Valuation used to be the province of finance specialists. That's no longer true.

WHAT'S IT WORTH?

A GENERAL MANAGER'S

by Timothy A. Luehrman

Behind every major resource-allocation decision a company makes lies some calculation of what that move is worth. Whether the decision is to launch a new product, enter a strategic partnership, invest in R&D, or build a new facility, how a company estimates value is a critical determinant of how it allocates resources. And the allocation of resources, in turn, is a key driver of a company's overall performance.

Today valuation is the financial analytical skill that general managers want to learn and master more than any other. Rather than rely exclusively on finance specialists, managers want to know how to do it themselves. Why? One reason is that executives who are not finance specialists have to live with the fallout of their companies' formal capital-budgeting systems. Many executives are eager to see those systems improved, even if it means learning more finance. Another reason is that understanding valuation has become a prerequisite for meaningful participation in a company's resource-allocation decisions.

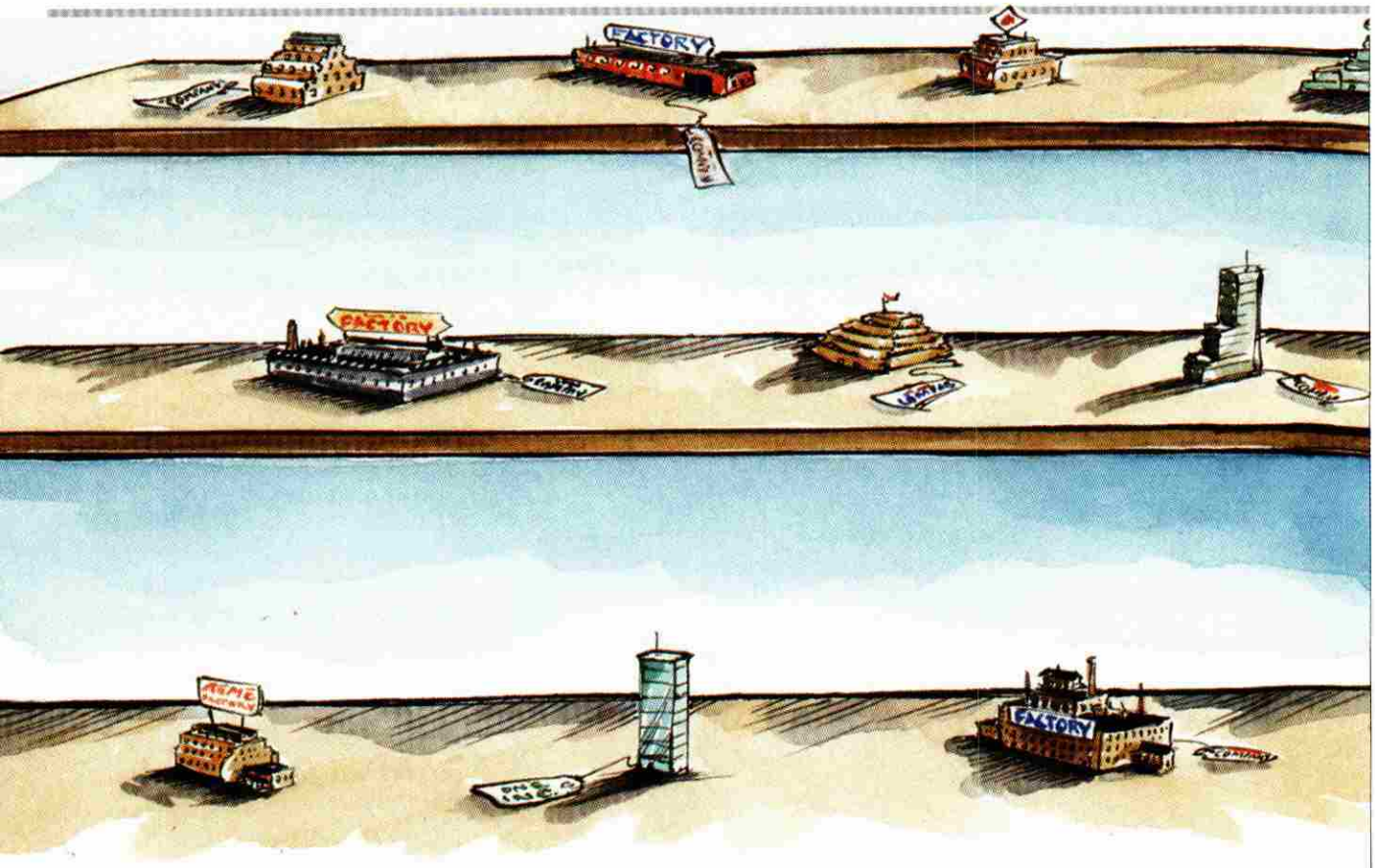
Most companies use a mix of approaches to estimate value. Some methodologies are formal, comprising a theory and a model; others are informal, operating by ad hoc rules of thumb. Some are applied explicitly, and others implicitly. They may be personalized by individual executives' styles and tastes or institutionalized in a system with procedures and manuals.

