University of Rochester

William E. Simon Graduate School of Business Administration

September, 2000

A Rude Awakening: Internet Shakeout in 2000

Elizabeth Demers
William E. Simon Graduate School of Business, University of Rochester

Baruch Lev
New York University

A Rude Awakening:
Internet Shakeout in 2000

Elizabeth Demers[*] and Baruch Lev[**]

September 2000

Abstract

This study explores the major value-drivers of business-to-consumer ("B2C") Internet companies' share prices both before and after the "bursting of the Internet bubble" in the spring of 2000. Although many market observers had predicted that the bubble would eventually burst (e.g., Perkins and Perkins 1999), the ultimate and previously unanswered challenge lay identifying which stocks would fall and which ones would survive the shakeout. We develop an empirical valuation model and provide evidence that the Internet stocks that this model suggests were relatively over-valued prior to the Internet stock market correction experienced relatively larger drops in their price-to-sales ratios when the bubble burst. This result is robust to the inclusion of competing explanatory variables suggested by the economics literature related to industry rationalizations.

We also investigate a number of additional issues related to the rapidly changing Internet world. First, we provide descriptive evidence of the correlation between monthly stock returns and contemporaneous and lagged Nielsen/Netratings web traffic metrics (both levels and changes). We then undertake a factor analysis on the set of Nielsen/Netratings raw web metrics with a view to synthesizing the data into a parsimonious set of orthogonal web performance measures. Our factor analysis results in the extraction of three factors that capture the most relevant dimensions of website performance: (1) reach, (2) "stickiness", and (3) customer loyalty. Our findings suggest that all three web performance measures are value-relevant to the share prices of Internet companies in each of 1999 and 2000. Our findings of significance for the year 2000 contradict the recent claims of some analysts that web traffic measures are no longer important. We also explore the valuation role of our proxy for B2C companies' ability to sustain their current rate of "cash burn" and find that this proxy is a significant value-driver in each of 1999 and 2000. Finally, our results suggest that investors adopted a more skeptical attitude towards expenditures on intangible investments as the Internet sector began to mature. Consistent with the results of prior studies in other knowledge asset based industries, we find that investors appear to implicitly capitalize product development (R&D) and advertising expenses (customer acquisition costs) during the "bubble" period when the market was more optimistic about the prospects of B2C companies. However, neither marketing expenses nor product development costs are implicitly capitalized into value, on average, subsequent to the shakeout in the spring of 2000. Overall, our study provides a preliminary view of the shakeout and maturation of one of the most important New Economy industries to emerge to date – the Internet.

A Rude Awakening: Internet Shakeout in 2000

1. Introduction

The market capitalization of U.S. publicly traded Internet stocks plummeted in value by approximately 45% from February to May 2000, as measured by the ISDEX, an authoritative and widely cited Internet stock index.[1] Although the Internet sector was badly mauled from this "bursting of the bubble," it remains a very significant component of the U.S. economy. The market capitalization of U.S. publicly traded Internet stocks was estimated to be $1.3 trillion dollars prior to the shakeout (*Barron's Online*, March 20, 2000) and $843 billion as of June 2000 (Morgan Stanley Dean Witter, June 2000).

Many market observers had predicted that the "Internet Bubble" would eventually burst (most famously, Perkins and Perkins 1999). However, the ultimate and previously unanswered challenge lay in identifying which stocks would fall and which ones would survive the shakeout. We develop an empirical valuation model and provide evidence that the Internet stocks that this model suggests were relatively over-valued prior to the Internet stock market correction experienced relatively larger drops in their price-to-sales ratios when the bubble burst. This result is robust to the inclusion of competing explanatory variables suggested by prior research in the economics literature related to industry shakeouts.

We also examine a number of additional issues and questions raised in the fast-changing Internet world. We begin our analysis with an examination of the simple pairwise correlations between monthly stock returns and contemporaneous and lagged raw web traffic metrics (both levels and changes) for each of 1999 and 2000. The correlations provide us with descriptive evidence related to the market's speed of adjustment to these widely cited non-financial performance measures. This investigation is timely and

---

[1] The ISDEX (http://www.wsrn.com/apps/ISDEX/) fell from a high of approximately 1100 in February 2000 to a low of about 600 in May of 2000.

important because the relation between stock returns and raw web traffic measures such as "reach"[2] has recently come under considerable scrutiny and criticism.[3]

Our study proceeds with an investigation into the value-drivers of publicly traded business-to-consumer ("B2C") Internet stocks in each of 1999 and 2000. Given the changing marketplace, the continued absence of positive profits for many companies in this sector, and the increasing skepticism of investors about the prospects of Internet companies, the search for the fundamental value drivers of these companies is of paramount importance to investors and managers. Several recent studies (e.g., Trueman, Wong, and Zhang 1999 ("TWZ"), Hand 2000(B), and Rajgopal, Kotha, and Venkatachalam 2000 ("RKV")) have documented a positive relation during the "bubble" period between Internet companies' market values and various combinations of financial statement variables and web traffic measures, particularly those indicating "reach".

Our study builds upon and extends the previously cited Internet studies in several ways. First, we undertake a factor analysis on an extensive set of raw web metrics with a view to synthesizing the data into a parsimonious set of relevant and orthogonal web traffic performance measures. Our factor analysis results in the extraction of three factors that capture the most relevant dimensions of website performance: (1) reach, (2) "stickiness," and (3) customer loyalty. Our "reach" factor encompasses the extent to which the Internet company is able to attract unique visitors. Website "stickiness" captures the notion of how long visitors stay at the site once they're there, and is driven primarily by web traffic metrics measuring the average time spent at the site per visit and the average number of pages viewed per visit. "Customer loyalty" is a third distinct measure of web company performance, and this factor is driven primarily by the average number of visits to the site per unique visitor per period. Our findings suggest that all three web performance measures are value-relevant to the share prices of Internet companies in each of 1999 and 2000. Our findings of significance for the year 2000 contradict the recent claims of some analysts that web traffic measures are no longer important.

---

[2] Reach is defined as the number of unique visitors to a web site, and is usually stated as a percentage of the (total or active) web surfing population.

[3] See, for example, "Lyin' Eyeballs" by Scott Wooley (<u>Forbes</u>, August 7, 2000).

We further extend the prior literature by examining the valuation role of our proxy for Internet companies' ability to sustain their current rate of "cash burn." Recent industry reports suggest that many money-losing Internet companies are quickly depleting their stores of cash and that the pending liquidity crises are threatening the very viability of these companies as going concerns (see, e.g., *Barron's Online*, March 20, 2000). The spring of 2000 carnage in the market for Internet stocks is alleged to have been driven, in part, by investors' concerns about Internet companies' cash flow deficits (Nelson 2000). We find that our proxy for the firms' ability to sustain their current rate of "cash burn" is significantly associated with the price-to-sales ratios of the Internet companies in our B2C sample in each of 1999 and 2000.

We also examine the valuation role of a meaningfully expanded set of financial statement variables relative to those that were considered in prior studies and provide some evidence on the importance of strategic alliances in explaining the value of Internet stocks. Our findings suggest that the market treats expenditures on marketing expenses and product development costs as assets rather than current expenses in assessing B2C companies' price-to-sales ratios, but only during the period prior to the bursting of the bubble. We also find that alliances with AOL are positively valued in 1999, but are not significant determinants of price-to-sales in 2000. Consistent with some industry observers' criticisms of internet companies' over-investments in expensive alliances, we find that the total number of strategic alliances entered into is negatively associated with B2C companies' price-to-sales ratios in each of 1999 and 2000.

We thus focus in this study on the dramatic <u>changes</u> in investors' perceptions about the prospects of B2C Internet companies that have taken place during the first half of 2000, and in particular on the March-April 2000 fallout. Of course, this is not the end of the story, as the Internet sector continues to mature and evolve. However, we believe that it is important to carefully follow the evolutionary process in order to learn whatever we can about the emergence, growth, shakeout, and eventual stabilization of one of the most important New Economy industries to materialize to date – the Internet.

The balance of this paper is organized as follows. Section 2 provides a brief background related to the economics of the Internet industry, and Section 3 develops the hypotheses to be tested. Section 4 discusses the collection of our sample and provides a description of the data and companies included in our study. Section 5 describes the pairwise correlations between monthly stock market returns and measures of web traffic, while Section 6 presents the results of our investigation into the value drivers of B2C Internet stocks in each of 1999 and 2000. An empirical analysis of the Internet "shakeout" is presented in Section 7, and Section 8 concludes with a summary of our findings and a discussion of future work.

2. Background to the Internet Industry

There are currently over 400 Internet companies trading on U.S. stock exchanges[4], with many more about to go public.[5] The total market value of these companies is over $1 trillion dollars (*Barron's Online*, March 20, 2000 and, on an ongoing basis, by inference from the ISDEX Internet stock index at http://www.wsrn.com/apps/ISDEX/). Since its inception in 1994, the Internet sector has evolved from a nascent stage industry to become the third-largest technology sector by market value. By 1999 the market wealth creation by the Internet, on an equivalent basis, exceeded that created by the PC (Perkins and Perkins 1999). Indeed, the 5-year old Internet sector is the second leading technology sector in terms of wealth creation, falling only slightly behind the more mature software industry (Morgan Stanley Dean Witter, 2000).

