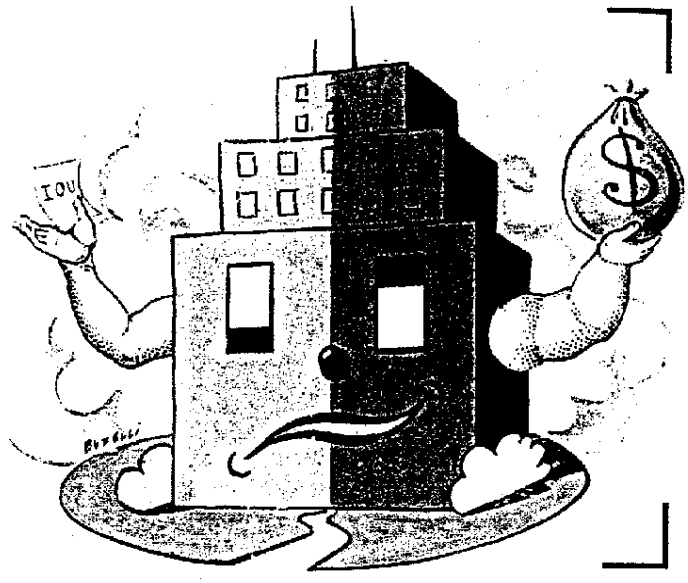
How Much Cash Does Your Company Need?



by Richard Passov

More than you think – a lot more – if yours is a knowledge-based corporation. That's because you need to provide for intangible liabilities – the investments a company has to make to realize the benefits of its knowledge.

AFTER ITS MERGER with rival Warner-Lambert in 2000, New York–based pharmaceutical giant Pfizer found itself sitting on a net cash position approaching $6 billion. That seemed extraordinarily conservative for a company whose products generated close to $30 billion in revenues. Those products included some of the world's best-selling drugs. The anticholesterol blockbuster Lipitor alone generated worldwide revenues in excess of $7 billion in 2001.

Most large companies with revenues that healthy would increase their leverage, or the amount of debt they carry, thereby unlocking tremendous value for their shareholders, both from tax benefits and from the market's well-documented perception that managers with less money to spend will spend it more wisely. Consider Bank of America. Its capital structure, like that of most banks, relies heavily on debt. The value of the tax shields alone accounts for approximately one-third of the company's $120 billion market capitalization. But is this kind of strategy appropriate for a knowledge-based company like Pfizer? To answer that question, Tim Opler of Credit Suisse First Boston and I undertook an in-depth study of

the knowledge-based businesses that were most closely comparable to Pfizer. There, we saw a rather different picture: The world's largest and most successful technology and life sciences companies were consistently holding significant net cash positions.

Like Pfizer, these companies had market valuations that were much greater than the value attributable to their ongoing businesses, a premium that reflects these companies' ability to create new products through R&D. And like Pfizer's, these companies' assets were very risky – a fact often obscured by the companies' balance sheet structure. Pfizer shares, for example, had approximately the same price volatility (30%) as those of Bank of America in 2001. But Pfizer had a negative leverage ratio of 0.3:1 where Bank of America had a ratio approaching 10:1. If the equity volatilities are adjusted to eliminate the effect of the two companies' balance sheet structures – treating both companies as if they were wholly equity financed and had no cash – we see that Pfizer has an underlying asset volatility of close to 30% while Bank of America has a volatility closer to 5%. Because of this higher underlying volatility, Pfizer and the other knowledge companies we looked at were in a group apart from other large corporations.

We believe that these companies' decisions to run large cash balances is one of the key factors in sustaining the value of their intangible assets – which typically comprise a substantial portion of overall valuations for knowledge companies. Only by consistently investing in their intangible assets can knowledge companies hope to preserve the value of those assets. A company that finds itself unable to meet such commitments because unfavorable market conditions reduce its operating cash flows will find its share price suffering almost as much as if it were to default on its debts. By the same token, with the right balance sheet, knowledge companies can profitably insure against the risk of failing to sustain value-added investments in difficult times. An optimal capital structure that calls for significant cash balances is at odds with the results of a traditional capital structure analysis but explains the financial policies of many well-run knowledge companies.

