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The Role of Book Income, Web Traffic, and Supply and Demand in the Pricing of U.S. Internet Stocks

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Abstract. In this paper I assess the degree of similarity in the cross-sectional pricing of Internet and non-Internet stocks during the tumultuous year of 2000. Despite large differences in their economic fundamentals, I find that the equity market values of Internet firms with immaterial web traffic, firms that are randomly selected, and firms that went public at the same time as Internet firms are similarly related to analysts' forecasts of earnings in 2001 and the long-term rate of growth in earnings. This is not the case for firms with intensive web traffic. I also find that at the peak of Internet prices in March 2000 the market rewarded losses of web-traffic-intensive firms but did not reward profits, while after the peak the market reversed its view, rewarding profits but not losses. Beyond earnings, web traffic is significantly positively priced both at and after the Internet peak. However, I find no evidence that two proxies for supply and demand forces – the degree of public float and short interest – are value-relevant for Internet firms. Overall, I argue that there are enough similarities in the cross-sectional pricing of Internet and non-Internet firms to make it unlikely that the pricing of Internet stocks during 2000 was entirely irrational. Moreover, any irrationality in the prices of Internet stocks cannot be linked to public float and short interest.

Key words: Internet stocks; earnings; web traffic; supply and demand; rational pricing.

JEL classifications: G12, G14, M41.

1. Introduction and Summary of Findings

Public and private interest in Internet stocks over the past few years has been intense. Fueled by huge price run-ups and equally dramatic crashes, many have wondered how rationally, if at all rationally, Internet stocks have been priced (e.g., Perkins and Perkins, 1999). This study sheds partial light on this question by examining the degree to which the prices of Internet and non-Internet stocks are determined by similar factors. The thesis of the paper is that if cross-sectional variation in the equity market values of Internet and non-Internet stocks at multiple

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points in time can be consistently explained by similar factors, then it is unlikely that the pricing of Internet stocks has been entirely irrational.

My work adds to the rapidly emerging literature in accounting and finance on the pricing of Internet stocks (e.g., Demers and Lev, 2001; Jorion and Talmor, 2000; Rajgopal et al., 2000; Trueman et al., 2000) in several ways. First, I contrast the cross-sectional determinants of the pricing of two types of Internet firms with that of two types of non-Internet firms. I separately analyze Internet firms with and without material web traffic, as well as randomly selected companies and those that went public at the same time as Internet firms. The combination of heterogeneity in the types of firms analyzed and in the dates on which the pricing analysis is done should maximize the ability of my tests to assess the degree to which the prices of Internet and non-Internet stocks have been determined by similar versus dissimilar factors.

Second, in addition to the accounting and web traffic factors that have been examined in other studies, I explore the pricing of two proxies for supply and demand forces, namely the firm's public float and the extent of short interest in its stock. Although seen by Wall Street as price-relevant factors, public float and short interest should be irrelevant in an efficient market where prices are set through the combination of no-arbitrage and rational investors.

Third, I estimate cross-sectional valuation models for Internet and non-Internet firms at two quite different points in time: at the peak in U.S. Internet stocks (March 2000) and substantially after it (December 2000). My motivation is the proposition that irrationality in the pricing of Internet stocks should be greatest at the pricing peak in March 2000, but much less in December 2000, by which time the typical surviving Internet stock had lost some 80% of its peak value. Lastly, I finesse the econometric problems created by outliers by using ranked data in my regressions rather than data that are unscaled or scaled by book equity, revenues or total assets. This method has not been used in other studies.

Regression results indicate that despite large differences in their economic fundamentals, similar factors explain cross-sectional variation in the pricing of non-Internet firms and Internet firms with immaterial web traffic. Both at and substantially after the peak in the Internet market, the equity market values of Internet firms with immaterial web traffic are increasing in positive forecasted fiscal 2001 earnings, and increasing in the forecasted long-run growth rate in earnings, but decreasing in negative forecasted fiscal 2001 earnings. In a similar manner, the equity market values of randomly selected firms, IPO-matched firms, and firms with immaterial web traffic are increasing in positive forecasted fiscal 2001 earnings, and increasing in the forecasted long-run growth rate in earnings, but decreasing in negative forecasted fiscal 2001 earnings. Although seemingly anomalous, the "negative pricing" of losses almost certainly arises not because the market perversely rewards poor operating performance but because losses typically reflect the expensing of significant investments in intangible assets under U.S. accounting rules (Hand, 2001; Zhang, 2000).

In contrast, the pricing of book income for web-traffic-intensive firms differs from that of other firms both before and after the peak of the Internet market. At the Internet pricing peak, the equity market values of web-traffic-intensive Internet firms are unrelated to positive forecasted fiscal 2001 earnings and the forecasted long-run earnings growth rate, but they are strongly negatively related to negative forecasted fiscal 2001 earnings. After the peak, positive earnings become significantly positively priced, while negative earnings are no longer significantly negatively priced. This shift in the pricing of losses is consistent with the view of the financial press that the market suddenly became unwilling to view web-traffic-intensive Internet firms' expenditures on R&D and marketing intangibles as assets. The shift in the pricing of profits is consistent with the market rewarding those firms that were on a clear path to profitability in the form of positive forecasted fiscal 2001 earnings.

