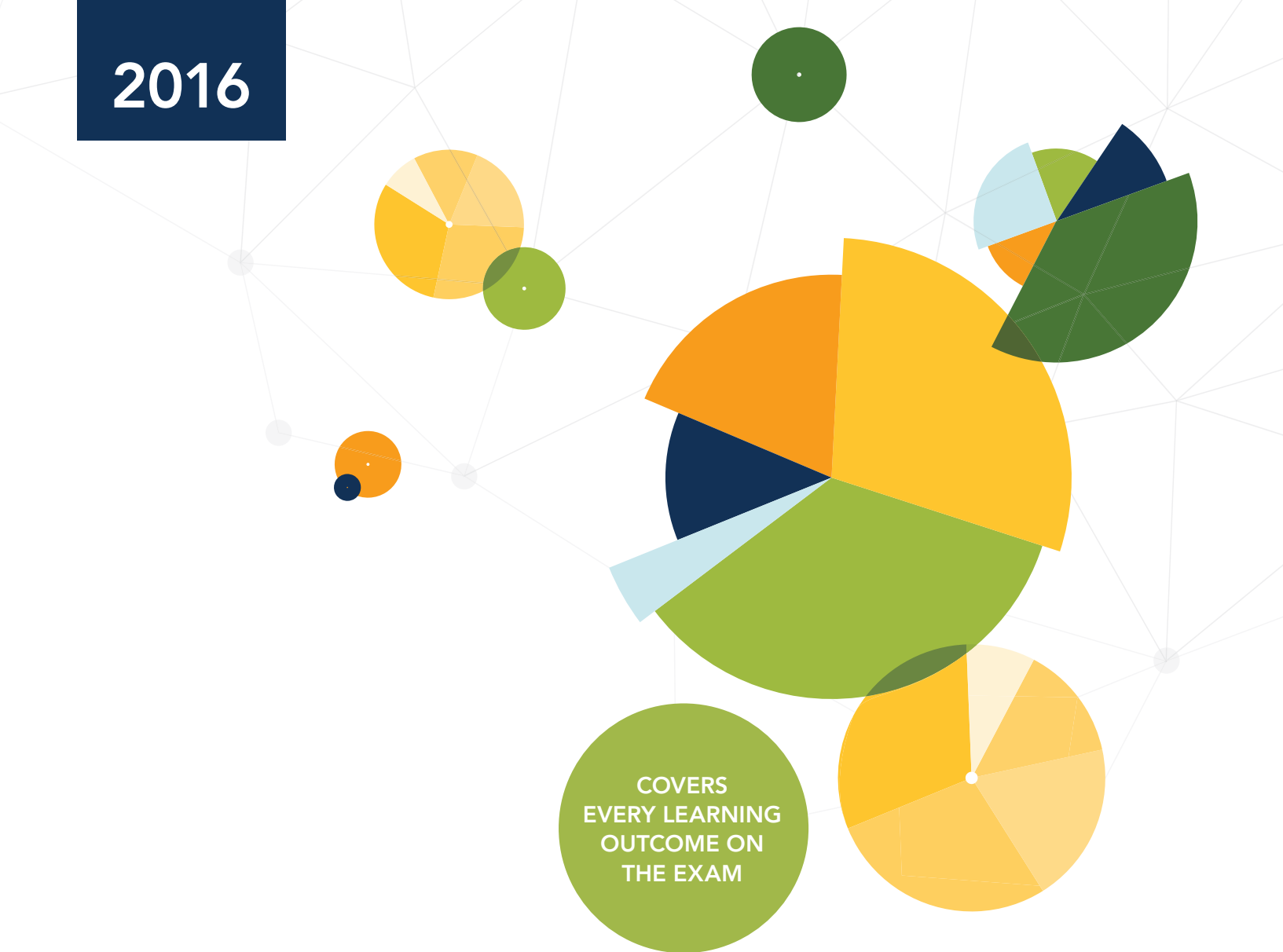


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FOUNDATIONS OF RISK MANAGEMENT,
QUANTITATIVE ANALYSIS

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Part I, Volume 1

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**Foundations of Risk Management,
Quantitative Analysis**

Christian H. Cooper, CFA, FRM

WILEY

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How to Study for the Exam

The FRM Exam Part I curriculum covers the tools used to assess financial risk:

- Foundations of risk management—20%
- Quantitative analysis—20%
- Financial markets and products—30%
- Valuation and risk models—30%

It is important to focus only on the learning objectives as you are asked about them and pay close attention to the percentages of each section. That is the core of my focus throughout the text, the online lecture sessions, and with the practice questions. A study hour doesn't count unless you are laser focused on specifically how GARP asks a learning objective.