Though executives estimate value in many different ways, the past 25 years has seen a clear trend toward methods that are more formal, explicit, and institutionalized. In the 1970s, discounted-cash-flow analysis (DCF) emerged as best practice for valuing corporate assets. And one particular version of DCF became the standard. According to that method, the value of a business equals its expected future cash flows discounted to present value at the weighted-average cost of capital (WACC).

Today that WACC-based standard is obsolete. This is not to say that it no longer works – indeed,

Timothy A. Luehrman is a visiting associate professor of finance at the Massachusetts Institute of Technology's Sloan School of Management in Cambridge.

DRAWING BY MARK STEELE



GUIDE TO VALUATION

with today's improved computers and data, it probably works better than ever. But it is exactly those advances in computers and software, along with new theoretical insights, that make other methods even better. Since the 1970s, the cost of financial analysis has come down commensurately with the cost of computing – which is to say, breathtakingly. One effect of that drop in cost is that companies do a lot more analysis. Another effect is that it is now possible to use valuation methodologies that are better tailored to the major kinds of decisions that managers face.

What do generalists (not finance specialists) need in an updated valuation tool kit? The resource-allocation process presents not one, but three basic types of valuation problem. Managers need to be able to value *operations*, *opportunities*, and *ownership claims*. The common practice now is to apply the same basic valuation tool to all problems. Although valuation is always a function of three fundamental factors – cash, timing, and risk – each type of problem has structural features that set it apart from the others and present distinct analytical challenges. Fortunately, today's computers make a one-size-fits-all approach unnecessary and, in fact, suboptimal. Three complementary tools – one for each type of valuation problem – will outperform the single tool (WACC-based DCF) that most companies now use as their workhorse valuation methodology.

Valuing Operations: Adjusted Present Value

The most basic valuation problem is valuing operations, or assets-in-place. Often managers need to estimate the value of an ongoing business or of some part of one – a particular product, market, or line of business. Or they might be considering a new equipment purchase, a change in suppliers, or an acquisition. In each case, whether the operation in question is large or small, whether it is a whole business or only a part of one, the corporation either has already invested in the activity or is deciding now whether to do so. The question is, How much are the expected future cash flows worth, once the company has made all the major discretionary investments?

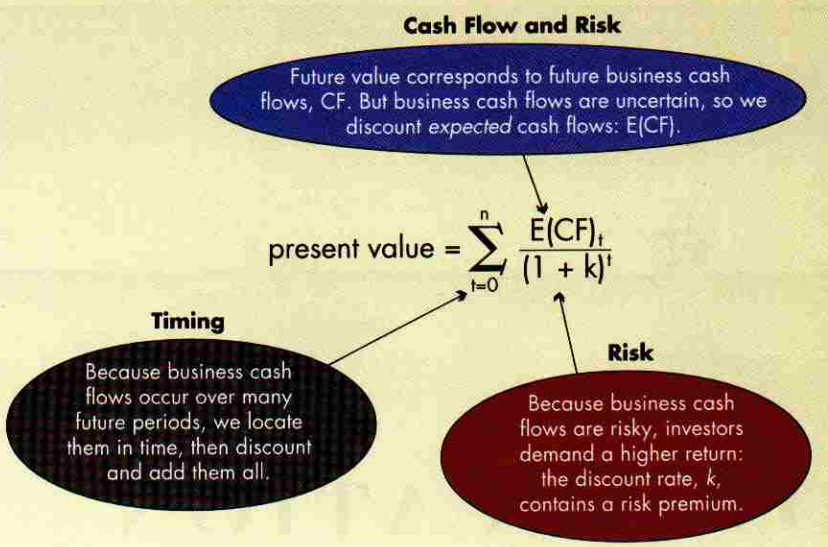
The Basic Logic of Discounted-Cash-Flow Valuation

DCF valuation methodologies are all built on a simple relationship between present value and future value.

The concept is
future value = present value (1 + interest rate)

That concept produces this relationship:
$$\text{present value} = \frac{\text{future value}}{1 + \text{interest rate}}$$

To apply the fundamental DCF relationship to a business, we modify the relationship so that present value equals the sum of the future cash flows adjusted for timing and risk.



That is precisely the problem at which traditional DCF methods are aimed. A discounted-cash-flow analysis regards businesses as a series of risky cash flows stretching into the future. The analyst's task is first, to forecast expected future cash flows, period by period; and second, to discount the forecasts to present value at the *opportunity cost* of funds. The opportunity cost is the return a company (or its owners) could expect to earn on an alternative investment entailing the same risk. Managers can get benchmarks for the appropriate opportunity cost by observing how similar risks are priced by capital markets, because such markets are a part of investors' set of alternative opportunities.

Opportunity cost consists partly of *time value* – the return on a nominally risk-free investment. This is the return you earn for being patient without bearing any risk. Opportunity cost also includes a *risk premium* – the extra return you can expect commensurate with the risk you are willing to bear. The cash-flow forecasts and the opportunity cost are combined in the basic DCF relationship. (See the exhibit "The Basic Logic of Discounted-Cash-Flow Valuation.")

