Valuing
dot-coms

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You don't have to step through the looking glass into
a parallel universe to understand the valuations of Internet stocks.
Discounted-cash-flow analysis can focus your mind on the right issues,
help you see the risks, and separate the winners from the losers.

In the present era of cheap and accessible capital, Internet entre-
preneurs have succeeded in quickly transforming their business ideas into
billion-dollar valuations that seem to defy the common wisdom about
profits, multiples, and the short-term focus of capital markets. Valuing these

high-growth, high-uncertainty, high-loss firms has been a challenge, to say the least; some practitioners have even described it as a hopeless one.

In this article, we respond to that challenge by using a classic discounted-cash-flow (DCF) approach to valuation, buttressed by microeconomic analysis and probability-weighted scenarios. Although DCF may sound suspiciously retro, we believe that it works where other methods fail, reinforcing the continuing relevance of basic economics and finance, even in uncharted Internet territory.[1] Yet it is important to bear in mind that while the valuation techniques we sketch out can help bound and quantify uncertainty, they won't make it disappear. Internet stocks are highly volatile for sound and logical reasons, and they will remain highly volatile.

DCF analysis when there is no *CF* to *D*

Three related factors make it hard to value Internet companies. First, like many start-ups, they typically have losses or very small profits for a few

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[1]For a complete discussion of the DCF approach, *see* Tom Copeland, Timothy M. Koller, and Jack Murrin, *Valuation: Measuring and Managing the Value of Companies*, second edition, New York: John Wiley & Sons, 1995. Chapter 3, "Cash Is King," may be of particular interest.

years, partly because of the high marketing costs (aimed at attracting customers) that they must write off against current earnings. Second, these companies are growing at very high rates: successful ones will increase their revenues by 100 times or more in the early going. Finally, the fate of these companies is quite uncertain.

Shorthand valuation approaches, including price-to-earnings and revenue multiples, are meaningless when there are no earnings and revenues are growing astronomically. Some analysts have suggested benchmarks such as multiples of customers or multiples of revenues three years out. These approaches are fundamentally flawed: speculating about a future that is only three or even five years away just isn't very useful when high growth will continue for an additional ten years. More important, these shorthand methods can't account for the uniqueness of each company.

Shorthand valuation techniques are absurd if **there are no earnings** and revenues grow astronomically

The best way of valuing Internet companies is to return to economic fundamentals with the DCF approach, which makes the distinction between expensed and capitalized investment, for example, unimportant because accounting treatments don't affect cash flows. The absence of meaningful historical data and positive earnings to serve as the basis for price-to-earnings multiples also doesn't matter, because the DCF approach, by relying solely on forecasts of performance, can easily capture the worth of value-creating businesses that lose money for their first few years. The DCF approach can't eliminate the need to make difficult forecasts, but it does address the problems of ultrahigh growth rates and uncertainty in a coherent way.

In this discussion, we assume that the reader has a basic knowledge of the DCF approach. Three twists are required to make this approach more useful for valuing Internet companies: starting from a fixed point in the future and working back to the present, using probability-weighted scenarios to address high uncertainty in an explicit way, and exploiting classic analytical techniques to understand the underlying economics of these companies and to forecast their future performance.

We illustrate this approach with a valuation of Amazon.com, the archetypal Internet company. In the four years since its launch, it has built a customer base of ten million and expanded its offerings from books to compact discs, videos, digital video discs, toys, consumer electronics goods, and auctions. In addition, Amazon has invested in branded Internet players such as pets.com and drugstore.com, and since the end of September 1999 it has

allowed other retailers to sell their wares on its Web site through what it calls its "associates program." Indeed, the company has become a symbol of the new economy; market research shows that 101 million people in the United States recognize the Amazon brand name.

All this activity has been rewarded with a high market capitalization: $25 billion as of mid-November 1999. Yet Amazon has never turned a profit and is expected to lose at least $300 million for the year, so it has become the focus of a debate about whether Internet stocks are greatly overvalued.

Start from the future

In forecasting the performance of high-growth companies like Amazon, don't be constrained by current performance. Instead of starting from the present—the usual practice in DCF valuations—start by thinking about what the industry and the company could look like when they evolve from today's very high-growth, unstable condition to a sustainable, moderate-growth state in the future; and then extrapolate back to current performance. The future growth state should be defined by metrics such as the ultimate penetration rate, average revenue per customer, and sustainable gross margins. Just as important as the characteristics of the industry and company in this future state is the point when it actually begins. Since Internet-related companies are new, more stable economics probably lie at least 10 to 15 years in the future.

