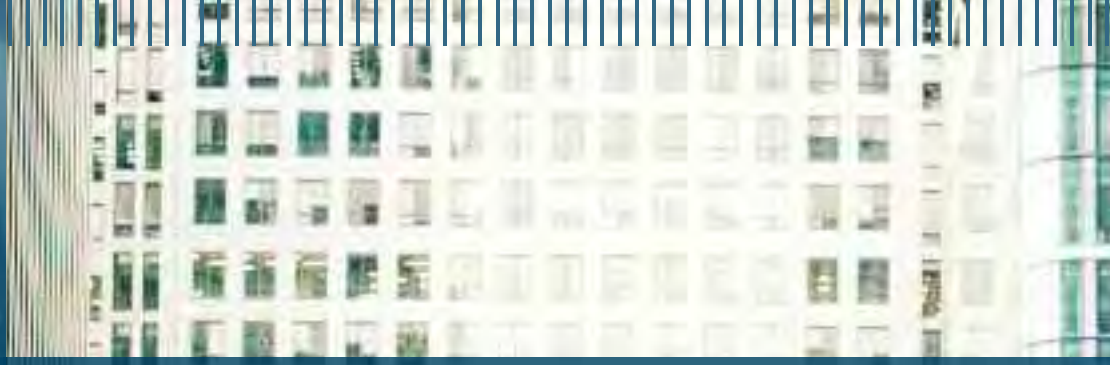

PRMIA
The Professional Risk Managers' International Association

THE PROFESSIONAL RISK MANAGER (PRM™)
CERTIFICATION PROGRAMME

PRM Self Study Guide – Exam III

(THREE OF FIVE)

RISK MANAGEMENT PRACTICES · MARKET RISK
CREDIT RISK · OPERATIONAL RISK

[PREE·mee·ah]

FROM THE CRADLE TO THE PINNACLE OF YOUR CAREER

A Higher Standard for Risk Professionals

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PRM™ SELF-STUDY GUIDE – EXAM III

Risk Management Practices, Market Risk, Credit Risk, Operational Risk

OVERVIEW

Exam III of the PRM™ certification tests a candidate's knowledge and understanding of the modern risk management practices.

Exam III is split into three parts, which address market risk, credit risk and operational risk in turn. These three are the main components of risk borne by any organization, although the relative importance of the mix varies.

You can use this Self-Study Guide to focus your study on the key Learning Outcome Statements from each chapter. These Learning Outcome Statements form the basis for the questions asked during the examination that you will take as Exam III of the PRM™ certification program. We recommend that you first read the chapter, then review the Learning Outcome Statements, then re-read the chapter with particular emphasis on these points.

We recommend strongly that you do not simply read the Learning Outcome Statements and then try to find the information about each in the books as a short-cut way of preparing for the exam. Real-life risk management requires your ability to assemble information from many simultaneous inputs and you can expect that some exam questions will draw from multiple Learning Outcome Statements.

After studying the book for this section, becoming comfortable with your knowledge and understanding of each Learning Outcome Statement, and working through the Study Questions and the Sample Exam Questions, you will have read the materials necessary for passing Exam III of the PRM™ Certification program. You may then wish to purchase access to online Sample Exams (Diagnostics) via the PRMIA website to assess your readiness.

Taking the PRM™ qualification, as well as working as a risk officer, requires a certain amount of mathematical expertise. This is not excessive. Anyone who was passed mathematics studies at advanced high school level, or who has completed the first year of a university degree in a mathematical-based qualification (physics, economics, engineering, etc) should have no problem with the requirements. For others, we recommend that they take tuition in the mathematics required and that they focus on this as the first part of their studies for the PRM™.

Please note that testing conditions, your state of mind and various factors can make your performance on the actual exams somewhat less strong than on the Sample Exams. If your Sample Exam scores are near to the passing mark, you may wish to study the subject materials even further.

Please remember that the exams of the PRM™ certification are very challenging. After all it's "a higher standard in risk certification" and you would expect nothing less. There is no guarantee that using the Self-Study Guide, in combination with the reading materials and Sample Exams will give you a passing score. But, they should all provide you with assistance in doing your best. We wish you much success in your effort to become certified as a Professional Risk Manager!

TABLE OF CONTENTS

WORD DEFINITIONS

In this guide, we use the Command Words that the CFA Institute uses, and a few additional words, to indicate levels of ability expected from successful candidates on each Learning Outcome Statement.

