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TURN HEARING EXHIBIT

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CORPORATE VALUATION

Tools for Effective Appraisal and Decision Making

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Contents

example, if the firm is typically financed 60 percent with debt and 40 percent with equity, w_d is 0.60 and w_s is 0.40. Viewed in this light, the WACC can be interpreted as a company's after-tax cost of raising funds, assuming that funds are raised by issuing a mix of securities with proportions equal to the long-run financing weights. This is not meant to imply that every time a company raises money it will issue securities in amounts proportional to the long-run financing weights. In fact, most companies commonly issue only one type of security at a time. However, over time and across a number of issues, the financing weights will be maintained so that the firm's average cost of funds is given by the WACC.

Whose Cost of Capital?

When calculating a company's WACC, the business being appraised must be considered in isolation. To see why this is important, consider the following situation. AT&T requests a DCF appraisal of a small, high-risk computer company that we will call Altos. AT&T is considering acquiring Altos. As part of the job, the appraiser must estimate the cost of capital. But whose cost of capital should be estimated? Should it be AT&T's cost of capital because AT&T is purchasing Altos, or should it be Altos's cost of capital?

The answer to the question will have a significant impact on the appraisal, because AT&T is in a low-risk business and, therefore, has a low WACC, while Altos is in a high-risk business and has a high WACC. Though it may appear that it is appropriate to use AT&T's cost of capital because it measures "what it will cost AT&T to finance the purchase of Altos," such reasoning is incorrect. The erroneous logic is revealed by the paradox it produces. Suppose that it was appropriate to use AT&T's cost of capital. Because AT&T has a lower cost of capital than Altos, the appraised value of Altos using AT&T's WACC will be larger than the appraised value of Altos using Altos's WACC. This means that AT&T should be willing to pay more for Altos than it is worth to the current owners. Furthermore, the same argument holds for every small computer company because they all have higher WACCs than AT&T. It follows, therefore, that AT&T should buy every small computer company. But AT&T has acquired only a

select few computer companies. Is antitrust regulation the reason for AT&T's reticence? Is AT&T foolish? Or is there a financial economic explanation for AT&T's behavior?

The paradox arises because the wrong cost of capital was employed. The cost of capital that AT&T should use in valuing Altos is Altos's WACC, the same number that Altos's current management would use. If both companies use Altos's WACC, there is no reason, at least from an appraisal standpoint, for AT&T to acquire Altos. Of course, AT&T may still choose to acquire Altos for other reasons. For instance, AT&T may conclude that there is synergy between the computer business and the telephone business. However, these considerations do not affect the estimate of the cost of capital. Instead, the synergies will be reflected in forecasts of higher cash flows for Altos once it becomes part of AT&T.

To see further why Altos's cost of capital is the appropriate choice, think of the postacquisition AT&T as consisting of two parts: its huge telephone business and Altos. Assume that the WACC for the telephone business is 10 percent and the WACC for Altos, considered in isolation, is 20 percent. Assume, furthermore, that Altos represents 1 percent of AT&T's total business. Before the merger, AT&T's cost of capital is 10 percent. After the merger, AT&T's cost of capital, including the computer company, is 10.1 percent. The WACC rises because AT&T is now a blend of 99 percent telephone operations and 1 percent computer operations. (The new WACC = (0.99)(10%) + (0.01)(20%) = 10.1%). Because the increase in the WACC is so small, it can easily be overlooked, and the appraiser can falsely conclude that acquiring Altos has no impact on AT&T's cost of funds. This is analogous to concluding that throwing a gallon of yellow dye in the Pacific Ocean has no effect because there is no observable yellow tint to the ocean afterwards. There is a small effect, and if you tossed enough dye in the ocean, it would be noticeable.

