15.997 Practice of Finance: Advanced Corporate Risk Management
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Chapter 1: Introduction

1.1 The Revolution in Risk Management

Risk management as it is currently taught is a relatively new field in the domain of finance. Why? What makes it new?

Risk has always been at the center of business. Any company that makes an investment, builds a factory, pours dollars into developing a new technology or commits resources to branding a new product is taking on risk. That is how profit is made.

And the management of risk isn't exactly a new line of business. Insurance companies have been around for ages.

But risk management in the way it is now practiced in corporations and in how it is taught in business schools is a new field. Something changed; something is different; something is new. The latter half of the twentieth century ushered in a revolution in our understanding of risk. And this understanding wasn't suddenly pulled out of Zeus' head fully formed, but was built upon and developed in tandem with new markets in specific risks. From their origins in agricultural commodities and metals in the mid-nineteenth century, the use of futures, options and other derivatives grew and multiplied, first gradually, then exploding in the latter part of the twentieth century. This development provided fertile terrain for the intellectual mastery of new concepts and tools for measuring, pricing and managing risk. And the effort to understand these new markets for risk also benefited from advances in mathematics and economics that made it possible to grapple with the complications presented by the problem.

During the first half of the twentieth century corporate finance theory struggled mightily to cope with just two types of financing: debt and equity. Debt was low risk. Equity was high risk. The company's choice was largely limited to how much debt, how much equity. Then things changed. By the end of the century the risk could be carved up and packaged into more cuts than a side of beef. Highly leveraged transactions created debt that seemed, in terms of risk, to more nearly resemble stock. Warrants and stock options presented us with risk distilled in more and more concentrated forms. Creditors could make their loans repayable in gold or copper or oil.

Investors could participate in various tranches of mortgages, the level of interest rate risk portioned out in ever higher concentrations as the number of the tranches grew. Participants in the financing of this or that major investment project could assign the various risks to different stakeholders: construction completion risk to one lender, oil price risk to the bondholder, foreign exchange risk to the currency market, operating risk to the equity investor. Modern financial managers have many choices about risk beyond how much debt and how much equity.

Even practices that had always been present—such as making the ultimate funding of a credit or investment contingent upon key events or hurdles—suddenly became more subject to careful engineering and management. The contingent events could, in some cases, be precisely specified, their likelihood measured, and the value of the contingency measured in an active marketplace.

This is the revolution in risk management. Certain risks now have a market. These risks are subject to careful measurement, valuation and management. Therefore corporations and other economic agents can shape their business decisions, their capital investments, their operating decisions, their product offerings and marketing campaigns to reflect this more precise understanding of risk, its measure and its value. Corporations have more flexibility in shaping their financing plans and their business strategy. And competitive pressures will demand that they exploit this possibility or fail.

1.2 What is Corporate Risk Management?

Risk management as a discipline has been developed primarily by and for financial institutions, whether commercial banks, investment banks or other financial intermediaries. A key principle of this course is that the tools and principles developed for banks and other financial intermediaries are useful, indeed, essential tools for non-financial corporations that are the customers of the banks.[1]

The perspective of non-financial corporations is essentially different than the perspective of financial corporations. Because of the historical development of the field, most courses in risk management are taught from the perspective of the financial corporation, even when they claim to

[1] In the field of derivatives a distinct term came to be applied to these non-financial corporations who found themselves deeply involved in these markets for risk: they were called “end-users”. Following some of the early derivatives debacles in the mid-1990s they had even formed their own advocacy and lobbying arm, the End-Users of Derivatives Association.

be addressing risk management issues generally. This course is different. It is organized specifically for non-financial corporations.

How does this different perspective shape the course?

First and foremost is the question of "where is value created?"

In many courses targeted to investment bankers, the focus is on spotting mispriced securities and profiting from them: so-called arbitrage trading. Value is captured through trading – buying low and selling high. Value isn't really created. The game is zero-sum. Value is captured by one party at the expense of the other. While the zero-sum game needn't, indeed oughtn't, be the end-point of a course for non-financial corporations, it often is. And the value of risk management is often taught to originate from getting the pricing right when others are getting it wrong. The objective is to execute the right arbitrage transaction and end up on the right side of the zero-sum game.

Where value is actually created by financial corporations is a complicated subject that we won't grapple with here. Our concern is with non-financial corporations where the source of value is, generally, easier to comprehend.

Non-financial corporations are essentially in the business of taking a bundle of assets—whether plant and equipment, or skilled employees, or intellectual property, or organizational skill and capabilities—and transforming a set of inputs with one market value into a set of outputs with a higher market value. The transformation occurs within the company. In older style companies the transformation is transparent: wheat is transformed into bread, iron ore is transformed into steel, steel, plastic and glass are worked into an automobile. In newer style companies, a similar transformation happens, but the process may be less transparent.

Risk management for non-financial corporations is first, and foremost, about how to make better investment and operating decisions so that the firm can operate and produce its product more efficiently and more effectively. There is no zero sum game. If the firm can find a way to produce the same quantity of output with less risk and therefore greater value, everyone wins. If the firm can find a way to organize the risk profile of its financings so that ultimately more assets can be accumulated to produce more output at lower cost, then everyone wins. This is the core subject matter of corporate risk management.

A second way that the perspective of the non-financial corporation shapes this course comes in the way the material is taught. We focus more on the strategic element of risk management—the why and how—and less on the tactics and execution.

Most risk management courses as they are currently taught focus to a large degree on the mathematical details, esoteric terminology and bewildering array of potential transactions that could be executed and positions taken. There is an entire menagerie of derivative instruments, and many a risk management course presents its own specialized taxonomy for the peculiar flora and fauna of this new financial world. The high level of mathematics required can be daunting, but also intriguing and sometimes enchanting. Quite often it is wielded in a manner that obscures the relevant business issues and the intuition that it ought to be used to develop and sharpen. Some risk management textbooks revel in the long list of 'greeks' which are described in excruciating detail. Others offer an exhaustive guided tour of every conceivable financial marketplace and financial security – but never address the actual business operations of the company's that are ostensibly making use of the products.