Calculate	To ascertain or determine by mathematical processes.
Characterize	To describe the essential character or quality of.
Compare	To examine the character or qualities of, for the primary purpose of discovering resemblances.
Construct	To create by organizing ideas or concepts logically and coherently.
Contrast	To compare in respect to differences.
Deconstruct	To disassemble the key elements of ideas or concepts.
Define	To set forth the meaning of; specifically, to formulate a definition of.
Demonstrate	To prove or make clear by reasoning or evidence; to illustrate and explain, especially with examples.
Derive	To obtain by reasoning.
Describe	To transmit a mental image, an impression, or an understanding of the nature and characteristics of.
Differentiate	To mark or show a difference in; to develop different characteristics in.
Discuss	To discourse about through reasoning or argument; to present in detail.
Draw	To express graphically in words; to delineate.
Explain	To give the meaning or significance of; to provide an understanding of; to give the reason for or cause of.
Identify	To establish the identity of; to show or prove the sameness of.
List	To enumerate.
Show	To set forth in a statement, account, or description; to make evident or clear.
State	To express in words.

STUDY TIME

Preparation time will vary greatly according to your knowledge and understanding of the subject matter prior to your self-study, your ability to commit dedicated and uninterrupted time to your study and other factors. In general, candidates who prepare for the exams of the PRM™ certification program allocate about three months to preparation for each exam.

You may spend three hours each week in study, or as much as ten or more, each week to ready yourself. Follow the suggestions above regarding the use of the Learning Outcome Statements and Sample Exams. Once you are comfortable with your readiness, it's time to register for the exam.

TESTING STRATEGIES

All questions are multiple-choice and there are no penalties for incorrect answers. Bear in mind that it is vitally important to finish the exam in the time allotted. Do not linger over questions longer than is sensible.

For example, if the exam has 30 questions in 90 minutes, do not spend longer than three minutes per question. If at the end of three minutes you have not answered the question, decide on the best answer you can (ignoring the obviously wrong), mark your answer and move on. If you do have any spare time at the end of the exam you can always go back and review the answer. However, make absolutely sure that you have an answer for every question at the end of the exam!

Another strategy would be to go through all the questions answering the ones you find easier ones first. Then after a first pass, divide the remaining questions by the time remaining and proceed as above.

USAGE OF THE CALCULATOR

At the exam centre you will have access to an on-line calculator. This is very similar to the Microsoft Calculator (available as standard with Microsoft Windows) and offers both scientific and standard functionality which is toggled through a "View" menu option.

Candidates may **not** take their own calculators into the exam venue. Candidates must familiarize themselves with the usage of this calculator before the exam including all calculations described in the PRM™ Handbooks. Finding out during the exam that the exam venue calculator is not the same as that with which you are familiar is not a recommended strategy!

STUDY QUESTIONS

A few questions, with answers, have been provided to help the candidate understand some of the concepts of the PRM™ Handbook. These study questions are not comprehensive of all concepts in the exam, nor are they necessarily questions of a similar type to those in the exam. They are provided in good faith as a study aid.

SAMPLE EXAM QUESTIONS

In Volume 5 of this Study Guide there are sample questions from all for exams. These sample questions should give you a flavor for the format and content of the actual exams. They are only part of the length of the actual exams and therefore do not cover all subjects contained in the detailed content description provided in this document. Questions on any of the subjects listed previously may appear on the actual exam.

RISK MANAGEMENT PRACTICES

The practice of risk management is evolving at a rapid pace, especially with the impending arrival of Basel II. Aside from these regulatory pressures, shareholders and other stakeholders increasingly demand higher standards of risk management and disclosure of risk. In fact, it would not be an overstatement to say that risk consciousness is one of the defining features of modern business. Interest in risk management is at an unprecedented level as institutions gather data, upgrade their models and systems, train their staff, review their remuneration systems, adapt their business practices and scrutinise controls for this new era.

The last line of defence against risk is capital, as it ensures that a firm can continue as a going concern even if substantial and unexpected losses are incurred. Accordingly, one of the major themes of Exam III is how to determine the appropriate size of this capital buffer. How much capital is enough to withstand unusual losses in each of the three areas of risk? The measurement of risk has further important implications for risk management as it is increasingly incorporated into the performance evaluation process. Since resources are allocated and bonuses paid on the basis of performance measures, it is essential that they be appropriately adjusted for risk. Only then will appropriate incentives be created for behaviour that is beneficial for shareholders and other stakeholders. CHAPTER 1 explores this fundamental idea at general level, since it is relevant for each of the three risk areas that follow.