Similar to most high-tech start-up businesses, Internet companies generally require significant up-front capital investments in order to establish both the technological architecture and the critical mass of customers that will be necessary to ultimately attain

---

[4] The InternetStockList™ (http://www.internetnews.com/stocks/list/) provides a listing of over 280 companies that went public prior to approximately the fourth quarter of 1999. IPO-Alert (www.ipo-alert.com) together with the IPODEX (http://www.internetnews.com/stocks/ipodex/) reference an additional set of over 150 Internet companies that have gone public since the autumn of 1999.
[5] See http://www.internetnews.com/stocks/ipo/ for a list of over 100 additional companies that are "on deck" (i.e., about to go public).

profitability.[6] Accordingly, most Internet companies report large expenditures on product development (sometimes referred to as R&D) and sales/marketing expenses as they attempt to grow themselves into profitability. It has been widely (and accurately) reported in the popular press that most Internet companies are still not profitable. In the absence of an established history of profit-generating ability, the "top line" (i.e., revenues) has become an important focal point in the financial analysis of companies in this sector. Most Internet analysts (including venture capitalists and others who are interested in the performance evaluation of web companies) have also come to rely upon non-financial measures of web traffic activity as indicators of the current performance and future cash generating ability of these intangible asset based firms.

Following the classification scheme provided by Wall Street Research Net © WSRN.com (http://www.wsrn.com/apps/internetstocks/), the Internet industry can be divided into the following sectors: e-tail, content/communities, financial news/services, portal, services, consultants/designers, e-commerce enablers, Internet security, isp/access, performance software, advertising, and speed/bandwidth. Of these sectors, only the first five are considered to have business models for which web traffic plays an important economic role. Entities in the e-tail, content/communities, financial news/services, portal, and services sectors are business-to-consumer (or "B2C") companies that are expected to earn revenues either directly or indirectly by attracting web traffic to their sites.

3. Hypotheses Development

3.1 The Value-Relevance of Non-Financial Information

We investigate whether two types of non-financial data, web traffic measures and strategic alliances, are value-relevant for the share prices of Internet stocks.

---

[6] The Internet may be viewed as an extreme example of Metcalfe's Law. Robert Metcalfe, inventor of the Ethernet and founder of 3Com, established the "law" which states that the value of any network increases by the square of the number of people using it (Perkins and Perkins 1999).

3.1.1   Web Metrics

Web traffic measures have become standard Internet company performance benchmarks that are now commonly reported in the business press, voluntarily disclosed by companies at the time of their earnings announcements, and frequently mentioned as valuation parameters in analysts' reports. Prior Internet studies (TWZ, RKV, and Hand 2000(B)) have provided evidence on the value-relevance of raw web metrics (particularly, reach or unique audience) for Internet stocks prior to the "bursting of the bubble."

We expand upon this prior web metric research by investigating several additional hypotheses. First, given the plethora of web traffic metrics that are available to us from the Nielson/Netratings database, we select a parsimonious set of three orthogonal web traffic factors through the use of factor analysis and investigate the separate valuation role of these three different dimensions of web traffic performance.[7]   Second, we examine the value-relevance of these three web performance factors both before and after the Internet market "correction" in March-April of 2000. This question is pertinent because some Wall Street practitioners are beginning to suggest that web traffic metrics are no longer important.[8]

Three key dimensions of traffic generating performance are: the attraction of new visitors (or "eyeballs") to a website; the retention of visitors at the site, conditional on having gotten them to the site for a visit; and the ability to generate repeat visits from surfers who have been attracted to the site in the past. These three dimensions of web traffic performance are commonly referred to as "reach", "stickiness", and "customer loyalty", respectively.

---

[7] This initial selection of factors is of importance beyond our subsequent valuation analyses. A reading of Internet analysts' valuation reports suggests that they treat the various raw web traffic metrics as orthogonal performance measures, and that they are seemingly unaware of the potentially confounding influence of the correlations between the raw metrics.

[8] For example, in their discussion of Internet stock valuation models, UBS Warburg's Global Equity Research group stated in May 2000 that "(They) … favour cash flow and EBIT but are disenchanted with the commonly used hits – eyeballs and page-views – as statistical measures of future value creation" (UBS Warburg).

Reach:

Reach is generally defined as the number of unique individuals who visit a site, stated as a percentage of the (active or total) websurfing population. Reach is the web metric that is most frequently cited in the business press and has been studied by prior researchers (e.g., Trueman, Wong, and Zhang 1999 ("TWZ"), Hand 2000(B), and Rajgopal, Kotha, and Venkatachalam 2000 ("RKV")). As a performance measure, reach provides an indication of the scale of the web property's visitor base, which is a measure of how successful the company has been at attracting web surfers to their site. Given the importance of scale in the B2C sector, our proxy for reach is expected to be positively associated with the value of B2C Internet companies.

Stickiness:

Website "stickiness" generally refers to a site's ability to retain a surfer at their site once a customer has arrived there. Web site "stickiness" is a desirable quality because a "sticky" site may be able to generate higher advertising rates from advertisers who believe that visitors are more likely to spend sufficient time at the site to read, retain, and/or otherwise be influenced by the ads that are placed there.

Customer Loyalty:

Customer loyalty generally refers to a website's ability to generate repeat visits from surfers who have previously visited their site. This metric is relevant because a website's ability to re-attract current visitors is expected to be an important determinant of its ability to sustain, and/or ultimately grow to, the critical mass of traffic that is necessary to attain profitability.[9]

Both stickiness and customer loyalty reflect important dimensions of the site's brand value and are expected to be positively associated with the market values of Internet stocks.

---

[9] For example, in a discussion of Amazon's reported first-quarter results from operations, Motley Fool™ analyst, David Gardner, claims (after mentioning that sales rose 95% from the prior year's comparative quarter) that: "The most important metric (for me) remains *orders from repeat customers*, and these represented 76% of all orders in the period" (Gardner 2000, emphasis Gardner's).

3.1.2   Strategic Alliances

Strategic business alliances, aimed at sharing technology and other core competencies (e.g., marketing and/or existing customer base), are becoming increasingly common in the Internet sector. Analysts' reports and anecdotal evidence suggest that such strategic alliances are potentially important value drivers for Internet stocks.[10]   RKV have previously examined the role of alliances as possible determinants of reach. We extend their work by investigating more directly the role of alliances as potential value drivers for Internet stocks.

We also examine whether strategic alliances remain positively valued by the market in 2000. This investigation is prompted by post-bubble reports in the business press that the previously hyped strategic alliances have generally not lived up to expectations.[11]

3.2   The Value-Relevance of Financial Information

The "common wisdom", as represented in the business press, is that, with the exception of revenues, traditional financial statement information is not relevant for the valuation of Internet stock prices. Hand (2000A) was the first to document that financial statement data are significantly associated with the market values of publicly-traded Internet companies. However, Hand's (2000A) valuation regressions do not include the often-cited web traffic metrics as explanatory variables (or "value-drivers"), and hence his findings are potentially subject to a correlated omitted variables bias. TWZ, Hand 2000(B), and RKV all investigate the value-relevance of various subsets of financial

---

[10] For example, although the Internet Stock Index dropped 3.26% on October 12th, 1999, the share prices of several companies that announced alliances significantly increased in value: Stamps.com leaped 2 ½ to 35 after reaching a deal with IBM Corp. to put its postage software on IBM's Aptivas; E.piphany Inc. soared 10 11/16 to 62 11/16 as they sealed a deal with Amazon.com; and Phone.com gained an additional 9 13/16 to 214 13/16 as its shares continued to benefit from the prior day's announced deal with Ireland's Apion Ltd. (The Internet Stock Report, http://www.internetstockreport.com/close/article/0,1785,216901,00.html).

[11] For example, The Industry Standard reported in May 2000 that "as recently as six months ago, many e-commerce companies saw prominent portal alliances as a sign that they had arrived – a guarantee of traffic, sales and eventual success. But now many say the partnerships have been disappointing, and they are re-evaluating their use of marketing dollars" (http://www.thestandard.com/article/display/0,1151,14412,00.html).

statement data, conditional upon the inclusion of a web metric for "reach" in the valuation regressions. The results from these prior studies *vis a vis* the value-relevance of particular financial statement variables are somewhat mixed.

In the early euphoric days of the Internet bubble, aggressive spending by B2C companies on acquiring customers and on developing the technological architecture and product offerings necessary to "grow to a profitable scale" were heralded by analysts and market commentators.[12] Accordingly, and following the prior literature related to start-up industries (e.g., Amir and Lev (1996)) and R&D-intensive firms (e.g., Lev and Sougiannis (1996)), we examine the value relevance of two categories of Internet companies' expenditures related to the acquisition of intangible assets: marketing expenses; and product development and R&D expenses. We hypothesize that both of these variables will be positively valued by the market in their determination of B2C stock prices during the pre-crash "bubble" period.

3.3   Investigating the Role of "Cash Burn"

The new millennium coincided with a dramatic reassessment by investors of the viability and prospects of Internet companies. As early as January 2000, influential sources such as Barron's and Forrester Research predicted that the availability of cash would determine the fate of many Internet companies. Accordingly, we extend our investigation of the value-drivers of Internet companies to examine the value-relevance of a proxy for the companies' ability to sustain their current level of "cash burn." We predict that companies with high rates of cash burn relative to their current stores of cash will be less highly valued and more susceptible to a shakeout.

