

# What Went Wrong With the Dot-Coms?

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**F**rom market highs in March 2000, Internet stocks had lost 85% of their value by April 2001. Out of 317 Internet IPOs, only 16 stocks were trading above their offer price, and only 9 above their first-day close price.

What were the bases of early high valuations? Is there a theoretical explanation for the sharp decline in prices? What are the implications?

The purpose of this article is to answer these questions using the investment opportunities approach to the valuation of shares. It is very important for investors to understand Internet stock-pricing mechanisms. Yet the literature lacks a theoretical foundation for valuation of Internet stocks. This research contributes by finding theoretical support for the investment opportunities approach.

## INVESTMENT OPPORTUNITIES APPROACH

Miller and Modigliani [1961] propose that the investment opportunities approach is the most appropriate method to value growth firm shares. A growth firm is a firm that has the opportunity to invest capital in new assets at a rate of return higher than normal.

The model predicts that a manager buys a firm with abnormal return potential to maximize personal wealth. The price that the manager pays for the firm equals the sum of the present value of current operations and the

value of the growth opportunities (see the appendix for mathematical formulas and a more detailed explanation):

$$\begin{aligned} \text{Value of a Growth Firm} = \\ \text{Present Value of Current Operations} + \\ \text{Value of Growth Opportunity} \end{aligned}$$

A firm that has a comparative advantage in a growing industry, whether because of market position, a dominant technology, or possession of a patent, has an opportunity to invest in new assets at a higher rate of return than normal. Therefore, the value of a growth opportunity is a function of 1) the abnormal rate of return, and 2) investment in new assets. As the opportunity to invest at the abnormal rate diminishes, due to a maturing market or increased competition, the value of a growth opportunity declines. The source of the firm's value shifts to the present value of current operations, which is a function of earnings (operational cash flows). Once the growth opportunity completely disappears, investments in new assets add value to a firm only if the investments have the ability to produce visible earnings.

The stock price of a firm that once had an opportunity to invest at an abnormal rate of return remains relatively high if the firm successfully converts the value of growth into steady earnings. Otherwise, the price falls.

## APPLICATION TO VALUATION OF INTERNET STOCKS

Jagle [1999] uses the investment opportunities approach to find that the value of growth opportunities amounts to 103% of total market capitalization for Internet firms. Exhibit 1 presents the Internet stock valuation process using the fundamental features of the investment opportunities approach.

### Opportunity for Abnormal Returns Exists

The high-tech nature of the Internet industry presents an opportunity for abnormal returns. The critical point is that only a few firms out of many will dominate the industry in the future. Firms that develop a superior technology have a higher probability of becoming industry leaders.

This is especially true if the new technology can be paired with current technology, and if the owner of the new technology becomes the dominant player (*see Exhibit 2*).

### Investors Buy (Start) the Firm

The information asymmetry between insiders and outsiders makes it impossible for an investor to determine which firm has the greatest probability to dominate the industry in the future. An investor has a better chance to realize the abnormal returns by actually managing the firm with the opportunity for abnormal returns. Therefore, the high-tech experts felt confident that they could

start a firm that could develop the superior technology to realize the financial rewards that follow.

In support of this idea, Schultz [2001] finds that managerial ownership in Internet firms is higher than in other firms. Owner-managers are generally optimistic about the future of their firms, and they are less likely to diversify personal portfolios than managers of other firms.

### Managers Invest Heavily in R&D and Marketing

The presence of an opportunity to invest capital at a higher rate of return than normal encourages investment in new assets. Managers of Internet firms, trying to gain a competitive advantage, invest heavily in research and development of new products, and aggressively market current products and research efforts to a growing market population.

### Volatility Increases due to Uncertainty

The uncertainty as to whether R&D efforts will produce a commercially profitable product is extremely high, with the volatile nature of high-tech industry. The intangible features of R&D and marketing investments only add to already high volatility.