Capital Allocation and RAPM

Learning Outcome Statement
The candidate should be able to:

- Describe the Role of Capital in a Financial Institution
- Define and Describe the different types of capital
- Demonstrate Economic Capital
- Describe the different approaches to calculating Economic Capital
- Describe Regulatory Capital
- Explain the Basel Norms
- Explain the Derivation of Regulatory Capital
- Explain Capital Allocation
- Demonstrate the Risk Contribution Methodologies for Economic Capital Allocation
- Explain Risk Adjusted Performance Measurement (RAPM)
- Demonstrate Risk Adjusted Return On Capital (RAROC)

MARKET RISK

CHAPTER 2 introduces the topic of market risk as it is practiced by bankers, fund managers and corporate treasurers. It explains the four major tasks of risk management (identification, assessment, monitoring and control/mitigation), thus setting the scene for the quantitative chapters that follow.

Market Risk Management

Learning Outcome Statement
The candidate should be able to:
- Define Market Risk
- Explain the importance of market risk
- Differentiate Market Risk from other risks
- Describe the Market Risk Management Tasks
- Describe the organization of Market Risk Management
- Explain Market Risk Management in Fund Management
- Explain Market Risk Management in Banking
- Explain Market Risk Management in Non-financial firms

These days one of the major tasks of risk managers is to measure the risk using value-at-risk (VaR) models. The basic VaR models for market risk are covered in CHAPTER 3.

Introduction to Value at Risk Models

Learning Outcome Statement
The candidate should be able to:
- Define Value-at-Risk VaR
- Discuss Internal Models for Market Risk Capital
- Demonstrate Analytical VaR Model
- Explain Monte Carlo Simulation VaR model
- Demonstrate Historical Simulation VaR model
- Describe Risk Factor Mapping
- Demonstrate Mapping Spot Positions
- Demonstrate Mapping Equity Positions
- Demonstrate Mapping Zero-Coupon Bonds
- Describe Mapping Forward/Futures Positions
- Demonstrate Mapping Complex Positions
- Demonstrate Mapping Options: Delta and Delta-Gamma Approaches
- Describe Backtesting of VaR models
- Explain Central Limit Theorem and non-normality of financial markets

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CHAPTER 4 covers advanced VaR models for market risk along with some other advanced topics such as risk decomposition.

Advanced Value at Risk Models

Learning Outcome Statement
The candidate should be able to:
- Discuss the issues related to the three VaR models
- Demonstrate Standard Distributional Assumptions
- Demonstrate Volatility Clustering Models
- Demonstrate impact of Volatility Clustering on VaR

- Discuss GARCH model
- Demonstrate VaR with the Student's t distribution
- Explain VaR with Extreme Value Theory
- Demonstrate VaR with Normal Mixtures
- Describe the rules for disaggregating risk
- Demonstrate Incremental VaR (IVaR)
- Demonstrate Component VaR (CVaR)
- Demonstrate Principal Component Analysis (PCA)
- Explain VaR with PCA

The main challenge for risk managers is to model the empirical characteristics observed in the market, especially volatility clustering. The advanced models are generally more successful in this regard, although the basic versions are easier to implement. Realistically, there will never be a perfect VaR model, which is one of the reasons why stress tests are a popular tool. They can be considered an ad hoc solution to the problem of model risk. CHAPTER 5 explains the need for stress tests and how they might usefully be constructed.

Stress Testing

Learning Outcome Statement
The candidate should be able to:

- Define Stress Testing
- Describe the historical and conceptual context of stress testing
- Explain Historical Scenarios Approaches
- Demonstrate Hypothetical Scenarios Approaches
- Demonstrate Algorithmic Approaches
- Describe Extreme Value Theory as a Stress-Testing Method

CREDIT RISK

CHAPTER 6 introduces the sphere of credit risk management. Some fundamental tools for managing credit risk are explained here, including the use of collateral, credit limits and credit derivatives.