But consider what Amazon has already achieved. Its ability to enter and dominate categories is unprecedented, both in the off- and the on-line worlds. In 1998, for example, it took the company only a bit more than three months to banish CDNOW to second place among on-line purveyors of music. In early 1999, Amazon assumed the leadership among on-line purveyors of videos in 45 days; recently, it became the leading on-line consumer electronics purveyor in 10.

Let us create a fairly optimistic scenario based on this record. Suppose that Amazon were the next Wal-Mart, another US retailer that has radically changed its industry and taken a significant share of sales in its target markets. Say that by 2010, Amazon continues to be the leading on-line retailer and has established itself as the overall leading retailer, both on- and off-line, in certain markets. If the company could take a 13 and 12 percent share of the total US book and music markets, respectively, and captured a roughly comparable share of some other markets, it would have revenues of $60 billion in 2010, when Wal-Mart's revenues will probably have exceeded $300 billion.
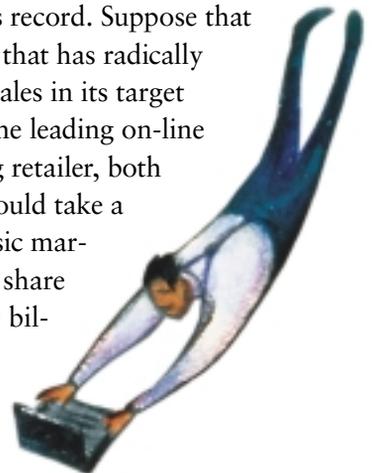
What operating profit margin could Amazon.com earn on that $60 billion? The superior market share of the company is likely to give it significant purchasing power. Remember too that Amazon will earn revenues and incur few associated costs from other retailers using its site. In this optimistic scenario, Amazon, with an average operating margin in the area of 11 percent, would most likely do a bit better than most other retailers.

Our goal is not to define precisely what **will** happen to Internet companies but to offer a rigorous description of what **could** happen

And what about capital? In the optimistic scenario, Amazon may well need less working capital and fewer fixed assets than traditional retailers do. In almost any scenario, it should need less inventory because it can consolidate its stock-in-trade in a few warehouses, and it won't need retail stores at all. We assume that Amazon's 2010 capital turnover (revenues divided by the sum of working capital and fixed assets) will be 3.4, compared with 2.5 for typical retailers.

Combining these assumptions gives us the following financial forecast for 2010: revenues, $60 billion; operating profit, $7 billion; total capital, $18 billion. We also assume that Amazon will continue to grow by about 12 percent a year for the next 15 years after 2010 and that its growth will decline to 5.5 percent a year in perpetuity after 2025, slightly exceeding the nominal growth rate of the gross domestic product.[2] To estimate Amazon's current value, we discount the projected free cash flows back to the present. Their present value, including the estimated value of cash flows beyond 2025, is $37 billion.

How can we credibly forecast ten or more years of cash flows for a company like Amazon? We can't. But our goal is not to define precisely what *will* happen but instead to offer a rigorous description of what *could*.

Weighting for probability

Uncertainty is the hardest part of valuing high-growth technology companies, and the use of probability-weighted scenarios is a simple and straightforward way to deal with it. This approach also has the advantage of making critical assumptions and interactions far more transparent than do other modeling approaches, such as Monte Carlo simulation. The use of probability-weighted scenarios requires us to repeat the process of estimating a future set of financials for a full range of scenarios—some more optimistic, some less. For Amazon, we have developed four of them (Exhibit 1).

[2] Real GDP growth has averaged about 3 percent a year for the past 40 years, and the long-term expected inflation rate built into current interest levels is probably about 2 to 2.5 percent a year.
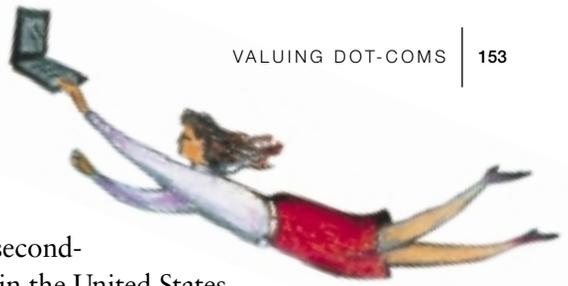
In Scenario A, Amazon becomes the second-largest retailer (on- or off-line) based in the United States. It uses much less capital than traditional retailers do because it is primarily an on-line operation. It captures much higher operating margins because it is the on-line retailer of choice; even if its prices are comparable to those of other on-line retailers, it has more purchasing clout and lower operating costs. This scenario implies that Amazon was worth $79 billion in the fourth quarter of 1999.