---

[12] For example, the Director of Research for on-line investment bank Wit Capital suggests that the "operating model (of Internet companies) derives from the notion that the most capital-intensive part of many Internet businesses are sales and marketing-related expenses such as customer acquisition costs. It is significant that those expenses tend to decline sharply as a percentage of revenues after reaching critical mass or market leadership positions. We believe strongly that Internet companies that achieve market leadership should generate proportionately lower variable costs over their operating lifetimes, and should therefore produce consistently stronger operating margins compared with those companies that do not enjoy the benefit of market leadership" (Cohen 1999).

3.4   Predicting the Shakeout

The 45% drop in the ISDEX Internet stock index in the spring of 2000 was not entirely unanticipated. Many market observers had predicted that the "bubble" would eventually burst (e.g., Perkins and Perkins 1999), and e-tail companies were identified as being particularly susceptible to fallout. Of course, the ultimate and still largely unanswered challenge lay in identifying which stocks would fall and which ones would survive the shakeout.

The extant industrial economics literature identifies several variables that are commonly associated with firm failure during periods of an industry shakeout, including failure to keep up with technological innovation, firm age, and firm size (Klepper and Simons, 2000). In the short time since the inception of the Internet industry, there has not yet been a significant identifiable technological innovation that would catapult some companies to success and others to failure. Accordingly, we investigate the role of firm age, firm size, cash burn, and e-tail sector membership as possible determinants of shakeout. A contribution to the industry shakeout literature is our test of whether B2C companies that were "over valued" on a relative basis (defined as having a positive residual in a price-to-sales valuation regression) would experience relatively larger drops in their price-to-sales ratios when the bubble burst.

4. Sample Selection and Data Description

4.1   Sample

The population of publicly-traded Internet companies was identified from a comprehensive list, the InternetStockList™, provided by Internet.com (http://www.internetnews.com/stocks/list/). The publicly traded Internet companies were then separated into industry segments based upon the classification scheme provided by Wall Street Research Net © WSRN.com (http://www1.wsrn.com/icom_index/index.xpl).

Because we are interested in the association between web traffic metrics and market values (prices and returns), we limit our sample of Internet companies to those for which we expect web traffic measures to be economically important. Specifically, Internet companies were included in the initial sample if they fell into the following business-to-consumer ("B2C") sectors: e-tail, content/communities, financial news/services, portal, and services. Due to data constraints, Internet companies were also excluded from the sample if their initial public offering took place after August 31, 1999. The results reported in this paper are based upon 84 publicly traded Internet companies for which stock market prices, financial statement data, and web traffic measures were available for at least one quarter within 1999 or the first half of 2000. A list of the sample companies is provided in Table 1.

4.2   Data Description

The daily stock prices and market values of the firms included in our sample were obtained from the Datastream database. Financial statement data for companies included in the valuation regressions were hand-collected from corporate quarterly financial statements filed with the SEC. Information related to strategic alliances was derived from the Securities Data Corp. ("SDC") database.

Web traffic measures were obtained from the Nielsen/Netratings "Audience Measurement" database. Nielsen/Netratings, together with MediaMetrix and PC Data, are the leading providers of commercial web traffic databases. Nine web traffic measures are included in the Nielsen/Netratings database: <u>unique audience</u> (the number of unique web surfers who have viewed the site during the month), <u>active reach</u> (the percentage of active web surfers who viewed the site during the month), <u>universal reach</u> (the estimated percentage of the universe of web surfers who have viewed the site during the month), <u>rank by unique audience</u> for the month, the <u>total number of pages viewed</u> by web surfers during the month, the <u>number of visits to the site per unique visitor</u> during the month, the <u>average time spent at the site</u> per person, and the <u>percentage of pages that were viewed from browser cache</u> during the month.

The Nielsen/Netratings data is available on a monthly basis beginning with the month of February 1999. The database includes audience measures for all web properties that meet the "statistical cutoff" for that particular month.[13] Some sample companies may not make the cutoff for the Nielsen/Netratings listings in any particular month, but are otherwise included in the database for earlier and/or later months. In such instances, based upon the Nielsen/Netratings criteria for inclusion, we assign a value of zero to the web metrics for those firm-month observations.

4.3   Descriptive Statistics

A listing of the Internet companies included in our initial sample, together with their market values at December 31, 1999, February 28, 2000, and May 31, 2000, respectively, is provided in Table 1. As reported in the table, the total market value of this subset of the population of publicly traded Internet companies was over $400 billion at December 31, 1999 and February 28, 2000, but was slightly less than $300 billion as of May 31, 2000.

Further descriptive statistics for the sample are provided in Table 2. As reflected in that table, the market capitalization of the mean (median) Internet company quarter in our sample is $5,559 ($619) million and $3,823 ($246) as at December 31, 1999 and May 31, 2000, respectively. As evidenced by both the market value listings in Table 1 and the descriptive statistics provided in Table 2, the distribution of the market values of the companies included in the sample is significantly skewed. Table 2 also reports the descriptive statistics for the sample excluding AOL and Yahoo!. The mean (median) market values for the balance of the sample are $2,067 ($599) million and $1,513 ($219) million, at December 31, 1999 and May 31, 2000, respectively.

---

[13] According to Nielsen/Netratings, a web property meets the cutoff in any given month if a sufficient number of Nielsen/Netratings' approximately 50,000 panel members visit the site such that extrapolation to the population of web surfers as a whole can be reliably performed.

5. The Correlation Between Monthly Stock Returns and Web Traffic Metrics

Prior to undertaking a full valuation analysis involving quarterly financial and non-financial data, we examine in this section the association between monthly stock returns and a broad set of web metrics. In particular, we examine the speed and direction of investors' reaction to web traffic performance data. This is an important issue, given the extensive use of traffic measures by investors and financial analysts.

5.1   Contemporaneous Correlations

The Nielsen/Netratings database upon which we rely releases web traffic measures on a weekly basis during any given month, and then reports the consolidated monthly totals several weeks subsequent to the end of the month. It is therefore plausible that the market may impound the information contained in monthly levels and/or changes in web metrics within the month of their occurrence (i.e., contemporaneously).

Table 3A reports the Spearman rank correlations between monthly stock returns and the contemporaneous *levels* of web metrics for 1999 and 2000, respectively.[14] As reflected in the table, Internet companies' monthly stock returns are positively correlated with contemporaneous measures of reach, unique audience, total pageviews, and visits per person in 1999. The significance of these correlations provides preliminary evidence that, consistent with analysts' reports, anecdotal discussions in the business press, and prior research (TWZ, RKV, and Hand (2000b)), web companies that had attained a "critical mass" of customers and/or web traffic in 1999 were those that investors expected to profit most in the networked economy. As reflected in the second panel of Table 3A, the reach, unique audience, and total page view web metrics remained positively correlated with monthly stock returns in the first 5 months of the year 2000, but less significantly so than in 1999.

---

[14] The 1999 correlations include the months of February (the inception of the database) through to December. The year 2000 correlations include the months of January through May for this current draft of the paper.

In order to provide some descriptive evidence regarding the speed with which changes in web metrics appear to be impounded into stock price, we examine the pairwise correlations between monthly stock returns and *changes* in various measures of web traffic activity. The Spearman rank correlations provided in Table 3B suggest that the contemporaneous changes in total page views and in visits per person are both significantly correlated with the monthly percentage changes in Internet stock prices in each of 1999 and 2000. In 2000, the change in the average time spent per person per visit is also positively correlated with contemporaneous stock returns. Overall, it appears as though investors react rather promptly to web traffic data.

5.2   One-month Lag Correlations

Although the Nielsen/Netratings service releases web traffic measures on a weekly basis during any given month, other web rating agencies upon which market participants may rely may not produce such frequent and timely information. Either because of delayed reporting or delayed market reaction, the stock market may not impound the web traffic information in a manner that is consistent with strong form market efficiency.[15]

Accordingly, we investigate the correlations between Internet companies' monthly stock returns and the one-month lag in levels and percentage changes in web traffic metrics. As shown in the top panel of Table 3C, the correlations between the current returns and the one-month lag in *levels* of reach, unique audience, total page views, and visits per person are all significant in 1999. From the bottom panel of Table 3C, it is evident that none of the web metric levels are significantly correlated with monthly stock returns in 2000. The results are consistent with market participants having increased the speed with which they impound web traffic levels into price in the year 2000 relative to 1999. This,

---

[15] When interpreting the behavior of Internet stocks, it is important to recognize that a significant percentage of the public floats of these companies are held by individual investors (including "day traders"). Subscriptions to commercial web metric databases cost approximately $50,000 per year, so it seems reasonable to assume that individual investors are unlikely to have access to the web metric data in a timely fashion. Nevertheless, the web metric data does become disseminated through various other channels (e.g., MediaMetrix provides a free listing of the "Top 50" properties visited on their homepage, articles and corporate news releases carried in the popular press will often report the most recent web traffic statistics for the company being reported on, and web investing "chat rooms" are replete with information related to web companies' traffic performance).

in turn, could be interpreted as an increase in market efficiency with respect to the web traffic metrics.

Table 3D presents the correlations between monthly stock returns and one-month lag *changes* in web metrics. The results reflect that none of the lagged changes in web metrics are significantly correlated with monthly stock returns in either 1999 or 2000.