The upshot of the AT&T example is that the cost of capital depends only on the cash flows of the firm being appraised. If the cash flows produced by a computer company are sufficiently risky that the financing cost is 20 percent, the financing cost is 20 percent whether the firm is owned by AT&T or Brad Cornell. However, if Brad Cornell owns the firm, it will be clear that the cost of capital is 20 percent. If AT&T owns the firm, its individual cost of capital will no longer be observable, because it is blended

with the cost of capital for AT&T's other operations. That is why the firm must be considered in isolation when estimating its weighted average cost of capital, even if the firm is a subsidiary of a larger corporation.

THE COST OF DEBT

The starting point for estimating the cost of debt is the one factor that affects the cost of all three types of financing—the interest rate. Interest rates are direct determinants of the cost of debt and indirectly affect the cost of preferred and common stock because equity securities compete with fixed income securities for investors' dollars. An analysis of interest rates, in turn, must begin with a brief review of the market for U.S. Treasury securities. Because Treasury securities are highly liquid and free of default risk, the interest rates on these securities are used to measure the risk-free rate that serves as the benchmark from which the cost of capital is calculated on more complicated and riskier securities.

U.S. Treasury Securities: A Brief Review

As Table 7–1 shows, there are two types of Treasury securities, Treasury bills and Treasury notes and bonds. Treasury bills have a maturity of one year or less, while Treasury notes range in maturity from 2 to 10 years, and Treasury bonds have maturities from 10 to 30 years. Because the U.S. Treasury can pay principal and interest on its securities by printing new money as well as collecting taxes, Treasury securities are considered to be free from default risk.

The data reported in Table 7–1 are based on prices quoted in the secondary market. After their initial auction, Treasury securities are actively traded through a network of government securities dealers. Each of these dealers quotes prices at which the firm is willing to buy or sell outstanding Treasury issues. The dollar volume of trading in Treasury securities far outstrips the volume of trading on the New York Stock Exchange despite the fact that there are a relatively limited number of issues. This makes the market one of the most liquid in the world.

of an increment in expected return frequently referred to as a risk premium. Before introducing the asset pricing models, therefore, it is necessary to explore what is meant by risk aversion and explain how it produces risk premiums.

Risk aversion and risk premiums. Risk aversion is based on a simple idea with a big name—the declining marginal utility of consumption. The declining marginal utility of consumption says, in basic terms, that the wealthier you are, the less you will value another dollar. The implications of this idea for investment behavior and risk taking are best illustrated by an example. Suppose you are offered a bet. A fair coin will be flipped: If it lands heads, you win $250,000; if it lands tails, you lose $250,000. Assuming you are one of the vast majority of people who would refuse to take this bet, ask yourself why. The answer given by economists is that the added happiness, or utility, associated with winning $250,000 is smaller than the sorrow, or disutility, associated with losing $250,000. Put another way, the added utility from consuming an added $250,000 worth of goods is less than the lost utility from having to forgo consumption of $250,000 worth of goods.

Due to the declining marginal utility of consumption, investors will not take risks unless a premium is offered. In the case of the coin flip, for example, what would the minimum payoff for a win have to be before you would take the bet and risk the $250,000 loss? $350,000? $500,000? If the answer is $500,000, then the expected profit from the bet is:

$$\begin{aligned}\text{Expected profit} &= \text{Probability of losing} \cdot \$\text{ lost} \\ &+ \text{Probability of winning} \cdot \$\text{ won} \\ &= \tfrac{1}{2} \cdot -\$250{,}000 + \tfrac{1}{2} \cdot \$500{,}000 \\ &= \$125{,}000\end{aligned}$$

This minimum expected profit represents the premium required to induce you to bear the risk of making the bet. For this reason, it is referred to as a risk premium.

On reflection, there is something a little odd about the previous example. In a coin flip, there are two parties to the bet. If one party is to receive a risk premium, then the other party must pay

the premium. But that makes life pretty dismal for the person paying the premium. Not only does he or she bear the risk of the bet, he or she also has to pay the risk premium. Why would risk averse investors ever pay a premium for bearing risk? The answer is, they never would. As will be shown shortly, premiums are paid only for bearing risks that cannot be avoided. The risk of coin flips can be avoided by "just saying no" and not betting. Thus, rather than paying a premium, risk averse investors will simply refrain from betting. That is why $250,000 bets on coin flips are rarely seen.