Scenario B has Amazon capturing revenues almost as large as it does in Scenario A, but its margins and need for capital fall in the range between those of the first scenario and the margins and capital requirements of a traditional retailer. This second scenario implies that Amazon had a value of $37 billion as of the fourth quarter of 1999.
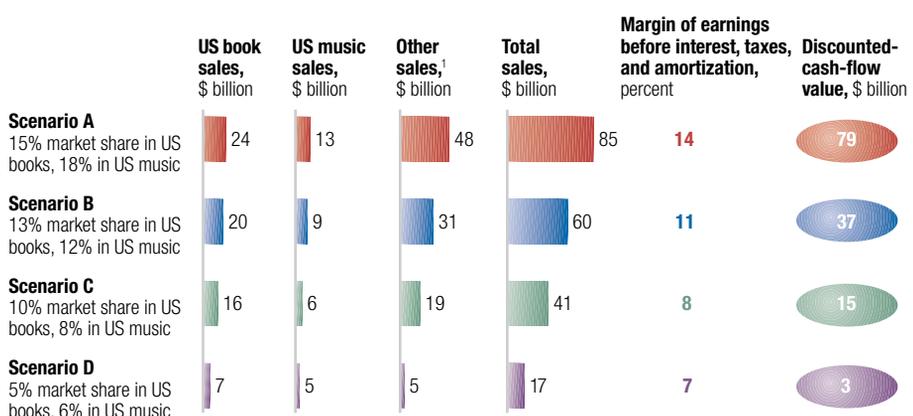
Amazon becomes quite a large retailer in Scenario C, though not as large as it does in Scenario B, and the company's economics are closer to those of traditional retailers. This third scenario implies a value for Amazon of $15 billion.

Finally, in Scenario D, Amazon becomes a fair-sized retailer with traditional retailer economics. On-line retailing mimics most other forms of the business, with many competitors in each field. Competition transfers most of the value of going on-line to consumers. This scenario implies that Amazon was worth only $3 billion.

We now have four scenarios, in which the company's value ranges from $3 billion to $79 billion. Although the spread is quite large, each scenario

EXHIBIT 1

Amazon.com: Potential outcomes

	US book sales, $ billion	US music sales, $ billion	Other sales,[1] $ billion	Total sales, $ billion	Margin of earnings before interest, taxes, and amortization, percent	Discounted-cash-flow value, $ billion
Scenario A 15% market share in US books, 18% in US music	24	13	48	85	14	79
Scenario B 13% market share in US books, 12% in US music	20	9	31	60	11	37
Scenario C 10% market share in US books, 8% in US music	16	6	19	41	8	15
Scenario D 5% market share in US books, 6% in US music	7	5	5	17	7	3

[1]Books and music sold outside the United States as well as sales of videos, digital video discs, toys, and consumer electronic goods in any market.
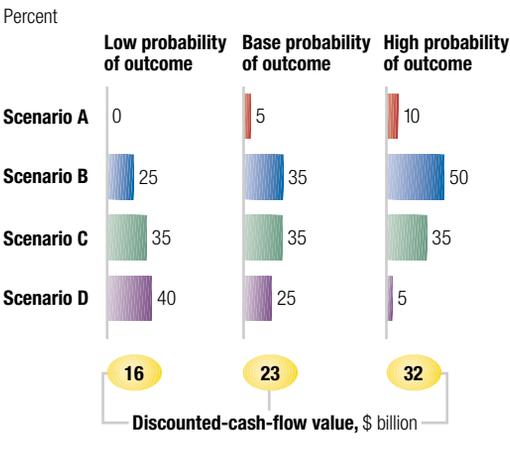
EXHIBIT **2**

Amazon.com: Expected value

	Discounted-cash-flow value, $ billion	X	Probability, percent	=	Expected value, $ billion
Scenario A	79		5		3.9
Scenario B	37		35		13.0
Scenario C	15		35		5.3
Scenario D	3		25		0.8
					$23.0 billion

EXHIBIT **3**

Amazon.com: Volatility of expected values

Percent

	Low probability of outcome	Base probability of outcome	High probability of outcome
Scenario A	0	5	10
Scenario B	25	35	50
Scenario C	35	35	35
Scenario D	40	25	5
	16	**23**	**32**

Discounted-cash-flow value, $ billion

is plausible.[3] Now comes the critical phase of assigning probabilities and generating the resulting values for Amazon (Exhibit 2). We assign a low probability, 5 percent, to Scenario A, for though the company might achieve outrageously high returns, competition is likely to prevent this. Amazon's current lead over its competitors suggests that Scenario D too is improbable. Scenarios B and C—both assuming attractive growth rates and reasonable returns—are therefore the most likely ones.