### Value Increases due to Expectations

The increase in volatility due to R&D and marketing investments is translated into higher estimates of above-normal rates of return, positively affecting the value of

## EXHIBIT 1

### Internet Stock Pricing Mechanism

Opportunity for abnormal return exists →	Investors buy to manage the firm to realize abnormal returns →	Managers invest heavily in R&D and marketing →	Volatility increases due to uncertainty of investments ↓
Negative earnings value (investment opportunities approach) ∞	Excess investments cause negative profitability ←	Managers lack business savvy, overspending on R&D and marketing ←	Value increases due to expectations that current investments will pay off in the future ←

## EXHIBIT 2

### Factors in Valuing R&D Project Options

<b>Technology pairing</b>	A new technology can be paired with an existing technology to create value.
<b>Size of current and potential market</b>	The value of a technology option relates to the value added per unit and the number of units in the target market.
<b>Strength of linkages</b>	The links between technology pairings can be strong or weak.
<b>Polarization of linkages</b>	Determines whether the owner of the new technology or the owner of the current technology is dominant.

Source: Boer [1998].

the growth opportunity. In other words, firms that invest more in R&D and marketing in the present will be worth more in the future.

#### Managers Lack Business Savvy

Realizing the positive relationship between investments (volatility) and the future value of a firm, managers explore several projects at the same time, keeping the option to abandon some projects in the future and to continue with the development of other projects, depending on projected success. Supporters of "real option" pricing models argue that, even though certain projects at an initial stage of development have a negative net present value, the managerial option to invest in new projects (enter new markets) positively affects the value of a firm, providing that the final stage of product development will generate sufficient cash flows (Myers [1984]).

A firm with a portfolio of positive NPV projects may sustain losses from accepting an initially negative NPV project, and realize financial rewards later. But if the firm has a portfolio of initially negative NPV projects, like most of the Internet firms do, there is a great chance that a firm may not be able to sustain short-term losses. This is the fact that most Internet firm managers overlook.

Shama [2000] calls this a lack of vision, or lack of business savvy, while Schultz [2001] calls it overoptimism or overconfidence. Tokic [2001] finds that a sample of 20 Internet firms spends on average 75% of revenue on R&D and marketing. This overspending breaks the rules of traditional strategic planning and financial management.

#### Excess Investments Cause Negative Profitability

It is not surprising that Internet firms have negative profitability, given that managers invest on average 75% of revenue in R&D and marketing. They view profits as a distraction [Shama 2000] and treat R&D and marketing as investments rather than expenses [Schultz 2001].

#### Negative Earnings Diminish Value

As long as there is an opportunity for abnormal returns, a firm may have a relatively high value due to growth potential, even if earnings are negative or insignificant. As the opportunity for abnormal returns diminishes, however, the source of value shifts to earnings.

As the number of people on-line in the U.S. grew to represent over 50% of the population, it appears that the industry leaders (at least) should have produced steady earnings in an already mature market. With overspending, Internet firms had a serious problem with negative earnings. And with slower growth prospects, the prospect of future earnings is extremely unpredictable and weak. This caused the recent fall of Internet stock prices.

#### WHAT WENT WRONG?

According to the investment opportunities approach, Internet company managers did not have the business skills to take advantage of the opportunity of abnormal returns. Financial analysts also contributed to the irrational exu-

berance, by valuing Internet stocks according to real-option fundamentals, ignoring the absence of earnings.

### Managerial Lack of Business Savvy

Internet firms spent on average 75% of revenues on R&D and marketing in fiscal 1999-2000 (Tokic [2001]). As a result, earnings remained negative during the critical period when the source of firms' value was shifting from growth to earnings. This suggests that managers lacked strategic planning skills and financial discipline.

The survival probability of a firm managed by a young business-inexperienced Internet executive is very low. Many Internet firms have been delisted on Nasdaq, and several have already filed for bankruptcy.

### Financial Analysts' Projections

It is not simply managers who are solely responsible for the drop in Internet valuations. Financial analysts must share the blame—they fell for optimism and suggestions that excess investments would eventually result in earnings. They ignored the negative earnings, valuing Internet shares at extreme multiples, justified by the (real) options pricing model. It was convenient to misuse a method that accepts negative NPV projects with the possibility that values will rebound in a subsequent stage of development.

