where T is the time from today until the last contract in the portfolio rolls off, and t is the time from today.

A. T/5
B. T/3
C. T/2
D. None of the above

Answer: A

Taking now the variance instead of the volatility, we have $\sigma^2 = k(T - t)^4 \times t$, where k is a constant. Differentiating with respect to t, setting the derivative to zero, we have $t = T/5$.

29. Assume that you have entered into a fixed-for-floating interest rate swap that starts today and

ends in six years. Assume that the duration of your position is proportional to the time to maturity. Also assume that all changes in the yield curve are parallel shifts, and that the volatility of interest rates is proportional to the square root of time. When would the maximum potential exposure be reached?

A.   In two months
B.   In two years
C.   In six years
D.   In four years and five months

Answer: B

Exposure is a function of duration, which decreases with time, and interest rate volatility, which increases with the square root of time. Define T as the original maturity and k as a constant. This give $\sigma(Vt) = k(T - t)\sqrt{t}$. Taking the derivative with respect to t gives a maximum at t = (T/3). This gives t = (6/3) = 2 years.

Key Point: Credit Exposure of the Currency Swap

$$V_t = S_t(\$/BP) \times B^*(GBP50, t, T, c^*, r^*) - B(\$100, t, T, c, r)$$
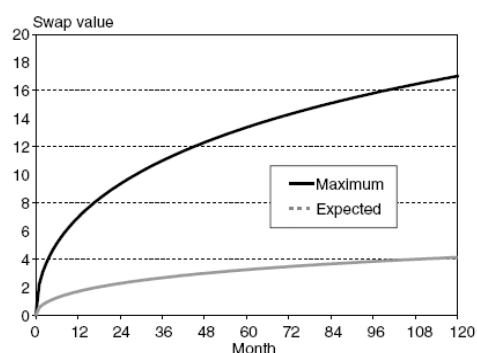
> With a positively sloped term structure, the receiver of the floating rate (payer of the fixed rate) has a greater credit exposure than the counterparty.
> The receiver of a low-coupon currency has greater credit exposure than the counterparty.

30. Which one of the following deals would have the greatest credit exposure for a $1,000,000 deal size (assume the counterparty in each deal is an AAA-rated bank and has no settlement risk)?

A.   Pay fixed in an Australian dollar (AUD) interest rate swap for one year.
B.   Sell USD against AUD in a one-year forward foreign exchange contract.
C.   Sell a one-year AUD cap.
D.   Purchase a one-year certificate of deposit.

Answer: D

The CD has the whole notional at risk. Otherwise, the next greatest exposure is for the forward currency contract and the interest rate swap. The short cap position has no exposure if the

premium has been collected. Note that the question eliminates settlement risk for the forward contract.

31. BNP Paribas has just entered into a plain-vanilla interest-rate swap as a pay-fixed counterparty. Credit Agricole is the receive-fixed counterparty in the same swap. The forward spot curve is upward-sloping. If LIBOR starts trending down and the forward spot curve flattens, the credit risk from the swap will:

A. Increase only for BNP Paribas
B. Increase only for Credit Agricole
C. Decrease for both BNP Paribas and Credit Agricole
D. Increase for both BNP Paribas and Credit Agricole

Answer: B

With an upward-sloping term structure, the fixed payer has greater credit exposure. He receives less initially, but receives more lately. This back-loading of payments increases credit exposure. Conversely, if the forward curve flattens, the fixed payer (i.e., BNP Paribas) has less credit exposure. Credit Agricole must have greater credit exposure. Alternatively, if LIBOR drifts down, BNP will have to pay more, and its counterparty will have greater credit exposure.

Key Point: Exposure Modifiers

> ✓ Marking to Market
> ✓ Collateral and Haircut
> ✓ Netting Arrangements
> ✓ Credit Triggers & Time Puts (**Credit triggers** specify that if either counterparty's credit rating falls below a specified level, the other party has the right to have the swap cash settled. **Time puts**, or **mutual termination options**, permit either counterparty to terminate unconditionally the transaction on one or more dates in the contract.)

32. Which of the following are methods of credit risk mitigation?
    I. Collateral agreements
    II. Netting

    A. I only
    B. II only
    C. Both
    D. Neither

Answer: C

Both collateral and netting agreements are methods of mitigation credit risk.

33. A diversified portfolio of OTC derivatives with a single counterparty currently has a net mark-to-market value of USD 20,000,000 and a gross absolute mark-to-market value (the sum of the value of all positive-value positions minus the value of all negative-value positions) of USD 80,000,000. Assuming there are no netting agreements in place with the counterparty, determine the current credit exposure to the counterparty.

A. Less than or equal to USD 19,000,000
B. Greater than USD 19,000,000 but less than or equal to USD 40,000,000
C. Greater than USD 40,000,000 but less than USD 60,000,000
D. Greater than USD 60,000,000

Answer: C

Define X and Y as the absolute values of the positive and negative positions. The net value is $X - Y = 20$ million. The absolute gross value is $X + Y = 80$. Solving, we get $X = 50$ million. This is the positive part of the positions, or exposure.

Key Point: Modeling Collateral

Certain parameters impact the effectiveness of collateral in lessening credit exposure. These parameters are as follows:

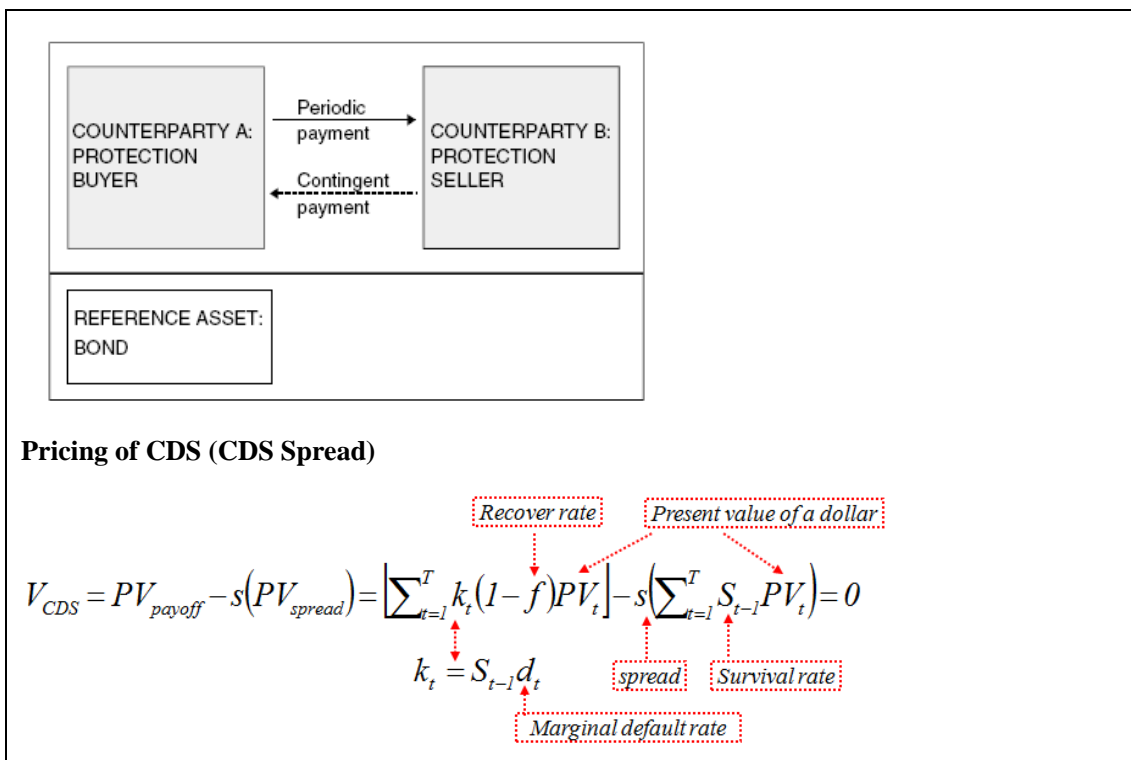**Remargin (追加保证金) period**: the time between the call for collateral and its receipt.

Threshold: an exposure level below which collateral is not called. It represents an amount of uncollateralized exposure.

Minimum transfer amount: the minimum quantity or block in which collateral may be transferred. Quantities below this amount represent uncollateralized exposure.

Independently amount: an amount posted independently of any subsequent collateralization. This is also referred to as the initial margin.

Key Point: Credit Derivatives 1 - CDS

✓ In a Credit Default Swaps (CDS "信用违约互换") contract, a protection buyer (say A) pays a premium to the protection seller (say B), in exchange for payment if a credit event occurs.

✓ A default swap acts like a put option on the reference obligation for the buyer of the swap. If there is a default, the buyer receives a payment, which limits the buyer's downside risk.

✓ A long position in a corporate bond is equivalent to a long position in a risk-free bond plus a short position in a credit default swap.

Pricing of CDS (CDS Spread)

$$V_{CDS} = PV_{payoff} - s(PV_{spread}) = \left[\sum_{t=1}^{T} k_t (1-f) PV_t\right] - s\left(\sum_{t=1}^{T} S_{t-1} PV_t\right) = 0$$

$$k_t = S_{t-1} d_t$$

Recover rate, *Present value of a dollar*, *spread*, *Survival rate*, *Marginal default rate*

34. A portfolio consists of one (long) $100 million asset and a default protection contract on this asset. The probability of default over the next year is 10% for the asset and 20% for the counterparty that wrote the default protection. The joint probability of default for the asset and the contract counterparty is 3%. Estimate the expected loss on this portfolio due to credit defaults over the next year with a 40% recovery rate on the asset and 0% recovery rate for the counterparty.

   A. $3.0 million
   B. $2.2 million
   C. $1.8 million
   D. None of the above

Answer: C

The only state of the world with a loss is a default on the asset jointly with a default of the guarantor. This has probability of 3%. The expected loss is $100,000,000 × 0.03 × (1 − 40%) = $1.8 million.

35. You are currently long $10,000,000 par value, 8% XYZ bonds. To hedge your position, you must decide between credit protection via a 5-year CDS with 60bp annual premiums or digital swap with 50% payout with 50bp annual premiums. After one year, XYZ has defaulted on its debt obligations and currently trades at 60% of par. Which of the following statements is true?

   A. The contingent payment from the protection buyer to the protection seller is greater under the single-name CDS than the digital swap.

B. The contingent payment from the protection buyer to the protection seller is less under the single-name CDS than the digital swap.

C. The contingent payment from the protection seller to the protection buyer is greater under the single-name CDS than the digital swap.

D. The contingent payment from the protection seller to the protection buyer is less under the single-name CDS than the digital swap.

Answer: C

Choices A and B can be eliminated because payments in default are made from protection seller to protection buyer. The payoff from the digital swap will be 50% of par value while the payoff from the single name will be 40% (i.e., 1-0.6) of par value.

36. When an institution has sold exposure to another institution (i.e., purchased protection) in a CDS, it has exchanged the risk of default on the underlying asset for which of the following?