In summary, we find that both contemporaneous *levels* and *changes* in various web traffic metrics are significantly correlated with monthly stock returns in each of 1999 and 2000, but the significance levels decrease in the later time period. More strikingly, the one-month lag in web traffic levels is significantly correlated with monthly stock returns in 1999, but the significance disappears in 2000. Thus, while investors generally appear to react promptly to the release of traffic measures, the results suggest that there may have been some delayed reaction by the market in the earlier stages of the internet economy.

6. The Valuation Role of Financial and Non-Financial Information

6.1   The Results of Factor Analysis on The Web Traffic Measures

Table 4 presents the results of a common factor analysis on the quarterly web traffic metrics derived from the Nielsen/Netratings database for the firms included in our sample.[16],[17] Panel A shows the standardized regression coefficients associated with each factor, while Panel B presents the rotated factor pattern matrix resulting from the factor analysis.[18] We have labeled each of the estimated factors according to the underlying web traffic performance construct that we interpret the factor to represent. As shown in the table, the first factor is labeled "REACH" because it loads heavily on the unique audience, total page views, and active reach raw web metrics. The second factor loads

---

[16] The Nielsen/Netratings database provides monthly web traffic metrics. We compile quarterly metrics by averaging the three monthly metrics for the months included in each company's corresponding fiscal quarter.

[17] Our factor analysis results are obtained by setting the prior communality estimates to the squared multiple correlations of each included web metric variable with all other included web metric variables.

[18] The rotated factor pattern matrix is presented because it is more intuitively interpretable. The estimates are based upon the use of the varimax orthogonal factor rotation method.

most heavily on the original web metrics for the time spent per person per visit to the site and the average number of pages viewed per person per visit, and therefore corresponds to the underlying web traffic performance construct of "stickiness". The third factor loads on the web metric for the average number of visits to the site per person per quarter, and accordingly appears to capture the notion of "customer loyalty".

Using the scores for each of the preceding factors, we construct variables labeled "REACH", "STICKINESS", and "LOYALTY", which we use as explanatory variables for Internet company price-to-sales ratios in our subsequent regression analyses.[19]

6.2   Valuation Results

In Tables 5 and 6 we report the estimates from regressions of Internet companies' price-to-sales ("P/S") ratios on a number of financial statement variables and our parsimonious set of web traffic performance measures for the years 1999 and 2000, respectively.[20,21] Financial statement data for the second quarter of the year 2000 are not currently available at the time of this writing. In order to produce two quarters of data for the year 2000, and to reflect the delayed release of financial statement data to the market, we compute the following price to sales ratios: the market value of the firm's common equity as at February 28, 2000 divided by the firm's total revenues for the quarter ended December 31, 1999; and the market values at May 31, 2000 divided by total revenues reported for the quarter ended March 31, 2000. We refer to these two sets of observations as quarter one and quarter two of the year 2000, respectively.

In a slight deviation from prior research in the Internet industry, we choose the price-to-sales ratio rather than market-to-book as our dependent variable in the valuation

---

[19] The "visits per person" raw web metric was not available in the Neilson/Netratings database prior to August 1999. Accordingly, we estimate the factors for all quarters for which the full data is available, and then "back-fill" the first few quarters of 1999 using the firm-specific fitted factors from the first available quarter.

[20] Unless otherwise noted, all of the financial statement explanatory variables included in the regressions reported in this study are scaled by total revenues.

[21] All of the regression results reported in the paper are for the full sample of available firms for each period, excluding observations that were considered to have undue influence on the determination of the coefficients. Observations were excluded if the absolute value of the standardized residual was greater than three and/or if the value of the Cook's distance was greater than one.

regressions. We make this research design choice for several reasons. First, price-to-sales is the financial metric that is most commonly referred to by analysts and the business press in their evaluations and discussions of Internet companies. In this sector, price-to-sales takes on the role that the price-to-earnings ratio has traditionally held in the valuation of going concern entities because most Internet companies are not yet profitable (and therefore P/E cannot be sensibly applied). A similar argument applies to the book value of equity in this sector. Book values are depressed because Internet companies have few tangible assets and their massive expenditures on the all-important intangible assets are generally expensed rather than capitalized. The market-to-book ratio therefore does not have the same economic interpretation and intuitive appeal as it does in the cross-section of more established and profitable firms. Furthermore, from a statistical perspective, the market-to-book ratios tend to "blow up" because of this small denominator problem.

6.2.1   The Relevance of Web Traffic Factors

As shown in Table 5, the REACH and STICKINESS web performance factors are significantly positively associated with the P/S ratios in both 1999 and 2000, although LOYALTY is not significant in either year.[22] The finding of significance for our REACH factor is consistent with the results of prior studies that have examined the value-relevance of raw web metrics such as reach or unique visitors (TWZ, RVK, and Hand (2000b), but is inconsistent with Hand's (2000b) finding that total page views is not a significant valuation variable. Our finding of significance for the STICKINESS factor is unique to this study, and is inconsistent with Hand's (2000b) finding of insignificance for a raw measure of the time spent at a company's websites. For several reasons, a direct comparison between our results and those of Hand (2000b) is not possible. First, Hand (2000b) utilizes a log-linear valuation model, while we use a more conventional linear OLS specification. Second, we examine the value-relevance of an orthogonal set of fitted web factors, while Hand (2000b) includes the original raw web metrics as

---

[22] LOYALTY becomes relevant in a more extended version of the valuation model discussed in Section 6.4 below.

dependent variables.[23]   Finally, our sample is comprised of firms from only those B2C subsectors for which we expect web metrics to be relevant, while Hand (2000b) explores other economic issues and therefore includes virtually the entire population of publicly-traded Internet stocks in his study.

Our finding of statistically significant coefficients on REACH and STICKINESS in the year 2000 regressions is consistent with our hypotheses, but contrary to the recent suggestions of Wall Street analysts that web traffic metrics are no longer relevant for the valuation of Internet stocks. Thus, even as the Internet sector begins to mature and B2C companies develop longer operating histories (with the commensurate time series of financial valuation variables becoming available), the web traffic metrics that were relevant during the "bubble" period of the market continue to be significant determinants of Internet companies' price-to-sales ratios after the Internet shakeout.

6.2.2   The Value-Relevance of Traditional Financial Statement Information

With the exception of cost of goods/services sold (CGS), each of the income statement components is significantly value-relevant in 1999, as shown in the first column of Table 5. The positive coefficients on advertising and marketing expenses (MKTGEXP), and on R&D and product development (PRODEVLP) in 1999, are consistent with our predictions and with the results of prior studies related to the valuation of expenditures on intangible assets (e.g., Amir and Lev (1996) and Lev and Sougiannis (1996)).   The findings suggest that the market viewed B2C Internet companies' material expenditures directed towards customer acquisitions and product development as investments rather than current expenses in 1999.

The second column of Table 5 shows that, for 2000, cost of goods/services sold (CGS) is negatively and significantly associated with the P/S ratios, as expected, but marketing and product development expenses are no longer significant determinants of Internet companies' P/S ratios. These findings suggest that in the year 2000, the market is no

_____

[23]For our 1999 and 2000 data, the raw web metrics exhibit significant pairwise correlation (see Table 3A). Accordingly, the direct inclusion of any subset of these raw web metrics as explanatory regression variables would likely result in a significant multicollinearity problem in our valuation estimations.

longer willing to implicitly capitalize expenditures on intangible assets in valuing Internet stocks. Notably, the coefficients remain positive, which suggests that the market is not, on average, treating the marketing and development expenses as reductions to firm value. One possible interpretation of these results is that the market is continuing to capitalize marketing and development expenses for those companies for which it expects the expenditures to lead to realizable future benefits, while treating the expenses as reductions in value for those companies for which the future realization of benefits is more uncertain. Since our regression model estimates a mean coefficient for all of the companies in the year 2000 sample, the resultant coefficient would therefore not be significantly different from zero for the sample as a whole. An alternative interpretation is that the market continued to capitalize these expenditures during the first quarter of 2000, but then stopped capitalizing them and/or began treating them as expenses in the second quarter of 2000. In Section 7, we provide evidence that favors the latter interpretation of results.

6.3   The Importance of "Cash Burn"

Table 5 reports the results of our investigation into the valuation role of Internet companies' abilities to sustain their current rate of cash burn. The cash burn proxy, BURNLEFT, is defined as cash on hand divided by the current period's cash flows from operations. For many companies in the sample, cash flows from operations are negative, and therefore the BURNLEFT proxy provides a measure of the number of quarters left in the life of the company if it continues to "burn cash" at its current rate and does not obtain additional capital. Because the valuation implications of the cash burn proxy are likely to be different for firms with negative versus positive cash flows from operations, we also include the variable BURNnegv. BURNnegv is equal to BURNLEFT for firms with negative cash flows from operations and is set equal to zero for firms with positive operating cash flows. The coefficient estimate on BURNnegv is therefore interpretable as the incremental slope on the burn proxy for firms with negative operating cash flows.

The results in Table 5 show that for both 1999 and 2000, the ratio of cash on hand to cash flows generated from/used in operations during the quarter (BURNLEFT) is significantly associated with the price-to-sales ratios of Internet companies. For companies with negative cash flows from operations, the value of BURNLEFT is negative, and therefore the significant positive coefficient on BURNLEFT results in a reduction to overall firm value. In the year 2000, BURNnegv is also significant, carrying a negative coefficient that partially offsets the coefficient on BURNLEFT.[24] For companies with positive cash flows from operations, the positive coefficient on BURNLEFT results in a positive addition to value. The intuition for this may be that the free cash flows (i.e., significant cash stores and lack of cash burn) provide these Internet companies with greater option value - the availability of cash provides these companies with the flexibility to adapt to rapidly changing market conditions and to react to emerging opportunities.