While Black-Scholes [1973] models may be applicable in valuation of capital budgeting projects and financial options (calls), options pricing theory-based models are misleading in the valuation of Internet stocks. Growth firms must have visible earnings in addition to growth opportunities. This is the fundamental feature of the investment opportunity approach that managers, analysts, and individual investors overlook.

## IMPLICATIONS

The investment opportunities approach provides a theoretical explanation for the sharp decline in Internet stock prices. Initially, the opportunity for abnormal returns inflated valuation multiples to traditionally high levels. Then, however, firms overinvested in R&D and marketing, treating profits as a distraction.

The lack of earnings, as well as earnings visibility, diminished value when the industry entered a more mature growth stage. Investors realized that Internet firms were not able to convert an opportunity for abnormal

returns into steady earnings, questioning the business savvy of managers. Investors must value Internet firms according to their ability to produce steady earnings, in addition to strategically aggressive investments in growth.

Managers of Internet firms therefore face a difficult task. It will take a highly experienced and professionally diverse management team to transform just another recent Internet IPO into a future industry leader.

The financial literature has focused on the present value of cash flows to examine topics such as cash flow drivers, discount rates, the efficient markets hypothesis, and agency theory. The emergence of Internet firms opens the way to study the value of growth opportunities.

Future research should compare options pricing models with the value of growth opportunities component of the investment opportunities approach. Clearly there is a potential to combine these models into a more advanced valuation method for Internet stocks.

## APPENDIX

### Investment Opportunities Approach

Equation (A-1) illustrates the investment opportunities approach:

$$V(t,0) = \frac{X(0)}{\rho} + \sum_{t=0}^{\infty} I(t) \left[ \frac{\rho^*(t) - \rho}{\rho} \right] (1 + \rho)^{-t} \quad (\text{A-1})$$

where

- $X(0)$  = the earnings from assets-in-place;
- $\rho$  = a normal rate of return;
- $I$  = investments in new assets at time  $t$ ; and
- $\rho^*$  = a rate higher than normal.

The first expression resembles traditional discounted cash flow (DCF) models. The "normal" rate of return discounts forecasted earnings from assets-in-place to the present value. As this rate increases, the present value declines, resulting in Equation (A-2), the negative risk-value relationship fundamental to all DCF models:

$$V(\text{Current Operations}) \downarrow = \frac{\text{Earnings}}{\rho \uparrow} \quad (\text{A-2})$$

The second expression represents the value of growth opportunities. Expecting returns higher than normal, the owner invests in new real assets ( $I(t) \uparrow$ ). Increased investments induce high uncertainty regarding the commercial success of these

investments. The uncertainty translates into an increase in volatility ( $\rho^* \uparrow$ ), a measure of risk associated with the opportunity for abnormal returns.

As illustrated in Equation (A-3), the increase in investments and the underlying uncertainty positively affect the value of the growth component ( $V \uparrow$ ) in the investment opportunities approach. It is important to note the positive volatility-value relationship, a feature fundamental to options pricing models (Black and Scholes [1973]), the opposite of the traditional DCF predictions.

$$V(\text{Growth}) \uparrow = I(t) \uparrow \left[ \frac{\rho^*(t) \uparrow - \rho}{\rho} \right] (1 + \rho)^{-t(t)} \quad (\text{A-3})$$

Traditional DCF models assume that there is no opportunity to consistently produce above-normal returns. ( $\rho^* = \rho$ ). The semistrong version of the efficient markets hypothesis supports this assumption, saying that it is impossible to produce abnormal returns based on all publicly available information, including historical price behavior. Many argue that traditional DCF models undervalue Internet stocks because they ignore the value of growth opportunities, in the absence of significant earnings.

The growth component of the investment opportunities approach is similar to the real-options pricing method in several ways. First, it assumes a positive value-volatility relationship. Second, it recognizes the importance of managerial project selection in investments in new assets. Some argue that the real-options pricing model is applicable to the valuation of Internet stocks because of these assumptions (Boers [1998], Jagle [1999]). In fact, it tends to overvalue Internet stocks because it ignores the negative effect of losses on the value of earnings.

The investment opportunities approach is a balanced valuation model that considers both the value of growth and the value of earnings.

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