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Funding the Intangible

To see why knowledge companies aren't suited to traditional capital structures, consider again Pfizer. In mid-2001, the company's market valuation was in excess of $200 billion. Of that amount, Wall Street analysts estimated that more than 30% was derived from the company's R&D pipeline and its worldwide branding and marketing capabilities. A large portion of the drug pipeline was in advanced stages of development, but significant investment and risks were still associated with realizing the potential value. Furthermore, a great deal of value was attributed to early-stage development projects. Indeed, looking forward, Pfizer's anticipated revenue stream relied more and more on products yet to be developed and less on those already being marketed.

Pfizer's intangible assets are the product of heavy ongoing investment. The company's R&D alone consumes about $7 billion a year. What's more, the productivity of the company's research scientists depends on maintaining a vast, interconnected IT infrastructure. Such investments are not treated as liabilities in a traditional capital structure analysis. To see why that's a problem, consider what would happen if Pfizer found itself in a situation where internally generated funds could no longer sustain R&D. Finance theory maintains that the market will always be willing to provide funds for a good investment opportunity. Based on that reasoning, companies with promising pipelines should always be able to find funding for R&D. History has shown, however, that in times of need, external financing can be exorbitantly expensive or simply unavailable for knowledge companies.

Intel experienced just such a funding crisis in the early 1980s. At that time, the company's 80286 microprocessor chip had just emerged as the key hardware component for IBM's burgeoning personal computer business. Unfortunately, Intel was at the same time involved in producing DRAM memory chips, which were becoming commoditized due to competition from Japanese manufacturers. Intel's cash position dwindled and its debt rose to the point where the company was unable to make the capital expenditures necessary to complete the development of its microprocessors. Intel was forced to raise new equity capital from its primary business partner, IBM, which purchased 12% of the company for $250 million. The capital infusion allowed Intel to continue its R&D program and build manufacturing plants for new microprocessors while simultaneously sustaining a costly transition away from the DRAM market.

Arguably, Intel's inability to meet its R&D commitment cost its shareholders as much as a debt default would have. Like a debt crisis, the funding crisis had forced the company into financial distress. Had Intel not shrewdly repurchased the stake in the late 1980s, by 2001, IBM would have earned a 100-fold increase on its initial investment.

Of course, Intel and Pfizer are not the only companies that have large capital commitments. Oil companies, for example, spend huge amounts of money on exploration and development. Yet they often use more leverage and seem less vulnerable to the whims of the capital markets. The difference in financial strategies seems to lie in two important distinctions between tangible and intangible assets. These factors also explain the relatively high asset volatility of Intel, Pfizer, and other successful knowledge-based companies.

Intangible assets are company dependent. The value of tangible assets – even those that require considerable investments to exploit – is usually widely recognized by outside investors. An oil reserve, for example, has a generally agreed-upon value, regardless of the company that owns it. Energy giant ChevronTexaco has to spend billions to exploit its reserves. But because the value of those reserves can be estimated

and easily communicated, the company usually can find the money to fund development regardless of the state of its finances. By contrast, the value of a company's intangible assets is typically understood only by the company itself or its close partners. If the company fails to invest in maintaining the value of its intangible assets, no one else is likely to volunteer. In other words, the value of intangible assets is highly dependent on a company's own ability to fund those assets, while the value of tangible assets is independent of the company. In Intel's case, nobody had any idea in 1983 what a huge market microprocessors would become, which explains why the company could obtain funding only on expensive terms from IBM. This experience cast into sharp relief the value of holding cash reserves, and Intel went on to build a strong balance sheet to provide insurance against potential future funding needs.

Intangible liabilities cannot be hedged. The second reason intangible assets are different from tangible ones is that the risk that a company will be unable to meet commitments on intangible assets cannot be easily hedged. The value of an oil company's exploration and development budget is subject to the variable market pricing of oil; a sharp fall in oil prices reduces the value of those projects. However, the risk of a fall in oil prices can be hedged in the financial markets, which allows the company to preserve the value of its exploration and development projects even when business conditions deteriorate. Even if it decides not to protect its exploration and development projects in this way, the company enjoys a natural hedge because the price of oil is highly correlated with cash flows. When the firm's cash flows are low, so is the expected value of exploration and development. That means the company is most likely to be short on funds when it least needs to spend the money on the asset. By contrast, a knowledge company's primary risk – whether or not the various molecular compounds in its pipeline will react as hoped, for example – is impossible to hedge in the financial markets. That risk is also unlikely to be correlated with the company's cash flows. A particular molecule may react as planned, but the company may run out of funds before discovering that. Unlike an oil company, therefore, a pharmaceutical company may face a funding crisis just when the value of continuing its research is highest. The only way to manage that risk is to ensure that the company always has on hand enough liquid assets – essentially, cash – to meet its R&D liabilities.