When we weight the value of each scenario, depending on its probability, and add all four of these values, we end up with $23 billion, which happened to be the company's market value on October 31, 1999. It therefore appears that Amazon's market valuation can be supported by plausible forecasts and probabilities.

Now, however, look at the sensitivity of this valuation to changing probabilities. As Exhibit 3 shows, relatively small variations lead to big swings in value. Indeed, the volatility of the share prices of companies like Amazon has been precipitated by small changes in the market's view of the likelihood of different outcomes. Nothing can be done about this volatility.

From probability to reality

The last difficult aspect of valuing very high-growth companies is relating future scenarios to current performance. How can you tell a soon-to-be-successful Internet play from a soon-to-be-bankrupt one? Here, classic microeconomic and strategic skills play a critical role because building sound scenarios for a business and understanding that business both require knowledge of what actually drives the creation of value. For Amazon and many other

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[3]We capture cash-flow risk through the probability-weighting of scenarios, so the cost of equity applied to each of them shouldn't include any extra premium; it can consist of the risk-free rate, an industry-average beta, and a general market-risk premium.

Internet companies, customer-value analysis is a useful approach. Five factors drive the customer-value analysis of a retailer like Amazon:

- The average revenue per customer per year from purchases by its customers, as well as revenues from advertisements on its site and from retailers that rent space on it to sell their own products
- The total number of customers
- The contribution margin per customer (before the cost of acquiring customers)
- The average cost of acquiring a customer
- The customer churn rate (that is, the proportion of customers lost each year)

Let us see how Amazon could achieve the financial performance predicted by Scenario B and compare this with the company's current performance. As Exhibit 4 shows, the biggest changes over the next ten years involve the number of Amazon's customers and the average revenue for each. In Scenario B, Amazon's customer base increases from 9 million a year in 1999 to about 120 million worldwide by 2010—84 million in the United States and 36 million outside it. We assume that Amazon will remain the number-one US on-line retailer and achieve an attractive position abroad.

EXHIBIT 4

Amazon.com: Customer economics, Scenario B

	1999	2010
Average revenue per customer, $	140	500
Customers, million	9	120
Contribution margin, percent	14	14
Acquisition cost per customer, $	29	50
Customer churn rate, percent	25	25

Scenario B also calls for Amazon's average revenue per customer to rise to $500 by 2010, from $140 in 1999. That $500 could be accounted for by two CDs at $15 each, three books at $20 each, two bottles of perfume at $30 each, and one personal organizer at $350. Amazon will probably continue to dominate its core book and music markets. It will probably enter adjacent categories and may come to dominate them.

In Scenario B, Amazon's 2010 contribution margin per customer before the cost of acquiring customers is 14 percent, a figure in line with that of current top-notch large-scale retailers—Wal-Mart, for instance. Despite competition, this seems rational in view of Amazon's likely ability to gain offsetting economies of scale through devices such as renting other retailers space to market their products on Amazon's Web sites.

Scenario B predicts that Amazon will have acquisition costs per customer of $50 in 2010. Despite the argument that these costs will rise once all on-line customers have been claimed, this is a reasonable figure if the company

can achieve brand dominance and advertising economies of scale. The cost of acquiring new customers is closely linked to the customer churn rate, which at 25 percent suggests that once Amazon acquires customers it will keep them four years. This implies a truly world-class (or addictive) customer offer and a deeply loyal (or lazy) customer base.