Today most companies execute discounted-cash-flow valuations using the following approach: First, they forecast business cash flows (such as revenues, expenses, and new investment), deliberately excluding cash flows associated with the financing program (such as interest, principal, and dividends). Second, they adjust the discount rate to pick up whatever value is created or destroyed by the financing program. WACC is by far the most common example of such an adjustment. It is a *tax-adjusted* discount rate, intended to pick up the value of interest tax shields that come from using an operation's debt capacity.

The practical virtue of WACC is that it keeps calculations used in discounting to a minimum. Anyone old enough to have discounted cash flows on a handheld calculator – a tedious, time-consuming chore – will understand immediately why WACC became the valuation methodology of choice in the era before personal computers.

But WACC's virtue comes with a price. It is suitable only for the simplest and most static of capital structures. In other cases (that is, in most real situations), it needs to be adjusted extensively – not only for tax shields but also for issue costs, subsidies, hedges, exotic debt securities, and dynamic capital structures. Adjustments have to be made not only project by project but also period by period within each project. Especially in its sophisticated, multilayered, adjusted-for-everything versions, the WACC is easy to misestimate. The more complicated a company's capital structure, tax position, or fund-raising strategy, the more likely it is that mistakes will be made. (See the insert "The Limitations of WACC.")

Today's better alternative for valuing a business operation is to apply the basic DCF relationship to each of a business's various kinds of cash flow and then add up the present values. This approach is most often called *adjusted present value*, or APV. It was first suggested by Stewart Myers of MIT, who focused on two main categories of cash flows: "real" cash flows (such as revenues, cash operating costs, and capital expenditures) associated with the

business operation; and "side effects" associated with its financing program (such as the values of interest tax shields, subsidized financing, issue costs, and hedges).[1] More generally, APV relies on the principle of *value additivity*. That is, it's okay to split a project into pieces, value each piece, and then add them back up.

What are the practical payoffs from switching to APV from WACC? If all you want from a valuation analysis is to know whether the net present value is positive or negative *and* if you already use WACC properly, the payoff will be low. The two approaches, skillfully applied, seldom disagree on that question. But there is a lot of room for improvement once you have answered it.

APV helps when you want to know more than merely, Is NPV greater than zero? Because the basic idea behind APV is value additivity, you can use it to break a problem into pieces that make *managerial* sense. Consider an acquisition. Even after the deal has closed, it helps to know how much value is being created by cost reductions rather than operating synergies, new growth, or tax savings. Or consider an investment in a new plant. You may negotiate specific agreements with, for example, equipment suppliers, financiers, and government agencies. In both examples, different people will be in charge of realizing individual pieces of value. APV is a natural way to get information about those pieces to managers – or for them to generate that information for themselves.

Executives are discovering that APV plays to the strength of now-ubiquitous spreadsheet software: each piece of the analysis corresponds to a subsection of a spreadsheet. APV handles complexity with lots of subsections rather than complicated cell formulas. In contrast, WACC's historical advantage was precisely that it bundled all the pieces of an analysis together, so an analyst had to discount only once. Spreadsheets permit unbundling, a capability that can be powerfully informative. Yet traditional WACC analyses do not take advantage of it. Indeed, many managers use their powerful spreadsheets merely to generate dozens of bundled valuation analyses, rather than to produce unbundled analyses that would be managerially relevant.

WACC still has adherents, most of whom argue that it works well enough when managers aim for a constant debt-to-capital ratio over the long run. Some go even further, saying that managers *ought* to aim for exactly that – and so therefore WACC is appropriate. But whether managers ought to behave thus is highly questionable; that they do not, in fact, follow this prescription is indisputable. To de-

New Valuation Practices Are on the Way

Valuation practices are changing already. The question is not whether companies will adapt, but when. Business schools and textbooks continue to teach the method based on the weighted-average cost of capital (WACC) because it is the standard, not because it performs best. But some business schools already teach alternative methodologies. Consulting and professional firms are actively studying and modifying their approaches to valuation. And new valuation books, software, and seminars are appearing on the market.

Here's some of what's coming:

☐ Companies will routinely use more than one formal valuation methodology. The primary purpose will not be redundancy (to get more than one opinion about a project's value), but analytical *tailoring* (to use a methodology that fits the problem at hand).

☐ Discounted cash flows will remain the foundation of most formal valuation analyses. But WACC will be displaced as the DCF methodology of choice by adjusted present value or something very much like it.

☐ Many companies will routinely evaluate the opportunities inherent in such activities as R&D and marketing by using tools derived from option pricing, simulation, and decision-tree analysis. The primary purpose of such evaluation will not be to arbitrate go-or-no-go decisions (Should we invest or not?) but to make more refined comparisons (Should we invest this way or that way?) and to support line managers with more formal analyses (How can we take further advantage of our position in this market?).

☐ Enhanced analytical capabilities will reside inside corporations, not solely in fee-for-service professional boutiques. The power of valuation analyses is enhanced more by a deep understanding of the business than by general experience with valuation. Insiders can learn valuation more readily than outsiders can learn the business.

☐ Good corporate capital-budgeting processes will be less rigid and more adaptive. Not mere systemizations of a single valuation approach, they will synthesize insights from different approaches according to the business characteristics of the project or opportunity. This should come as good news to line managers.

