

PAK Online Seminar

Enterprise Risk Management (ERM) Exam
Fall 2015 Edition



PAK Study Manual for ERM Fall 2015



PRODUCT FEATURES

Purposes	Features	PAK Study Manual	PAK Exam Aid	PAK Flash Cards	PAK Test Aid	PAK Study Manual Package	PAK Online Seminar
Study	Summaries	X				X	
Study	Relevant Past Questions (List)	X				X	
Study	Practice Questions	X				X	
Study	Application-Type Question Set	X				X	
Study	Mock Questions	X				X	
Study	Online Tutorial	X				X	
Study	Suggested Schedule (Detailed)	X				X	
Study	Email Support	X				X	
Practice	Mock Questions		X			X	
Practice	Case Study Analysis		X			X	
Practice	Past Questions (Sorted PDFs)		X			X	
Review	Flash Cards			X		X	
Review	Condensed Summary			X		X	
Evaluation	Mock Exam				X	X	
Bonus	Bonus materials					X	
Study	Online Video Seminar						X
Study	Practice Questions						X



PAK STUDY MANUAL (ERM CORE + EXT.)

1. Summary (ERM Core + ERM Extension)

The PAK Study Manual covers the entire Enterprise Risk Management (ERM) syllabus (***The ERM extension is included***). Not only does it give you the detailed explanations on conceptual, calculation, and exam materials, but it also fills in the gaps among the topics that are not covered in the source readings. It helps you better understand and master the confusing logics and difficult materials.

In addition, it links the similar topics across readings together and connects them to the syllabus so that you can see the whole picture of this exam.

2. Relevant Past ERM SOA Exam Questions (List)

For each reading, we compose a list of relevant past exam questions (if any) so that you can locate the questions quickly and practice them immediately. This saves your time on searching what materials are relevant to this exam.

3. 200+ Practice Questions (200+ in total)

One key point to pass this exam is to "practice" (Practice makes perfect!). Due to this reason, I include many practice questions in each reading (200+ in total) to refresh the materials just learnt and to strengthen your knowledge. More practice will be available in the PAK Exam Aid.

4. Application-Type Practice Question Set

This practice question set gives you an idea on how to apply the materials into a scenario/situation.

5. Mock Exam Questions

The mock exam questions mimic the same difficulty level of the real exam questions. 5 mock exam questions and solutions are included in the PAK Study Manual to challenge your understandings. More practice will be available in the PAK Exam Aid.

6. Suggested Study Schedule (Detailed)

The syllabus is huge. It is very easy to lose track on your study. A clearly defined study schedule and some useful tips are included to help you better manage your schedule.

7. Online Tutorial

Starting from 9/27, we will upload weekly tutorial videos online to clarify some confusing concepts and discuss some important topics for this exam sitting. Don't miss out!

8. Email Support

Get questions? Please send me an email

"The study materials were very helpful in preparing me for the exam. Most importantly I was better able to apply the things that I learned to exam style questions. It was very organized and valuable." By Marc Roberts

[Read the whole story](#)

DO YOU KNOW?

The PAK Study Manual and related aids are updated EVERY exam sitting.

You will see the most updated materials, examples, and explanations to help you master the concepts and pass this exam in the first attempt.

PAK FLASH CARDS

A printed copy of the flash cards can be purchased separately.

1. Electronic Flash Cards

- ◇ Summarize the key points (with mnemonics) (PDF version is also available)
- ◇ Contain around 300+ flash cards (front and back)
- ◇ Work best for any big-screen cellular phone (e.g. iPhone, HTC, Android, etc)

2. Bonus: Condensed Summary

- ◇ Summarize the key points in outline format
- ◇ Quickly refresh all the important topics in the readings

PAK TEST AID

1. Mock Exam

- ◇ This set of mock exam is different from those mock questions available in the PAK Exam Aid. You can write down your answers and send them to me. I will give you detailed feedbacks on how to improve your exam score

PAK EXAM AID

1. 30 Mock Exam Questions and Solutions

The mock exam questions mimic the same difficulty level of the real exam questions. 30 mock exam questions and solutions are included to challenge your understandings.

2. Case Study Analysis

This set connects the case study materials to the study materials so that you can see the picture on how they can be tested.