If the defining characteristic of a liability is that the company's inability to meet it triggers financial distress, then it is only logical that R&D expenditures of Intel, Pfizer, and their peer companies should be considered liabilities – just as inescapable a commitment as if they were a debt obligation. Companies do not currently treat R&D and comparable investments in intangible assets as balance sheet items. But from an economic perspective, they probably should. After all, if the market is placing a value on the promise of future success in drug discovery, for example, it is also expecting that the resources necessary to discover these drugs will be available to spend as needed.

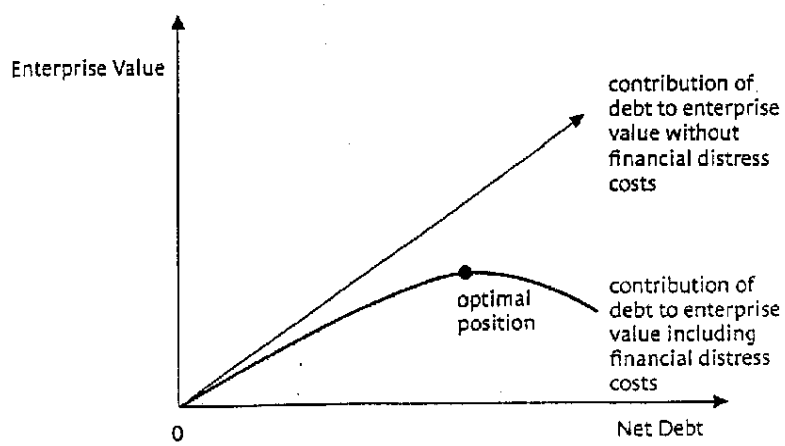
Reoptimizing the Balance Sheet

Once a company's intangible assets – and the unhedgeable liability associated with them – are recognized as being capable of causing financial distress, a key input variable into the calculation of optimal capital structure changes. Traditionally, companies determine the optimal capital structure by calculating the point at which the expected costs of financial distress from the likelihood of defaulting on debt begin to outweigh the tax benefits of debt – unlike dividends, debt interest payments are tax deductible. (See the exhibit "Determining the Optimal Capital Structure.")

Let's look at the numbers in more detail. The tax benefit, or tax shield as it is usually called, is determined by the

Determining the Optimal Capital Structure

This chart shows how the benefits of debt evolve as leverage increases for a company with a 35% corporate tax rate. At first, enterprise value rises in a straight line with debt – each dollar of debt yielding 35 cents of extra value for the company. But as the costs of financial distress kick in, the line starts to curve, flatten, and eventually fall, reflecting the increasing severity of expected distress costs. The top of the curve marks the optimal net debt-to-cash position for that company.



