Pacific Gas and Electric Company Securitization

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TURN HEARING EXHIBIT

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Excerpts from *Principles of Corporate Finance*

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Principles *of* Corporate Finance

TENTH EDITION

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Brief Contents

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Month	Market return	Anchovy Q return	Deviation from average market return	Deviation from average Anchovy Q return	Squared deviation from average market return	Product of deviations from average returns (cols 4 × 5)
1	–8%	–11%	–10	–13	100	130
2	4	8	2	6	4	12
3	12	19	10	17	100	170
4	–6	–13	–8	–15	64	120
5	2	3	0	1	0	0
6	8	6	6	4	36	24
Average	2	2		Total	304	456
			Variance = σ_m^2 = 304/6 = 50.67			
			Covariance = σ_{im} = 456/6 = 76			
			Beta (β) = σ_{im}/σ_m^2 = 76/50.67 = 1.5			

TABLE 7.7 Calculating the variance of the market returns and the covariance between the returns on the market and those of Anchovy Queen. Beta is the ratio of the variance to the covariance (i.e., $\beta = \sigma_{im}/\sigma_m^2$).

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Here is a simple example of how to do the calculations. Columns 2 and 3 in Table 7.7 show the returns over a particular six-month period on the market and the stock of the Anchovy Queen restaurant chain. You can see that, although both investments provided an average return of 2%, Anchovy Queen's stock was particularly sensitive to market movements, rising more when the market rises and falling more when the market falls.

Columns 4 and 5 show the deviations of each month's return from the average. To calculate the market variance, we need to average the squared deviations of the market returns (column 6). And to calculate the covariance between the stock returns and the market, we need to average the product of the two deviations (column 7). Beta is the ratio of the covariance to the market variance, or 76/50.67 = 1.50. A diversified portfolio of stocks with the same beta as Anchovy Queen would be one-and-a-half times as volatile as the market.

7-5 Diversification and Value Additivity

We have seen that diversification reduces risk and, therefore, makes sense for investors. But does it also make sense for the firm? Is a diversified firm more attractive to investors than an undiversified one? If it is, we have an *extremely* disturbing result. If diversification is an appropriate corporate objective, each project has to be analyzed as a potential addition to the firm's portfolio of assets. The value of the diversified package would be greater than the sum of the parts. So present values would no longer add.

Diversification is undoubtedly a good thing, but that does not mean that firms should practice it. If investors were *not* able to hold a large number of securities, then they might want firms to diversify for them. But investors *can* diversify.[32] In many ways they can do so more easily than firms. Individuals can invest in the steel industry this week and pull out next week. A firm cannot do that. To be sure, the individual would have to pay brokerage fees on the purchase and sale of steel company shares, but think of the time and expense for a firm to acquire a steel company or to start up a new steel-making operation.

You can probably see where we are heading. If investors can diversify on their own account, they will not pay any *extra* for firms that diversify. And if they have a sufficiently wide choice of securities, they will not pay any *less* because they are unable to invest separately in each factory. Therefore, in countries like the United States, which have large and competitive capital markets, diversification does not add to a firm's value or subtract from it. The total value is the sum of its parts.

This conclusion is important for corporate finance, because it justifies adding present values. The concept of *value additivity* is so important that we will give a formal definition of it. If the capital market establishes a value PV(A) for asset A and PV(B) for B, the market value of a firm that holds only these two assets is

$$\text{PV(AB)} = \text{PV(A)} + \text{PV(B)}$$

A three-asset firm combining assets A, B, and C would be worth PV(ABC) = PV(A) + PV(B) + PV(C), and so on for any number of assets.

We have relied on intuitive arguments for value additivity. But the concept is a general one that can be proved formally by several different routes.[33] The concept seems to be widely accepted, for thousands of managers add thousands of present values daily, usually without thinking about it.

[32] One of the simplest ways for an individual to diversify is to buy shares in a mutual fund that holds a diversified portfolio.

[33] You may wish to refer to the Appendix to Chapter 31, which discusses diversification and value additivity in the context of mergers.

SUMMARY

Our review of capital market history showed that the returns to investors have varied according to the risks they have borne. At one extreme, very safe securities like U.S. Treasury bills have provided an average return over 109 years of only 4.0% a year. The riskiest securities that we looked at were common stocks. The stock market provided an average return of 11.1%, a premium of 7.1% over the safe rate of interest.

This gives us two benchmarks for the opportunity cost of capital. If we are evaluating a safe project, we discount at the current risk-free rate of interest. If we are evaluating a project of average risk, we discount at the expected return on the average common stock. Historical evidence suggests that this return is 7.1% above the risk-free rate, but many financial managers and economists opt for a lower figure. That still leaves us with a lot of assets that don't fit these simple cases. Before we can deal with them, we need to learn how to measure risk.