Credit Risk Management

Learning Outcome Statement
The candidate should be able to:
- Describe the responsibilities of a credit risk manager
- Describe the Review of Strategic Credit Positions
- Describe Credit Limits and Provisions
- Explain Credit Exposure Measurement Issues
- Demonstrate Credit Risk Reporting
- Describe Stress and Scenario Analysis
- Describe Provisioning
- Describe Documentation
- Describe Credit Protection
- Describe Annual tasks of the credit officer

Foundations for credit risk modelling are laid in CHAPTER 7, which explains the three basic components of a credit loss: the exposure, the default probability and loss given default. The product of these three, which can be defined as random processes, is the credit loss distribution.

Foundations of Credit Risk Modelling

Learning Outcome Statement
The candidate should be able to:
- Define Default Risk
- Define Exposure, Default and Recovery Processes
- Explain the Credit Loss Distribution
- Explain Expected and Unexpected Loss
- Describe Recovery Rates
- Discuss use of beta distribution in credit risk modeling

CHAPTER 8 takes a more detailed look at the exposure amount. While relatively simple to define for standard loans, assessment of the exposure amount can present challenges for other credit sensitive instruments such as derivatives, whose values are a function of market movements.

Credit Exposure

Learning Outcome Statement
The candidate should be able to:
- Define Pre-settlement Risk
- Define Settlement Risk
- Demonstrate Exposure Profiles of Standard Debt Obligations
- Demonstrate Exposure Profiles of Derivatives
- Explain Mitigation of Exposures

CHAPTER 9 examines in detail the default probability and how it can evolve over time. It also discusses the relationship between credit ratings and credit spreads, and credit scoring models.

Default and Credit Migration

Learning Outcome Statement
The candidate should be able to:

- Define and Discuss Default Probabilities and Term Structures of Default Rates
- Define Credit Ratings
- Demonstrate Measurement of Rating Accuracy
- Describe the Methodology of Credit Rating followed by Rating Agencies
- Demonstrate Transition Matrices, Default Probabilities and Credit Migration as done by Rating Agencies
- Explain Credit Scoring
- Discuss the Estimation of the Probability of Default
- Demonstrate Market-Implied Default Probabilities
- Explain Credit Rating and Credit Spreads

CHAPTER 10 tackles one of the most crucial issues for credit risk modelling: how to model credit risk in a portfolio context and thereby estimate credit VaR. Since diversification is one of the most important tools for the management of credit risk, risk measures on a portfolio basis are fundamental. A number of tools are examined, including the credit migration approach, the contingent claim or structural approach, and the actuarial approach.

Portfolio Models of Credit Loss

Learning Outcome Statement
The candidate should be able to:

- Define Default
- Describe new approaches to Credit Risk Modelling
- Explain Credit VaR
- Define Credit Migration
- Describe the Credit Metrics Framework
- Demonstrate Credit VaR for a single Bond/Loan
- Demonstrate the Estimation of Default and Rating Changes Correlations
- Describe the Credit VaR approach of a Bond/Loan Portfolio
- Explain the Conditional Transition Probabilities – CreditPortfolioView Model
- Explain the idea of contingent claim approach in credit risk measurement
- Demonstrate Structural Model of Default Risk: Merton's (1974) Model
- Demonstrate Estimation of Credit Risk as a function of Equity Value
- Demonstrate the KMV approach
- Demonstrate the Actuarial Approach

CHAPTER 11 extends the discussion of credit VaR models to examine credit risk capital. It compares both economic capital and regulatory capital for credit risk as defined under the new Basel Accord.

Credit Risk Capital Calculation

Learning Outcome Statement

The candidate should be able to:

- Explain the calculation of Economic Credit Capital using Credit Portfolio Models
- Demonstrate Minimum Credit Capital Requirements under Basel I
- List the Weaknesses of the Basel I Accord for Credit Risk
- Explain the Latest proposal for Minimum Credit Capital requirements
- Describe the Standardised Approach in Basel II
- Describe the Internal Ratings Based Approach (IRB) for Corporate, Bank and Sovereign Exposures
- Describe the Internal Ratings Based Approach (IRB) for Retail Exposures
- Describe the Internal Ratings Based Approach (IRB) for SME Exposures
- Describe the Internal Ratings Based Approach (IRB) for Specialised Lending and Equity Exposures
- List the new components of Pillar II for credit risk
- Explain Credit Model Estimation and Validation in Basel II
- Describe Securitisation in Basel II
- Describe the application of credit risk contribution methodologies for Economic Credit Capital Allocation
- Demonstrate the Shortcomings of VaR for Economic Credit Capital and Coherent Risk Measures

OPERATIONAL RISK

The framework for managing operational risk is first established in CHAPTER 12. After defining operational risk, it explains how it may be identified, assessed and controlled.