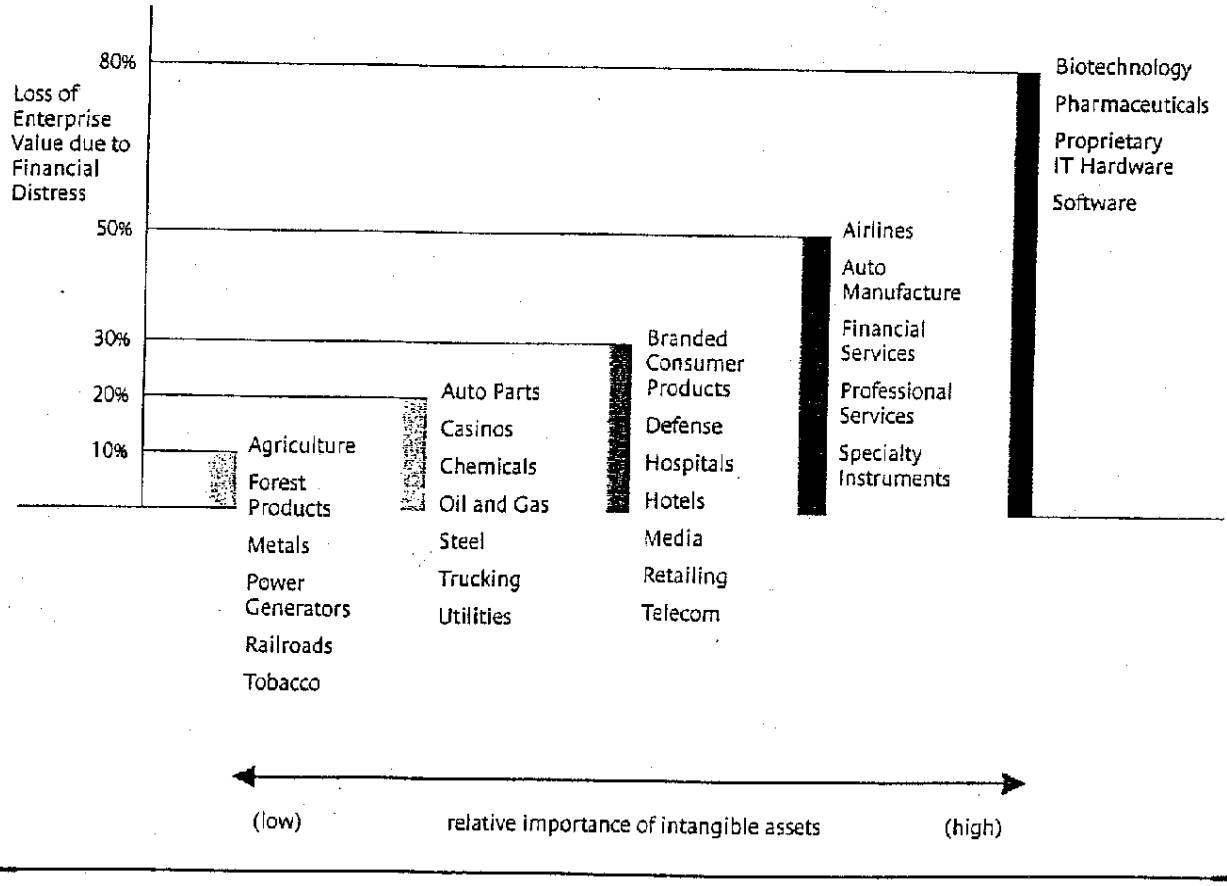
corporate tax rate: Simply multiply the amount of debt by the marginal corporate tax rate. Arriving at the cost of defaulting on debt is a bit more complicated: The *probability* that the company will not be able to meet its debt obligations is multiplied by the likely *impact* of that default, should it happen, on the company's value. One practical way to estimate the probability of default is to look at the historical volatility of a company's cash flows. From that, you can determine through statistical analysis how frequently a company's cash flows are likely to be less than the level of interest payable for a given level of debt. Obviously, the greater the size of the interest bill, the higher that probability. If a company's historical cash flows are not available, analysts can use industry data or empirical studies that provide default rates. Debts rated Aaa by Moody's, for instance, have historically had a 0.1% chance of defaulting within five years, a Baa rating a 1.8% chance, and a B rating a 32% chance. A more ambitious analyst could also use default rates implied by an analysis of spreads on corporate bonds or credit derivatives.

The impact of default can be estimated by looking at the empirical data. Research shows that a typical company will lose roughly 20% of its enterprise value (market value of the company's shares plus the value of its debt less cash) in times of financial distress. Multiplying this number by the probability of default determined above produces the expected cost of default, or the amount a company would want to insure itself for, if it could. So for an average company with a default probability of 5% over a five-year horizon, the expected cost of default, over that same time period, would be 1% of the firm's enterprise value.

The underlying assumption in using this method of calculating optimal capital structure is that a company's debt level is the principal determinant of whether or not a company will suffer financial distress. But as we've argued, a company can lose just as much value, if not more, if it cannot fund the intan-