☐ The trend toward more active participation by the CFO and other financial executives in strategy formulation and business development (both of which precede capital budgeting) should continue. In fact, it may accelerate.

The Limitations of WACC

The WACC formula is a tax-adjusted discount rate. That is, when used as a discount rate in a DCF calculation, WACC is supposed to pick up the tax advantage associated with corporate borrowing. For a simple capital structure:

WACC = (debt/debt+equity)(cost of debt)(1- corporate tax rate) + (equity/debt+equity)(cost of equity).

The cost of debt and the cost of equity are *both* opportunity costs, each consisting of time value and its own risk premium. But WACC also contains capital structure ratios and an adjustment reflecting the term *1 minus the corporate tax rate.* Together, these have the effect of modestly lowering WACC. This in turn gives a higher present value than one would obtain by discounting at a non-tax-adjusted opportunity cost. When WACC works as intended, the exact value of interest tax shields is automatically included in the present value of the project.

Note that to use WACC in this fashion is to rely on one term – *1 minus the corporate tax rate* – in the discount rate to automatically make *all* the adjustments required by a complex capital structure. How many corporations inhabit a world so neat that one parameter can summarize it? Accordingly, some specialists customize their estimates of WACC with subtle adjustments. Unfortunately, the adjustments then are buried in an intimidating formula, one and a half lines long, in a single cell of a spreadsheet. Errors and assumptions, whatever they are, will probably remain hidden from view.

And errors are indeed likely. The "automatic" feature of WACC relies on fairly restrictive assumptions to get the value of interest tax shields just right. With non-plain-vanilla debt securities (such as high-yield debt, floating-rate debt, original-issue-discount debt, convertible debt, tax-exempt debt, and credit-enhanced debt), WACC has an excellent chance of misvaluing the interest tax shields or, which is probably worse, misvaluing the *other* cash flows associated with the project or its financing. In general, companies with complex tax positions will be poorly served by WACC. It is even more unrealistic for the sort of complexity encountered in, for example, cross-border capital-budgeting problems.

cree that managers should maintain constant debt ratios because that policy fits the WACC model is to let the tail wag the dog.

Valuing Opportunities: Option Pricing

Opportunities – the second type of commonly encountered valuation problem – may be thought of as possible future operations. When you decide how much to spend on R&D, or on which kind of R&D, you are valuing opportunities. Spending now creates, not cash flow from operations, but the opportunity to invest again later, depending on how things look. Many marketing expenditures have the same characteristic. Spending to create a new or stronger brand probably has some immediate payoff. But it also creates opportunities for brand extensions later. The opportunity may or may not be exploited ultimately, but it is valuable nonetheless. Companies with new technologies, product development ideas, defensible positions in fast-growing markets, or access to potential new markets own valuable opportunities. For some companies, opportunities are the most valuable things they own.

How do corporations typically evaluate opportunities? A common approach is not to value them formally until they mature to the point where an investment decision can no longer be deferred. At that time, they join the queue of other investments under consideration for funding. Critics have long decried this practice as myopic; they claim that it leads companies to undervalue the future and hence, to underinvest.

What actually happens appears to be more complicated and to depend a great deal on how managers are evaluated and rewarded. The absence of a formal valuation procedure often gives rise to personal, informal procedures that can become highly politicized. Champions arise to promote and defend the opportunities that they regard as valuable, often resulting in overinvestment rather than underinvestment.

Some companies use a formal DCF-based approval process but evaluate strategic projects with special rules. One such rule assigns strategic projects a lower hurdle rate than routine investments to compensate for DCF's tendency to undervalue strategic options. Unfortunately, in many cases DCF's negative bias is not merely overcome but overwhelmed by such an adjustment. Once again, overinvestment can occur in practice where theory would have managers worry about underinvestment. Another special rule evaluates strategic opportunities off-line, outside the routine DCF system. For better or worse, experienced executives make a judgment call. Sometimes that works well,

but even the best executives (perhaps especially the best) inform their judgment with sound analyses when possible.

In general, the right to start, stop, or modify a business activity at some future time is different from the right to operate it now. A specific important decision – whether or not to exploit the opportunity – has yet to be made and can be deferred. The right to make that decision optimally – that is, to do what is best when the time comes – is valuable. A sound valuation of a business opportunity captures its contingent nature: "If R&D proves that the concept is valid, we'll go ahead and invest." The unstated implication is that "if it doesn't, we won't."