It may seem that the popularity of Las Vegas and Atlantic City contradicts the prediction that risk averse investors will "just say no" to gambles that do not offer a risk premium. There is, however, an important distinction between casino gambling and investing. In most cases, people risk only a small fraction of their wealth in the casino. They gamble because it's fun and exciting, not because they expect to make money. In fact, the expected losses can be thought of as the price of having fun. The cost of a Las Vegas show is the price of admission, the cost of the casino is the expected loss. But this analogy applies only to small-stakes gambling. Most people do not liquidate their pension funds and take the money to the casino. When the stakes are large, investors are almost universally risk averse.

Nonetheless, there are apparent exceptions. The Hunt brothers risked billions of dollars in silver gambles that could have been avoided by just saying no. How does the theory of risk aversion explain why some people make such huge bets? The answer is that not everyone agrees on the probabilities that define the risk. What appears risky to one investor may appear safe to another. Consider the coin flip example. At the outset, it was assumed that the coin was fair, so that the probability of it landing heads was ½. But suppose that an investor believes that the coin is unbalanced, so that the probability of it landing heads is ¾. Under such circumstances, the investor will conclude that a bet on heads entails less risk and offers greater expected return than if the probability was ½. Similarly, an investor who believes that the probability of the coin landing tails is ¾ would conclude that the risk of betting on tails is less risky and offers a greater expected return. If there are two such investors, then they are

likely to make a bet on the coin flip. As a further illustration, recall the discussion of football betting. For there to be an active betting market, investors must have different beliefs about the relative abilities of the competing teams and, therefore, different assessments regarding the probability that one team will beat the spread.

Reading through the opinions of the Hunt brothers indicates why they invested so much in silver. They believed that inflation in the United States and upheaval in the Middle East, combined with increasing consumption and decreasing production of silver, would drive the price of the metal sky-high. For them, the risk of a huge investment in silver appeared reasonable in light of the potential rewards. The people who were selling silver, on the other hand, felt that speculative buying by the Hunts had driven prices to the point where they were likely to collapse. To the sellers, shorting silver appeared to be a low-risk, high-reward activity. Thus, both the buyers and the sellers in the silver market believed they were earning a risk premium because they disagreed about the probability distribution for the future price for silver.

High-stakes gambling and a good deal of speculative investing can be explained by the fact that different investors have different opinions. It does not contradict the fundamental premise that investors, as a class, are risk averse and will require a premium to bear risk that cannot be avoided.

If only risks that cannot be avoided are associated with risk premiums, then it is critical to determine what risks can be avoided. The risks associated with gambling are easy to avoid by choosing not to gamble. Unfortunately, this avoidance procedure only works for a narrow class of risks. The risks associated with owning a home, investing in a business, or holding a retirement portfolio cannot be avoided so easily. There is a way, however, to reduce, if not eliminate, the risks associated with most investments. The solution is diversification. The way it works can be illustrated by another example.

Imagine that you are the owner of a house worth $250,000. Suppose the chance is 1/1,000 that the house will be destroyed by a fire, flood, or storm next year. This means that the expected loss is given by:

$$\begin{aligned}\text{Expected loss} &= \text{Probability of Loss} \cdot \$ \text{ lost} \\ &= 1/1{,}000 \cdot \$250{,}000 \\ &= \$250\end{aligned}$$

If you are risk averse, you will be willing to pay more than $250 to purchase an insurance policy, because the utility that results from paying $250 for insurance and having a house with certainty exceeds the utility associated with saving the $250 insurance payment but facing 1/1,000 chance of losing the house.