3. Past SOA Exam Questions (from All FSA Tracks) Relevant to This Exam

This set not only includes the past exam questions from the ERM exam, but also includes the past exam questions from all the other FSA exam tracks (e.g. FETE, APM, CSP, DP, etc). It helps you better understand how the materials were tested and gets you familiar with the SOA exam question style.

NOTES

1. The availability date of the 1st and 2nd items above may be different. It depends on when the SOA releases the new case study.
2. If the SOA do not release the case study, an additional 5 mock questions will be used to replace the case study analysis.

DO YOU KNOW?

You can find the most updated information about the PAK Study Manual and related aids under the “Announcement” section on the front page of the PAK website.

“The Mock questions, Mock exam and Exam Aid are also very beneficial to make sure you're abilities are up to par before the real exam.” By Wes Smith

[Read the whole story](#)

RELEASE SCHEDULE

Purposes	Features	PAK Study Manual	PAK Exam Aid	PAK Flash Cards	PAK Test Aid	PAK Study Manual Package	PAK Online Seminar
Study	Summaries	5/15 and 6/30				5/15 and 6/30	
Study	Relevant Past Questions (List)	6/30				6/30	
Study	Practice Questions	6/30				6/30	
Study	Application-Type Question Set	6/30				6/30	
Study	Mock Questions	6/30				6/30	
Study	Suggested Schedule (Detailed)	5/15				5/15	
Study	Online Tutorial	9/27 (Weekly)				9/27 (Weekly)	
Study	Email Support	Anytime				Anytime	
Practice	Mock Questions		8/30			8/30	
Practice	Case Study Analysis		8/30			8/30	
Practice	Past Questions (Sorted PDFs)		7/30			7/30	
Review	Flash Cards			8/15		8/15	
Review	Condensed Summary			8/15		8/15	
Evaluation	Mock Exam				9/15	9/15	
Bonus	Bonus materials					To Be Announced	
Study	Online Video Seminar						5/15 and 6/30
Study	Practice Questions						6/30



PAK STUDY MANUAL PACKAGE

1. PAK Study Manual (Release on 5/15 and 6/30)
2. PAK Exam Aid (Release on 7/30 and 8/30)
3. PAK Flash Cards (Release on 8/15)
4. PAK Test Aid (Release on 9/15)
5. Bonus materials

PAK ONLINE SEMINAR

1. Over 70 video lectures to clarify and explain the key concepts/calculations in each syllabus reading (Core + Extension) and past exam questions
2. Analyze the new case study (e.g. how to answer the case-study-related questions)
3. Review the ERM Extension materials in both video and webinar format
4. Discuss the past exam questions (e.g. exam techniques, how to score)
5. Contain condensed outlines for each reading on the syllabus
6. Include practice questions to test your knowledge
7. Review the lectures and study at your own pace
8. On-demand video library compatible with smartphones (iPhone, Android, etc), tablets (iPad, Android), and PC/Mac devices.
9. Email support
10. Free access for 2nd attempt (only for those who scored 2-5)

SAMPLES?

You can find more samples on the [PAK](#) website.

IMPORTANT NOTES

1. Please note that all products (except flash cards) are in electronic (PDF) format. **No** hard copy is provided.
2. Once you make a purchase (please use your work email address), we will send you a confirmation email within 1 business days. Once the files are available, we will send them to you through email. Please make sure that you put the correct email address when you purchase the PAK products. **If you do not receive the confirmation email, please send us an email (services@pakstudymanual.com).**
3. Please check your "junk" mailbox. Sometimes, our email is blocked.

MORE INFORMATION

Want more information? Please contact me at eddy.chan@pakstudymanual.com or visit www.pakstudymanual.com

COMMENTS FROM THE PAST CANDIDATES

You can find more comments from the past candidates here: [PAK Testimonials](#).

WHERE TO PURCHASE PAK PRODUCTS

The PAK products are available at [Actex](#), [Actuarial Bookstore](#), and [SlideRule Books](#).

DO YOU KNOW?

If you are not sure which exam track to take, or how it can advance your career, you can send an email to Eddy and discuss your situation with him. He will share his work experience with you so that you can make your decision informatively.