The crucial decision to invest or not will be made after some uncertainty is resolved or when time runs out. In financial terms, an opportunity is analogous to an option. With an option, you have the right – but not the obligation – to buy or sell something at a specified price on or before some future date. A call option on a share of stock gives you the right to buy that share for, say, $100 at any time within the next year. If the share is currently worth $110, the option clearly is valuable. What if the stock is worth only $90? The option still is valuable because it won't expire for a year, and if the stock price rises in the next few months, it may well exceed $100 before the year passes. Corporate opportunities have the same feature: "If R&D proves that the concept is valid" is analogous to "if the stock price rises in the next few months." Similarly, "we'll go ahead and invest" is analogous to "we'll exercise the option."[2]

So an option is valuable, and its value clearly depends on the value of the underlying asset: the stock. Yet owning the option is not the same as owning the stock. Not surprisingly, one must be valued differently than the other. In considering opportunities, cash, time value, and risk all still matter, but each of those factors enters the analysis in two ways. Two types of cash flows matter: cash from the business and the cash required to enter it, should you choose to do so. Time matters in two ways: the timing of the eventual flows and how long the decision to invest may be deferred. Similarly, risk matters in two ways: the riskiness of the business, assuming that you invest in it, and the risk that circumstances will change (for better or worse) before you have to decide. Even simple option-pricing models must contain at least five or six variables to capture information about cash, time, and risk and organize it to handle the contingencies that managers face as the business evolves. (See the exhibit "What Makes Opportunities Different?")

Because it handles simple contingencies better than standard DCF models, option-pricing theory has been regarded as a promising approach to valuing business opportunities since the mid-1970s. However, real businesses are much more complicated than simple puts and calls. A combination of factors – big, active competitors, uncertainties that do not fit neat probability distributions, and the sheer number of relevant variables – makes it impractical to analyze real opportunities formally. Just setting up the valuation problem, never mind solving it, can be daunting. As a result, option pricing has not yet been widely used as a tool for valuing opportunities.

Interest in option pricing has picked up in recent years as more powerful computers have aided sophisticated model building. Nevertheless, models remain the domain of specialists. In my view, generalists will get more out of option pricing by taking a different approach. Whereas technical experts go questing for objective truth – they want the "right" answer – generalists have a business to manage and simply want to do a better job of it. Getting closer to the truth is good, even if you don't get all the way there. So an options-based analysis of value need not be perfect in order to improve on current practice.

The key to valuing a corporate investment opportunity as an option is the ability to discern a simple correspondence between project characteristics and option characteristics. The potential investment to be made corresponds to an option's exercise price. The operating assets the company would own, assuming it made the investment, are like the stock one would own after exercising a call option. The length of time the company can wait before it has to decide is like the call option's time to expiration. Uncertainty about the future value of the operating assets is captured by the variance of returns on them; this is analogous to the variance of stock returns for call options. The analytical tactic here is to perform this mapping between the real project

The absence of formal valuation procedures often gives rise to informal procedures that can become highly politicized.

and a *simple* option, such as a European call option. (A European call can be exercised only on the expiration date, making it the simplest of all options.) If the simple option captures the contingent nature of the project, then by pricing the option we gain some additional, albeit imperfect, insight into the value of the project.

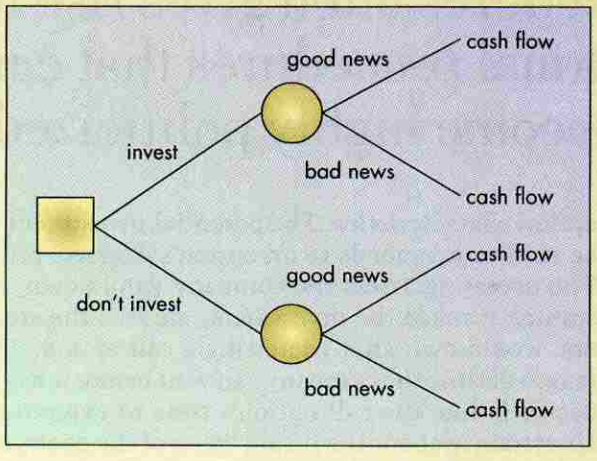
To illustrate, suppose a company is considering whether to invest $1 million to modify an existing product for an emerging market. A DCF analysis of the expected cash flows shows them to be worth only about $900,000. However, the market is volatile, so that value is likely to change. A combination of patents and know-how will protect the company's opportunity to make this investment for at least two more years. After that, the opportunity may be gone. Viewed conventionally, this proposal's NPV is negative $100,000. But the opportunity to wait a couple of years to see what happens is valuable. In effect, the company owns a two-year call option with an exercise price of $1 million on underlying assets worth $900,000. We need only two more pieces of information to value this business opportunity as a European call option: the risk-free rate of return (this is the same as the time value referred to above – suppose it's 7%); and some measure of how risky the cash flows are. For the latter, suppose that annual changes in the value of these cash flows have a standard deviation of 30% per year, a moderate figure for business cash flows. Now, a simple option-pricing model, such as the Black-Scholes model, gives the value of this call as about $160,000.[3]

What did the company learn from option pricing? The value of the opportunity is positive, not negative. That is always true as long as time and uncertainty remain. The company should not invest the $1 million now – to do so would be to waste $100,000 – but neither should it forget about ever investing. In fact, the odds are pretty good that it will want to invest two years from now. In the meantime, the product or country manager monitors developments. He or she focuses not only on NPV but also on the proper timing of an investment. Alternatively, if the company doesn't want to invest and doesn't want to wait and see, it can think about how to capture the value of the opportunity now. The option value gives it an idea of what someone might pay now for a license to introduce the new product. In the same way, the option value can help a company think about how much to pay to acquire such a license or to acquire a small business whose most interesting asset is such an opportunity.