Suppose that a risk averse homeowner would be willing to pay as much as $1,000 for insurance. A $1,000 payment would include $250 to cover the expected loss and a $750 risk premium to induce the counterparty to bear the risk. Though the homeowner may be willing to pay, is it necessary to offer a $750 risk premium to induce an insurance company to accept the risk? In a competitive insurance market, the answer is no. Because insurance companies can eliminate the risk by diversifying, the cost of insurance will be bid down to $250. (More precisely, the cost of insurance would be bid down to $250 plus the incremental transaction costs of writing another insurance policy.) Insurance companies diversify the risk of the house being destroyed by pooling it with thousands of other houses. If the pool is large enough, and if there is no connection between a disaster befalling one house in the pool and a disaster befalling any other, the insurance company can be highly confident that almost exactly 1/1,000 of the total value of the pool will be destroyed. Assuming that there is no collusion in the insurance industry, competition between insurance companies will drive prices down to the point where the premiums they receive from homeowners will cover only expected losses and the cost of operations, including a normal profit. For you as homeowner, this translates into an insurance payment of just over $250 per year.

The bottom line is that homeowners do not have to pay the insurance companies a risk premium for bearing the risk of loss because insurance companies can eliminate the risk by diversifying. This idea—that diversification can reduce or eliminate risk—is one of the foundations of modern finance. In 1990, Harry Markovitz and William Sharpe shared the Nobel prize for showing how risk, expected return, and diversification interact in the

market for common stock. (Merton Miller also shared the prize, but he was cited for different contributions.) Their work developed into what is today called the *capital asset pricing model,* or *CAPM.* The CAPM states how risk and return will be traded off in a competitive capital market.

THE CAPITAL ASSET PRICING MODEL

What makes asset pricing models such the CAPM difficult to derive is that some risk, but not all risk, can be avoided by diversification. Consider, for instance, an investment in Apple Computer. The risks associated with this investment can be seen as arising from two sources. First, there are risks that are unique to Apple. Will Apple design competitive products? Will Apple's operating system be accepted by computer users? Second, there are risks that affect all common stocks. Will the economy enter a recession? Will war break out in the Middle East?

The risks that are unique to Apple can be eliminated by diversification. Investors who invest only in Apple will suffer significant losses if Apple's new products are a failure, but investors who hold Apple along with hundreds of other securities will hardly notice the impact on the value of their portfolios if Apple's new products fail. Conversely, marketwide risks cannot be eliminated by diversification. If the economy enters a recession and stock prices fall across the board, investors holding hundreds of securities fare no better than investors who put all their money in Apple Computer. For this reason, the unique risk associated with Apple is called *diversifiable risk,* because it can be eliminated by diversification, whereas marketwide risk, which is not affected by diversification, is called *nondiversifiable risk.*

To draw an analogy with homeowner's insurance, diversifiable risks are those like the risk of fire, for which the chance of one house burning is largely unrelated to the chance of other houses burning (except for other houses in the immediate neighborhood). Marketwide risks are like the risk of earthquakes. If an earthquake hits, all the homes in the region will be damaged. This risk cannot be reduced by diversification except by writing policies outside the region.

Unlike the basic balance sheet approach, the adjusted balance sheet approach is difficult to apply to conglomerates on a firm-wide basis. Recall that balance sheet adjustments are designed to reflect factors such as inflation and obsolescence that drive a wedge between the market values of assets and their historical book values. The impact of such factors clearly depends on the nature of the assets and the business in which they are employed. For example, inflation adjustment is critical in the railroad business because railroad equipment is long-lived, while adjustment for obsolescence plays a key role in the computer business because of the rapid pace of technological change. If a multibusiness company owns both a computer firm and a railroad, it would be a mistake to apply one adjustment to all assets. The assets of the computer firm and the railroad should be segregated and adjusted separately.

The preceding example is not unique. In general, the only way to deal with the problems caused by different asset lives and different rates of obsolescence is to value a conglomerate firm on a business line by business line basis. This requires developing adjusted balance sheets for each subsidiary business unit.