The Operational Risk Management Framework

Learning Outcome Statement
The candidate should be able to:

- List the emerging Operational Risks in Banks
- Discuss main types of losses that occurred in practice
- Define Operational Risk
- Describe the Operational Risk Advanced Measurement Approach (AMA) Framework
- List the objectives of an operational risk management function
- Describe the scope of an operational risk management function
- Describe the Key components of Operational Risk
- Describe the Supervisory Guidance on Operational Risk
- Explain the Risk Catalogue
- Explain the Operational Risk Assessment Process
- Describe the Operational Risk Control Process

CHAPTER 13 discusses operational risk process models. By better understanding business processes we can find the sources of risk and often take steps to re-engineer these processes for greater efficiency and lower risk.

Operational Risk Process Models

Learning Outcome Statement
The candidate should be able to:

- Explain the relevance of Operational Risk Management (ORM)
- Describe how to develop and apply operational risk models
- Describe the various ORM tools
- Describe the Top-down models
- Describe the Bottom-up models
- Describe the Key Attributes of the ORM Framework
- Describe the Integrated Economic Capital Model
- State the objectives of an ORM programme
- Demonstrate Risk Transfer
- Discuss the IT Outsourcing case study

One of the most perplexing issues for risk managers is to determine appropriate capital buffers for operational risks. Operational VaR is the subject of CHAPTER 14, including discussion of loss models, standard functional forms, both analytical and simulation methods, and the aggregation of operational risk over all business lines and event types.

Operational Value-at-Risk

Learning Outcome Statement

The candidate should be able to:

- Explain the Loss Model Approach
- Explain the Frequency Distribution
- Explain the Severity Distribution
- Demonstrate the Internal Measurement Approach
- Explain the Loss Distribution Approach
- Demonstrate Aggregating Operational Risk Capital (ORC)

STUDY QUESTIONS

MARKET RISK

Duration and Convexity

Q: When does the duration of a bond equal its maturity?

Duration being the weighted average of the maturity of (discounted) cash flows, duration and maturity equate when there is only a final cash flow to be received at maturity (in other words, for a single cash flow, or a zero-coupon bond).

Cash Flow Mapping, PVBP and Interest Rate Sensitivity

Q: What happens to the variance of a bond portfolio when cash-flow mapped?

The aim of such procedure is to aggregate the constituents of a portfolio into a set of cash flows with different maturities, to be used for purposes of sensitivity analysis. The variance is preserved as the same, as a change would invalidate risk analysis.

Greeks of Instruments and Portfolios

Q: A portfolio of bond options is delta-hedged. What risks is it still exposed to?

The portfolio is still exposed to the other 'Greek' risks: vega, rho, and theta. If the underlying asset moves in price, the delta of the portfolio will change, making the original delta-hedge either insufficient or excessive: this is the gamma risk.

Implied Volatility, Smirk and Smile

Q: Does the volatility smile come from theory or market practice?

The commonly used option pricing models assume normal returns, hence log-normal distribution of prices, with no account for kurtosis. Practice and empirical studies, show that returns are distributed differently from the assumed normal distributions, with 'fat tails'. Hence the probability of a far out-of-the-money option to be exercised is higher than suggested by a model using flat volatilities. Hence the volatility smile is a market practice solution to an incomplete model.

Value at Risk (VaR)

Q: How does VaR change if the holding period goes from 1 to 10 days, under the usual set of assumptions?

Usual assumptions include normal returns and no autocorrelation, hence the variance of returns will be proportional to the number of days. The standard deviation, hence the VaR, will be proportional to the square root of the number of days, hence will be multiplied by sqrt (10) = 3.16.

Calculation of VaR for Linear Portfolios

Q: Under the standard parametric VaR methodology, which of the following assumptions is true?

a) Returns follow a log normal distribution
b) Log returns follow a normal distribution
c) Mean log return is zero for daily VaR
d) All of the above

The values of the lognormal distribution are all positive, the normal distribution covers all values. The answer a) would mean that returns be always positive, b) would mean that we talk of logs of negative numbers. This leaves us with c).