Consistency is also key. Making a regular weekly study time is going to be important to staying on track. There is a reason: Only ~50% of the candidates pass the exam every year. It's a tough exam. It also tests intuition, not just memorization. That is why I attempt at every opportunity to connect the dots across readings, teach how changing environments change both markets and the models we use to model them, as well as help you with the questions where GARP specifically wants you to calculate an outcome.

Calculator policy:

It is best to begin your study with one of the approved calculators. You will not be admitted to the exam without one of these approved calculators!

- Hewlett Packard 12C (including the HP 12C Platinum and the Anniversary Edition)
- Hewlett Packard 10B II
- Hewlett Packard 10B II+
- Hewlett Packard 20B
- Texas Instruments BA II Plus (including the BA II Plus Professional)

Every year, candidates are turned away from the exam site because of wrong calculators. Make sure you aren't one of them.

ABOUT THE INSTRUCTOR

Christian H. Cooper is an author and trader based in New York City. He initially created the FRM program because, as a candidate, he was frustrated with the quality of study programs available. Writing from a practitioner's point of view, Christian drew on his experience as a trader across fixed income and equity markets, most recently as head of derivatives trading at a bank in New York, to create a program that is very focused on exam results while connecting the dots across topics to increase intuition and understanding.

Christian is active with the Aspen Institute, a Truman National Security Fellow, and a term member at the Council on Foreign Relations.

Wiley FRM Exam Review Study Guide 2016
Part I, Volume 1

FOUNDATIONS OF RISK MANAGEMENT (FRM)

This area focuses on your knowledge of foundational concepts of risk management and how risk management can add value to an organization. The broad areas of knowledge covered in foundations-related readings include the following:

- Basic risk types, measurement and management tools
- Creating value with risk management
- The role of risk management in corporate governance
- Enterprise risk management (ERM)
- Financial disasters and risk management failures
- The Capital Asset Pricing Model (CAPM)
- Risk-adjusted performance measurement
- Multi-factor models
- Information risk and data quality management
- Ethics and the GARP Code of Conduct

CROUHY, CHAPTER 1

Michel Crouhy, Dan Galai, and Robert Mark, *The Essentials of Risk Management*, 2nd Edition (New York: McGraw-Hill, 2014). Chapter 1. Risk Management: A Helicopter View (Including Appendix 1.1)

After completing this reading you should be able to:

- Explain the concept of risk and compare risk management with risk taking.
- Describe the risk management process and identify problems and challenges which can arise in the risk management process.
- Evaluate and apply tools and procedures used to measure and manage risk, including quantitative measures, qualitative assessment, and enterprise risk management.
- Distinguish between expected loss and unexpected loss, and provide examples of each.
- Interpret the relationship between risk and reward and explain how conflicts of interest can impact risk management.
- Describe and differentiate between the key classes of risks, explain how each type of risk can arise, and assess the potential impact of each type of risk on an organization.

Learning objective: Explain the concept of risk and compare risk management with risk taking.

Within the context of the FRM exam, risk is defined as variability of outcomes. These outcomes can be the result of a wide array of changes in expected future cash flows (earning potential), a change in book value (balance sheet assets), or broader economic variables. Companies are often exposed to an incredibly diverse range of risks, which could be described as business or financial risks.

Business risks include decisions purely related to business development, including marketing decisions, new product development, etc. Financial risks are risks that occur from changes in interest rates or other market movements. Ideally, companies will work to identify and minimize financial risks so they can concentrate on the risk to their business. A core concept of risk management is how a good business can be destroyed by mismanaged financial risks.

Learning objective: Describe the risk management process and identify problems and challenges which can arise in the risk management process.

The risk management process begins with identifying risk exposures, quantifying those exposures if possible, determining to keep or hedge the risk, finding the appropriate way to mitigate the risk if that is the choice—selling a business line or using financial products to hedge the risk are all ways of mitigating.

The big takeaway from this reading is this: Something may not be considered risk by the model or the market until something goes wrong. Risk management helps us monitor known risks but it is not so great at finding or predicting new sources of risk.

Learning objective: Evaluate and apply tools and procedures used to measure and manage risk, including quantitative measures, qualitative assessment, and enterprise risk management.