Risk is best judged in a portfolio context. Most investors do not put all their eggs into one basket: They diversify. Thus the effective risk of any security cannot be judged by an examination of that security alone. Part of the uncertainty about the security's return is diversified away when the security is grouped with others in a portfolio.

Risk in investment means that future returns are unpredictable. This spread of possible outcomes is usually measured by standard deviation. The standard deviation of the *market portfolio,* generally represented by the Standard and Poor's Composite Index, is around 15% to 20% a year.

Risk and the Cost of Capital

Long before the development of modern theories linking risk and return, smart financial managers adjusted for risk in capital budgeting. They knew that risky projects are, other things equal, less valuable than safe ones—that is just common sense. Therefore they demanded higher rates of return from risky projects, or they based their decisions about risky projects on conservative forecasts of project cash flows.

Today most companies start with the *company cost of capital* as a benchmark risk-adjusted discount rate for new investments. The company cost of capital is the right discount rate only for investments that have the same risk as the company's overall business. For riskier projects the opportunity cost of capital is greater than the company cost of capital. For safer projects it is less.

The company cost of capital is usually estimated as a weighted-average cost of capital, that is, as the average rate of return demanded by investors in the company's debt and equity. The hardest part of estimating the weighted-average cost of capital is figuring out the cost of equity, that is, the expected rate of return to investors in the firm's common stock. Many firms turn to the capital asset pricing model (CAPM) for an answer. The CAPM states that the expected rate of return equals the risk-free interest rate plus a risk premium that depends on beta and the market risk premium.

We explained the CAPM in the last chapter, but didn't show you how to estimate betas. You can't look up betas in a newspaper or see them clearly by tracking a few day-to-day changes in stock price. But you can get useful statistical estimates from the history of stock and market returns.

Now suppose you're responsible for a specific investment project. How do you know if the project is average risk or above- or below-average risk? We suggest you check whether the project's cash flows are more or less sensitive to the business cycle than the average project. Also check whether the project has higher or lower fixed operating costs (higher or lower operating leverage) and whether it requires large future investments.

Remember that a project's cost of capital depends only on market risk. Diversifiable risk can affect project cash flows but does not increase the cost of capital. Also don't be tempted to add arbitrary fudge factors to discount rates. Fudge factors are too often added to discount rates for projects in unstable parts of the world, for example.

Risk varies from project to project. Risk can also vary over time for a given project. For example, some projects are riskier in youth than in old age. But financial managers usually assume that project risk will be the same in every future period, and they use a single risk-adjusted discount rate for all future cash flows. We close the chapter by introducing certainty equivalents, which illustrate how risk can change over time.

9-1 Company and Project Costs of Capital

The **company cost of capital** is defined as the expected return on a portfolio of all the company's existing securities. It is the opportunity cost of capital for investment in the firm's assets, and therefore the appropriate discount rate for the firm's average-risk projects.

If the firm has no debt outstanding, then the company cost of capital is just the expected rate of return on the firm's stock. Many large, successful companies pretty well fit this special case, including Johnson & Johnson (J&J). In Table 8.2 we estimated that investors require a return of 3.8% from J&J common stock. If J&J is contemplating an expansion of its existing business, it would make sense to discount the forecasted cash flows at 3.8%.[1]

The company cost of capital is *not* the correct discount rate if the new projects are more or less risky than the firm's existing business. Each project should in principle be evaluated at its *own* opportunity cost of capital. This is a clear implication of the value-additivity principle introduced in Chapter 7. For a firm composed of assets A and B, the firm value is

$$\begin{aligned}\text{Firm value} &= \text{PV(AB)} = \text{PV(A)} + \text{PV(B)} \\ &= \text{sum of separate asset values}\end{aligned}$$

Here PV(A) and PV(B) are valued just as if they were mini-firms in which stockholders could invest directly. Investors would value A by discounting its forecasted cash flows at a rate reflecting the risk of A. They would value B by discounting at a rate reflecting the risk of B. The two discount rates will, in general, be different. If the present value of an asset depended on the identity of the company that bought it, present values would *not* add up, and we know they do add up. (Consider a portfolio of $1 million invested in J&J and $1 million invested in Toyota. Would any reasonable investor say that the portfolio is worth anything more or less than $2 million?)

If the firm considers investing in a third project C, it should also value C as if C were a mini-firm. That is, the firm should discount the cash flows of C at the expected rate of return that investors would demand if they could make a separate investment in C. *The opportunity cost of capital depends on the use to which that capital is put.*

Perhaps we're saying the obvious. Think of J&J: it is a massive health care and consumer products company, with $64 billion in sales in 2008. J&J has well-established consumer products, including Band-Aid® bandages, Tylenol®, and products for skin care and babies. It also invests heavily in much chancier ventures, such as biotech research and development (R&D). Do you think that a new production line for baby lotion has the same cost of capital as an investment in biotech R&D? We don't, though we admit that estimating the cost of capital for biotech R&D could be challenging.