Historical Calculation of VaR, Monte Carlo

Q: When is a Monte Carlo approach most advantageous for computing VaR

a) In volatile markets
b) When the markets expected behaviour is non-normally distributed
c) When quick calculations are requested
d) When regulators are getting nervous about VaR calculations

Monte Carlo approaches provide a good flexibility in setting the distributions of returns, but require a lot of calculation time and computing power and time. VaR should be more of a management tool than a defence against regulators: b).

Covariance Matrix Construction

Q: For EWMA (Exponentially Weighted Moving Average), using a decay factor of 0.94 and a tolerance level of 1% (i.e. excluding exponential weights below 1%), the effective number of data points used to estimate the covariance matrix is:

a) 74
b) 150
c) 100
d) 250

The decay factor compounds by day, hence we have: $0.94^x = 0.01$. Using natural logarithms, x Log(0.94) = Log (0.01). Hence x =74.4, a). We shall note that 250 appeared as the most plausible answer, as this represents one year of daily prices.

Market Risk Limits

Q: What should happen if a successful trader consistently uses between 80% and 95% of his trading limit?

The trader has not exceeded his trading limits, so he has not transgressed, however one would expect to see his risk rise and fall with market opportunities, and if the market had an unexpected move, he may well exceed his limits. The type of trading and risk needs to be more closely examined and the

trader reminded of the need not to exceed limits, even for an unusual market move. If after review the risk / reward ratio in his trading is favourable, it may be applicable to increase his limits so that his normal position size now represents 50-60% of limits.

Stress Testing and Scenario Analysis

Q: Which of the elements below argue for the use of stress-tests?

I) Natural catastrophes
II) Presence of long options in the portfolio
III) Terrorist networks
IV) Fat tails

a) II, III and IV
b) II and III
c) I, III and IV
d) All of the above

Natural catastrophes are seldom included in VaR frameworks, let alone in our thought processes. Long options immunise a portfolio against extreme movements, so they are helpful not hurtful to the portfolio. Terrorist attacks provide possibility of shocks that are potentially correlated, hence even worse against VaR. Fat tails belie normality assumptions: c).

RAROC and Economic Capital Allocation

Q: Which of the following is a weakness in a RAROC implementation?

a) Recognising different types of capital (economic, regulatory)
b) Integrating liquidity risk
c) Informing different departments about the capital allocation strategy across departments
d) Analysing the possibilities of RAROC-arbitrage, including tax-based arbitrages, to design it as much as possible arbitrage-free

Regulatory capital is based upon the aim to avoid systemic risk: this is not directly an internal concern (obviously the bank must however be compliant), the institution should be concerned about economic capital per se. Liquidity risk is a component of market risk, although at the end of a chain of events. The key to allocate capital should be kept as managerial information rather than used to create tensions between capital-envious departments. Raroc should be arbitrage-free: c).

Alternative Risk Measures and Advanced VaR

Q: Which of the following are typical functions of the market risk management department?

I) Identification
II) Assessment
III) Monitoring
IV) Control/Mitigation
V) Collateral Documentation

a) I, II, III and IV
b) I, II and III only
c) V only
d) I only

I, II, III and IV are all functions of the typical market risk management department. In IV, we include selective hedging of exposures related to market movements. While the market risk management department may assist with collateral valuation, the legal or credit risk department will typically deal with collateral documentation.

CREDIT RISK

Types of Credit Risk

Q: Why has the development of derivatives necessitated credit risk regulations, when these instruments are designed to deal with market risk?

Derivatives, being off-balance sheet, were poorly captured by previous regulation. However, they offer a wide potential for leverage, and involve very volatile credit risk exposures between market participants: the profit of a counterparty is the loss of the other counterparty. Derivatives, for all their merits, have blurred the distinction between credit risk and market risk. Therefore, besides their usefulness in transferring risk, they created an increase in credit risk in the system, that needed a better monitoring and assignment of risk capital.

Actuarial Methods

Q: What are the main limitations of standard deviation as an indicator of credit risk?

The distribution of credit risk losses is skewed (asymmetric). Hence the standard deviation combines information related to the right-hand side of the curve (upside), which is not directly relevant to credit risk assessments. To complement standard deviation, percentiles of loss distribution can be used.

