Part II

Risk and Return

...in a Perfect Market under Risk Aversion

We are now moving on to the next step in complexity. We shall still (cowardly) maintain that financial markets are perfect: no information differences, no transaction costs, no taxes, and many buyers and sellers. But we are now abandoning the assumption that investors are risk-neutral—that they are indifferent between receiving $1 million for sure, and receiving $500,000 or $1,500,000 with equal probability. An investor who is risk-averse prefers the safe $1 million.

We now introduce a complication that adds not only complexity but also realism: risk aversion. Under risk aversion, projects can influence one another from an "overall risk" perspective. If one project's return is always high (say, +20%) when the other project's return is low (say, –20%), and vice-versa, then it can even be possible that the overall risk cancels out completely! This simple insight means that determining the best investment choices, selected from the large universe of available investment projects, becomes a much more difficult task for corporate investors and consequently, for their corporations' managers. Projects are no longer self-contained islands.

As a corporate manager, it now becomes a question of how your corporate projects work together with your other projects (for internal corporate risk management) or even with your investors' projects elsewhere. This also means that you need to first understand your investors' problems before you can answer what projects they would like you to undertake. So, who are your investors, what do they like and dislike, and how should you evaluate your project relative to what you believe your investors' alternatives are? What exactly *are* your investors' alternatives? How do your projects interact with your investors' other projects? This is a wide and deep subject, which is why we require an unprecedented four chapters: It requires a larger expedition

into the world of uncertainty.

Although the details of how to invest now become more difficult, fortunately, all the important questions and tasks still remain the same—and, fortunately, so do many of the answers. As a corporate executive, you must still understand how to work with rates of return and how to decide whether to accept or reject investment projects. You can still use the net present value method. You still need knowledge of projects' expected cash flows, $E(C)$, and of the cost of capital, $E(r)$,

$$\text{NPV} = C_0 + \frac{E(C_1)}{1 + E(r_1)} + \frac{E(C_2)}{1 + E(r_2)} + \cdots$$

The novel complication arises in the denominator. Investors' risk aversion influences the NPV (only) through $E(r)$. Still, it continues to be best to think of it as the opportunity cost of capital. As a manager, the difficulty is only that you must somehow calculate what it should be on behalf of your corporation's owners (investors). The cost of capital still measures the same thing: whether your investors have better alternatives elsewhere in the economy. If they do, you should return their capital to them and let them invest their money there. The opportunities elsewhere determine your corporation's cost of capital, which in turn determines what projects you should take.

What You Want to Learn in this Part

In sum, we now assume that investors are risk-averse—as they truly are in the real world. Then what is the correct $E(r)$, the opportunity cost of capital, in the NPV formula? As in earlier chapters, great opportunities elsewhere in the economy still manifest themselves as a high cost of capital $E(r)$ that you should apply to your projects. But in this

part of the book, you must judge all opportunities not only by their rewards, but also by their risks.

- Chapter 7 gives you a short tour of historical rates of return on various asset classes to whet your appetite. Its appendix explains some of the (ever-changing) current institutional setups of U.S. equity markets.

  Typical questions: Did stocks, bonds, or cash perform better over the last 30 years? How safe were stocks compared to bonds or cash? What are the roles of brokers and exchanges? How do stocks appear and disappear?

- Chapter 8 considers choices if investors like more reward and less risk. It takes the perspective of an investor. It explains how you should measure risk and reward, and how diversification reduces risk. It draws a strong distinction between a security's own risk and a security's contribution to an investor's over-all portfolio risk.

  Typical questions: What is the standard deviation of the rate of return on my portfolio? What is Intel's market beta, and what does it mean for my portfolio? What is Intel's own risk, and should I care? What is the average market beta of my portfolio?

- Chapter 9 looks at two key quantities: The price of time (i.e., the risk-free rate) and the price of risk (i.e., the expected rate of the stock market above an equivalent risk-free rate). As a corporate CFO, you can benchmark your cost of capital to these quantities. If you offer no-risk securities, it is enough for your projects to meet the risk-free rate of return. If you offer projects about as risky as the stock market, they should offer expected rates of return just like those of the stock market. These are the opportunity costs of capital for projects of different types for your investors.

  Typical questions: What should a short-term safe investment offer? What should a long-term safe investment offer? What should a risky investment offer?

- Chapter 10 takes this perspective one step further. It explains how to determine the degree to which projects are like bonds and stocks through the market-beta. An extreme version thereof is the "capital asset pricing model" (CAPM), which even states an exact relation between a project's expected rates of return and its market-beta. Alas, it holds only under very special circumstances.

  Typical questions: What characteristics should influence the appropriate expected rate of return that your investors care about? What should be the appropriate expected rate of return for any one particular project? Can you trust the CAPM?

Looking ahead, Part III will explain what happens when financial markets or decision rules are not perfect.