Aggregation of Risks and Allocation of Capital (Sections 4-7)

Key Point of This Reading

1. Understand the various risk assessment methodologies
2. Understand the approaches to aggregate capital
3. Understand the various techniques to allocate capital

Risk Assessment Methodologies

How can we determine the economic capital required for each risk factor?

Immediate Stress

- Change a risk factor
- Recalculate assets and liabilities
- All done at $t = 0$

- **Easy to calculate/understand**
- **Unable to capture the future**

Projection Scenarios

- Uses a shock application period
- Can overcome limitations of immediate stress

- **Dynamic, flexible, realistic**
- **Complex and intensive**

Risk Assessment Methodologies

How can we determine the economic capital required for each risk factor?

Multivariate Stress Tests

- Change multiple factors at once
- Can be used with projection scenarios (with **ESG**)

ESG Risk Factors

- Interest rates
- Equity
- Property
- Spreads
- Currency
- Correlations

- **Allows for a full distribution of results under many assumptions**
- **Very complex**

Aggregation Techniques

Aggregate capital \leq Sum of individual capital

Method #1: **Correlation**

Simple, but correlation is NOT constant!

$$\text{Total Risk} = \left\{ \sum_i \sum_j \rho_{ij} X_i X_j \right\}$$

For example (Life/Annuity company)

- Mortality Capital = \$100
- Longevity Capital = \$75
- Correlation = -0.5

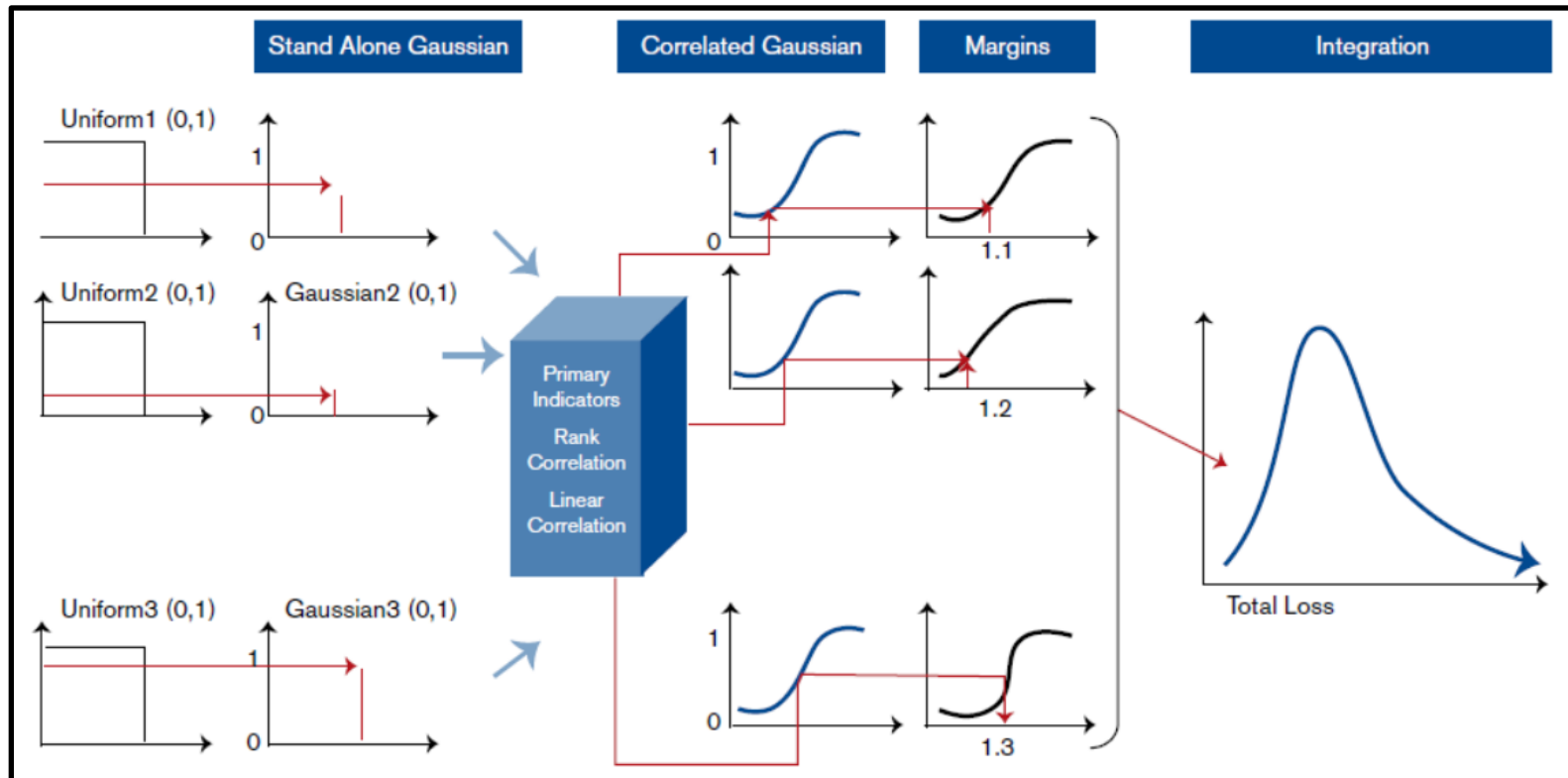
$$\text{Total Capital} = \sqrt{(100 \quad 75) * \begin{pmatrix} 1 & -0.5 \\ -0.5 & 1 \end{pmatrix} * \begin{pmatrix} 100 \\ 75 \end{pmatrix}} = 90.14$$