Exposure, Loss Given Default (LGD) and Exposure

Q: How is the loss given default incorporated in the CreditMetrics Technical Document?

a) The document does not consider it
b) By a parameterized distribution
c) By a look up table
d) By a constant

Although the document does not mention the term of loss given default, this concept is handled in chapter 7 (pp. 77-80) through recovery rates. The rationale is that recovery rates are 'highly uncertain', but can be assessed through beta distributions (p. 80), with different parameters for different seniority classes: b).

Rating Agencies and Their Grades

Q: What are the main limitations of an assessment exclusively based on accounting figures?

The Enron case highlights enough that the statement is true. In less dramatic cases, however, the following reasons can be alleged:

- accounting figures, by nature, are based on the past, while a rating is aimed at informing about future possible events
- the possibility of a firm to access cash through capital markets can change daily
- accounting figures must be used with judgement whenever possible

Settlement Risk and Netting Systems

Q: Herstatt Risk relates to:

a) The market risk of an FX contract
b) The German Mark debacle of 1978
c) The settlement risk of an FX contract
d) None of the above

Herstatt Bank, in 1974, went bankrupt following a missing payment due to different time zones in which it was operating. For this question, the candidate needs to understand what is Herstatt risk, or at least that it was related to a settlement risk. c).

Marginal and Cumulative Default Risk

Q: The default rates on a portfolio have been estimated at 2% for the coming year and 4% for next year. What is the expected payment of 2-year obligations?

The cumulative default rate is (1-0.02)*(1-0.04) = 0.9408, 94% of obligations are likely to be paid back.

Transition Matrix

Q: Given a one-year probability of default of 20%, what would be the cumulative probability of default for the bond for the three years?

a) 45.4%
b) 48.8%
c) 60.5%
d) None of the above

The probability of non-default is 80%, for 3 years it becomes
0.8 *0.8 * 0.8 = 51.2%, hence probability of default before 3 years is 48.8%: b)

Joint Transition Matrices and Correlated Migrations

Q: The portfolio contains one risky bond from company A. Company A is a subsidiary of XYZ and if XYZ defaults, company A does so too. The probability of default of XYZ is 0.3 and the probability of company A going into bankruptcy without XYZ defaulting is 0.5. What is the probability of having a default on the risky bond?

a) Cannot be determined
b) 0.60
c) 0.70
d) None of the above

It looks necessary to draw a mental map of events: if the parent defaults or not, if the subsidiary defaults or not, with their probabilities. Company A will default either following its parent, which will default with probability 30%, or if its parent does not default (probability 70%) but the subsidiary does default (probability of stand-alone default: 0.7 * 0.5 = 0.35). Hence the probability of default of A is 65%: d).

Credit Derivatives

Q: Under what common circumstances is it advisable for an AAA-rated corporate to purchase a total return swap on a client from a counterparty of a lesser rating?

a) Any time, as credit risk is not the business of a corporate
b) When the risk concentration on a category of clients is excessive
c) When anticipating an upgrade for the counterparty
d) Never, as an AAA can fund its credit risk

It generally is not advisable to transfer risk to a lesser rating, as the funding costs of the corporate are likely to be lower than those of the counterparty. There are no compelling reasons to systematically transfer or retain credit risks for a corporate, it can depend on an array of circumstances. There is little sense to speculate on banks' rating changes. It makes sense for a corporate to manage the portfolio of credit risks as a portfolio, and therefore to avoid excessive concentrations without interfering with the commercial relationship: b).

Recovery Rate Distributions

Q: The distribution of recovery rates is characterised by:

a) Fairly consistent mean, low standard deviation
b) Fairly uncertain mean, high standard deviation
c) Fairly consistent mean, low standard deviation
d) Fairly uncertain mean, high standard deviation

The mean is between 0% and 100% (over long periods, 50% is about right). As for the standard deviation, uncertainty reigns even more: d).

Implied Default Probability

Q: What is the probability of default of the issuer of a zero-coupon 1-year bond trading at 80 b.p. above the yield curve, if the expected recovery rate is 50% and risk-free interest rate is 5%?

p= probability of default
r= risk-free rate
s= spread
The expected value of the cash flows from the risky bond is: 100 * ((1-p) +p/2).