6.4   The Value-Relevance of Strategic Alliances

Table 6 reports the results of valuation regressions that include three variables representing the nature and extent of alliances with strategic partners. "**AOLdummy**" is an indicator variable that is set equal to one if the firm has announced a strategic alliance with AOL, and is zero otherwise. "**TOP10dummy**" is an indicator variable that is set equal to one if the firm has announced a strategic alliance with one or more of the other "top 10" internet traffic-generating companies, which include: Lycos, Amazon, Yahoo!, MSN/Microsoft, Excite@Home, Alta Vista, GO Network, Go2Net, Time Warner (prior to the merger with AOL), and C/NET. "**TotalAlliances**" is a count variable that captures the cumulative number of strategic alliances that the company has announced itself to have entered into.

With the exception of the coefficient on LOYALTY, which becomes significant and positively associated with B2C companies' price-to-sales ratios for both 1999 and 2000

---

[24] Given the relatively high degree of multicollinearity between these variables, we refrain from making any strong inferences related to the magnitudes of their coefficients.

when the alliance variables are added to the regression, all of the previous findings remain intact.

As shown in the first column of Table 6, an alliance with AOL is positively associated with the price-to-sales ratios of B2C stocks in 1999. This finding with respect to alliances with AOL in 1999 complements those of Rajgopal, et al (2000), who document a weak positive association between alliances with AOL and a web traffic measure for reach during 1999. We establish a more direct link between AOL alliances and the market value of B2C stocks for the same time period. In 2000, we find that AOL alliances are no longer value relevant for Internet stocks, as shown in the second column of Table 6. We also find that the cumulative sum of alliances entered into (TotalAlliances) is significantly negatively associated with the price-to-sales ratios of Internet stocks in both 1999 and 2000. These findings lend support to arguments in the popular press that strategic alliances have not provided their anticipated benefits (e.g., The Industry Standard, May 1, 2000).

7. Predicting the Shakeout

In Table 7A we present the results of the full valuation model applied to the first quarter of the year 2000. The significance levels for some of the coefficients have clearly dropped relative to their counterparts in Table 6 due to the smaller number of observations used in the Table 7A estimation. With one notable exception, however, the signs and magnitudes of the coefficients generally remain unchanged. The exception is R&D and product development (PRODEVLP), which carries a positive and significant coefficient. This result is consistent with the previous finding for the year 1999, but inconsistent with the lack of significance found for PRODEVLP for the combined 2000 results shown in the second column of Table 6. Thus, the second quarter of 2000 was responsible for driving away the positive and significant coefficient on PRODEVLP in the previously reported combined 2000 results. In other words, the market appears to have capitalized B2C companies' expenditures on R&D and product development until the bursting of the bubble in the spring of 2000.

Table 7B reports the correlations between the residuals from the Table 7A regression and the percentage change in the price-to-sales ratios from quarter 1 to quarter 2 of 2000 – i.e., the change in P/S from before to after the bursting of the bubble. As shown, the residuals from the first quarter valuation regression are significantly negatively correlated with subsequent changes in the P/S ratios. In other words, B2C companies that were relatively "over-valued" before the bursting of the bubble (i.e., those with more positive regression residuals) experienced more negative changes in their P/S ratios in the second quarter of 2000.

In Table 8 we present the results of regressing the percentage change in the P/S ratio from quarter 1 to quarter 2 of 2000 against the residual from the regression reported in 7A, together with a number of variables that prior studies in the industrial economics literature have found to be associated with companies that fail during the rationalization of a nascent industry. Consistent with the pairwise correlation results in Table 7B, our measure of the extent of relative over-valuation (RESIDQ1) is significantly negatively associated with the percentage change in the price-to-sales ratio in the second quarter of 2000, even when other competing explanatory variables are included in the regression. Consistent the findings of prior studies in the economics literature (e.g., Klepper and Simons (2000)), company age is a significant determinant of shakeout. The positive coefficient on AGE (measured as the number of days since IPO) suggests that firms that went public later in the Internet boom experienced more negative changes in their price-to-sales ratios when the bubble burst. Contrary to the results of prior studies, company size (logMV) is not a significant determinant of shakeout.[25]

The coefficient on ETAIL, an indicator variable that is set equal to one for firms that are in the e-tail sector (and zero otherwise), is negative but not quite significantly associated with the change in price-to-sales ratio. This result is consistent with the fact that e-tail companies led the B2C shakeout, and had already shed a considerable percentage of their market values prior to the end of the first quarter of 2000 and therefore fell somewhat less dramatically in the second quarter of 2000 than stocks in other B2C sectors.

---

[25] The results are robust to other measures of firm size, including log(total revenues) and log(total assets).

8. Conclusions and Suggestions for Future Work

In this study we have explored the major value-drivers of Internet companies' share prices. Our study extends the pioneering work on Internet stock valuation along several dimensions: (1) we examine the role of financial and non-financial drivers both before and after the "bursting of the Internet bubble" in March-April 2000; (2) we apply a systematic selection process (factor analysis) to the multiple web traffic measures that are available from commercial databases in order to arrive at a parsimonious set of orthogonal web performance measures; (3) we investigate the valuation role of our proxy for B2C companies' ability to sustain their current rate of "cash burn"; and (4) we investigate the determinants of fallout during the market correction of the spring of 2000.

Our primary conclusions from this study are as follows. First, we find evidence that contradicts the claims by some analysts that web traffic metrics are no longer important. All three of our three web traffic performance factors remain value-relevant in 2000. Second, consistent with the findings of prior studies in other intangible asset based industries, we find that despite the expensing in financial reports of all periodic expenditures on knowledge, customer acquisitions, and technology, investors make a distinction between expenses and investments. In particular, product development (R&D) and advertising expenses (customer acquisition costs) appear to be capitalized as assets by investors in their assessment of Internet company value during the "bubble" period when investors were more optimistic about the prospects of B2C companies. However, neither marketing nor product development costs are implicitly capitalized into value, on average, subsequent to the industry shakeout in the spring of 2000. We also find that our proxy for companies' ability to sustain their current rate of "cash burn" is an important value-driver in each of 1999 and 2000. Finally, we find that our measure of the relative over-valuation of B2C stocks in the first quarter of 2000 is positively associated with the drop in price-to-sales ratios during the shakeout. This finding is robust to the inclusion of competing explanatory variables suggested by the economics literature related to industry rationalizations.

We thus provide a preliminary view of the shakeout and maturation of the B2C Internet sector. Overall, our study suggests that in the post-bubble 2000 period investors adopted a more skeptical attitude with regards to intangible investments (product development and customer acquisition costs); absent meaningful financial results, investors continue to rely heavily on web traffic measures; and, perhaps most importantly, the excesses of the early 1998-1999 valuations have been systematically eliminated.

In ongoing work in this sector, we examine several additional Internet stock valuation issues, including the role of web metric momentum in explaining stock returns and the determinants of Internet stock price volatility. The latter issue is of considerable concern to both policymakers and investors.

List of Works Cited

Amir, Eli and Baruch Lev, 1996, "Value-relevance of nonfinancial information: the wireless communications industry," Journal of Accounting & Economics (Aug.-Dec.) Vol. 22, Nos. 1-3, pp.3-30.

Barron's Online, March 20, 2000, "Burning Up: Warning – Internet Companies Are Running Out of Cash -- Fast" (available at: http://interactive.wsj.com/archive/retrieve.cgi?id=SB953335580704470544.djm&template=barrons.tmpl).

Business Week, December 14, 1998, "Internet Stocks: What's Their Real Worth?" pp.120-122.

Cohen, Jonathan, 1999, Internet Investing White Paper, Wit Capital (www.witcapital.com).

Gardner, David, April 26, 2000, "Amazon's Customers Stick Around" (available at: http://www.fool.com/portfolios/rulebreaker/2000/rulebreaker000426.htm).

Hand, John R. M. (2000A), "Profits, losses, and the Non-Linear Pricing of Internet Stocks," unpublished working paper, January 2000, University of North Carolina.

Hand, John R. M. (2000B), "The Role of Accounting Fundamentals, Web Traffic, and Supply and Demand in the Pricing of U.S. Internet Stocks, February 2000, University of North Carolina.

Harmon, Steve, 2000, "The Metrics for Evaluating Internet Companies", The Internet Stock Report, February 23rd (http://www.internetstockreport.com/column/article/0,1785,1661_71961,00.html).

The Industry Standard, May 1st, 2000, "Portals Start to Feel the Heat," p.63 (also available at http://www.thestandard.com/article/display/0,1151,14412,00.html).

Internet Stock Report, October 12, 1999, "Inflation, Rate Fears Bruise Stocks," at: http://www.internetstockreport.com/close/article/0,1785,216901,00.html.

Klepper, Steven and Kenneth L. Simons, 2000, "The Making of an Oligopoly: Firm Survival and Technological Change in the Evolution of the U.S. Tire Industry," Journal of Political Economy, Vol. 108, No.4, pp.728-760.

Lev, Baruch and Theodore Sougiannis, 1996, "The Capitalization, Amortization, and Value-Relevance of R&D," Journal of Accounting & Economics, Vol. 21, No. 1, pp. 107-138.