There are a number of quantitative and qualitative tools you need to know for the exam. Right now, just focus on these:

Stop Loss—Stop loss means “stop my losses at this price.” For example, if you are long a stock and you enter a stop-loss order, you are entering an order to exit the trade actually below where the current market is trading. To make this more concrete, if you own a stock at \$50 and you wish to stop your losses at \$45, your stop-loss order would be entered with a limit of \$45. The problem with stop-loss orders is that they usually can trade through your limit leaving the order unexecuted. In other words, a stop-loss order is not a guarantee that you will exit the trade at the price that you want.

For purposes of risk management, this means that you could be open to larger losses than the stop price of your order, and that is what you need to know for the exam.

Notional Limits—Notional limits refer to the absolute dollar value that is committed to a trade. It has been an ineffective method of risk management.

There are limits to the use of notionals, however, because they only consider the dollar value committed to the trade. For example, a \$1 billion trade in a bond with a duration of one year has significantly less risk than a single \$1 billion investment in a 30-year bond—which has a much longer duration and therefore much higher risk for the same notional amount. Therefore, risk management by controlling notional amounts of derivatives, cash, or securities is ineffective because it does not put risk limits in terms of risk but in terms of notional, which is not an effective measure of risk. No major firm will look at risk in this way.

Scenario Analysis—Scenario analysis can be broadly lumped into a method of risk management that re-prices a portfolio over a wide range of outcomes. Scenario analysis typically takes a predefined scenario and alters the portfolio value (PV) according to that historical outcome. For example, if we again lose 23% of the stock market’s value in a single day (as we did on Black Monday), then what effect would there be on our portfolio?

Stress Tests—The key difference between scenario analysis and a stress test is usually the range of potential outcomes. For example, stress tests can be used to test a portfolio to the limit of what would normally be expected under extreme events—including correlation going to one, and the normal inverse relationship between stocks and bonds breaking down.

Duration and Beta Exposure Limits—Duration and beta exposure limits are, on the surface, a better measure of risk control than notional limits, stop-loss limits, or stress test and scenario analysis. The reason is that beta refers to the variation expected within an equity portfolio, and duration is a measure of fixed-income risk. For example, an

equity portfolio with a beta of 1.25 would, on average, be expected to have a variation 1.25 times greater than the underlying equity portfolio. Duration, on the other hand, is a measure of how long it takes to get your return of principal invested in a particular bond. The longer the duration, the greater the risk of the bond.

VaR—Value at risk is among the most widely used measures of risk because of its ease and simplicity. However, the ease of use belies the complex assumptions that the model makes. Due to the complexity of the underlying assumptions, VaR is often misused and/or misunderstood. While the mathematics of VaR are completely sound, the complexity of the VaR assumes a high degree of understanding about the assumptions of the model, which include how asset prices behave.

Learning objective: Distinguish between expected loss and unexpected loss, and provide examples of each.

Think of expected losses as when the market moves and you actually lose as much as you expected. This is a good thing because it means your risk runs are right and everything is working as it should. The problem arises when you actually lose more than you expected. It is equally as problematic when you lose less than you expected because it means something is wrong with your data, your calibration, or your model. So-called “tying out” is the single most important thing a desk can do—even more than generating a profit. If a desk doesn’t tie out it means something is wrong and this is the biggest micro risk flag an institution can face. Unexpected losses, or unexpected gains, all merit extra scrutiny.

Learning objective: Interpret the relationship between risk and reward and explain how conflicts of interest can impact risk management.

The greater the risk, the greater the potential for reward. We will come back to this more in the CAPM section where we quantify risk and portfolio construction. We will discuss a number of types of risk and you should know these definitions early on:

Market Risk—Risk that stems from changes in market prices or changes in the variability of market prices. The author highlights two types of market risk. *Absolute market risk* is used to measure the change in a portfolio’s value in dollar terms. *Relative risk*, by contrast, is used to measure the change in a portfolio according to some benchmark. An example of relative market risk would be the use of beta to limit or describe potential changes in equity portfolio relative to its underlying index.

Liquidity Risk—There are two types of liquidity risk you need to know. *Market/product liquidity* is the risk of moving the market due to the size of the trade necessary to manage risks. This type of risk is usually product-type specific. Secondly, there is *inability to meet cash flow requirements*, which could be an inability to pay on swaps or a pension fund unable to meet obligations. It can take many forms, related to any cash flow operation necessary for continued business operation.

Credit Risk—Credit risk seeks to describe the probability of counterparty failure. In this case, the risk manager wants to evaluate the probability that a counterparty is either unwilling or unable to meet their financial obligations.