This discounted value, at the rate of 1+r+s, equates that of the risk-free bond. 100*(1+p/2)/(1+r+s)=100/(1+r). Hence p=1.5%.

Merton and KMV Models

Q: The Merton (1974) model implies that a position in a credit-sensitive bond is equivalent to:

a) A long position in the firm's equity and a short position in a risk-free bond
b) A long put and a long call position on the firm's assets
c) A long position in a credit-risk-free bond and a short put on the firm's assets
d) An up-and-in call on a credit-risk-free bond and a short call on the firm's equity

A long position on a bond means a short cash position. If the bond issuer defaults, the bondholder is left with a bad loss, hence the position equates to shorting something. Hence only c) remains. A more thorough way to address this question is as follows:

- a short position on a risk-free bond means a borrowing; this is not the case of a long bond position: a) falls
- such a position as in b) would make the put very valuable in case of issuers' default: b) falls
- if the firm's (net) assets are worth nothing, a short put represents a loss (as with a risky bond)
- an up-and-in call (besides the fact that this exotic was unknown in 1974) gives the holder, after the bond has gone higher than a certain level, the right to purchase the bond: this does not equate a risky bond.

RAROC and Economic Capital Allocation

Q: Which of the following is an appropriate way to measure operational risk?

a) VaR
b) Notional exposure
c) Loss data distribution
d) Insurance values

VaR is a market risk management tool, notional exposures are related to credit risk, insurance values show only insured assets instead of operations. Loss distribution data record the history of operational losses: c).

OPERATIONAL RISK

Typologies of Operational Risk

Q: Which one of the following is a risk driver rather than a risk indicator?

a) Staff turnover
b) Product complexity
c) Systems downtime
d) Model errors

Indicators are response variables, while drivers are decision variables, so the answer is b).

Insurance and Re-insurance

Q: What is the main hurdle seen by the Basel Committee in fully recognising the use of insurance?

The market for insurance products for banking operations is 'still developing', which means the products are not yet widespread enough and not standardised. Besides, quantification is arduous. Another reason is that the presence of insurance may replace an operational risk with a counterparty risk. Insurance companies do not usually pay up "on the nail," they generally seek to reduce a claim through loss adjustment and litigation and hence have a different "risk model" from the banking sector.

Causal Models

Q: Which of the following principles does not help in an operational risk measurement process:

a) Consistency
b) Transparency
c) Timeliness
d) Relevance

Risk exposures should be adequately reported to senior management. Consistency and relevance make reporting easier to use, transparency ensures that information is truthfully reported. Timeliness is less relevant (contrarily to market risk), as an existing risk can be present for a long time without occurring.

Risk Management Processes

Q: When used to protect against catastrophic risks, Insurance:

a) Reduces the need for capital by more than 50%
b) Transforms catastrophic risk into counterparty risk
c) Is always too expensive, as actuaries price to a certain return for the insurance companies
d) Eliminates default risk

Insurance is a way to transform a more esoteric and less measurable risk into something more widely understood like counterparty risk, c).

Loss Event Databases and Their Uses

Q: What are the main advantages of using external loss databases?

a) Access to a wider pool of data
b) Potential access to competitors' data
c) Access to well-structured data
d) Access to regulation-compliant data

The data in external databases are edited so that names and other means of identification of the origin are deleted. Moreover, these databases are not designed for mutual spying, but for common progress. Every institution should design and structure these databases at the outset so that they can stand the test of time as well as external databases. A badly structured internal database is likely to be a costly and useless exercise. Internal databases should be, at the outset, regulation-compliant, as regulation is flexible enough to allow tools that are compliant as well as internally useful. For high-impact low-frequency data, internal data are likely to be too succinct. The collated data of several institutions are likely to be a much better guide to the future: a).

RAROC and Economic Capital Allocation

Q: What could be the most effective hedge of a portfolio of weather derivatives?

a) Back-to-back matching
b) Global diversification
c) Catastrophe bonds
d) Equity sector equity index futures

Weather derivatives are not likely to find perfect hedges, as these instruments are new, fragmented and thinly traded. Back-to-back matching (buying protection from winter sports resorts, selling to beach resorts, or similar approaches) is of limited application. Hedging with a position on a particular sector, if there were enough of these instruments, would be similarly insufficient. Catastrophe bonds would matter only for extreme weather. Global diversification can help compensate the effect of dry weather in a region with excessive rain in another one: b).

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