Aggregation Techniques

Aggregate capital \leq Sum of individual capital

Method #2: **Copulas**

Combines marginal distributions into a bivariate distribution, so we can look at complex dependency



Capital Measurement

Correctly allocated capital can help determine the true “cost” of a project

1. Return on Assets (ROA)
 2. Return on Equity (ROE)
 3. Risk Adjusted Return on Capital (RAROC)
 4. Risk Adjusted Return on Risk Adjusted Capital) (RARORAC)
- Accounting Based ←
Risk Based ↘

The traditional measures ignore leverage, and ignore riskiness of assets. A high ROE might not be good if the risk is extremely high.

RAROC

- Risk adjusted return on **total** capital

RARORAC

- Risk adjusted return on **required** capital

Risk Adjusted Return on Risk Adjusted Capital

$$RARORAC = \frac{\text{Risk Adjusted Return}}{\text{Required Capital}} = \frac{\text{Revenue} - \text{Costs} - \text{Expected Losses}}{\text{Required Capital}}$$

A = Assets to support L

L = Liability

l = 1 in 100 loss

r_a = Return on Assets

r_l = Increase in liabilities

$$EC = A - L = A \left\{ 1 - \left[\frac{(1 + r_a)(1 - l)}{(1 + r_l)} \right] \right\}$$

$$\text{Risk Adjusted Return} = (A * r_a - L * r_l - EL)$$

Capital Allocation – Marginal Approaches

1a. Pro-rata marginal contributions

Give each unit capital according to the standalone capital

- Annuities has capital of \$40
- Insurance has capital of \$20
- Total capital is \$50

Unit	Allocation
Annuities	$50 * (40/60) = 33.33$
Insurance	$50 * (20/60) = 16.66$
Total	\$50

Capital Allocation – Marginal Approaches

1b. Discrete Marginal Distributions

Calculate total capital, excluding one unit

- Total capital without Annuities = \$20
- Total capital without Insurance = \$40

Unit	Marginal Contribution	Scaled Contribution
Annuities	$50 - 20 = 30$	$30 * 50/40 = 37.50$
Insurance	$50 - 40 = 10$	$10 * 50/40 = 12.50$
Total	\$40	\$50

Capital Allocation – Marginal Approaches

1c. Continuous Marginal Distributions

Same idea, but done on a continuous basis

1d. Myers-Read Allocation Method

- Marginal increments will add up to total capital
- Assume normality or lognormality
- Assume the shareholders have a put option
- Use the Black-Scholes formula to price it

Capital Allocation

2. Game Theory

Solves the problem of how to allocate diversification benefit

Takes the average of the marginal contribution when the unit is:

- 1st in
- 2nd in
- 3rd in
- ...
- Last in