A. Default risk of the counterparty

B. Default risk of a credit exposure identified by the counterparty

C. Joint risk of default by the counterparty and of the credit exposure identified by the counterparty

D. Joint risk of default by the counterparty and the underlying asset

Answer: D

The protection buyer is exposed to the joint risk of default by the counterparty and underlying credit. If only one defaults, there is no credit risk.

37. Lin Ping is valuing a 1-year credit default swap (CDS) contract which will pay the buyer 75% of the face Value of a bond issued by Xiao Corp. immediately after a default by Xiao. To purchase this CDS, the buyer will pay the CDS spread, which is a percentage of the face value, once at the end of the year. Lin estimates that the risk-neutral default probability for Xiao is 5% per year. The risk-free rate is 3% per year. Assuming defaults can only occur halfway through the year and that the accrued premium is paid immediately after a default, what is the estimate for the CDS spread?

A. 380 basis points
B. 385 basis points
C. 390 basis points
D. 400 basis points

Correct: answer: C

Explanation: The key to CDS valuation is to equate the present value (PV) of payments to the PV of expected payoff in the event of default. Let s denote the CDS spread.

π = probability of default during year 1 = 5%

C = contingent payment in case of default=75%

d_i= discount factor = $e^{-0.03 \times 1}$ for 1-year and $e^{-0.03 \times 0.5}$ for half a year = 0.97044 and 0.98511

s = CDS spread (to be solved)

The premium leg, which includes the spread payment and accrual, is:

$$s*(0.5d_{0.5}* \pi +d_1(1- \pi)) = s*(0.02463+0.92192) = s*0.94655$$

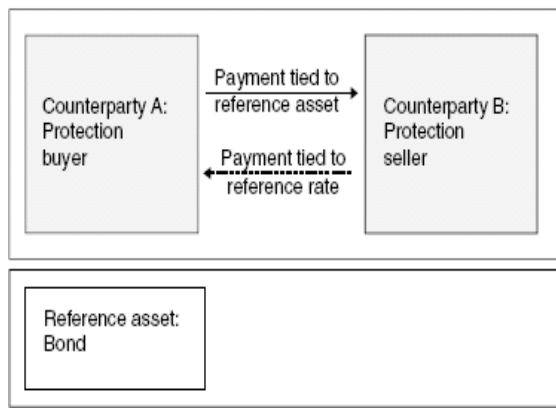The payoff leg is:

$$C * (d_{0.5}) * \pi = 0.03694$$

Solving for the spread: s*0.94655 = 0.03694 → s = 0.03902 or a spread of 390 basis points.

Key Point: Credit Derivatives 2 - TRS

Total Rate of Return Swaps (TROR "总收益率互换") are contracts where one party, called the protection buyer (also called TROR payer and risk seller), makes a series of payments linked to the total return on a reference asset.

38. A bank holds USD 60 million worth of 10-year 6.5% coupon bonds that are trading at a clean price of USD 101.82. The bank is worried by the exposure due to these bonds but cannot unwind the position for fear of upsetting the client. Therefore, it purchases a total return swap (TRS) in which it receives annual LIBOR + 100 bps in return for the mark-to market return on the bond. For the first year, the LIBOR sets at 6.25%, and by the end of the year the clean price of the bonds is at USD 99.35. The net receipt/payment for the bank in the total return swap will be to:

   A.   Receive USD 1.97 million
   B.   Receive USD 2.23 million
   C.   Pay USD 2.23 million
   D.   Pay USD 1.97 million

Answer: A

$$7.25*60m+\frac{101.82-99.35}{101.82}*60m-6.5*\frac{60m}{101.82}=1.97m$$

39. Risk Averse Bank (RAB) has made a loan of USD 100 million at 8% per annum. RAB wants

to enter into a total return swap under which it will pay the interest on the loan plus the change in the mark-to-market value of the loan, and in exchange, RAB will get LIBOR + 30 basis points. Settlement payments are made annually. What is the cash flow for RAB on the first settlement date if the mark-to-market value of the loan falls by 2% and LIBOR is 6%?

A.   Net inflow of USD 0.3 million
B.   Net outflow of USD 0.3 million
C.   Net inflow of USD1.7 million
D.   Net outflow of USD 1.7 million

Answer: A

40. Gamma industries inc issues an inverse floater with a face value of USD 50.000.000 that pays a semiannual coupon of 1150% minus LIBRO gamma industries intends to execute an arbitrage strategy and earn a profit by selling the notes. Using the proceeds to purchase a bond with a fixed semiannual coupon rate of 6.75% a year, and then hedge the risk by entering into an appropriate swap. Gamma industries receive a quote from a swap dealer with a fixed rate of 5.75% and a floating rate of LIBOR. What would be the most appropriate type of swap of Gamma industries, Inc., to enter into to hedge its risk?

A.   Pay-fixed, receive-fixed swap
B.   Pay-floating, receive-fixed swap
C.   Pay-fixed, receive-floating swap
D.   The risk cannot be hedged with a swap

Answer: B
Short inverse floater: -11.5% +LIBOR
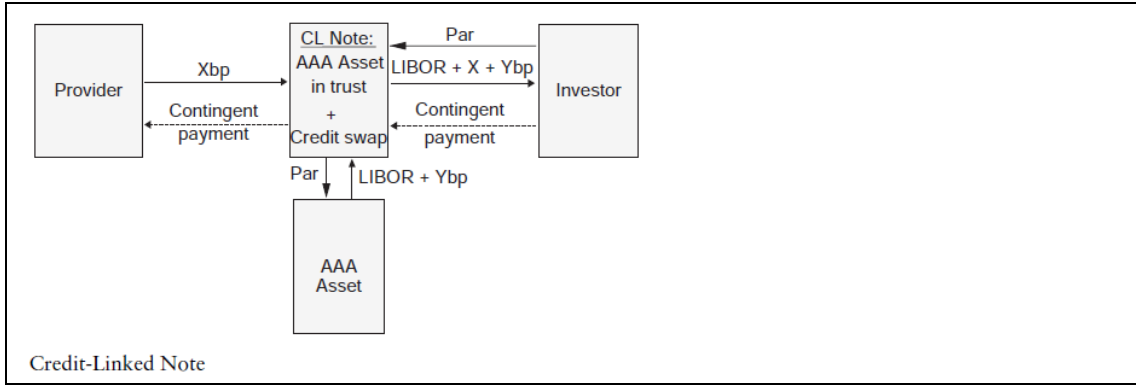Long a bond: +6.75%
Net profit: -4.75% +LIBOR
The swap in the market: 5.75% ~ LIBOR, so the LIBOR in the market is overpriced.

Key Point: Credit Derivatives 3 -Credit-Linked Notes

Credit-linked notes (CLN "信用连结票据") are not stand-alone derivatives contracts but instead combine a regular coupon-paying note with some credit risk feature.

Credit-Linked Note

41. Which of the following statements about credit-linked notes is true?

    A. The borrower receives an enhanced coupon.
    B. The borrower receives a reduced coupon.
    C. The lender receives an enhanced coupon.
    D. The lender receives a reduced coupon.

Answer: C

In a credit-Linked note, the lender (note holder) receives an enhanced coupon as compensation for bearing the credit risk of the issuer.

42. A three-year, credit-linked note (CLN) with underlying company Z has a LIBOR + 60bps semi-annual coupon. The face value of the CLN is USD 100. LIBOR is 5% for all maturities. The current three-year CDS spread for company Z is 90bps. The fair value of the CLN is closest to

    A. USD 100.00
    B. USD 111.05
    C. USD 101.65
    D. USD 99.19

Answer: D

Because the current CDS spread is greater than the coupon, the CLN must be selling at a discount. The only solution is D.

Key Point: Credit Derivatives 4 – Structured Products & CDO

Collateralized Debt Obligation Structure

CDO Market: Cash-flow CDOs VS Synthetic CDOs

➤ **Cash-flow CDO with**

   N underlying securities

➤ **Synthetic CDO with**

   N underlying securities

Characteristics:
➤ Sell CDS
➤ Buy high quality asset
➤ Off-balance sheet
➤ No operational risk

	Balance Sheet CDOs	*Arbitrage CDOs*
Typical underlying assets	Loans	Bonds
Asset origination	Originator's balance sheet	Open market
Management	Passive	Active
Purpose	Credit risk management	Profit
Residual interest	Retained by originator	May be sold to investors

43. The Big Bank Corp has securitized a large pool of 100 mortgages as follows: $75 million in senior AAA notes, $20 million in mezzanine BB notes, and $5 million in equity tranche. Big Bank Corp would like to provide a credit enhancement to the issue. Which of the following strategies would most effectively reinforce the credit rating of the AAA notes?

A. 26th-to-default basket.

B. Standard basket.

C. Senior basket with $25 million loss level.

D. Subordinated basket with $25 million loss level.

Answer: C

The senior basket provides compensatory payouts after $25 million in loss is suffered by the pool. Because the goal is to enhance the AAA notes, $25 million can be absorbed by the mezzanine and equity investors without impairing the AAA notes. Assuming all credits are of equal size, the 26th-to-default basket would provide minimal protection since all defaults above 26 would directly impair AAA claims. The standard basket would provide protection starting with the first default and thus would be very expensive if used to protect the AAA

44. A hedge fund is considering taking positions in various tranches of a collateralized debt obligation (CDO). The fund's chief economist predicts that the default probability will decrease significantly and that the default correlation will increase. Based on this prediction, which of the following is a good strategy to pursue?

A. Buy the senior tranche and buy the equity tranche.

B. Buy the senior tranche and sell the equity tranche.

C. Sell the senior tranche and sell the equity tranche.

D. Sell the senior tranche and buy the equity tranche.

Answer: D

Explanation: The decrease in probability of default would increase the value of the equity tranche. Also, a default of the equity tranche would increase the probability of default of the senior tranche, due to increased correlation, reducing its value. Thus, it is better to go long the equity tranche and short the senior tranche.

45. National united bank has recently increased the bank's liquidity through securitization of existing credit card receivables. The proposed securitization includes tranches with multiple internal credit enhancements as shown in Exhibit 1 below. The total value of the collateral for the structure is USD 600 million, no lockout period, and the subordinated tranche B bond is the first loss piece:

Exhibit 1: Proposed ABS Structure

Bond Class	par value
Senior tranche	USD 250 million
Junior tranche A	USD 200 million
Junior tranche B	USD 70 million

Subordinated tranche A	USD 50 million
Subordinated tranche B	USD 30 million
Total	**USD 600 million**

At the end of the fourteenth month after the securities were issued, the underlying credit card accounts have prepaid USD 300 million in principal in addition to regularly scheduled principal and interest payments. What is the amount of the prepaid principal paid out to the holders of the junior tranche A bond class?

A. USD 0 million
B. USD 50 million
C. USD 120 million
D. USD 230 million

Answer: B

USD 50 million is calculated by USD300-USD250=USD50, since prepayments are first distributed to the senior tranches.