Lev, Baruch and Paul Zarowin, 1999, "The Boundaries of Financial Reporting and How to Extend Them," Journal of Accounting Research (Autumn), Vol. 37, No.2, pp. 353-385.

Nelson, Peter, 2000, "How Badly Burned?" Multex Investor, April 13th, 2000 (http://www.multexinvestor.com/Magazine.asp?ref=ideas20000413%2Ehtml).

Perkins, Anthony B. and Michael C. Perkins, 1999, The Internet Bubble: Inside the Overvalued World of High Tech Stocks. New York, NY: Harper.

Rajgopal, Shivaram, Suresh Kotha, and Mohan Venkatachalam, January 2000, "The Relevance of Web Traffic for Internet Stock Prices," unpublished working paper, University of Washington.

Shapiro, Carl and Hal Varian, 1998, Information Rules: A Strategic Guide to the Network Economy. Boston, MA: Harvard Business School Press.

Trueman, Brett, M.H. Franco Wong, and Xiao-Jun Zhang, December 1999, "The Eyeballs Have It: Searching for the Value in Internet Stocks," unpublished working paper, University of California at Berkeley.

UBS Warburg Global Equity Research, May 2000, <u>Navigating the I-Valuation Jungle</u> (www.ubswarburg.com/researchweb).

Wooley, Scott, "Lyin' Eyeballs," <u>Forbes</u>, August 7, 2000, p. 118 (also available at: http://www.forbes.com/forbes/00/0807/6604118a.htm).

TABLE 1
List of Internet Companies Included in the Study
Market Values (in millions)

Company Name	Ticker Symbol	Sector	Market Value as at 12/31/99	Market Value as at 2/28/00	Market Value as at 5/31/00
1-800-FLOWERS.COM	FLWS	e-tail	$248.05	$204.55	$143.06
About.com	BOUT	content/community	1,377.48	1,143.43	696.27
Alloy Online	ALOY	e-tail	227.90	249.61	174.56
Amazon.com	AMZN	e-tail	25,942.40	22,406.73	16,886.04
America Online (AOL)	AOL	portal	169,617.44	138,189.50	121,789.31
Ameritrade Holding	AMTD	financial news/svcs	3,428.01	2,815.70	1,986.27
Ask Jeeves	ASKJ	services	3,027.29	2,014.46	709.96
Audible	ADBL	e-tail	384.46	323.59	143.97
Audiohighway	AHWY	e-tail	48.75	39.86	11.42
barnesandnoble.com	BNBN	e-tail	414.49	233.72	281.89
Beyond.com	BYND	e-tail	283.20	190.31	60.63
BigStar Entertainment	BGST	e-tail	66.20	45.91	15.87
Bluefly	BFLY	e-tail	50.74	52.89	15.39
Broadcast.com	BCST	content/community	*	*	*
C/NET	CNET	content/community	4,169.76	4,922.89	2,916.03
CareerBuilder	CBDR	content/community	152.46	145.06	54.93
CDnow	CDNW	e-tail	299.76	242.84	96.34
Cheap Tickets	CTIX	e-tail	328.55	372.95	303.48
Concentric Network	CNCX	services	1,276.65	2,144.16	2,316.13
Crosswalk.com	AMEN	e-tail	38.65	43.36	19.08
Cyberian Outpost	COOL	e-tail	234.00	203.83	122.80
DLJdirect	DIR	financial news/svcs	249.55	175.95	156.40
drkoop.com	KOOP	content/community	359.86	268.95	37.98
drugstore.com	DSCM	e-tail	1,569.34	823.97	313.03
Earthweb	EWBX	content/community	491.20	264.21	103.64
E*TRADE Group	EGRP	financial news/svcs	6,500.68	6,613.04	4,539.77
eBay	EBAY	e-tail	16,191.50	18,762.09	16,289.14
EDGAR Online	EDGR	financial news/svcs	91.80	141.58	52.95
eFax	EFAX	services	93.13	82.24	14.01
Egghead.com	EGGS	e-tail	600.59	352.47	135.99
E-Loan.com	EELN	financial news/svcs	677.90	370.24	204.02
eToys	ETYS	e-tail	3,143.59	1,801.13	587.82
Exodus Communications	EXDS	services	15,138.27	22,797.95	14,548.57
fashionmall.com	FASH	e-tail	33.28	28.59	17.81
FatBrain.com	FATB	e-tail	286.09	181.21	85.04
Go2Net	GNET	content/community	2,419.90	3,284.10	1,427.29
GoTo.com	GOTO	services	2,675.00	2,908.35	717.41
HeadHunter.NET	HHNT	content/community	135.40	168.41	92.76
Healtheon(WebMD)	HLTH	services	2,705.66	4,040.46	2,753.46
Homestore.com	HOMS	content/community	5,202.18	5,328.59	1,814.17
Hoover's Inc.	HOOV	financial news/svcs	106.22	139.80	82.96
HotJobs.com	HOTJ	content/community	1,347.67	771.20	368.39
Infonautics	INFO	content/community	82.49	115.63	52.77
Infoseek	SEEK	portal	*	*	*
InfoSpace.com	INSP	portal	10,314.15	21,025.94	9,954.43
InsWeb	INSW	e-tail	886.23	546.04	82.34

30

TABLE 1 (cont'd)
List of Internet Companies Included in the Study
Market Values (in millions)

Company Name	Ticker Symbol	Sector	Market Value as at 12/31/99	Market Value as at 2/28/00	Market Value as at 5/31/00
internet.com	INTM	content/community	1,218.73	1,122.11	388.08
iTurf	TURF	content/community	104.70	92.07	29.56
iVillage	IVIL	content/community	598.06	564.84	233.38
JFAX.com	JFAX	services	220.74	166.33	54.15
Launch Media	LAUN	content/community	242.12	233.33	117.25
LookSmart	LOOK	content/community	2,309.85	4,111.75	1,219.60
Lycos	LCOS	portal	7,668.79	6,351.11	6,649.61
Mail.com	MAIL	services	653.57	615.99	258.86
MapQuest.com	MQST	services	757.49	627.40	594.75
MarketWatch.com	MKTW	financial news/svcs	505.63	596.54	296.29
MP3.com	MPPP	content/community	2,171.51	1,237.80	756.19
Mpath Interactive	MPTH	content/community	636.84	445.49	164.66
Multex.com	MLTX	financial news/svcs	1,008.61	717.09	393.23
musicmaker.com	HITS	e-tail	193.84	142.29	66.28
MyPoints.com	MYPT	services	1,866.95	1,351.27	294.30
NetBank	NTBK	financial news/svcs	543.79	451.93	303.83
Network Solutions	NSOL	services	7,270.72	10,615.79	10,700.14
NextCard	NXCD	financial news/svcs	1,464.02	1,188.33	491.18
ONSALE	ONSL	e-tail	*	*	*
Peapod	PPOD	e-tail	156.60	154.33	37.02
Preview Travel	PTVL	e-tail	726.57	617.67	*
priceline.com	PCLN	e-tail	6,936.98	7,888.75	6,485.67
Quokka Sports	QKKA	content/community	577.50	580.25	202.71
Salon.com	SALN	content/community	56.82	77.86	27.73
SportsLine USA	SPLN	content/community	1,180.64	1,012.82	301.60
Stamps.com	STMP	services	1,672.99	1,220.83	485.01
StarMedia Network	STRM	portal	2,337.65	2,749.74	1,167.91
Student Advantage	STAD	content/community	781.31	523.81	118.45
Talk City	TCTY	content/community	637.01	268.21	42.17
theglobe.com	TGLO	content/community	222.93	211.29	48.55
TheStreet.com	TSCM	financial news/svcs	470.52	285.07	151.82
Ticketmaster Online-CitySearch	TMCS	e-tail	536.05	913.35	651.27
uBid	UBID	e-tail	305.36	337.77	*
US SEARCH Corp.com	SRCH	services	130.66	7.00	27.47
Value America	VUSA	e-tail	226.57	179.02	65.87
Xoom.com	XMCM	services	*	*	*
Yahoo!	YHOO	portal	113,900.63	85,256.81	61,422.75
ZD Net	ZDZ	content/community	1,501.50	2,252.25	764.16
Total Market Capitalization			**$444,712**	**$402,146**	**$298,187**

* Broadcast.com and OnSale were purchased by Yahoo and Egghead.com, respectively, prior to December 31, 1999. Xoom merged with NBCi in November 1999. NetGravity merged with DoubleClick in November 1999. Preview Travel merged with Travelocity in March 2000. Infoseek became part of the Walt Disney Internet Group in November 1999. Ubid was acquired by CMGI in April 2000. These companies are included in the sample for periods ending prior to their acquisitions.