Long-lived opportunities in volatile business environments are so poorly handled by DCF valuation methods that an option-pricing analysis does not have to be very sophisticated to produce some worthwhile insight. A pragmatic way to use option pricing is as a supplement, not a replacement, for the valuation methodology already in use. The extra insight may be enough to change, or least seri-

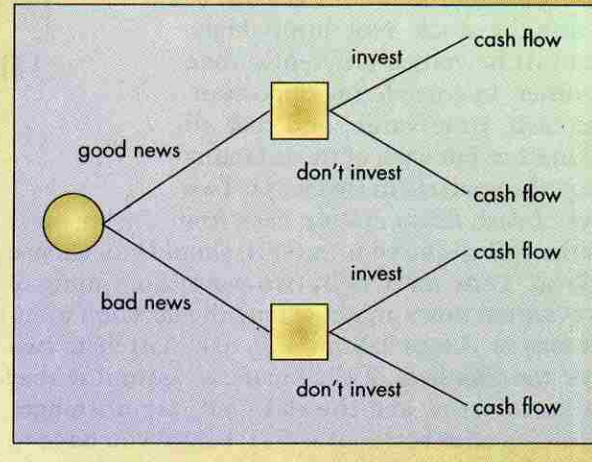
What Makes Opportunities Different?

Assets-in-place look like this:



Here we make a decision, then find out what happens. Traditional DCF methods are designed for this kind of problem.

Opportunities look like this:



Here we find out what happens before we make a decision. Traditional DCF methods work poorly here.

These two scenarios must have different values; they also must be managed differently.

ously challenge, decisions implied by traditional DCF analyses.

Here's another way to think about the analytical strategy I am recommending. Values for fairly illiquid or one-of-a-kind assets (real estate, for example) are often benchmarked against values of assets or transactions regarded as comparable but not identical. Many terrific business opportunities are one-of-a-kind, and many are illiquid. Lacking a comparable benchmark for the example above (modifying our product to enter an emerging market), the company synthesized one by setting up a simple European call option. By pricing the synthetic opportunity (the call option), it gained additional insight into the real opportunity (the product introduction proposal). This insight is valuable as long as the company doesn't expect the synthesis or the resulting estimate of value to be perfect.

What the generalist needs, then, is an easy-to-learn tool that can be used over and over to synthesize and evaluate simple options. Furthermore, because the goal is to complement, not replace, existing methods, managers would like a tool that can share inputs with a DCF analysis, or perhaps use DCF outputs as inputs. My favorite candidate is the Black-Scholes option-pricing model, the first and still one of the simplest models. Arguably not the easiest to learn, it is perhaps the most versatile of the simpler models. An intuitive mapping between Black-Scholes variables and project characteristics is usually feasible. And even though the model contains five variables, there is an intuitive way to combine these five into two parameters, each with a logical, managerial interpretation. This intuitive process lets a manager create a two-dimensional map, which is much easier than creating one with five variables. Finally, the Black-Scholes model is widely available in commercial software, which means that if you can synthesize the comparable option, your computer can price it for you. The crucial skills for the generalist are to know how to recognize real options and how to synthesize simple ones, not how to set up or solve complex models.

Valuing Ownership Claims: Equity Cash Flows

Claims that companies issue against the value of their operations and opportunities are the last major category of valuation problem. When a company participates in joint ventures, partnerships, or strategic alliances, or makes large investments using project financing, it shares ownership of the venture with other parties, sometimes many others. Managers need to understand not simply the value of the venture as a whole but also the value of their company's interest in it. That understanding is essential to deciding whether or not to participate as well as how to structure the ownership claims and write good contracts.

Suppose your company is considering investing in a joint venture to develop an office building. The building itself has a positive NPV – that is, constructing it will create value. What's more, the lead developer is confident that lenders will provide the necessary debt financing. You are being asked to contribute funds in exchange for an equity interest in the venture. Should you invest? If all you've done is value the building, you can't tell yet. It could be that your partner stands to capture all the value created, so even though the building has a positive NPV, your investment does not. Alternatively, some ventures with negative NPVs are good investments because a partner or the project's lenders make the deal very attractive. Some partners are simply imprudent, but others – governments, for example – deliberately subsidize some projects.

A straightforward way to value your company's equity is to estimate its share of expected future cash flows and then discount those flows at an opportunity cost that compensates the company for the risk it is bearing. This is often referred to as the *equity cash flow* (ECF) approach; it is also called *flows to equity.* It is, once again, a DCF methodology, but both the cash flows and the discount rate are different from those used either in APV or the WACC-based approach. The business cash flows must be adjusted for fixed financial claims (for example, interest and principal payments), and the discount rate must be adjusted for the risk associated with holding a financially leveraged claim.

Handling leverage properly is most important when leverage is high, changing over time, or both. In those situations, lenders' interests may diverge from those of shareholders, and different shareholders' interests may diverge from one another. Such divergence is especially common in transactions that produce or anticipate substantial changes in the business or its organization – in mergers, acquisitions, and restructurings, for example.