46. An investor has sold default protection on the most senior tranche of a CDO. If the default correlation decreases sharply, assuming everything else is unchanged, the investor's position will

A. Gain significant value since the probability of exercising the protection falls.
B. Lose significant value since his protection will gain value.
C. Neither gain nor lose value since only excepted default losses matter and correlation does not affect expected default losses.
D. It depends on the pricing model used and the market conditions.

Answer: A

47. Harris Smith, CFO of XYZ Bank Corp, is considering a $500 million loan securitization. He has enlisted a well-respected structuring agent to help decide on the most beneficial structure. XYZ is a $100 billion regional bank with a moderately strong balance sheet. Its current credit rating on unsecured debt is BBB. It recently issued a secured bond issue with a credit rating of A after ring-fencing certain assets. XYZ desires to minimize the cost of funds and achieve AAA credit rating on the senior tranche of the new securitization. After reviewing the financials of XYZ and forecasting future economic conditions, the structure has recommended an arbitrage CDO with the following loss distributions:
• Equity tranche: 0—30%
• Junior tranche: 30—50%
Smith should use which of the following CDO structures?

A. Arbitrage CDO with $25 million equity tranche.
B. Arbitrage CDO with $150 million equity tranche.
C. Balance sheet CDO with $25 million equity tranche.
D. Balance sheet CDO with $150 million equity tranche.

Answer: C

Since XYZ wants to securitize loans it originated, this fits the profile of a balance sheet CDO. Also, the suggested loss distribution likely has too large of an equity tranche. Hence, the smaller equity tranche of $25 million, which represents 5% of the issue, is more appropriate to still retain AAA rating of senior tranche.

48. King Motors Acceptance Corporation (KMAC), the finance arm of King Motors, issues an auto-loan asset-backed security that consists of a senior tranche, denoted Tranche A in the amount of $50 million and an interest payment of 5 percent, and two subordinated tranches, denoted Tranches X and Z respectively, each with a face amount of $35 million. Tranche X pays investors annual interest at a rate of 6.5 percent while Tranche Z pays investors annual interest at a rate of 7.5 percent. Which of the following methods of credit support would NOT affect the credit quality of subordinated Tranche X?

A. The total amount of the auto loans that make up the asset-backed issue is $125 million.
B. The weighted average interest rate on the auto loans making up the pool is 6.4 percent.
C. Any defaults on the part of King Motor's customers will be first absorbed by Tranche Z.
D. KMAC has a reserve in the amount of $10 million that will remain on KMAC's balance sheet.

Answer: D

An investor's claim when purchasing an ABS is solely with the ABS and no longer with the originator. The fact that KMAC has $10 million set aside means nothing for the ABS issue if it remains on KMAC's balance sheet and is not part of the ABS issue. The other answer choices all describe forms of credit support that will support at least Tranches X and A, if not all 3 tranches. By having Tranche Z be subordinate to Tranche X, Tranche X has additional support. Also, loans of $125 million are used to back asset-backed securities worth ($50 + $35 + $35) = $120 million, which means the issue, is over-collateralized. The weighted average interest rate paid on the securities is approximately 6.2%. If the weighted average interest rate on the loans that make up the pool is 6.4% that means there is an excess spread between the loans and securities that also provides support for the entire issue.

49. A standard synthetic CDO references a portfolio of 10 corporate names. Assume the following. The total reference notional is X, and the term is Y years. The reference notional per individual reference credit name is X/10. The default correlations between the individual credit names are all equal to one. The single-name CDS spread for each individual name is 100 bp, for a term of Y years. The assumed recovery rate on default for all individual

reference credits is zero in all cases. The synthetic CDO comprises two tranches, a 50% junior tranche priced at a spread J, and a 50% senior tranche priced at spread S. All else constant, if the default correlations between the individual reference credit names are reduced from 1.0 to 0.7, what is the effect on the relationship between the junior tranche spread J and the senior tranche spread S?

A.   The relationship remains the same
B.   S increases relative to J
C.   J increases relative to S
D.   The effect cannot be determined given the data supplied

Answer: C

If the correlation is one, all names will default at the same time, and the junior and senior tranche will be equally affected. Hence, their spread should be 100bp, which is the same as for the collateral. With lower correlations, the losses will be absorbed first by the junior tranche. Therefore, the spread on the junior tranche should be higher, which is offset by a lower spread for the senior tranches.

Key Point: Securitization（资产证券化）

Securitization is the process of selling credit-sensitive assets to a third party that subsequently issues securities backed by the pooled cash flows (principal and interest) of the same underlying assets.

FIGURE 4-1 Basic securitization structure.
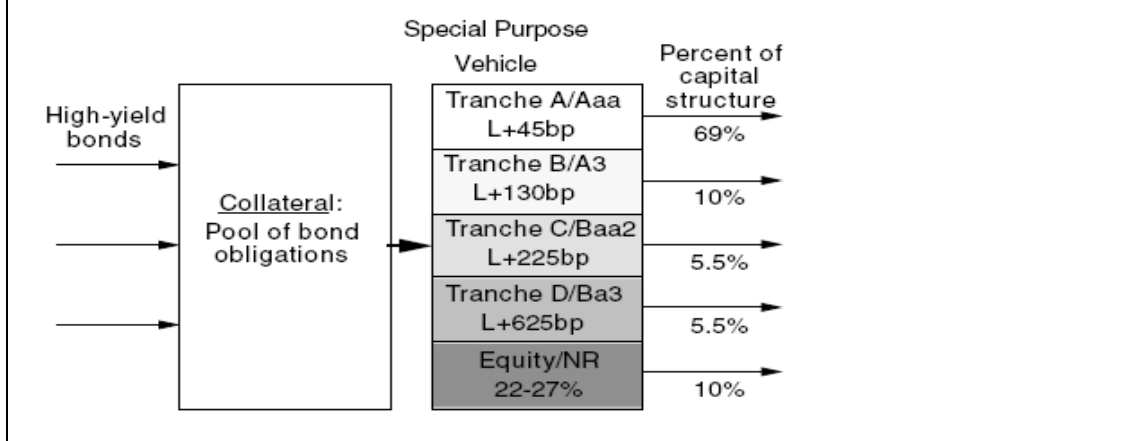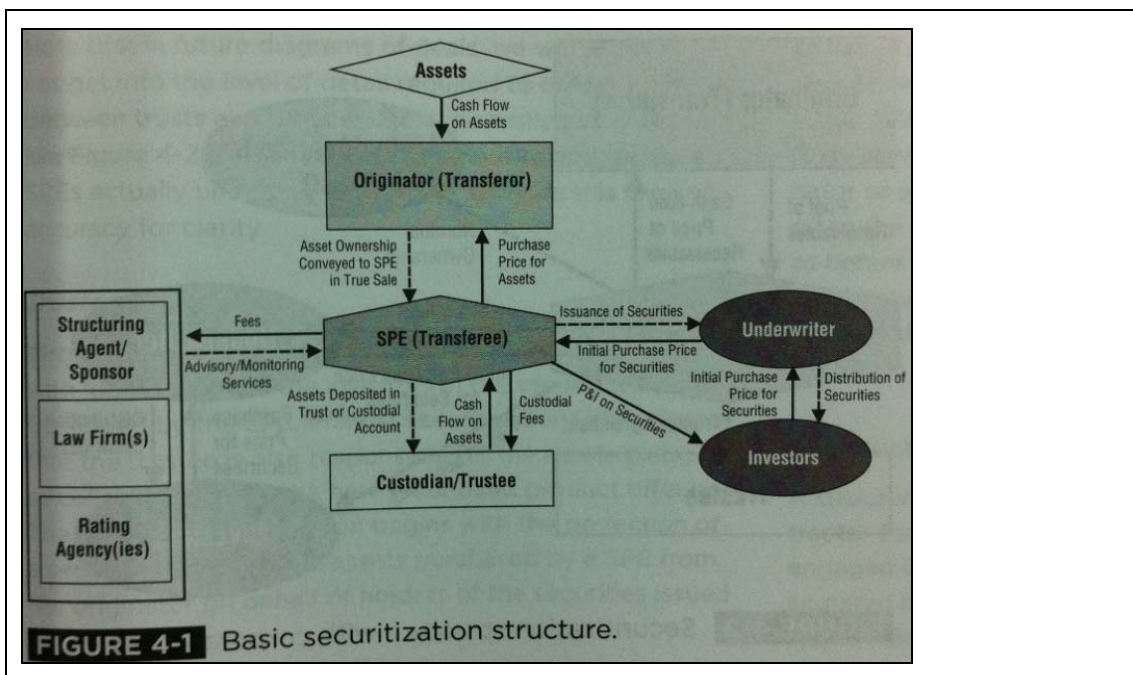
50. Portland General Electric (PGE) was an Enron subsidiary that was able to survive after the Enron implosion. At that time, there was a trend towards electric utility downgrades, particularly for those utilities operating within larger corporate structures. PGE survived in part due to ring-fencing. Which of the following statements about ring fencing is correct?

A. A ring-fencing assets approach is typically only useful when a low quality firm wants to finance a high-quality project.

B. When ring-fencing assets, options for credit enhancement include overcollateralization and financial guarantees provided by the parent against default of the subsidiary.

C. A subsidiary holding the ring-fenced assets may be able to gain a higher credit rating than the parent, allowing it to issue bonds on the assets at a lower cost.

D. Because the parent does not retain an equity interest in the subsidiary holding the ring-fenced assets, the subsidiary is not consolidated on the parent's balance sheet.

Correct answer: C

Explanation: Ring fencing is often undertaken to provide a higher credit rating to a subsidiary than is available to the parent. Derivative product companies or unregulated subsidiaries of investment banks are examples of this structure. There are other reasons for ring fencing assets, including freeing the assets from restrictions, taxes or other laws specific to a particular country.

Ring-fencing can be useful in two main situations: either when a low-quality firm cannot finance a high-quality project, or when a high-quality firm does not want to run the risk of being the sole financier of a low-quality project. The parent cannot guarantee the ring fenced assets, as this would allow creditors of the subsidiary to seek relief through the parent in the event of default of the subsidiary. The purpose of ring fencing assets is to create a structure that is bankruptcy remote from the parent. The retention of equity is a common feature of ring fencing. A subsidiary may remain consolidated on the parent company's balance sheet in cases where the parent retains a substantial equity interest.

51. Which of the following statements regarding frictions in the securitization of subprime mortgages is correct?

    A. The arranger will typically have an information advantage over the originator with regard to the quality of the loans securitized.

    B. The originator will typically have an information advantage over the arranger, which can create an incentive for the originator to collaborate with the borrower in filing false loan applications.

    C. The major credit rating agencies are paid by investors for their rating service of mortgage-backed securities, and this creates a potential conflict of interest,

    D. The use of escrow accounts for insurance and tax payments eliminates the risk of foreclosure.

Correct answer: B

Explanation: One of the key frictions in the process of securitization involves an information problem between the originator and arranger. In particular, the originator has an information advantage over the arranger with regard to the quality of the borrower. Without adequate safeguards in place, an originator can have the incentive to collaborate with a borrower in order to make significant misrepresentations on the loan application. Depending on the situation, this could be either construed as predatory lending (where the lender convinces the borrower to borrow too large of a sum given the borrower's financial situation) or predatory borrowing (the borrower convinces the lender to lend too large a sum).