Before attempting to construct individual balance sheets for each business unit, the appraiser should decide whether an adjusted balance sheet approach is likely to produce a valid value indicator. In Chapter 2, it was pointed out that with the possible exception of rate base–regulated companies, this is rarely the case. In most circumstances, therefore, the benefit to be derived from constructing adjusted balance sheets for each subsidiary is unlikely to justify the time and expense.

The Stock and Debt Approach

By definition, the stock and debt approach is applicable only to the parent company that issues securities. (If a subsidiary independently issues securities that are held by public investors as well as the parent, then the stock and debt approach can be applied to a subsidiary.) Therefore, it is applicable directly only when the appraiser is attempting to estimate the total value of a conglomerate firm. In such situations, the best value indicator is simply the sum of the market values of the company's outstanding securities, as explained in Chapter 3.

In situations where the appraiser is seeking to estimate the value of subsidiary business units, the stock and debt approach can still be employed as a consistency check. The sum of the appraised values of the subsidiaries, plus any value attributed to the headquarters, should equal the stock and debt value of the firm.

The Direct Comparison Approach

As explained in Chapter 4, the success of the direct comparison approach depends on comparability. This means that if a multibusiness firm is to be valued in the aggregate, the comparable firms must also be multibusiness firms with similar business profiles. Assuming such comparable firms can be found, the direct comparison approach can be applied without alteration. Unfortunately, conglomerate firms typically are composed of relatively unique mixes of businesses. This leaves the appraiser with the difficult task of deciding whether two conglomerates are similar enough to apply the direct comparison approach on a firmwide basis. If a clear decision cannot be made, the firm should be appraised on a business line by business line basis because comparability is much easier to assess at that level.

The great advantage of the direct comparison approach for appraising subsidiary business lines is that it reduces the valuation problem to the calculation and application of ratios. The problem is finding publicly traded firms that both can be valued using the stock and debt approach, and are exclusively in the same line of business as the subsidiary being appraised. In many cases, finding pure comparables is surprisingly difficult. For instance, Union Pacific Corporation's subsidiary, Union Pacific Railroad, is valued annually by tax appraisers in the states in which the railroad operates. If "pure" publicly traded railroads that were comparable to Union Pacific Railroad could be found, it would be easy to value the UPRR using a direct comparison. The problem is that essentially all the major railroads in the country are owned by conglomerates. Furthermore, the conglomerates that own the comparable railroads do not own the same mix of businesses as Union Pacific Corporation.

Assuming that publicly traded comparables can be found, the ratios calculated for those companies still should not be applied

to the subsidiary business until the financial variables have been adjusted to take account of interfirm allocations. Once again, the problem is making sure that the allocations reflect arm's length prices. For example, if IBM were subsidizing its personal computer division by making memory chips available at below market cost, it would be misleading to apply market value to EBIDT ratios calculated for comparable personal computer makers to the EBIDT of IBM's personal computer division without taking into account the subsidy.

Once interfirm adjustments have been made, the direct comparison approach proceeds precisely as described in Chapter 4. As long as comparables for the subsidiary are available, the approach is applied exactly as if the subsidiary were an independent company.

The Discounted Cash Flow Approach

The DCF approach is sufficiently flexible that it can be applied to a conglomerate firm or to any of its subsidiaries. If the approach is applied to the aggregate firm, then cash flow must be forecast on a firmwide basis. The discount rate in that case is the average cost of funds for the firm as a whole. If the approach is applied to a subsidiary, then cash flow must be forecast for that subsidiary and discounted at that subsidiary's cost of capital.

To reflect the subsidiary's value as an independent business, the costs and benefits provided by headquarters and by other subsidiaries are netted out when forecasting cash flow. Once again, the allocations should be based on arm's length prices.