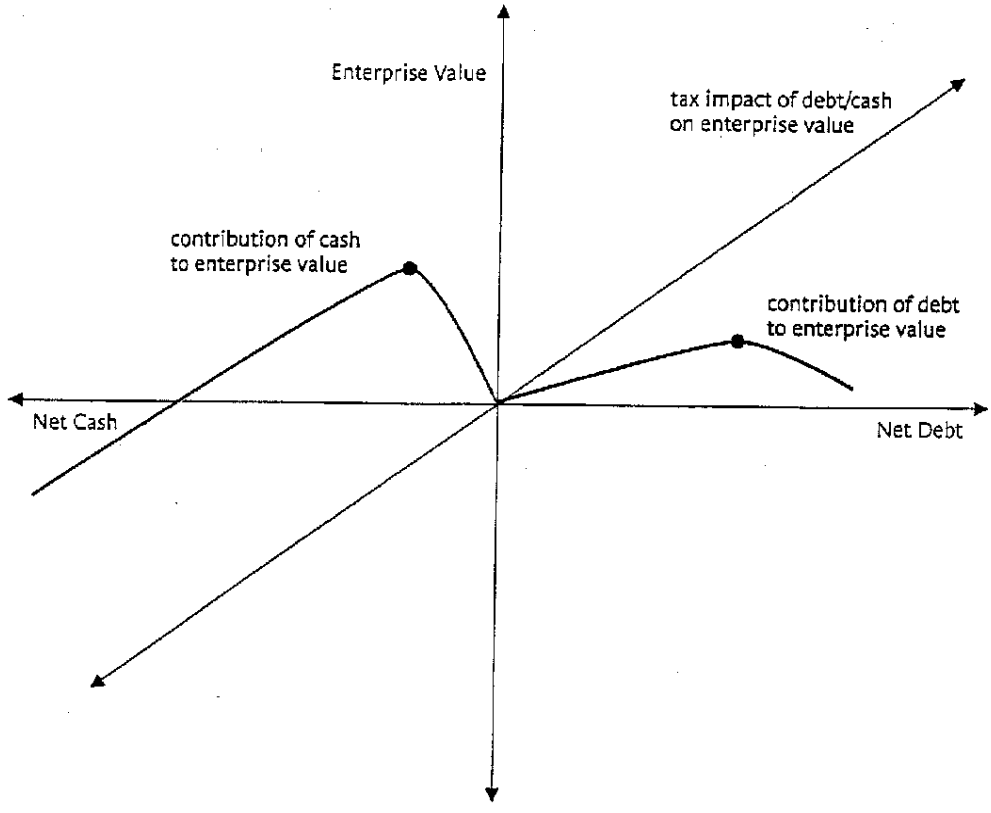
The Impact of Distress Costs by Industry

Our research shows that companies with a preponderance of intangible assets are most vulnerable to financial distress. Knowledge-intensive industries such as high technology and life sciences lose up to 80% of enterprise value in times of financial distress, while tangible-asset companies, like those in petroleum and railroads, lose as little as 10%, on average.



Pfizer's Optimal Capital Structure

Incorporating intangible liabilities into the determination of capital structure dramatically changes how a company's debt-to-cash position contributes to enterprise value. The graph below compares the contribution of cash and the contribution of debt to Pfizer's enterprise value. The straight line represents the impact in terms of tax benefits of holding cash or debt, assuming no financial distress costs. The blue curve–resulting from the traditional method of calculating optimal capital structure–tracks the net contribution to Pfizer of holding debt (tax benefits less distress costs due to debt). The green curve tracks the net contribution to Pfizer's enterprise value of holding cash (insurance value less tax disadvantage from holding cash). As the graph shows, the contribution of the insurance value of cash is greater than the contribution from the tax shields of debt, which means that Pfizer should choose the optimal position on the net cash curve. For a company with heavy tangible assets, by contrast, the contribution to enterprise value of debt would dominate the insurance value of cash, in which case the optimal capital structure would be driven by the debt curve.



gible liabilities associated with its intangible assets. In other words, financial distress costs can kick in even while a company has a net-cash position. On that basis, the calculation needs to be adjusted. First, the probability of default must be adjusted to encompass the probability of distress: It should be determined not by the probability of interest costs exceeding cash flow but by the probability of interest costs plus R&D expenses (or other capital expenditures) exceeding cash flow. Similarly, the impact of default must be adjusted to reflect the fact that the value of intangible assets tends to be much more volatile than that of tangible ones and their higher volatility exposes the company to greater financial risk.

Recalculating Distress Probability. The adjustment for this is quite simple, since all you are doing is raising the cash flow bar. In effect, you're increasing interest costs by the size of your R&D budget, or at least that portion of it for which it would be difficult to obtain external financing on reasonable terms. Applying historical cash flow volatility to this new number gives you the probability of distress due to default on intangible liabilities.

Companies may wish to make even more precise estimates. At Pfizer, for

instance, an analysis of our historical cash flows allows us to quantify the impact of losing patent protection on currently marketed products. Another key risk we consider is the possibility that a drug might be withdrawn from the market due to safety concerns. To account for that, we use industry data to model the likelihood of an approved drug being pulled from the market.