The major rating agencies are not paid by the investors. Escrow accounts can forestall but not eliminate the risk of foreclosure.

Key Point: Credit Enhancement

Internal credit enhancement

✓ **Over collateralization (O/C)**: more assets are pledged to back the structure and exceed the liabilities

✓ **Direct equity issue**: issues debt with a face value less than the collateral in the pool and the difference could be made up by issuing equity

✓ **Cash collateral account (CCA)**: reserves set aside by the originator to cover losses in the pool

✓ **Excess spread**: a positive excess spread between the collateral assets and the liabilities (coupons) of the SPV, less fees and expenses.

External credit enhancement

✓ **Insurance and guaranties**

✓ **Letters of credit (LOC)**

✓ **Credit default swaps**

✓ **Put options on assets**

52. A collateralized mortgage obligation (CMO) has the characteristics below. Which of the following are most accurate regarding its credit enhancement?

Return on assets	8.75%
Senior tranche	$400,000,000
Subordinated tranche A	$120,000,000
Subordinated tranche B	$50,000,000
Value of collateral	$600,000,000
Interest paid on liabilities of SPE	7.50%
Fees and expenses	0.60%

    I.   There is overcollateralization.

    II.   The investors gain credit enhancement through the excess spread.

    A. I only.
    B. II only.
    C. Both I and II.
    D. Neither I nor II.

Answer: C

The total value of the tranches is: $400 + $120 + $50 = $570 million. The value of the collateral is $600 million, so the CMO is over collateralized by $30 million.

The net excess spread is 8.75%-7.50%- 0.60% = 0.65%, so there is positive excess spread. This provides credit enhancement for the CMO investors.

Key Point: Credit Risk Portfolio Model

CreditRisk+: determines default probability correlations and default probabilities by using a set of common risk factors for each obligor. $f(x) = e^{-\lambda}\dfrac{\lambda^x}{x!}$ with $\lambda = n \times p$

CreditMetrics: uses historical data to estimate the probability of a bond being upgraded or downgraded using historical **transition matrices**.

KMV Portfolio Manager: default probability is a function of firm asset growth and the level of debt. The higher the growth and lower the debt level, the lower the default probability. $DD = \dfrac{A\text{-}K}{\sigma_A}$

CreditPortfolio Views: multifactor model for simulating joint conditional distributions of credit migration and default probabilities that incorporates **macroeconomic** factors.

53. Which of the following statements about credit risk models is correct?

    A. KMV models offer a structural approach to measuring credit risk that is based on credit migration.

B. CreditRisk+ models offer an actuarial approach to measuring credit risk that treats the bankruptcy and recovery processes as endogenous (内生的).

C. KMV models are an extension of Merton's option pricing model employing equity price volatility as a proxy for asset price volatility.

D. CreditRisk+ models, like the reduced-form models, use a chi-squared distribution to describe default.

Answer: C

A Incorrect. KMV models are NOT based on credit migration.

B Incorrect. In CreditRisk+ models, the bankruptcy/recovery processes are exogenous.

C Correct. KMV models employ equity price volatility as a proxy for asset price volatility.

D Incorrect. CreditRisk+ models use a Poisson or Poisson-like distribution to describe default.

54. The RiskMetrics model generates VaR directly from the mean and variance parameters of the portfolio, which does not provide an estimate of the worst-case scenario loss. Note that the RiskMetrics method does account for correlation between asset classes. Which of the following is NOT a limitation of KMV's Estimated Default Frequency (EDF) model?

A. It is difficult to price sovereign credit risk since asset values and volatility are not directly observable

B. EDFs are biased by periods of high or low defaults

C. Takes a simplified view of the capital structure of a firm

D. The model often fails to explain real world credit spreads

Answer: B

Choices A, C and D are limitations of KMV's estimated default frequency model. EDF are not biased by periods of high or low defaults as are models based on Moody's and Standard & Poor's risk ratings.

Part 3: Operational and Integrated Risk Management

Key Point：Core concepts related to operational risk

> The risk of loss resulting from inadequate or failed *internal processes, people and systems* or from *external events*. The definition *includes legal* risk but *excludes strategic and reputation* risk.

55. What are the driving forces of integrated risk management?

  I. The increasing complexity of products.
  II. Linkages between markets.
  III. The potential benefits offered by portfolio effects.

  A. I only.
  B. II only.
  C. II and III only.
  D. I, II, and III.

Answer: D

Integrated risk management is driven by the increasing complexity of financial products, the benefits of aggregating risk across the institution, and the interrelationship between markets.

56. What can be said about the impact of operational risk on both market risk and credit risk?

  A. Operational risk has no impact on market risk and credit risk.
  B. Operational risk has no impact on market risk but has impact on credit risk.
  C. Operational risk has impact on market risk but no impact on credit risk.
  D. Operational risk has impact on market risk and credit risk.

Answer: D

Operational risk can lead to market or credit risk. Operational errors in the settlement process may result in credit risk and market risk since the settlement amount may be dependent on market movements.

57. Operational Risk Capital should provide a cushion against:

  I. Expected losses.
  II. Unexpected losses.
  III. Catastrophic losses.

A. I only

B. II only

C. I and II only

D. I, II, and III

Answer: B

Risk capital should be used to address unexpected losses. Expected losses should be covered by income from the product or activity, while catastrophic losses should be covered by insurance.

58. Operational risk type losses range from high frequency, low severity to low frequency, high severity often seen as a lognormal distribution. The allocation of an institution's capital should be applied against:

I.   High Frequency, low severity (expected losses)

II.   Low Frequency, high severity (unexpected Losses)

III. Extreme 'tail' events (high-stress losses)

A. I only

B. II only

C. III only

D. II and III

Answer: D

Capital should be applied against the unexpected losses and high-stress losses. Expected losses should be addressed in product pricing.

Key Point: Operational Risk Measurement

> Two Kinds of events: LFHS & HFLS
> Two Kinds of methods: top-down & Bottom-up

Top-down

> They attempt to measure operational risk at the broadest level, that is, firm-wide or industry-wide data. Results are then used to determine the amount of capital that needs to be set aside as a buffer against this risk. This capital is allocated to business units.

Bottom-up

> They start at the individual business unit or process level. The results are then aggregated to determine the risk profile of the institution. The main benefit of such approaches is that they lead to a better understanding of the causes of operational losses.

Key Point：Actuarial Approaches - Parametric loss distribution

Loss Distribution Approach

The loss distribution approach (LDA) is used to meet the Basel II operational risk standards for regulatory capital. The LDA has several steps:

- Organize and group loss data into a business line/ event type matrix.
- Weight every data point in the matrix.
- Model a loss distribution in each cell of the matrix.
- Determine the operational risk capital requirements for each business line.

Frequency Distributions

- LDA models most often use the Poisson distribution, the negative binomial distribution, ot the binomial distribution.
- Practitioners-suggest only using internal data because it is most relevant, and it is difficult to ensure the completeness of external data.
- Modeling the frequency distribution requires less data when compared to modeling severity.

Severity Distributions

- The severity of each event follows a parametric distribution, such as a lognormal distribution or a Weibull distribution.
- Severity distributions are generally considered more important than frequency distributions.
- One problem with modeling severity is that recent internal loss data may not be sufficient fot calibrating the tails of the distribution.
- Using external data usually requires scaling the data and combining data from several sources.

59. The Chief Risk Officer of your bank has put you in charge of operational risk management. As a first step, you collect internal data to estimate the frequency and severity of operational-risk-related losses. The table below summarizes your findings:

Frequency Distribution		Severity Distribution	
Number of Occurrences	Probability	Loss (USD)	Probability
0	0.6	1,000	0.5
1	0.3	100,000	0.4
2	0.1	1,000,000	0.1

Based on this information, what is your estimate of the expected loss due to operational risk?

A. USD 20,000
B. USD 70,250
C. USD 130,600
D. USD 140,500

Correct answer: B

Explanation: The expected loss can be calculated by multiplying the expected frequency and the expected severity. Expected frequency is equal to: (0 * 0.6) + (1 * 0.3) + (2 * 0.1) = 0.5,
Expected severity is equal to: (1000 * 0.5) + (100,000 * 0.4) + (1,000,000 * 0.1) = 140,500
The expected loss is therefore: 0.5 * 140,500 = 70,250

60. Operational risk loss data is not easy to collect within an institution, especially for extreme

loss data. Therefore, financial institutions usually attempt to obtain external data, but doing so may create biases in estimating loss distributions. Which of the following statements regarding characteristics of external loss data is incorrect?

A. External loss data often exhibits scale bias as operational risk losses tend to be positively related to the size of the institution (i.e., scale of its operations).
B. External loss data often exhibits truncation bias as minimum loss thresholds for collecting loss data are not uniform across all institutions.
C. External loss data often exhibits data capture bias as the likelihood that an operational risk loss is reported is positively related to the size of the loss.
D. The biases associated with external loss data are more important for large losses in relation to a bank's assets or revenue than for small losses.

Answer: D

Explanation: The biases associated with external loss data are important for all losses in relation to a bank's assets or revenue.

61. Please find the right order of LDA structure process.

1. Assign every data point in the matrix an equal weight except for split losses, old loss and external losses.
2. Model a loss distribution in each cell of the business line/event type matrix.
3. Organize and group loss data into a business line/event type matrix.
4. Determine the operating risk capital requirement for each business line by combining empirical distributions and parametric tail distributions.

A. (4) (2) (3) (1)
B. (3)(1) (4) (2)
C. (3)(1) (2) (4)
D. (4)(1) (3) (2)

Answer: C

62. Suppose you are given the following information about the operational risk losses at your bank.

Frequency distribution		Severity Distribution	
Probability	*Frequency*	*Probability*	*Severity*
0.5	0	0.6	USD 1000
0.3	1	0.3	USD 10000
0.2	2	0.1	USD 1001000

What is the estimate of the VaR at the 95% confidence level, assuming that the frequency and severity distributions are independent?

A. USD 100000

B. USD 101000

C. USD 200000

D. USD 110000

Answer: A

Loss	Prob.
0	0.5=0.5
1,000	0.3*0.6=0.18
2,000	0.2*0.6*0.6=0.072
10,000	0.3*0.3=0.09
11,000	0.2*0.6*0.3+0.2*0.3*0.6=0.072
20,000	0.2*0.3*0.3=0.018
100,000	0.3*0.1=0.03
101,000	0.2*0.6*0.1+0.2*0.1*0.6=0.024
110,000	0.2*0.1*0.3+0.2*0.3*0.1=0.012
200,000	0.2*0.1*0.1=0.002

63. Company A uses a Pareto distribution to model the loss severity of its low-frequency, high-severity operational risk events. A Pareto distribution has the following properties, given parameter X_m and k:

Mean: $\dfrac{kX_m}{k-1}$, for k > 1

Variance: $\dfrac{kX^2_m}{(k-1)^2(k-2)}$, for k > 2

Cumulative distribution function: $1-(\dfrac{X_m}{X})^k$

After fitting the distribution to historical loss data, the parameters are estimated as k = 2.4, X_m = 10,000. What is the unexpected loss of a low-frequency, high severity operational risk event at 99% confidence level?