EXHIBIT 5

Customer economics: An example

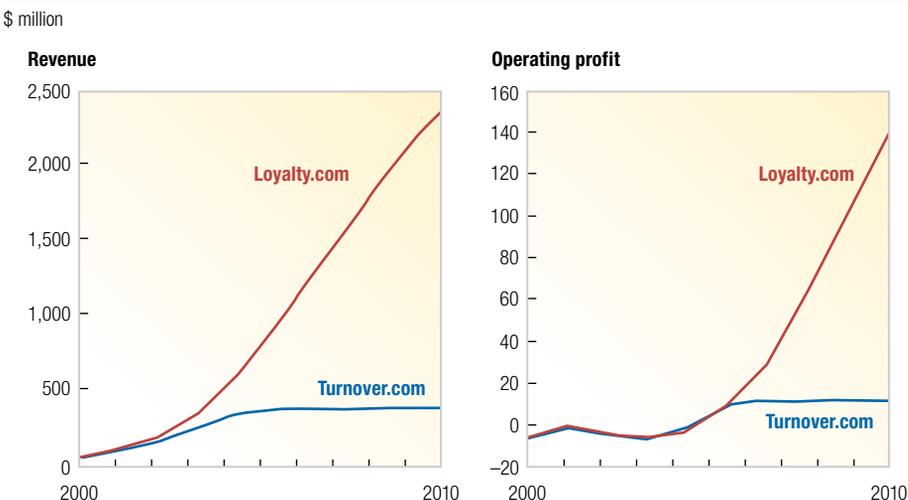|	Loyalty.com	Turnover.com[1]
Average revenue per customer, $	250	342
Contribution margin, percent	15	15
Acquisition cost per customer, $	75	93
Customer churn rate, percent	20	46

[1]Assumes discount rate of 12% in Year 2.

Looking at customer economics in this way makes it possible to generate the kind of information that is needed to assess the probabilities assigned to various scenarios. Consider how two hypothetical young companies, Loyalty.com and Turnover.com, with different customer economics might evolve over time (Exhibit 5). Each had $100 million in revenues in 1999 and an operating loss of $3 million. On traditional financial statements, the two companies look very much the same. Deeper analysis, however, using the customer economics model, reveals striking differences.

The lifetime value of a typical Loyalty.com customer is $50 over an average of five years; the typical Turnover.com customer is worth –$1 over two years. The difference in the value of a customer reflects the churn rate (20 percent attrition each year for Loyalty.com versus 46 percent for Turnover.com) and Turnover.com's higher acquisition costs.

EXHIBIT 6

Long-term performance: An example

$ million

Revenue

Operating profit
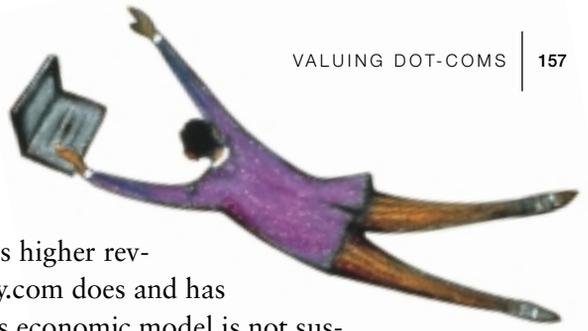
Even though Turnover.com earns higher rev-
enues per customer than Loyalty.com does and has
similar contribution margins, its economic model is not sus-
tainable. Loyalty.com will find it much easier to grow because it doesn't
have to find as many new customers each year. Since Loyalty.com will
have substantially lower customer acquisition costs than Turnover.com,
Loyalty.com's figures for earnings before income tax (EBIT) will turn
positive more quickly. If Loyalty.com and Turnover.com invested the same
amount of money in efforts to acquire customers over the next ten years,
and other factors remained the same, the revenue growth and EBIT pat-
terns of the two companies would vary a good deal (Exhibit 6). This in
turn means that their DCF values would differ radically, despite similar
short-term financial results.

Uncertainty is here to stay

By using the adapted DCF approach outlined here, we can generate reasonable
valuations for seemingly unreasonable businesses. But investors and companies
entering fast-growth markets like those related to the Internet face huge uncer-
tainties. Look at what could happen under our four scenarios to an investor
who holds a share of Amazon stock for ten years after buying it in 1999.

If Scenario A plays out, the investor will earn a 23 percent annual return,
and it will seem that in 1999 the market significantly undervalued
Amazon. If Scenario C plays out, the investor will earn about 7 percent
a year, and it will seem that the company was substantially overvalued
in 1999. These high or low returns should not, however, be interpreted as
implying that its 1999 share price was irrational; they reflect uncertainty
about the future.

A great deal of this uncertainty is associated with the problem of identifying
the winner in a large competitive field: in the world of high-tech initial
public offerings, not every Internet company can become the next Microsoft
or Cisco Systems. History shows that a small number of players will win big
while the vast majority will toil away amid obscurity and worthless options,
and it is hard to predict which companies will prosper and which will not.[4]
Neither investors nor companies can do anything about this uncertainty, and
that is why investors are always told to diversify their portfolios—and why
companies don't pay cash when acquiring Internet firms. ^M_Q

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[4] Morgan Stanley research on 1,243 technology initial public offerings has shown that more than 86 per-
cent of the value created in them during the past decade came from only 5 percent of the companies.