Suppose we measure the risk of each project by its beta. Then J&J should accept any project lying above the upward-sloping security market line that links expected return to risk in Figure 9.1. If the project is high-risk, J&J needs a higher prospective return than if the project is low-risk. That is different from the company cost of capital rule, which accepts any project *regardless of its risk* as long as it offers a higher return than the *company's* cost of capital. The rule tells J&J to accept any project above the horizontal cost of capital line in Figure 9.1, that is, any project offering a return of more than 3.8%.

It is clearly silly to suggest that J&J should demand the same rate of return from a very safe project as from a very risky one. If J&J used the company cost of capital rule, it would reject many good low-risk projects and accept many poor high-risk projects. It is also silly to

[1] If 3.8% seems like a very low number, recall that short-term interest rates were at historic lows in 2009. Long-term interest rates were higher, and J&J probably would use a higher discount rate for cash flows spread out over many future years. We return to this distinction later in the chapter. We have also simplified by treating J&J as all-equity-financed. J&J's market-value debt ratio is very low, but not zero. We discuss debt financing and the weighted-average cost of capital below.

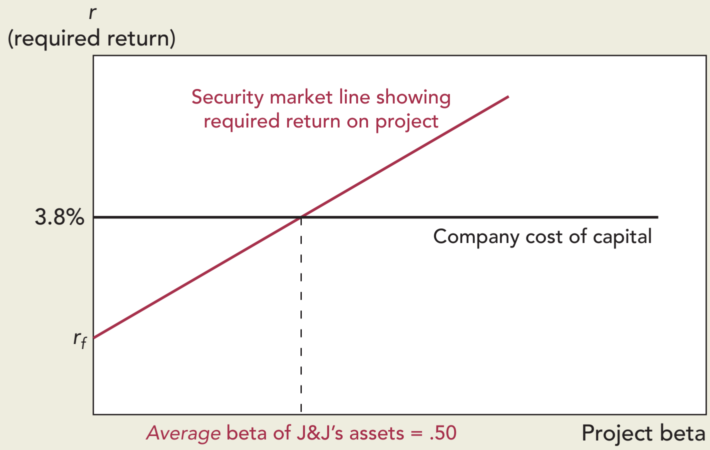

FIGURE 9.1

A comparison between the company cost of capital rule and the required return from the capital asset pricing model. J&J's company cost of capital is about 3.8%. This is the correct discount rate only if the project beta is .50. In general, the correct discount rate increases as project beta increases. J&J should accept projects with rates of return above the security market line relating required return to beta.

suggest that just because another company has a low company cost of capital, it is justified in accepting projects that J&J would reject.

Perfect Pitch and the Cost of Capital

The true cost of capital depends on project risk, not on the company undertaking the project. So why is so much time spent estimating the company cost of capital?

There are two reasons. First, many (maybe most) projects can be treated as average risk, that is, neither more nor less risky than the average of the company's other assets. For these projects the company cost of capital is the right discount rate. Second, the company cost of capital is a useful starting point for setting discount rates for unusually risky or safe projects. It is easier to add to, or subtract from, the company cost of capital than to estimate each project's cost of capital from scratch.

There is a good musical analogy here. Most of us, lacking perfect pitch, need a well-defined reference point, like middle C, before we can sing on key. But anyone who can carry a tune gets *relative* pitches right. Businesspeople have good intuition about *relative* risks, at least in industries they are used to, but not about absolute risk or required rates of return. Therefore, they set a companywide cost of capital as a benchmark. This is not the right discount rate for everything the company does, but adjustments can be made for more or less risky ventures.

That said, we have to admit that many large companies use the company cost of capital not just as a benchmark, but also as an all-purpose discount rate for every project proposal. Measuring differences in risk is difficult to do objectively, and financial managers shy away from intracorporate squabbles. (You can imagine the bickering: "My projects are safer than yours! I want a lower discount rate!" "No they're not! Your projects are riskier than a naked call option!")[2]

When firms force the use of a single company cost of capital, risk adjustment shifts from the discount rate to project cash flows. Top management may demand extra-conservative cash-flow forecasts from extra-risky projects. They may refuse to sign off on an extra-risky project unless NPV, computed at the company cost of capital, is well above zero. Rough-and-ready risk adjustments are better than none at all.

[2] A "naked" call option is an option purchased with no offsetting (hedging) position in the underlying stock or in other options. We discuss options in Chapter 20.