A. 40703

B. 23560

C. 50986

D. 68129

Answer: C

The first step, we must get the E(X). So k=2.4, X_m=10,000, mean=17143;

The second step, we must get the X. So, $1-(\dfrac{X_m}{X})^k$ =0.99, X=68,129;

The third step, Unexpected Loss = VaR = X – E(X) =50,986.

Key Point: Technology Risk

Economy of Scale

➢ The economy of scale advantage is a decline in the average cost of producing a service as the financial institution grows.

➢ Expansion in the same business line, the same business unit, or the same industry

➢ The U-shaped average cost curve implies that there is a point beyond which the initial economies of scale disappear and diseconomies begin.

Economy of Scope

➢ Expansion in the different business lines, the different business units, or the different industries.

➢ Economy of scope: The cost of joint production via cost synergistic is less than the separate and independent production of these services. （IF AC1+2< (TC1+TC2)/ (S1+S2), Then Economies of scope is achieved）

➢ Diseconomies of scope: The costs actually higher from joint production of services than if they were produced independently. （IF AC1+2> (TC1+TC2)/ (S1+S2), Then Diseconomies of scope exists）

64. What is likely to be the most appropriate policy to manage technology risk?

   A. Have regular technology audits performed by an external consultant.
   B. Stick to proven technologies.
   C. Outsource as many technology functions as possible.
   D. Make sure every area is password-protected.

Answer: A

External audits are an important part of a properly designed risk management system.

65. Woods Bank and Trust offers banking and investment services to wealthy individuals. Woods' senior management is looking to expand the services they offer in order to compete more effectively in a crowded market. Management is currently assessing 2 different project possibilities: Project 1: Woods offers a universal life insurance product to its top tier clients. Last year, Woods underwrote 54 policies with an average issuance cost per policy of $136. Management is currently looking at the possibility of offering the universal life product to its second tier clients. Management estimates that it can expand the number of policies offered to approximately 300 with an average cost per policy of $142. Project 2: Woods offers a money market savings account to approximately 3,000 clients. The account costs the bank $2,000,000 per year in order to create $100,000,000 in revenue. Woods also provides a brokerage account that can hold stocks, bonds, or mutual funds to 5,000 of its clients. The brokerage account cost the bank $500,000 per year to administer and generates $15,000,000 of revenue. Management is considering offering a Platinum account that would combine the features of the money market and brokerage accounts. Management estimates that the cost of

producing the Platinum account on a percentage basis would be 1.95 percent. Which of the following statements regarding the two projects is correct?

A. Project 1 reflects diseconomies of scale; Project 2 reflects economies of scale.
B. Project 1 reflects diseconomies of scope; Project 2 reflects economies of scale.
C. Project 1 reflects economies of scale; Project 2 reflects economies of scope.
D. Project 1 reflects diseconomies of scale; Project 2 reflects economies of scope.

Answer: D

Economies of scale refer to the cost of producing a single project falling as more products are produced. For Project 1, as more insurance policies are issued, the cost actually rises, which reflects diseconomies of scale. Economies of scope represent the synergies of producing two products together rather than each one independently. The total average cost of the money market and brokerage accounts separately are (2,000,000 + 500,000) / (100,000,000 + 15,000,000) = 2.17%. Since the percentage cost of the combined platinum account is less at 1.95%, and then economies of scope must exist.

Key Point: Model Risk

The risk associated with using financial models to simulate complex relationships. Sources of model risk include:
✓ Incorrect model specification
✓ Incorrect model application
✓ Implementation risk
✓ Calibration error
✓ Programming errors
✓ Data problems

66. A risk manager for a major investment bank makes several statements regarding model risk. Which of the following statements are inaccurate?

A. "It makes no sense to choose a complex model when a simple model provides useful results."
B. "Model risk would not exist at all if accurate asset prices were consistently available."
C. "It is best to make the tough decisions regarding the time spent on model problems. Smaller problems will have to be ignored in favor of larger problems that can cause greater problems."
D. "The data we have for emerging markets has leptokurtosis. Therefore, we should use non-parametric statistical tests."

Answer: C

When a simple model provides useful results, there is no need to add complexity Therefore, Statement A is correct. Model risk results from inaccurate prices. If accurate prices were available at all times, model risk would not exist. Therefore, Statement B is correct. Smaller model risk problems should not be ignored because they can be indicative of larger problems. Statement C is

incorrect. If the data is non-normal (e.g., has fat tails), then non-parametric statistical tests that do not assume a distribution may be optimal. Therefore, Statement D is correct.

67. You are the head of the Independent Risk Oversight (IRO) unit of XYZ bank, Your first task is to review the following existing polices relating to model implementation.

   I. The remuneration of the staff of the IRO unit is dependent on how frequently the traders of XYZ bank use models vetted by the IRO.
   II. Model specifications assume that markets are perfectly liquid.

   Which of the existing policies are sources of model risk?

   A. Statement I only
   B. Statement II only
   C. Both statements are correct
   D. Both statements are incorrect

   Answer: B
   Explanation:
   I. Incorrect. Even though this is a risk that can increase exposure to model risk, the policy itself is regarding compensation and not the model itself.
   II. Correct. This assumption can lead to major error where market liquidity is limited.

68. Which of the options below properly classifies each model risk error into a model risk category?

Model Risks
Risk 1: Failure to consider a sufficient number of trials in a Monte Carlo simulation.
Risk2: Use of the mid-quote price rather than the bid price to value long positions in financial instruments.
Risk 3: Failure to fully account for time-variation of volatility.

Model Risk Categorization
Implementation risk
Incorrect model calibration
Incorrect model application

   A. Risk 1 = Incorrect model calibration, Risk 2 = Implementation risk, Risk 3 = Incorrect model calibration
   B. Risk 1 = Implementation risk, Risk 2 = Incorrect model application, Risk 3 Incorrect model calibration
   C. Risk 1 = Incorrect model application, Risk 2=Implementation risk, Risk 3 = Incorrect model calibration

D. Risk 1 = Incorrect model application, Risk 2 = Implementation risk, Risk 3 = Implementation risk

Answer: B

Risk 1= Incorrect model application, Risk 2 = Implementation risk, Risk 3 = Incorrect model calibration

Implementation risk refers to model risk pertinent to implementation, it assumes the model is correctly specified and calibrated. It usually pertains to valuation errors, e.g. mark to market vs. mark to model, usage of mid-quote vs. bid-ask spread, hence it corresponds to Risk 2. Incorrect model calibration risk refers to model risk pertinent to non-calibration or inaccurate calibration of (usually correctly specified) models under changing circumstances. An example is unexpected rise in volatility, causing banks to experience higher losses than suggested under original risk models (past cases include LTCM, NatWest, BZW and Bank of Tokyo Mitsubishi cases), hence it corresponds to Risk 3. Incorrect model application risk refers to model risk pertinent to improper application of a risk model. An example is consideration of an insufficient number of trials in a Monte Carlo simulation. The wrong answers A, B and D capture cases when candidates do not fully understand correct classification and application of model risks.

69. An important source of model risk is incorrect model specification. Which of the following is not an example of model specification error?

    A. Omitting an important risk factor from the model.
    B. Assuming that variables are independent when significant correlations exist.
    C. Assuming data is from a particular distribution when a more accurate distribution is available.
    D. Estimating the model using data from an inappropriate sample period.

Answer: D

Using data from an inappropriate sample period is an example of calibration error.

70. The role of senior managers in managing model risk includes all of the following except

    A. Becoming expert modelers.
    B. Establishing an organizational framework that implements sound risk management procedures.
    C. Questioning model features.
    D. Understanding the fundamentals of model risk.

Answer: A

Senior managers need not be expert modelers, but they do need to understand the fundamentals of model risk so that they can ask the right questions and implement sound risk management procedures.

71. Which of the following actions could worsen rather than reduce model risk?

    A. Require documentation of the model so that the risk manager can produce the same prices as the user of the model.

    B. Use a simulation benchmark model to assess a model that has a closed-form solution.

    C. Make the model for the dynamics of the underlying fit past data better by making the price of the underlying depend on additional variables.

    D. Plot model prices against parameter values.

Answer: C

The other three are procedures that help to monitor the model and can help to reduce model risk.

72. As a risk practitioner. Leo realizes that model risk can never be eliminated, although he may find some ways to protect against it. Which of the following measures help reduce model risk?

    I. All else equal, choose the model with the fewest parameters.

    II. Have regularly scheduled model reviews that involve careful back-testing and stress-testing.

    III. Identify and evaluate key model assumptions, and ignore small but persistent problems.

    IV. Validate the model using simple Problems for which answers are independently known.

    A. II only

    B. I, II, and III

    C. I, II, and IV

    D. III and IV

Answer: C

I. is correct. First and foremost, practitioners should simply be aware of the model risk: It is true that unnecessary complexity is never a virtue in model selection.

II. is correct. Practitioners should evaluate model adequacy using stress tests and backtests: models should be recalibrated and re-estimated on a regular basis. and the methods used should be kept up to date.

III. is incorrect. Users should explicitly set out the key assumptions on which a model is based. evaluate the extent to which the model's results depend on these assumptions: But he should never ignore the small problems because small discrepancies are often good warning signals of larger Problems.

II. is correct. It is always a good idea to check a model on simple Problems to which one already knows the answer. and many Problems can be distilled to simple special cases that have knows answers.

Key Point: Liquidity and Leverage

Liquidity Risk

➢ The lack of a market for a security to prevent it from being bought or sold quickly enough to prevent or minimize a loss.

✓ It could result from: asset allocation, funding strategies, collateral policies, or mismanagement of risks.

➢ **Transactions liquidity risk**: risk that the act of buying or selling an asset will result in an adverse price move.

➢ **Funding liquidity risk**: results when a borrower's credit position is either deteriorating or is perceived by market participants to be deteriorating.

Leverage Ratio

A firm's leverage ratio is equal to its assets divided by equity: $L = \dfrac{A}{E} = \dfrac{E+D}{E} = 1 + \dfrac{D}{E}$

Leverage Effect

Return on equity (ROE) is higher as leverage increases, as long as the firm's return on assets (ROA) exceeds the cost of borrowing funds. The leverage effect can be expressed as:

$$ROE = \left(\text{Leverage ratio} \times ROA \right) - \left[\left(\text{Leverage ratio-1} \right) \times \text{cost of debt} \right]$$

73. Charleston funds intends to use leverage to increase the returns on a convertible arbitrage strategy. The return on assets (ROA) of the strategy is 8%. The fund has $1000 invested in the strategy and will finance the investment with 75% borrowed funds. The cost of borrowing is 4%. The return on equity (ROE) is closest to:

A. 4%
B. 32%
C. 20%
D. 12%

Answer: C

C debt = $1,000 × 0.75 = $750
leverage ratio = total assets / equity
leverage ratio = $1,000 / $250 = 4

$r_E = Lr_A - (L - 1)r_D$

where:
r_A = return on assets
r_E = return on equity
r_D = cost of debt
L = leverage ratio

return on equity = 4(8%) − [(4 − 1)(4%)] = 32% − 12% = 20%

74. Jeremy Park and Brian Larksen are both portfolio managers who hold identical long positions

worth GBP 100 million in the FTSE 1000 index. To hedge their respective portfolios, Park shorts TSE 1000 futures contracts while Larksen buys put options on the FTSE 1000. Who has a higher Liquidity-at-Risk (LaR) measure?