Unfortunately, leverage is most difficult to treat properly precisely when it is high and changing. When leverage is high, equity is like a call option, owned by the shareholders, on the assets of the company. If the business is successful, managers acting in the best interests of shareholders will "exercise the option" by paying lenders what they are owed. Shareholders get to keep the residual value. But if the business runs into serious trouble, it will

be worth less than the loan amount, so the borrower will default. In that situation, the lenders will not be repaid in full; they will, however, keep the assets in satisfaction of their claim.

It is widely understood that highly levered equity is like a call option because of the risk of default. Why not use an option-pricing approach to value the equity? Because the options involved are too complicated. Every time a payment (interest *or* principal) is due to lenders, the borrower has to decide again whether or not to exercise the option. In effect, levered equity is a complex *sequence* of related options, including options on options. Simple option-pricing models are not good enough, and complicated models are impractical. That is why it's worthwhile to have ECF as a third basic valuation tool.

It's important to state that an ECF valuation, no matter how highly refined, is not option pricing, and therefore will not give a "correct" value for a levered equity claim. But ECF can be executed so that its biases all run in the same direction – toward a low estimate. So, although the answer will be wrong, the careful analyst knows that it will be low, not high, and why.

The key to using ECF is to begin the analysis at a point in the future *beyond* the period in which default risk is high. At that point, an analyst can establish a *future* value for the equity using conventional DCF methods. Then ECF works backward year by year to the present, carefully accounting for yearly cash flows and changes in risk along the way, until it arrives at a present value. The procedure is quite straightforward when built into a spreadsheet, and if certain formulaic rules are adopted for moving from later to earlier years, ECF's biases contrive to underestimate the true equity value. The formulaic rules amount to an assumption that borrowers will not really walk away from the debt even when it is in their best interests to do so. Obviously, this assumption deprives them of something valuable – in real life, they might indeed walk away, so the real-life equity is more valuable than the contrived substitute.

An ECF analysis also shows explicitly how changes in ownership structures affect cash flow and risk, year by year, for the equity holders. Understanding how a program of change affects the company's owners helps to predict their behavior – for example, how certain shareholders might vote on a proposed merger, restructuring, or recapitalization of the venture. Such insight is available only from ECF or its variations.

What do companies use now instead of ECF analysis? Some evaluate equity claims by first valuing the entire business (with WACC-based DCF) and then subtracting the value of any debt claims and other partners' equity interests. This approach requires managers to presume they know the true value of those other claims. In practice, they don't know those values unless they apply ECF to estimate them. Another common approach is to apply a price-earnings multiple to your company's share of the venture's net income. That has the virtue of simplicity. But finding or creating the right multiple is tricky, to say the least. Skillfully chosen price-earnings ratios may indeed yield reasonable values, but even then they don't contribute the other managerial insights that flow naturally from the structure of an ECF analysis.

Learning New Tools: Costs and Benefits

As companies adopt valuation techniques made more powerful or accessible by desktop computers, the good news is that the tools a generalist needs are not very hard to learn. The time and effort necessary before the techniques pay off naturally will depend on a company's situation and its current finance capabilities.

> As companies adopt new valuation techniques, the good news is that the tools a generalist needs are not very hard to learn.

Benefits will be high for companies that expect to invest heavily in the near future. For them, the suboptimal execution of a large, multiyear investment program will be costly. Consider, for example, an industry such as telecommunications, in which capital intensity is coupled with rapid growth and technological change. Success requires a *sequence* of good investments, and getting even one of them wrong can be very expensive. Or consider industries with only a few significant players that compete head-on in nearly all aspects of their businesses. Companies able to take swift advantage of a competitor's mistakes should expect the benefits of insightful analyses – and the penalties for poor analyses – to be particularly high. Similarly, any company working

A Taxonomy of Valuation Problems and Methods

Where are the different types of valuation problems encountered? Think of a stylized "balanced sheet" for the business.

	Balance sheet	
	Assets	*Liabilities and equity*
Past investment decisions	1. Operations (assets-in-place)	Debt claims
Future investment decisions	2. Opportunities (real options)	3. Equity claims *Securities issued*

Each type of problem calls for a different valuation method.

Companies use a broad range of valuation methodologies.

Problem types	*Recommended valuation method*	*A sampling of alternative valuation methods* **less formal** → → → → **more formal**			
1. Operations (assets-in-place)	Adjusted present value	Sales multiples; Book-value multiples	EBIT multiples; Cash-flow multiples	WACC-based DCF	Monte Carlo simulation
2. Opportunities (real options)	Simple option pricing	Installed-base multiples; Customer, subscriber multiples	Decision trees	Simulation; scenario analysis	Fancy option pricing
3. Equity claims	Equity cash flow	Net income multiples; P/E ratios		WACC-based DCF, minus debt	Simulation; scenario analysis

now to exploit a first-mover advantage is highly dependent on the success of early investments.

The costs of upgrading capabilities are likely to be low for companies that meet one or more of the following three criteria:

☐ They already use DCF valuation in their capital-budgeting processes and have built the related systems for use on desktop computers.

☐ They have many managers, not just finance staff, who are already comfortable with the basics of modern corporate finance and will not find the new tools difficult to acquire.