When applying the DCF approach to subsidiaries, the appraiser needs to bear in mind that each subsidiary business will have its own capital structure and cost of capital. As noted in Chapter 5, a common mistake is assuming that the cost of capital for a subsidiary equals the cost of capital for the parent firm. The best way to avoid this mistake is to think of a conglomerate as a portfolio of companies. Seen in this light, it becomes clear that the cost of capital for a conglomerate is the value weighted average of the costs of capital for each of the subsidiary businesses. Unfortunately, this implies that cost of capital for each of the sub-

sidiary companies must be estimated as if the subsidiary were an independent company.

Unlike independent companies, the cost of capital for a subsidiary can rarely be estimated directly because most subsidiaries do not have publicly traded securities outstanding. They are, therefore, equivalent to privately held firms. As suggested in Chapter 7, the best way to estimate the cost of capital for privately held firms such as Forms Engineering is to find publicly traded firms that operate exclusively, or least primarily, in the same line of business. The cost of capital for these comparables can then be estimated using the standard techniques. As for FEC, the average cost of capital of the comparables, adjusted for leverage, is a reasonable estimate of the cost of capital of the subsidiary.

If comparable publicly traded firms cannot be found, then a less direct approach must be employed to estimate the cost of capital. For debt securities, this involves estimating the effective rating, as described in Chapter 7. For equity, a number of indirect procedures can be employed. If the subsidiary pays a dividend to the parent, the dividend discount model can be applied. Another possibility is estimating the effective beta for the subsidiary and applying the CAPM. By examining data on the betas of companies in similar industries as the target subsidiary, the appraiser can make an informed judgment regarding the subsidiary's beta. That judgment can be enhanced by discussing with management the risks of the business and the relation of those risks to economic activity. Before applying the CAPM to calculate the cost of equity, the beta of the subsidiary must be adjusted to reflect the subsidiary's use of leverage, as described in Chapter 7 for FEC.

When estimating beta for a subsidiary, the beta of the parent company may or may not provide useful information. The beta of a conglomerate equals the value weighted average of the betas of its subsidiaries. Therefore, if all the subsidiary businesses have similar betas, the parent firm's beta is a good proxy for all of them. However, if the betas of the subsidiaries vary markedly, the beta of the parent is unlikely to provide useful information about the beta of any individual subsidiary.

Like the financing costs, the capital structure weights used to calculate the WACC should be estimated as if the subsidiary were an independent company. The problem is that these capital

structure weights may be a good deal different than the capital structure weights of the parent firm or the capital structure weights that headquarters imposes on the subsidiary. For example, a subsidiary may be financed 100 percent by loans from the parent, but this does not mean that the appropriate capital structure is 100 percent debt. Few independent companies in any industry are financed 100 percent with debt.

The solution, once more, is to find publicly traded companies that are comparable to the subsidiary and use their capital structures weights as an estimate of the capital structure weights of the subsidiary. If comparable firms are not available, then wider industry data, combined with appraiser judgment and management input, must be relied on, as with the estimate of beta.

Dealing with Multinational Firms

Valuing foreign subsidiaries raises two additional appraisal problems. The most obvious problem is that the financial flows of a foreign subsidiary are measured in terms of a foreign currency. Somehow, the value produced by those flows must be translated into U.S. dollars. The allocation problem is also exacerbated when a firm operates internationally. International companies have a host of political and tax incentives for moving costs and benefits from one locale to another.

If the subsidiary is located in a country with a developed capital market, the foreign exchange problem can be handled in a straightforward manner. The value of the subsidiary is estimated in terms of the local currency, using local currency accounting information, local currency cash flows, and a local currency discount rate. The estimated value is then translated into U.S. dollars at the spot exchange rate in existence on the lien date. (The spot exchange rate is the price of foreign exchange for immediate delivery. The price of foreign exchange for deferred delivery is referred to as the forward rate.) For instance, Apple Computer has a German subsidiary. If, on the basis of available German data, an appraiser estimates that the German subsidiary is worth 500 million deutsche marks on December 31, 1991, that value is translated at the spot exchange rate of $.64 per deutsche mark, which prevailed on December 31. The resulting value in terms of U.S. dollars is 320 million.