A. Larksen
B. Park
C. Both have the same LaR
D. Insufficient information to determine

Answer: B

Explanation: The futures positions are exposed to margin calls in the event that the FTSE 1000 increases. Park, with the short futures position, is thus exposed more to liquidity risk (cash flow risk). The Park portfolio, hedged with the short futures contract, will thus have the higher LaR.

75. The Basel Committee recommends that banks use a set of early warning indicators in order to identify emerging risks and potential vulnerabilities in its liquidity position. Which of the following are not early warning indicators of a potential liquidity problem?

i. Rapid asset growth
ii. Negative publicity
iii. Credit rating downgrade
iv. Increased asset diversification

A. ii and iii
B. iv only
C. I and iv
D. i, ii and iv

Answer: B

Explanation: Rapid asset growth, negative publicity and credit rating downgrade are all early warnings of a potential liquidity problem. Increased asset diversification is not an early warning indicator of liquidity.

Key Point: Measuring Market Liquidity

Factors such as tightness, depth, and resiliency are characteristics used to measure market liquidity:

✓ **Tightness (or width)**: refers to the cost of a round-trip transaction, measured by the bid-ask spread and brokers' commissions. The narrower the spread, the tight it is. The tighter it is, the greater the liquidity.

✓ **Depth**: describes how large an order must be to move the price adversely. In other words, can the market absorb the sale?

✓ **Resiliency(回弹)**: Refers to the length of time it takes lumpy orders to move the market away

from the equilibrium price. In other words, what is the ability of the market to bounce back from temporary incorrect prices?

76. Gilbert has been analyzing bid-ask spreads on over-the-counter equities for the last several years in his job as an equity analyst. He notes that with the exception of the 2007—2008 financial crisis, spreads have generally narrowed over his period of study. If Gilbert is correct, this is an indication that

A. Liquidity has improved over the period.
B. The market has become more resilient over the period.
C. The depth of the market has improved over the period.
D. Credit risk has fallen over the period.

Answer: A

Factors such as tightness, depth, and resiliency are characteristics used to measure market liquidity. Tightness (Or width) refers to the cost of a round-trip transaction, measured by the bid-ask spread and brokers' commissions. The narrower the spread, the tighter it is. The tighter it is, the greater the liquidity. Depth describes how large an order must be to move the price adversely. In other words, can the market absorb the sale? Resiliency refers to the length of time it takes "lumpy orders" to move the market away from the equilibrium price. In other words, what is the ability of the market to "bounce back" from temporary incorrect prices? In this case, narrowing spreads is indicative of a more liquid market.

Key Point: liquidity-adjusted VAR (LVAR)

$$LVAR = V(z_\alpha \times \sigma - \mu) + \frac{1}{2} \times S \times V$$

$$LVAR = V(z_\alpha \times \sigma - \mu) + \frac{1}{2} \times V \times (\mu_S + z_\alpha' \times \sigma_S)$$

} **Endogenous liquidity**

$$LVAR = V\text{aR} \times \left(1 - \frac{\Delta P}{P}\right) = VaR \times \left(1 - E \times \frac{\Delta N}{N}\right), \quad E = \frac{\Delta P / P}{\Delta N / N}$$

} **Exogenous liquidity**

77. You are a manager of a renowned hedge fund and are analyzing a 1,000 share position in an undervalued but illiquid stock BNA, which has a current stock price of USD 80 (expressed as the midpoint of the current bid-ask spread). Daily return for BNA has an estimated volatility of 1.54%. The average bid-ask spread is USD 0.10. Assuming returns of BNA are normally distributed, what is the estimated liquidity-adjusted daily 95% VaR, using the constant spread approach?

A. USD 1,389
B. USD 2,076
C. USD 3,324
D. USD 4,351

Answer: B

Explanation:

The constant spread approach adds half of the bid-ask spread (as a percent) to the VaR calculation:

Daily 95% VaR = 80,000 (1.645*0.0154) = USD 2026.64

Liquidity cost (LC) = 80,000 * (05 * 0.10/80) = 50

LvaR=VaR+ LC = 2076.64

78. Suppose that portfolio XYZ has a $1,000,000 portfolio invested in a stock that has a daily standard deviation of 2%. The current bid-ask spread of that stock is 1%. Assuming a constant spread, what is the liquidity-adjusted VAR (LVAR) at the 95% confidence level?
    A. $5,000
    B. $38,000
    C. $44,200
    D. $43,000

Answer: B

79. You are holding 100 SkyTrek Company shares with a current price of $30. The daily mean and volatility of the stock return are 2% and 3%, respectively. VAR should be measured relative to initial wealth. The bid-ask spread of the stock varies over time, and the daily mean and volatility of this spread are 0.5% and 1%, reactively. Both the return and spread are normally distributed. What is the daily liquidity-adjusted VAR (LVAR) at a 99% confidence level assuming the confidence parameter of the spread is equal to 2.58?

    A. $193.15
    B. $172.62
    C. $103.50
    D. $195.90

Answer: D

80. Major Investments is an asset management firm with USD 25 billion under management. It owns 20% of the stock of a company. Major Investments' risk manager is concerned that, in the event the entire position needs to be sold, its size would affect the market price. His estimate of the price elasticity of demand is -0.5. What is the increase in Major Investments' Value-at-Risk estimate for this position if a liquidity adjustment is made?

    A. 4%
    B. 10%
    C. 15%

D.　20%

Answer: B

Explanation: What is needed is a liquidity adjustment that reflects the response of the market to a possible trade. The formula to use is the ratio of LVaR to VaR: $\dfrac{LVaR}{VaR} = 1 - \dfrac{\Delta P}{P} = 1 - E\dfrac{\Delta N}{N}$

The ratio of LVaR to VaR depends on the elasticity of demand E and the size of the trade, relative to the size of the market (ΔN/N). We are given: ΔN/N =0.2 and that the price elasticity is -0.5. Thus ΔP/P = elasticity $\times$ ΔN/N = -0.1. Therefore LVaR/VaR = 1 - ΔP/P =1+0.1 = 1.1 The liquidity adjustment increases the VaR by 10%.

Key Point: Risk-Adjusted Return on Capital

The RAROC measure is essential to successful integrated risk management. Its main function is to relate the return on capital to the riskiness of firm investments. The RAROC is the risk-adjusted return divided by risk-adjusted capital (e.g., economic capital).

$$RAROC = \frac{\text{revenues - EL - expenses + return on economic capital} \pm \text{transfer price}}{\text{economic capital}}$$

An adjusted BAROC (ARAROC) measure was developed to better align the risk of the business with the risk of the firm's equity.

$$ARAROC = \frac{(RAROC - R_F)}{\beta_E}$$

---

81. Given the following data for a project, which of the following statements is most accurate regarding the use of the RAROC?

Equity beta	1.20
Market return	13%
Variance of returns	5%
RAROC	16%
Risk-free rate	4%

I.　Using the adjusted RAROC, the project should be accepted because its adjusted RAROC is higher than the risk-free rate.

II.　Using the second-generation RAROC, the project should be accepted because its adjusted RAROC is higher than the market risk premium.

A.　I only.
B.　II only.
C.　Both I and II.
D.　Neither I nor II.

Answer: B

The adjusted RAROC (ARAROC) or second-generation RAROC compares the adjusted RAROC

to the market risk premium. So Statement I is incorrect.

The ARAROC is the RAROC minus the risk-free rate divided by the beta:(16% - 4%) / 1.20 = 10%. The project should be accepted because the ARAROC is greater than the excess market return: 13% - 4% = 9%. So Statement II is correct.

82. Suppose that a business line of a bank has a loan book of USD 100 million. The average interest rate is 10%. The book is funded at a cost of USD 5.5 million. The economic capital against these loans is USD 7.5 million (7.5% of the loan value) and is invested in low risk securities earning 5.5% per annum. Operating costs are USD 1.5 million per annum and the expected loss on this portfolio is assumed to be 1% per annum (i.e., USD 1 million). The firm's cost of capital is 15%.The RAROC for this business line is:

    A. 26.7%
    B. 37.1%
    C. 21.2%
    D. 32.2%

Answer: D

The RAROC for this business line is:

Risk-adjusted return / Risk-adjusted capital =（100*0.1 -5.5 -1.5 -1 + 7.5*0.055/7.5=2.4125 / 7.5 = 32.2%

83. Widget. Inc. is considering an investment in a new business line. The company calculates the RAROC for the new business line to be 12%. Suppose the risk-free rate is 5%. the expected rate of return on the market is 11 .0%. and the systematic risk of the company is 1.5. If the company only invests in new businesses for which the ARAROC (adjusted RAROC) exceeds the expected excess rate of return on the market. What return will this new business earn for Widget. Inc.?

    A. 0.0%
    B. 12.0%
    C. 4.7%
    D. 6.0%

Answer: A

A. is correct. ARAROC=(12%-5%)/1.5=0.047=4.7% the expected excess rate of return on the market=11%-5%=6%. 4.7%<6%. So as a rational company, it will reject the project. the contribution will be 0.

B. is incorrect. There is no reason for 5%-4.7%=0.3%

C. is incorrect 4.7% is ARAROC.

D. is incorrect. 6% is the expected excess rate of return on the market.

84. In calculating its risk-adjusted return on capital, your bank uses a capital charge of 2.50% for revolving credit facilities with a loan equivalent factor of 0.35 assigned to the undrawn portion. Recently, you have become concerned that the protective covenants embedded in these loans are weak and may not prevent customers from drawing on the facilities during times of stress. As such, you have recommended doubling the loan equivalent factor to 0.70. This recommendation has met with resistance from the loan origination team, and senior management has asked you to quantify the impact of your recommendation. For a typical facility that has an original principal of USD 1 billion and is 30% drawn, how much additional economic capital would have to be allocated if you increase the loan equivalent factor from 0.35 to 0.70?

    A.   USD 3.50 million
    B.   USD 6.13 million
    C.   USD 8.75 million
    D.   USD 13.63 million

Correct answer: B

Explanation: The required economic capital to support a loan in the RAROC model can be calculated using the following formula:

Required Capital= [B_{DRAWN} + ($B_{UNDRAWN}$ * LEF)]* CF

where LEF represents the loan equivalent factor and CF represents the capital factor.