☐ They are currently upgrading their staff capabilities for other reasons, so the incremental cost of installing a better system is minor.

Let's look at what's involved in learning the three valuation methods:

Adjusted Present Value. There are few tools as powerful and versatile as APV that require as little time to learn. My experience is that executives already schooled in WACC can learn the basics of APV in about two hours, either on their own or with an instructor. Within another half a day, people already comfortable with spreadsheet software are able to apply APV effectively to real problems. Today it is no exaggeration to say that a company not using spreadsheets for valuation is far behind the times. And companies that *are* using spreadsheets, but not APV, are underutilizing their software. Generally speaking, systems that can accommodate WACC can handle APV.

Option Pricing. This tool is costlier. There's more to learn, and for some people, it is less intuitive. Nevertheless, it is by no means inaccessible. Basic option pricing can be learned from a textbook. What is more difficult is the application of this tool to corporate problems, as opposed to simple puts and calls.

Corporate applications require a synthesis of option pricing and DCF-based valuation; that is, a way to use DCF outputs as option-pricing inputs and a way to reconcile the different values generated by each methodology. Simple frameworks embodying such a synthesis can be learned in a day or less. Simple applications require another day. Normally, half of this time is devoted to running numbers and the other half to the more subtle but important tasks of interpreting and qualifying results and exploring the limitations of both the framework and the methodology.

Option pricing does not fit naturally into most companies' existing capital-budgeting systems. Neither, for that matter, do tools such as decision-tree analysis, simulation, or scenario analysis, which are sometimes offered as alternatives to option pricing. Thus, the most practical way to begin using options-based analyses is to run them in sequence with DCF analyses. I mean that in two senses: first, in the sense that you do option pricing *after* you've already done a DCF analysis, to complement, not replace, the latter; and second, in the sense that outputs from a DCF analysis (such as present values and capital expenditures) become inputs for option-pricing (such as underlying asset value and exercise price). Most companies will not find it worthwhile to build separate systems to support each methodology. Indeed, if DCF and option pricing are set up as mutually exclusive rivals – you pick one or the other, but not both – option pricing will lose, for now.

Eventually, many companies will locate their most high-powered technical expertise within a small finance or business-development group. The rest of the company, both line managers and top-level managers, will be trained to use that resource effectively. Therefore, the ability to formulate simple option-pricing analyses will be widespread. If only the specialists know anything about valuing opportunities, either of two unattractive outcomes is likely: the model-builders will become high priests who dominate the capital-budgeting process; or they will become irrelevant geeks whose valuable talents go unexploited.

Equity Cash Flows. Managers already familiar with some kind of DCF valuation tool can learn ECF, along with a basic application, in less than a day. Companies that might be heavy users of this tool will want to adapt it to the particular kind of business or transactions they engage in most frequently. Probably the most common uses are in project and trade finance, mergers and acquisitions, buyouts, and joint ventures and alliances.

Adapting ECF and corporate systems to each other is not necessarily difficult or costly but needs to be assessed case by case. ECF is a more specialized valuation tool than either APV or option pricing because it addresses a more specific question. APV and option pricing ask, What is the value of this bundle of operations and opportunities? In contrast, ECF asks, What is the value of an equity claim on this bundle of assets and opportunities, assuming they are financed in this fashion? ECF therefore requires more support or, at a minimum, more inputs from corporate financial and capital-budgeting systems. But presumably, a company engaged in significant numbers of joint ventures or project financings, for example, must support these activities anyway, regardless of the valuation tools it chooses to build into a particular system.

For most companies, getting from where they are now to this vision of the future is not a corporate finance problem – the financial theories are ready and waiting – but an organizational development project. Motivated employees trying to do a better job and advance their careers will naturally spend time learning new skills, even financial skills. That is already happening. The next step is to use this broadening base of knowledge as a platform to support an enhanced *corporate* capability to allocate and manage resources effectively.

An active approach to developing new valuation capabilities – that is, deciding where you want your company to go and how to get there – should allow you to develop those capabilities faster than a passive, laissez-faire approach, and it ought to yield more focused and powerful results. Of course, it's also probably more expensive. However, the question is not whether it's cheaper to let nature take its course, but whether the more powerful corporate capability will pay for itself. That is, how much is that capability worth?

1. See Stewart C. Myers, "Interactions of Corporate Financing and Investment Decisions – Implications for Capital Budgeting," *Journal of Finance*, vol. 29, March 1974, pp. 1-25. APV is sometimes called *valuation in parts* or *valuation by components*.

2. For a more formal and extended discussion of such options, see Avinash K. Dixit and Robert S. Pindyck, "The Options Approach to Capital Investment," HBR May-June 1995, pp. 105-15. In particular, Dixit and Pindyck highlight the common, critically important characteristic of *irreversibility* in capital investments. When a risky investment is both irreversible and deferrable, common sense suggests waiting to invest.

3. For the model, see Fischer Black and Myron Scholes, "The Pricing of Options and Corporate Liabilities," *Journal of Political Economy*, vol. 81, May-June 1973, pp. 637-54.

Reprint 97305 To order reprints, see the last page of this issue.