	Market Value at 12/31/99 ($ millions)	Market Value at 5/31/00 ($ millions)	Market Value excluding AOL & Yahoo! at 12/31/1999 ($ millions)	Market Value excluding AOL & Yahoo! at 5/31/2000 ($ millions)
TABLE 2A				
Descriptive Statistics for the Internet Companies Included in the Sample				
Mean	$5,559	$3,823	$2,067	$1,513
Std. Deviation	22,750	15,537	4,079	3,555
1st Quartile	232	70	229	66
Median	619	246	599	219
3rd Quartile	2,206	747	1,818	712

TABLE 2B

1999: Pearson Correlations Between Regression Variables (N=118)

	PRSALES	CGS	MKTGEXP	PRODEVLP	REACH	STICKINESS	LOYALTY	BURNLEFT	BURNnegv	Top10dummy	AOLdummy	TotalAInc
PRSALES	1.000	-0.062	**0.264**	0.189	0.234	**0.346**	0.106	**0.201**	0.071	-0.050	**0.266**	0.064
CGS		1.000	**0.430**	-0.046	**-0.194**	**-0.184**	**-0.210**	-0.068	0.118	**-0.182**	*-0.158*	*-0.166*
MKTGEXP			1.000	0.229	-0.145	-0.090	-0.091	0.017	-0.026	**-0.192**	-0.029	**-0.205**
PRODEVLP				1.000	-0.119	-0.059	0.128	0.038	0.083	-0.005	0.044	-0.135
REACH					1.000	-0.058	**0.238**	0.046	0.079	**0.384**	**0.306**	**0.809**
STICKINESS						1.000	0.128	-0.053	0.021	0.135	**0.208**	0.092
LOYALTY							1.000	0.117	0.087	*0.156*	0.049	**0.477**
BURNLEFT								1.000	**0.311**	-0.044	-0.019	-0.001
BURNnegv									1.000	0.061	-0.022	0.071
Top10dummy										1.000	0.076	**0.477**
AOLdummy											1.000	**0.421**
TotalAInc												1.000

TABLE 2B

2000: Pearson Correlations Between Regression Variables (N=118)

	PRSALES	CGS	MKTGEXP	PRODEVLP	REACH	STICKINESS	LOYALTY	BURNLEFT	BURNnegv	Top10dummy	AOLdummy	TotalAInc
PRSALES	1.000	**-0.296**	-0.013	*0.160*	**0.424**	**0.324**	**0.217**	**0.189**	0.072	*0.170*	*0.158*	**0.307**
CGS		1.000	**0.201**	-0.122	-0.139	-0.140	**-0.258**	0.100	0.150	**-0.193**	-0.098	-0.136
MKTGEXP			1.000	**0.508**	*-0.155*	-0.108	-0.029	-0.052	0.014	-0.053	0.059	*-0.171*
PRODEVLP				1.000	-0.061	-0.038	*0.177*	0.051	0.098	0.083	-0.017	-0.067
REACH					1.000	0.061	0.046	*0.174*	0.119	**0.302**	*0.170*	**0.783**
STICKINESS						1.000	0.043	0.131	0.064	-0.026	**0.291**	0.202
LOYALTY							1.000	0.061	-0.025	*0.164*	**0.243**	**0.296**
BURNLEFT								1.000	**0.898**	0.075	*0.155*	*0.170*
BURNnegv									1.000	-0.012	0.054	0.092
Top10dummy										1.000	-0.004	**0.303**
AOLdummy											1.000	**0.359**
TotalAInc												1.000

				TABLE 3			
Panel A1999: Spearman Rank Correlations Between 1999 Monthly Stock Returns and Contemporaneous Web Metric *Levels*							
	RETRNMTH	REACH	UNIQAUD	PAGEVIEW	PAGEPP	VISITPP	TIMEPP
RETRNMTH	1.000	**0.129**	**0.131**	**0.142**	0.077	**0.144**	-0.027
REACH		1.000	**0.998**	**0.860**	**0.259**	**0.447**	**0.283**
UNIQAUD			1.000	**0.870**	**0.275**	**0.446**	**0.280**
PAGEVIEW				1.000	**0.683**	**0.627**	**0.599**
PAGEPP					1.000	**0.625**	**0.811**
VISITPP						1.000	**0.716**
TIMEPP							1.000

				TABLE 3 (cont'd)			
Panel A2000: Spearman Rank Correlations Between 2000 Monthly Stock Returns and Contemporaneous Web Metric *Levels*							
	RETRNMTH	REACH	UNIQAUD	PAGEVIEW	PAGEPP	VISITPP	TIMEPP
RETRNMTH	1.000	**0.118**	*0.111*	**0.120**	0.077	0.088	0.087
REACH		1.000	**0.999**	**0.909**	**0.433**	**0.480**	**0.407**
UNIQAUD			1.000	**0.909**	**0.432**	**0.481**	**0.406**
PAGEVIEW				1.000	**0.749**	**0.656**	**0.694**
PAGEPP					1.000	**0.681**	**0.909**
VISITPP						1.000	**0.702**
TIMEPP							1.000

				TABLE 3 (cont'd)			

Panel B1999: Spearman Rank Correlations Between 1999 Monthly Stock Returns and Contemporaneous *Changes in* Web Metrics*

	RETRNMTH	CHGREACH	CHGAUD	CHGVIEWS	CHGPAGPP	CHGVISIT	CHGTIMEPP
RETRNMTH	1.000	0.034	0.059	*0.081*	0.068	*-0.113*	-0.013
CHGREACH		1.000	**0.963**	**0.596**	**0.151**	0.006	0.050
CHGAUD			1.000	**0.606**	**0.149**	-0.030	0.070
CHGVIEWS				1.000	**0.806**	**0.351**	**0.474**
CHGPAGPP					1.000	**0.504**	**0.599**
CHGVISIT						1.000	**0.509**
CHGTIMEPP							1.000

				TABLE 3 (cont'd)			

Panel B2000: Spearman Rank Correlations Between 2000 Monthly Stock Returns and Contemporaneous *Changes in* Web Metrics*

	RETRNMTH	CHGREACH	CHGAUD	CHGVIEWS	CHGPAGPP	CHGVISIT	CHGTIMEPP
RETRNMTH	1.000	0.065	0.092	*0.107*	0.098	**0.162**	0.143
CHGREACH		1.000	**0.984**	**0.613**	**-0.029**	-0.035	*0.094*
CHGAUD			1.000	**0.626**	-0.025	-0.010	*0.107*
CHGVIEWS				1.000	**0.681**	**0.482**	**0.651**
CHGPAGPP					1.000	**0.638**	**0.814**
CHGVISIT						1.000	**0.578**
CHGTIMEPP							1.000

TABLE 3 (cont'd)

Panel C1999: Spearman Rank Correlations Between 1999 Monthly Stock Returns and One-Month Lags in Web Metric *Levels**

	RETRNMTH	LAGREACH	LAGUNIQ	LAGPGVIU	LAGPGPP	LAGVISTPP	LAGTIMEPP
RETRNMTH	1.000	**0.121**	**0.121**	**0.116**	0.049	**0.167**	-0.024
LAGREACH		1.000	**0.998**	**0.849**	**0.235**	**0.438**	**0.260**
LAGUNIQ			1.000	**0.859**	**0.249**	**0.437**	**0.256**
LAGPGVIU				1.000	**0.678**	**0.624**	**0.593**
LAGPGPP					1.000	**0.621**	**0.812**
LAGVISTPP						1.000	**0.728**
LAGTIMEPP							1.000

TABLE 3 (cont'd)

Panel C2000: Spearman Rank Correlations Between 2000 Monthly Stock Returns and One-Month Lags in Web Metric *Levels**

	RETRNMTH	LAGREACH	LAGUNIQ	LAGPGVIU	LAGPGPP	LAGVISTPP	LAGTIMEPP
RETRNMTH	1.000	0.079	0.069	0.089	0.059	0.068	0.048
LAGREACH		1.000	**0.999**	**0.908**	**0.411**	**0.475**	**0.388**
LAGUNIQ			1.000	**0.907**	**0.409**	**0.474**	**0.386**
LAGPGVIU				1.000	**0.730**	**0.651**	**0.678**
LAGPGPP					1.000	**0.673**	**0.906**
LAGVISTPP						1.000	**0.698**
LAGTIMEPP							1.000

TABLE 3 (cont'd)

Panel D1999: Spearman Rank Correlations Between 1999 Monthly Stock Returns and One-Month Lag *Changes in* Web Metrics*

	RETRNMTH	LAGCHGRCH	LAGCHGAUD	LAGCHGVIU	LAGCHGPGP	LAGCHGVPP	LAGCHGTPP
RETRNMTH	1.000	0.009	0.015	0.044	0.074	0.017	0.039
LAGCHGRCH		1.000	**0.957**	**0.590**	**0.151**	-0.060	0.060
LAGCHGAUD			1.000	**0.599**	**0.144**	-0.099	*0.092*
LAGCHGVIU				1.000	**0.812**	**0.362**	**0.489**
LAGCHGPGP					1.000	**0.554**	**0.604**
LAGCHGVPP						1.000	**0.465**
LAGCHGTPP							1.000

TABLE 3 (cont'd)

Panel D2000: Spearman Rank Correlations Between 2000 Monthly Stock Returns and One-Month Lag *Changes in* Web Metrics*

	RETRNMTH	LAGCHGRCH	LAGCHGAUD	LAGCHGVIU	LAGCHGPGP	LAGCHGVPP	LAGCHGTPP
RETRNMTH	1.000	0.085	0.047	0.018	-0.015	0.004	0.093
LAGCHGRCH		1.000	**0.988**	**0.617**	0.036	0.028	0.056
LAGCHGAUD			1.000	**0.622**	0.035	0.033	0.047
LAGCHGVIU				1.000	**0.729**	**0.492**	**0.585**
LAGCHGPGP					1.000	**0.633**	**0.781**
LAGCHGVPP						1.000	**0.592**
LAGCHGTPP							1.000