In contrast, for this course the science, mathematics and esoteric details of risk management as a specialty are secondary. These are useful only insofar as they help to illuminate something about the operations and financings of the particular business. For a course in corporate risk management, it is the firm's line of business and the structure of its operations that must be at the heart of the discussion. The centerpiece of corporate risk management is understanding ***how*** and ***why*** measuring, pricing and managing risk leads to better business decisions. Of course, once you see the connection, you may want to dive more deeply into the details of the science of risk, but those details will be better explored in some other course.

1.3 The Plan of the Course

This course is divided into 4 parts.

The first part is entitled *The Role of Risk Management*. It provides an overview and perspective on how risk management matters for the corporation. Chapter 2 identifies *How Companies Manage Risk*, exploring how different parts of the company exploit the insights about risk differently in executing their tasks. Chapter 3 analyzes *Why Companies Manage Risk*, analyzing how the company's competitive position is improved and how shareholder value is created. Chapter 4 describes *Where Companies Trade Risk*, putting the company into context with the financial marketplace.

The second part of the course is entitled *The Tools of Risk Management*. It discusses the toolkit needed to analyze and manage risk more effectively. This toolkit is the product of the revolution in finance theory that began in the last decades of the twentieth century. Chapters 5 and 6 explain the concepts necessary for *Measuring Risk*. This starts with the general concept of exposure and the practical risk metrics that companies use. It continues with an introduction to the complicated tools of stochastic processes and complex risk modeling. Chapters 7 and 8 describe different ways of *Packaging Risk*. This includes buying and selling simple instrument such as forwards or options. It also includes dynamic strategies in which the company adjusts its positions through time in response to changing circumstances. Finally, Chapters 9 and 10 analyze the critical issue of *Pricing Risk*—what's it worth. The key insights of risk neutral pricing are introduced and connected to the traditional tools of risk-adjusted discounting. Then the full power of the tool is demonstrated in practical application.

The toolkit presented in this part of the course is often the exclusive focus in many courses in risk management. Here we cover some of the same ground, but hopefully with an eye to what is most essential to getting at real world problems quickly and with the greatest insight.

The third part of the course is entitled *The Business of Risk Management*. This is the core of the course. Here we present the actual business actions, strategies and decisions where risk management tools are applied. This is where we show in detail how risk management can potentially add to shareholder value. The section is organized by chapters around the very different types of decisions that get made at very different locations within the company, and we discuss the role of risk and risk management in those decisions. Chapter 11 is titled *Valuation*. The task of valuation is an age old one. The traditional discounted cash flow valuation model is the workhorse of corporate finance, whether it be applied to the valuation of an asset, a new business venture or a contract for service. The science of risk has given us more powerful and specialized tools for valuation, and these will be covered here. Chapter 12 presents how these insights about risk and value can be used to improve and perfect *Asset Management* and the day-to-day operations of the firm. Chapter 13 analyzes a special line of business, the *Trading Operations*, where the tools of risk management are applied in a particularly concentrated form. Chapter 14 looks to the comptroller's functions and how risk management can improve cash management through *Transaction Hedging*. Chapters 15 and 16 elaborate how risk management impacts the company's *Liability Management* and its broader *Financial Policy* and the management of the various liabilities on its balance sheet. Finally, Chapter 17 addresses how risk management is relevant for *Taxes* and the tax planning department.

The fourth part of the course is entitled *The Risk Management Function*. It looks to how the developing use of risk management tools forces changes on the internal operation of the firm. Chapter 18 on *Organizing the Risk Management Function* provides an overview on how companies effectively organize and deploy management staff skilled in risk management to the benefit of the firm as a whole. Chapter 19 addresses the rules for *Accounting for Risk and Hedging* in the company's published financial statements and elsewhere. Chapter 20 discusses the impact of risk management on the *Performance Evaluation* of management. Chapter 21 analyzes the specialized problems of *Credit Risk and Counterparty Risk* created by the ability to buy and sell risks packaged in so many different ways. Finally, Chapter 22 addresses the increased demands for careful corporate *Governance & Control* given these new and powerful tools.

Highlights

Revolution in risk management – tools, choices & mathematics.

It's about corporates, end-users!

It's about producing value, not a zero-sum trading game.

Value is created by making better investment and operating decisions: measuring risk, pricing risk.

Value is created by maximizing positive NPV projects, leveraging the firm's capital: managing risk in liabilities and financial strategy.

Strategy, not tactics. Big picture, not minutiae.

Getting the Most Out of the Course

The simplest way to get the most out of this course is to constantly ask the question, "What have I learned about risk and the valuation of risk that I didn't already know?" When reviewing a case study of a corporate decision, the question is, "Can I solve this case adequately using a less sophisticated model of risk?" "Would a traditional DCF analysis, perhaps supplemented by a little scenario analysis have been approximately as good or insightful?"

If the answer to these questions is "I learned nothing new," or "The same insights could have been made with a simpler analysis," or simply "I don't know what more I got out of all this complication," then the material needs to be reviewed again. Or, perhaps, the material needs to be rewritten.

The bottom line for this course and these notes is to provide a new, deeper insight about a variety of corporate finance problems by provider a richer, fuller analysis of risk, the price of risk and the tools of risk management. Hopefully, upon finishing the course and these notes, you will have peered into a whole new world of richer thinking about risk, how to value and how react to risk, thinking that can be applied to more successfully managing a variety of problems confronting the firm.