Therefore the initial required economic capital is calculated as follows:

[(1 billion * 0.3) + (1 billion * 0.7 * 0.35)] * 2.5% = USD 13.625 million,

and the required capital if the change is implemented would be:

[(1 billion * 0.3) + (1 billion * 0.7 * 0.70)] * 2.5% = USD 19.75 million.

Hence the additional required economic capital would be 19.75 - 13.625 or 6.13 million.

Key Point: Enterprise Risk Management (ERM) and Firm-wide VaR

Enterprise Risk Management (ERM)

In developing an ERM system, management should follow the following framework:

- Determine the firm's acceptable level of risk.

- Based on the firm's target debt rating, estimate the capital (i.e., buffer) required to support the current level of risk in the firm's operations.

- Determine the ideal mix of capital and risk that will achieve the appropriate debt rating.

- Give individual managers the information and the incentive they need to make decisions appropriate to maintain the risk/capital trade-off.

The implementation steps of ERM are as follows:

- Identify the risks of the firm.

- Develop a consistent method to evaluate the firm's exposure to the identified risks.

Firm-wide VaR

- Firms that use value at risk (VaR) to assess potential loss amounts will have multiple VaR measures

to manage.

- Market risk, credit risk, and operational risk will each produce its own VaR measures.

- Due to diversification effects, firm-wide VaR will be less than the sum of the VaRs from each risk category.

85. In its efforts to enhance its enterprise risk management function. Countryside Bank introduced a new decision-making process based on economic capital that involves assessing sources of risk across different business units and organizational levels. Which of the following statements regarding the correlations between these risks is correct?

   A. Correlations between the risks in the asset and liability sides of the balance sheet can be changed by management decisions.
   B. Generally, correlations between broad risk types such as credit, market, and operational risk are well understood and are easy to estimate at the individual firm level.
   C. Correlations between business units are only relevant in deciding total firm-wide economic capital levels and are not relevant for decisions at the individual business unit or project level.
   D. The introduction of correlations into firm-wide risk evaluation will result in a total VaR that, in general, is greater than or equal to the sum of individual business unit VaRs.

Correct answer: A

Explanation: Management has the ability to influence the correlations between these risks by changing the asset/Liability mix, so management decision-making is indeed quite relevant.

Key Point: The Failure Mechanics of Dealer Banks

✓ Large dealer banks are active participants in over-the counter (OTC) derivatives, repo, and securities markets. Their functions in these markets, as well as asset managers and prime brokers, result in a variety of liquidity risks when their solvency is questioned and counterparties reduce their exposure with them.

✓ Large dealer banks are security underwriters in the primary securities market and provide liquidity as important counterparties in the OTC derivatives market and repo markets. They are prime brokers to hedge funds and are involved in many off-balance sheet activities, such as special purpose entities (SPEs). The systemic risk in these markets is increased by the fact dealer banks are often counterparties to other dealer banks.

86. In recent years, large dealer banks financed significant fractions of their assets using short-term, often overnight repurchase (repo) agreements in which creditors held bank securities as collateral against default losses. The table below shows the quarter-end financing of four broker-dealer banks. All values are in USD billions:

Bank A	Bank B	Bank C	Bank D

| Financial instruments owned | 823 | 629 | 723 | 382 |
| Pledged as collateral | 272 | 289 | 380 | 155 |

In the event that repo creditors become nervous about a bank's solvency, which bank is least vulnerable to a liquidity crisis?

A. Bank A
B. Bank B
C. Bank C
D. Bank D

Correct answer: A

Explanation: A liquidity crisis could materialize if repo creditors become nervous about a banks solvency and choose not to renew their positions. If enough creditors choose not to renew, the bank could likely be unable to raise sufficient cash by other means on such short notice, thereby precipitating a crisis. However, this vulnerability is directly related to the proportion of assets a bank has pledged as collateral.

Bank A is least vulnerable since it has the least dependence on short-term repo financing (i.e. the lowest percentage of its assets out of the four banks is pledged as collateral: 272/823, or 33%.

Part 5: Current Issues in Financial Market

SOVEREING CREDITWORTHINES AND FINANCLAL STABILITY: AN INTERNATIONAL PERSPECTIVE

Key Concepts

AIM 66.1

There are three key initial conditions that contributed to the global economic crisis: (1) there was insufficient capital, high leverage and large maturity and currency mismatches of the banking sector of major developed economies, (2) major sovereigns accumulated insufficient reserves during boom times to fully fund all long-term obligations during the financial crisis, and (3) the very high level of integration in the global financial system among sovereigns and financial institutions exacerbated the crisis.

AIM 66.2

Three primary ways in which risk from the financial sector can be transmitted to sovereigns include: (1) improper government policies as a result of one-off boosts to fiscal balances from financial institutions, (2) lending constraints of financial institutions that result in larger public sector deficit and deteriorating sovereign creditworthiness, and (3) necessary government support to struggling financial institutions in order to preserve financial stability.

AIM 66.3

Five ways in which sovereign risk can be transmitted to the financial sector include: (1) portfolio exposures of financial institutions to both domestic and foreign sovereign risk through their holdings of sovereign bonds, (2) funding conditions, as the availability of eligible collateral declines with sovereign risk increases, reducing banks' funding capacity, (3) sovereign capacity to assist, as weaker sovereigns have a reduced capacity to provide assistance to banks under pressure, increasing banks' credit risk, (4) crowding out, where government debt may crowd out private sector debt by increasing the cost and reducing the availability of bank funding, and (5) a loss of market confidence in sovereign debt may lead to fiscal consolidation.

AIM 66.4

During the 2002—2007 period leading up to the economic crisis, sovereign debt-to-GDP ratios were within sustainable levels, bond yields were low, sovereign ratings remained high, and bank profitability increased each year. Banks became heavily dependent on access to cheap short-term funding and, as a result, did not build up adequate liquidity reserves.

Factors that contributed to the crisis included: (1) a failure by markets to recognize the significant rise in private credit-to-GDP ratios and real estate prices above their long-term trends, (2) a continued expansion of business cycles which led to higher public sector account balances, and (3) increasing asset and real estate prices that caused governments to continue to spend freely.

AIM 66.5

During the financial crisis, sovereign creditworthiness was called into question, resulting in negative correlations of rising sovereign CDS spreads with declining bank CDS spreads. Beginning in late 2009 as the crisis deepened, this correlation of CDS spreads turned positive.

> **AIM 66.6**
>
> During the financial crisis, banks' foreign claims on sovereigns declined along with a decline in public sector debt. There were three reasons for the decline. First, some of the sovereign debt that matured on the banks' balance sheets was not renewed. Second, banks already marked down the value of sovereign debt to marker value. Third, banks either sold a portion of foreign government debt to the ECB or to the domestic banks of the sovereign governments.
>
> During 2011, banks' exposures to foreign public sector debt remained elevated while foreign portfolios of euro-area banks remained concentrated in riskier Euro-zone sovereign debt.
>
> **AIM 66.7**
>
> By 2012, the global financial system has become strongly integrated where decisions in one jurisdiction can significantly affect economic and financial developments in other regions. Rebuilding public confidence in sovereigns is paramount.
>
> There are several policy recommendations to mitigate the spread of future crises. Regulations should set a floor for the leverage ratio. Banks should apply a granular approach in distinguishing among sovereign risk, applying a higher risk weighting for higher risk sovereigns. In the short term, governments need to implement actions to reduce their high indebtedness by fiscal consolidations, timely reforms, and financing backstops in order to maintain investor confidence. In the long term, governments should provide a countercyclical policy approach in order to remain creditworthy.

87. A recently published article in a financial journal revealed that during 2007—2008 one of the major Euro-zone financial institutions maintained inadequate capital coupled with high leverage, and had considerable exposure to euro-area public sector debt. Based on these revelations, how many of the three initial key conditions of the spread of the financial crisis were satisfied?

    A. None
    B. One
    C. Two
    D. Three

Correct answer: B

Only one of the three key initial conditions of the spread of the crisis was satisfied (inadequate capital). The three conditions were (1) inadequate capital of the banking system coupled with high leverage, (2) inadequate fiscal reserves, and (3) large degree of interconnectedness of the global financial markets.

88. Fenn Tomnick is a risk analyst at one of the major equity research firms specializing in Eurozone banks. In a recent review of the European financial crisis, Tomnick indicated that in times of distress of systematically important financial institutions, sovereign governments are often compelled to provide financial support to the struggling institution. Which of the following statements best describes Tomnick's example?

A. The example describes one of the charnels through which sovereign risk is transmitted to the financial sector.

B. The example describes one of the channels through which financial sector risk is transmitted to sovereigns.

C. The example describes a key way in which financial institutions are vulnerable to exposure to private sector debt.

D. The example provides an illustration of the interconnectedness of the global financial system.

Correct answer: B

The example describes one of the channels through which financial sector risk is transmitted to sovereigns. These channels include (1) improper government policies (e.g., unsustainable spending increases) as a result of one-off boosts to fiscal balances from financial institutions, (2) lending constraints of financial institutions that result in larger public sector deficit and deteriorating sovereign creditworthiness, and (3) necessary government support to struggling financial institutions in order to preserve financial stability

OF RUNES AND SAGAS: PERSPECTIVES ON LIQUIDITY STRESS TESTING USING AN ICELAND EXAMPLE

Key Concepts

AIM 67.1

Three large commercial banks in Iceland were highly leveraged with a total debt of $61 billion, nearly 12 times the size of the gross national product. Also, the commercial banking sector was nearly nine times bigger than the GDP of Iceland when this small European country with open trade policies was hit by the waves of the global financial crisis. Multiple events summarize the Icelandic debt crisis, including a rapid and substantial decline in the value of the krona (克朗), breakdown of the international payment system, unavailability of short-term market funding, financing and servicing debt obstacles, depositors' panic, chronic liquidity shortages, and eventually, government takeover of operations of the three largest commercial banks.

AIM 67.2

The typical scenarios at the Icelandic banks in the period leading up to the financial crisis were apparently based on the belief that a bank with adequate capitalization—a strong, solvent bank—does not attract liquidity issues, whereas a bank with strong liquidity may have solvency risks. The Financial Supervisory Authority (FME) and the central bank primarily focused on solvency risk. Stress test results showed that the major banks in Iceland were well-capitalized, and they could withstand the adverse market conditions and unexpected losses.

AIM 67.3

Three sets of liquidity stress tests were based on the shocks used by the FME, the central bank, and actual shocks that occurred during the banking crisis. Assets and/or liabilities were shocked depending on the weight (percentage) of a specific shock to specific item(s). The short-term assets asset and or liabilities were impacted more (less) if the weight of the shock was larger (smaller).

AIM 67.4

Stress tests undertaken by the Financial Supervisory Authority (FME) and the central bank

(Sedlabanki, 冰岛央行) were different due to the types and the weights of shocks. The FME stress test did not give shocks to liabilities. It injected overall lighter shocks (weights) compared to the stress test employed by the central bank. The funding gap ratio, following actual shocks, was much lower compared to funding gap ratios produced in the stress tests conducted by the FME, as well as the central bank. That is, the actual liquidity shortage was much worse compared to the shortage estimated by both tests. Thus, stress tests conducted by both the FME and the central bank were ineffective in correctly assessing the magnitude of the liquidity shortage following the crisis.