Table 3 (continued)

Variable Name	Definition
RETRNMTH	Monthly change in the market value of the company's common stock
REACH	The percentage of active web surfers who viewed the site during the month
UNIQAUD	Unique Audience - the number of unique web surfers who viewed the site during the month
PAGEVIEW	Page Views - the total number of pages viewed at the site during the month
PAGEPP	Pages per Person - the average number of pages viewed per person per visit during the month
VISITPP	Visits per Person - the average number of visits to the site per unique visitor during the month
TIMEPP	Time per Person - the average time spent at the site per person per visit
CHGREACH	Change in Reach (i.e., the percentage change in reach relative to the prior month)
CHGAUD	Change in Unique Audience
CHGVIEWS	Change in Page Views
CHGPAGPP	Change in Pages per Person
CHGVISIT	Change in Visits per Person
CHGTIMEPP	Change in Time per Person
LAGREACH	Prior month's Reach (i.e., one-month lag in Reach)
LAGUNIQ	Prior month's Unique Audience
LAGPGVIU	Prior month's Page Views
LAGPGPP	Prior month's Pages per Person
LAGVISTPP	Prior month's Visits per Person
LAGTIMEPP	Prior month's Time per Person
LAGCHGRCH	Prior month's Change in Reach (i.e., one-month lag in Change in Reach)
LAGCHGAUD	Prior month's Change in Unique Audience
LAGCHGVIU	Prior month's Change in Page Views
LAGCHGPGP	Prior month's Change in Pages per Person
LAGCHGVPP	Prior month's Change in Visits per Person
LAGCHGTPP	Prior month's Change in Time per Person

* Correlations that are significant at the .10 level are *italicized.*
Correlations that are significant at the .05 level are in **bold-faced** type.
Correlations that are significant at the .01 level are in **<u>underlined, bold-faced</u>** type.

TABLE 4
RESULTS OF FACTOR ANALYSIS

Factor analysis on quarterly web traffic metrics derived from the Nielsen/Netratings database.

Panel A - Standardized Regression Coefficients

Nielsen/Netratings Web Metric	Factor 1 "REACH"	Factor 2 "Stickiness"	Factor 3 "Loyalty"
Unique Audience	0.8242	-0.5659	-0.0004
Total Page Views	0.8795	-0.1457	-0.1434
Visits per Person	0.9140	0.1850	0.1840
Pages per Person	0.7925	0.5592	-0.0704
Time per Person	0.8210	0.5465	-0.0251
% Pageviews from Browser Cache	0.1360	0.0036	0.2249
Reach (% Active Population)	0.8164	-0.5718	0.0050

Panel B - Rotated Factor Pattern Matrix

Nielsen/Netratings Web Metric	Factor 1 "REACH"	Factor 2 "Stickiness"	Factor 3 "Loyalty"
Unique Audience	**0.9679**	0.1662	0.1875
Total Page Views	**0.7317**	0.5252	0.0633
Visits per Person	0.4693	**0.7281**	**0.3915**
Pages per Person	0.1618	**0.9517**	0.1177
Time per Person	0.1831	**0.9547**	0.1683
% Pageviews from Browser Cache	0.0551	0.0584	0.2503
Reach (% Active Population)	**0.9658**	0.1557	0.1910

TABLE 5

COMPARATIVE 1999 & 2000 REGRESSIONS - MARKET VALUE SCALED BY TOTAL REVENUES

THE VALUE-RELEVANCE OF THE SUSTAINABILITY OF CURRENT "CASH BURN"

OLS regressions of internet companies' quarterly price-to-sales ratios on accounting variables (scaled by total revenues), web traffic factors, and a proxy for the companies' ability to sustain their current rate of cash burn.

The reported results are for regressions on the full sample of firm quarter observations excluding observations that were considered to have an undue influence on the determination of the coefficients. Observations were excluded if the absolute value of the standardized residual was greater than three and/or if the value of the Cook's distance was greater than one.

Dependent Variable: Market Value of Equity Scaled by Total Revenues

	Coefficient estimates *(p-values)*		
	1999		**2000**
Intercept	44.282		48.107
	(.033)		*(.0001)*
REACH	27.660		22.179
	(.0001)		*(.0001)*
STICKINESS	38.713		14.051
	(.0001)		*(.001)*
LOYALTY	-7.891		9.201
	(.553)		*(.262)*
BURNLEFT	0.2612		1.318
	(.013)		*(.028)*
BURNnegv	-0.1189		-1.296
	(.776)		*(.064)*
CGS	-16.129		-31.630
	(.613)		*(.042)*
MKTGEXP	41.285		5.802
	(.0005)		*(.475)*
PRODEVLP	112.01		22.147
	(.032)		*(.153)*
# obs.	118		118
White's Chi-Square	59.4		34.93
	(.254)		*(.834)*
Adj.R-squared	32.7%		33.6%

TABLE 6

COMPARATIVE 1999 & 2000 REGRESSIONS - MARKET VALUE SCALED BY TOTAL REVENUES

THE VALUE-RELEVANCE OF ALLIANCES & THE SUSTAINABILITY OF CURRENT "CASH BURN"

OLS regressions of internet companies' quarterly price-to-sales ratios on accounting variables (scaled by total revenues), web traffic factors, strategic alliance variables, and a proxy for the companies' ability to sustain their current rate of cash burn.

The reported results are for regressions on the full sample of firm quarter observations excluding observations that were considered to have an undue influence on the determination of the coefficients. Observations were excluded if the absolute value of the standardized residual was greater than three and/or if the value of the Cook's distance was greater than one.

Dependent Variable: Market Value of Equity Scaled by Total Revenues

	Coefficient estimates *(p-values)*	
	1999	**2000**
Intercept	59.327	57.979
	(.003)	*(.0001)*
REACH	66.457	37.777
	(.0001)	*(.0001)*
STICKINESS	40.699	17.080
	(.0001)	*(.0002)*
LOYALTY	30.599	19.238
	(.046)	*(.034)*
BURNLEFT	0.211	1.372
	(.028)	*(.024)*
BURNnegv	-0.085	-1.358
	(.825)	*(.054)*
Top10dummy	-17.970	-2.078
	(.437)	*(.859)*
AOLdummy	79.898	-5.634
	(.007)	*(.739)*
TotalAlliances	-9.525	-2.477
	(.0001)	*(.023)*
CGS	11.471	-28.450
	(.703)	*(.067)*
MKTGEXP	31.294	5.842
	(.004)	*(.475)*
PRODEVLP	76.803	19.158
	(.106)	*(.215)*
# obs.	118	118
White's Chi-Square	70.38	68.66
	(.598)	*(.654)*
Adj.R-squared	43.6%	35.6%

TABLE 7A
1ST QUARTER 2000 REGRESSIONS - MARKET VALUE SCALED BY TOTAL REVENUES

OLS regressions of internet companies' quarterly price-to-sales ratios on accounting variables (scaled by total revenues), web traffic factors, strategic alliance variables, and a proxy for the companies' ability to sustain their current rate of cash burn.

The reported results are for regressions on the full sample of firm quarter observations excluding observations that were considered to have an undue influence on the determination of the coefficients. Observations were excluded if the absolute value of the standardized residual was greater than three and/or if the value of the Cook's distance was greater than one.

Dependent Variable: Market Value of Equity Scaled by Total Revenues

	Coefficient estimates *(p-values)*
	1st Quater 2000
Intercept	60.196
	(.007)
REACH	49.914
	(.0005)
STICKINESS	25.278
	(.001)
LOYALTY	29.780
	(.047)
BURNLEFT	1.496
	(.078)
BURNnegv	-1.424
	(.174)
Top10dummy	-2.912
	(.883)
AOLdummy	-45.599
	(.206)
TotalAlliances	-3.526
	(.045)
CGS	-19.304
	(.414)
MKTGEXP	12.987
	(.457)
PRODEVLP	72.635
	(.072)
# obs.	58
White's Chi-Square	58.88
	(.517)
Adj.R-squared	37.1%

TABLE 7B
SPEARMAN RANK CORRELATIONS BETWEEN THE RESIDUALS FROM Q1 2000 VALUATION REGRESSION AND THE PERCENTAGE CHANGE IN P/S RATIOS IN Q2 2000 (N=48)

	RESIDUAL FROM Q1	% CHG IN P/S RATIO Q2
RESIDUAL FROM Q1	1.000	-0.286
		(0.0487)
% CHG IN P/S RATIO Q2		1.000

TABLE 8
DETERMINANTS OF THE SHAKEOUT

OLS regressions of the change in B2C companies' price-to-sales ratios from Q1 to Q2 of 2000 on the residuals from the Q1 2000 regression and other predicted determinants of shakeout.

The reported results are for regressions on the full sample of firm quarter observations excluding observations that were considered to have an undue influence on the determination of the coefficients. Observations were excluded if the absolute value of the standardized residual was greater than three and/or if the value of the Cook's distance was greater than one.

Dependent Variable: Percentage Change in Price-to-Sales Ratio

	Coefficient estimates *(p-values)*
Intercept	-1.695
	(.419)
AGE	0.003
	(.0001)
logMV	0.013
	(.906)
ETAIL	-0.652
	(.1163)
CASHQLFT	-0.005
	(.665)
RESIDQ1	-0.007
	(.085)
# obs.	47
White's Chi-Square	21.87
	(.291)
Adj.R-squared	33.8%