Recalculating Distress Impact. Intangible assets tend to be more volatile than tangible ones, so one would expect companies with substantial intangible assets to suffer more in financial distress than companies whose assets were largely tangible. Our own empirical research confirms this. We found that the extent of value loss during a period of financial difficulty is positively correlated to a company's underlying business risk – that is, its asset volatility. (See the exhibit "The Impact of Distress Costs by Industry.") When calculating the impact of distress costs, companies must take this higher volatility into account.

Running the numbers for Pfizer, we found that the company's optimal capital structure – the structure that maximized the company's value – called for holding a positive net financial balance, as shown in the exhibit "Pfizer's Optimal Capital Structure." That stands in sharp contrast with the optimal capital structure predicted by a conventional approach – a net debt position entirely inadequate to maintain the value of Pfizer's intangible assets.

Beyond Pfizer

Our model does not apply only to knowledge-based firms; it can be used to calculate the optimal capital structure of all types of firms. Consider again ChevronTexaco, which has $99 billion in annual revenues, nearly $10 billion in cash flow from operations, and annual capital expenditures approaching $8 billion in 2002. While the company has comparable capital outlays to those of Pfizer, it does not rely nearly as heavily on intangible assets.

The bulk of ChevronTexaco's capital commitments consists of exploration and development expenditures. As we have pointed out, development costs can be easily hedged. Exploration, however, counts as a true liability. To calculate the probability of distress at various levels of leverage, therefore, we looked at the volatility of ChevronTexaco's cash flows and applied that to the combined average historical interest and exploration costs. To estimate the impact of financial distress, we looked at our empirical data, which showed that oil companies typically lose about 20% of their enterprise value in times of distress. Our analysis indicated an optimal net debt level of approximately $10 billion for the company. This compares with ChevronTexaco's actual net debt position of $12 billion as of year-end 2002.

A conventional model based on the weighted average cost of capital approach would suggest that ChevronTexaco should have debt in excess of $20 billion. Clearly, our model does a better job of explaining this well-run company's financial policy.

Does our model always find that traditional firms can operate with leverage while knowledge-based firms shouldn't? Not necessarily. Consider the case of Oracle, the enterprise software giant that had nearly $9.7 billion in revenues in 2002. Approximately 60% of Oracle's revenues come from licenses associated with its software, while nearly 40% come from product support and consulting services. To counter fierce competition

Managing the Cash Position

The way in which companies create and manage their optimal cash (or debt) positions can make a difference to shareholder value. If a company issues short-term debt and holds the proceeds on the balance in matching short-term investments, for instance, it will create no value in terms of managing its business risks. On the other hand, a company that borrows longer term and invests at a shorter term creates a pool of liquidity that can be accessed to cover cash flow shortfalls until the debt matures. By reducing the risk of default in this way, companies increase their overall value. This is one reason why automotive and finance companies often borrow with maturities that are longer than the assets they hold.

In deciding how to manage a company's net cash, the first rule is to make sure that the asset you invest in is not subject to the same risks as those you are insuring against with that cash. A technology company that holds cash to ensure the completion of a multiyear development project even when its core business is failing should not invest those funds in other related technology companies. That doesn't mean, however, that you should avoid investing your cash in risky assets altogether. On the contrary, by avoiding risky assets, your company may well miss out on valuable opportunities.

Imagine that your company has determined that it is too highly leveraged and starts reducing its debt by adding to its cash position. Each extra dollar of cash confers a marginal benefit in that it lowers the company's expected distress costs. But that marginal benefit will gradually fall until the company achieves its optimal cash position, after which the marginal benefit of holding an extra dollar of cash turns negative, because the benefit of a dollar of debt starts to outweigh the benefit of a dollar of cash. The first dollar of cash, therefore, makes more difference to the company's overall value than the last dollar of cash. Given that difference, we believe that it makes sense for a company to allocate its cash position to reflect the different values of each dollar held as cash. Because the first dollar is worth the most, it should be invested in the safest possible asset. By the same token, it may make sense to put the last dollar of cash in a riskier security.

from giants like Microsoft and IBM, as well as newer competitors like SAP, Siebel, and PeopleSoft, Oracle invests considerable sums in R&D, marketing, and training. More than 10% of annual revenues are committed to the research and development of new products. In 2001 and 2002, the company spent over $1.4 billion each year on capital expenditures and R&D. To determine the probability of default for various net cash-to-debt scenarios, we used historical cash flow volatility, analysts' projections for the company's future debt, and R&D expenditures. To estimate the impact of default, we looked at the cost for companies with asset volatility comparable to Oracle's.