AIM 67.5

There are several ways to improve the management of solvency risk at banks. Stress tests need to assess liquidity risk because a solvent bank can quickly become insolvent, as witnessed in the 2008 global banking crisis, if faced with a liquidity shortage. Stress tests should focus on off-balance sheet items as well as the notes to the consolidated financial statements. Stress tests should incorporate severe and unusual risk scenarios. They should also focus on key risk items on both the asset and liability sides of the balance sheet, such as severe obstacles in funding availability or asset liquidation. Stress tests should not be complex, and there should be a meaningful integration between the stress test findings and risk management plans.

89. The stress tests conducted by the Financial Supervisory Authority (FME) and the central bank in Iceland in the period leading up to the banking crisis:

    A. primarily focused on liquidity risk.
    B. primarily focused on solvency risk.
    C. showed a significant liquidity risk.
    D. showed a significant solvency risk.

Correct answer: B

Stress tests primarily focused on solvency risk. None of the tests revealed any strong solvency risk or liquidity concern.

90. The stress testing of banks in the period leading up to the banking crisis in Iceland:

    A. was conducted by the Financial Supervisory Authority (FME) yearly.
    B. was not transparent, as the results were not made public.
    C. was endorsed and approved by the International Monetary Fund (IMF).
    D. focused on individual banks as the stress scenarios were not applied across the banking sector.

Correct answer: D

The FME conducted stress testing on a quarterly basis in a very transparent manner. The stress testing was not approved by the IMF. The stress testing focused on individual banks and the (same) stress scenarios were not applied across the banking sector.

TAILS OF THE UNEXPECTED

Key Concepts

AIM 68.1

Outcomes in a normal distribution are symmetrically distributed around the mean with a probability that steadily decays.

In the early 1 800s, Carl Friedrich Gauss advanced the understanding of the normal distribution and developed the "least squares" statistical method. Laplace, in 1810, developed what is now known as the central limit theorem. He showed that the sum of a large number of identically distributed, mutually independent variables is approximately normally distributed. -

AIM 68.2

Rather than evidence to support normality, studies have revealed evidence of fat-tailed distributions. The alternative distribution is called the power law distribution." In essence, the power law distribution indicates that the probability of large events (i.e., events away from the mean, events in the tails) decays polynomially with their size.

Fat tails are important because it means there are more large deviations from the mean than that implied by a normal distribution. This means that risk is underestimated and catastrophic risks are mispriced. One of the key explanations for fat tails is interdependence. The central limit theorem assumes observations are independent but they are almost assuredly not independent.

AIM 68.3

Interdependence was evident in the financial crisis of 2007—2008. Leverage contributes to tail risk as it generates non-linear system-wide responses to changes in income.

Financial markets likely exhibit non-linearity, criticality, and contagion. These factors are more prevalent during a crisis. As financial markets continue to become more integrated, we can likely expect more non-linearity, more chaos, and fatter tailed distributions.

AIM 68.4

The distinction between risk and uncertainty is important to asset pricing. Risk arises when the distribution of future data is known (or can be calculated). Uncertainty is unknown or incalculable. Under uncertainty there is no single asset price but a range of asset prices. Also, prices systematically differ from true (i.e., fundamental) prices.

Common methods of risk management, including value at risk (VaR), also assume normally distributed returns, Risk managers choose VaR because of its simplicity but it likely underestimates tail risk. This means that bank capital required to protect against loss is also underestimated.

The Black-Scholes-Merton option pricing model is used to price assets with option-like payoffs. It too assumes normally distributed returns and may misprice assets.

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91. During the 2007—2008 financial crisis, there was a grave concern that Bear Stearns and Lehman Brothers were highly interconnected to many other financial firms. It ended up being true. The interdependency of financial firms can lead to:

A. negative kurtosis.
B. lower variance of returns.
C. fat tailed distributions.

D. excess system-wide leverage.

Correct answer: C

Interdependencies can lead to fat tails. This increases risk in the overall financial system and increases the likelihood of catastrophic risks, as evidenced by the financial crisis. Firms were so dependent on each other that a problem at one bank, say Lehman Brothers, meant frozen short-term credit markets for other banks. Interactions are at least partially to blame for fat rails. The central limit theorem assumes events are independent. Analysis of the financial crisis makes it clear that events are generally not independent.

92. Meagan Ferris, a risk manager at a large, international commercial bank, uses value at risk (VaR) as a key risk management tool. Ferris uses VaR to help establish the levels of buffer capital needed to protect the bank against interest rate risk. The 99% VaR loss estimated by Ferris' model is $10 million over the next week. Instead, the bank suffers a nearly $200 million loss. Ferris' best explanation for the failure of the model is that VaR:

A. assumes that risks are interdependent.
B. is based on the incorrect assumption of normality.
C. was developed to manage risks in hedge funds, not commercial banks.
D. was created during a period of heavy interest rate regulation.

Correct answer: B

Common methods of risk measurement and management, such as value at risk (VaR), rely on the assumption of normality and are essentially silent about risks in the tail beyond the defined confidence interval. In this case, Ferris' VaR calculation is too low because of fat tails. If the regulatory capital requirement for the bank was based on VaR, the requirement would be dangerously understated.

THE DOG AND THE FRISBEE

> **Key Concepts**
> **AIM 69.1**
> Heuristics (试探法) are based on the assumption that human behavior follows simple rules. Research studies suggest simple models are more successful than complex models because there is greater uncertainty of parameter estimates with complex models.
> **AIM 69.2**
> Simple heuristics are more effective than complex models in complex environments where one of the following conditions exist: information is costly, too much information creates noise, equal-weighting strategies are used, sample sizes are small, and complex rules are present leading to defensive behavior.
> **AIM 69.3**
> Simple models are more effective than complex models in the following complex environments:
> • Sporting outcomes and heart attack prediction are more effective when too much information

creates noise.

· Equal-weighted models are more effective in predicting avalanches and asset prices.

· Simple models are more effective in tracking serial criminals and investment strategies when sample sizes are small.

· Complex rules for physicians encourage defensive behaviors to avoid malpractice lawsuits.

AIM 69.4

Over time, bank regulations from Basel I to Basel Ill have become increasingly more complex. This requires a substantial increase in the compliance requirements of banks and a substantial increase in the number of regulators required to examine bank performance.

AIM 69.5

A study of large global banks finds that a simple leverage model outperforms more complex Basel Tier 1 risk-weighted capital ratios in predicting the most recent financial crisis. A study of smaller regional U.S. banks using FDIC data confirms that even in less complex environments out-of-sample performance of a simple liquidity indicator outperforms more complex multiple CAMEL indicator models in predicting bank failure.

AIM 69.6

An experiment conducted where the GARCH (3,3) model was the true model for a hypothetical financial asset revealed that the GARCH (1,1) was the more effective in predicting asset prices. In addition, a simple MA model had a VaR violation ratio, defined as the ratio of actual losses to expected losses, closest to one in historical tests, which indicated a better performing model.

AIM 69.7

Five proposed changes to simplify the regulatory framework include the following:

· De-layering the regulatory structure.

· Emphasizing leverage indicators.

· Strengthening supervisory discretion and market discipline.

· Taxing complexity.

· Reconfiguring the financial system.

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93. Which of the following statements best describes the use of heuristics in decision- making models?

    A. Research studies suggest simple models based on heuristics are more successful in decision making than more complex models, unless the environment is complex.

    B. Heuristics are simple rules of thumb that are used in decision making.

    C. Models based on heuristics tend to have more parameter assumptions.

    D. A drawback of heuristic models is that they tend to over-fit sample data and perform poorly in predicting future outcomes.

Correct answer: B

Heuristics are simple rules of thumb that are used in decision making. Research studies find that simple models based on heuristics often are more successful in decision making than more complex models. Simple models have fewer parameter assumptions. More complex models tend to over-fit sample data and perform poorly in predicting future outcomes.

CHALLENGES OF FINANCIAL INNOVATION

Key Concepts

AIM 70.1

The six crucial functions of a financial system are:

- Processing transactions.
- Funding large investment projects.
- Transferring resources globally and across time
- Reducing and sharing risks.
- Increasing transparency to signal valuations.
- Reducing market frictions.

AIM 70.2

Financial innovators take advantage of out-of-date accounting systems and government protocols that lag financial innovations. The accounting systems for pension funds and derivatives on financial statements do not reflect the underlying risks of the transactions.

AIM 70.3

The risks and responsibility of providing a means for retirement income has shifted from corporations and the government to individuals. Fewer corporations provide defined-benefit pension plans. In addition, governments in the United States, Europe, and Japan are not willing to fund underfunded pension plans.

AIM 70.4

Information and financial technological advances have reduced hedging costs that, in turn, have allowed entities to reduce equity that historically was used as a cushion for idiosyncratic and market risks.

AIM 70.5

Speculators take risks and bring markets back to equilibrium more quickly by providing liquidity.

94. Which of the following functions of a financial system is most likely to help investor understand and value investments more accurately?

    A. Reducing risk.
    B. Increasing transparency.
    C. Transferring resources.
    D. Mitigating market frictions.

Correct answer: B

The function of increasing transparency allows investors to make more informed decisions regarding the valuation and pricing of securities.

95. Which of the following financial innovations will individuals most likely use for meeting their retirement income needs and hedging risk?

    A. Alternate assets.

B. Common stocks.

C. Government regulation.

D. Insurance products.

Correct answer: D

Innovative insurance products or other financial securities will need to be designed to help individuals hedge and manage risks and taxes during retirement.

EXCHANGE-TRADED FUNDS, MARKET STRUCTURE AND THE FLASH CRASH（闪电崩盘）

Key Concepts

AIM 71.1

The Flash Crash of May 6, 2010, represents the large intraday drop and highest total point swing in the history of The Dow Jones Industrial Average (DJLA). It was triggered by a large trade in S&P futures contracts by a fundamental trader and spilled over into equity markets within minutes by the combined selling, hedging, and liquidity withdrawing actions of high-frequency traders, hedgers, arbitrageurs, and other market participants. A few-second pause in the trading of futures contracts brought back overall sanity to the marketplace.

Possible triggers of the Flash Crash include incorrect order entry a computer glitch at a major market center, a conspiracy to severely damage the U.S. financial markets, pricing and trading of exchange-traded portfolios, high-frequency trading, an increase in quote stuffing, order flow toxicity and inter-market sweep orders.

96. The Flash Crash of May 6, 2010:

A. was a result of spillover from the futures market to the equity market.

B. is also known as the micro-flash crash.

C. was triggered by a technical trader.

D. has no relation with the market activity of the high-frequency traders.

Correct answer: A

The Flash Crash was triggered by a large sell order placed by a fundamental trader. High-frequency traders significantly contributed to the crash, as they started placing sell orders minutes after the execution of the large trade; many of them also just left the equity market, further squeezing the liquidity