Our analysis suggested an optimal net cash position of approximately $1 billion, which contrasts with Oracle's actual net cash position of around $6 billion. This finding raises some strategic questions. If current predictions about the slowing growth potential in the software industry come to pass, then there may come a time when even Oracle shareholders would fare better with a nice, steady dividend and leverage in the company's capital structure. (It is interesting to note that Oracle's move to acquire PeopleSoft, were it funded by debt, would bring its net cash position much closer to the optimal level predicted by our model.)

The value of intangible assets is highly dependent on a company's own ability to fund those assets, while the value of tangible assets is independent of the company.

Business strategy and financial strategy are inextricably linked. Therefore, companies must develop capital policies in light of their business risks. Indeed, balance sheet management is best viewed as a form of risk management to be coordinated with the other ways in which companies manage business and financial risks. Johnson & Johnson's consumer products business, for example, has had strong and stable operating cash flows, which tend to buffer the potential liquidity requirements of the company's riskier pharmaceutical business. As a result, Johnson & Johnson can afford to have a smaller financial asset position than would a pure-play pharmaceutical company. (For more on the risk implications of balance sheet structure, see the sidebar "Managing the Cash Position.")

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Intangible assets are the "dark matter" of the business universe. Since we can only observe them by their effects, it's difficult to understand and catalog them, which is precisely why the accounting balance sheet differs from the economic one. Accountants like to deal in concrete fact, while economists are happy enough with theory. But even accountants cannot deny that the effects of intangible assets are far-reaching. The ability of intangible assets to influence the likelihood and degree of financial distress through the liabilities they create is not the least important of those effects. By suggesting ways to measure the effects, we hope to have made a small contribution toward incorporating intangible assets into capital structure analysis.

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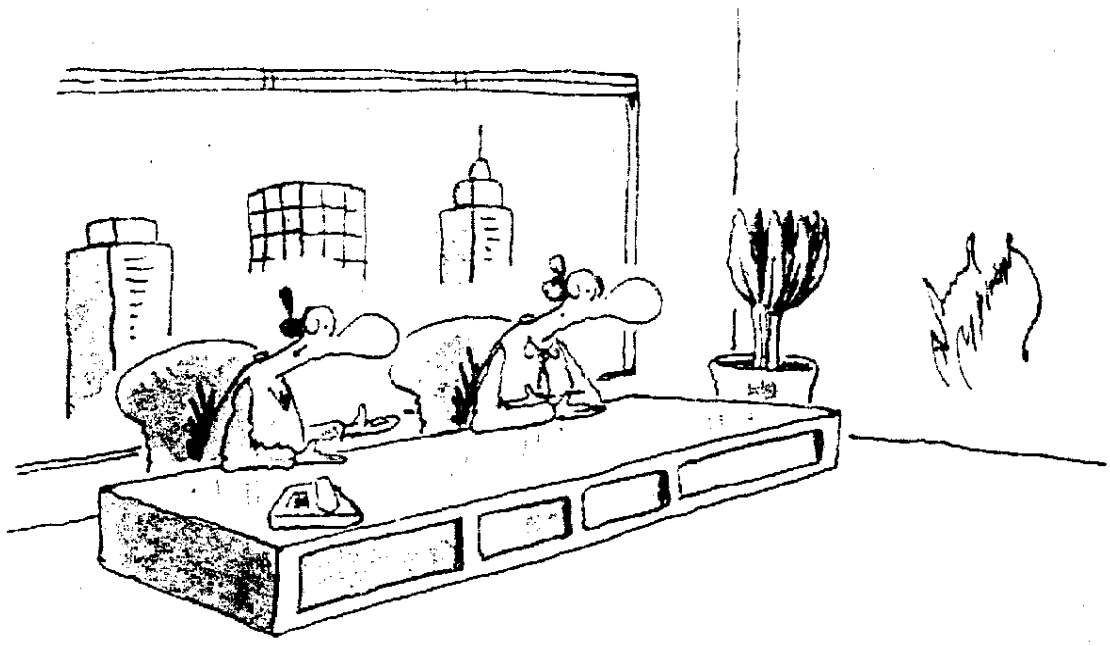

"You've been a great mentor, Mr. Franks, but I can take it from here."