Beyond earnings, I find that web traffic is significantly positively priced both at and after the Internet pricing peak. However, I find no evidence that two proxies for supply and demand forces – the degree of public float and short interest – are value-relevant for Internet firms. Lower public float does not seem to push up a firm's equity market value, nor is a greater amount of short interest indicative of overvaluation.

Overall, I conclude from my analysis that there are enough similarities in the cross-sectional pricing of Internet and non-Internet firms to make it unlikely that the pricing of Internet stocks during 2000 was entirely irrational. In addition, any irrationality that existed in the prices of Internet stocks cannot be linked to public float and short interest in the cross-section. The remainder of the paper is as follows. Section 2 summarizes the existing research on the pricing of Internet stocks and differentiates this paper from it. Section 3 describes the data used in the study. Section 4 compares and contrasts Internet and non-Internet firms across a variety of past, present and forecasted economic dimensions. Section 5 reports the results of the valuation regression tests, and Section 6 concludes.

2. The Pricing of Internet Stocks

Due to its rapid and worldwide impact on business and communications, the Internet has been seen by many as a revolution akin to that triggered by earlier innovations such as moveable type, radio, the telephone, and the computer. However, the enormous wealth created and lost by Internet firms via their spectacular and volatile stock returns – see Figure 1 – has led many to wonder how rationally, if at all rationally, Internet stocks have been priced (e.g., Perkins and Perkins, 1999). It has also led to a rapidly created literature in accounting and finance. I briefly summarize this work and then explain how my study adds to the literature.

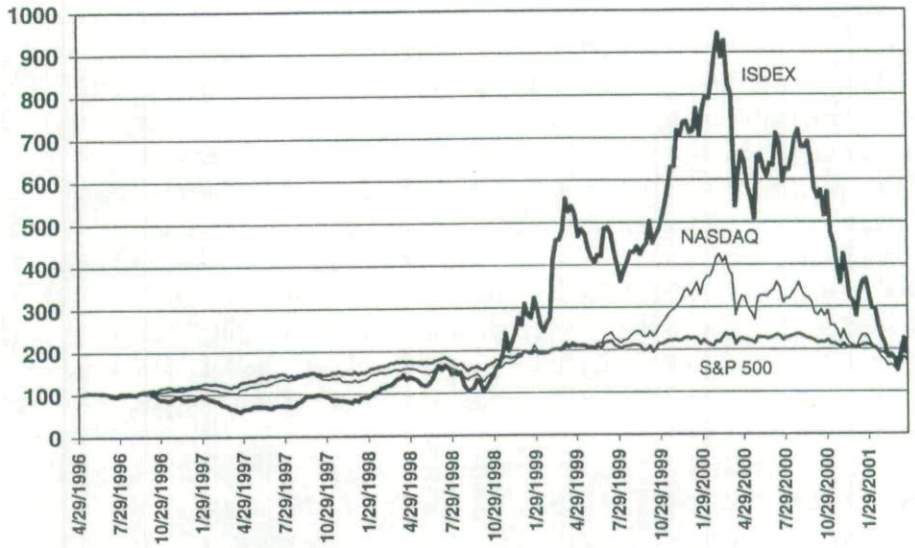

Figure 1. Level of the Internet Stock Index versus the NASDAQ and the S&P 500 (May 1996–April 2001). (Source: www.stockpoint.com)

2.1. EXTANT LITERATURE ON THE PRICING OF U.S. INTERNET STOCKS

Hand (2001) focuses on the value-relevance of accounting data, and concludes that book income and its components have been highly value-relevant for Internet stocks, but in a nonlinear manner. He finds that Internet firms' losses have generally been negatively priced, most likely because Internet firms' losses were viewed as huge investments in intangible marketing and R&D assets, not a result of poor operating performance.[1] He also reports that intangibles are (are not) priced as assets when most recent book income is negative (positive) and intangibles are (are not) dominant in the firm's business strategy.

Demers and Lev (2001), Jorion and Talmor (2000), Rajgopal et al. (2000) and Trueman et al. (2000) center their analyses on the value-relevance of nonfinancial web traffic measures for Internet firms. While each study concludes that web traffic is value-relevant, Jorion and Talmor (2000) find that the value relevance of web traffic materially diminishes over the period February 1999 through June 2000. As for accounting data, Hand (2001) and Jorion and Talmor (2000) find that the value relevance of accounting data increases over time.

Wysocki (1999a) examines the cross-sectional and time-series determinants of message-posting volume on stock message boards on the Internet. Wysocki (1999b) uses message-posting activity on *The Motley Fool* stock chat boards to test Kim and Verrecchia's (1997) predictions on the relation between trading volume

[1] Hand (2001) documents that Internet firms are highly intangible-intensive. Profitable (unprofitable) Internet firms spent a median of 35% (86%) of revenues on R&D and selling and marketing over the period 1997:Q1–2000:Q3.

during an earnings announcement and the amount of investor private information prior to and during the earnings announcement.

Cooper et al. (2000) find a mean abnormal stock return of 74% for the ten days surrounding the announcement by a firm that it is changing its name to an Internet-related ".com" one. They conclude that their results indicate "investor mania" in the pricing of Internet stocks. In contrast, Schultz and Zaman (2000) examine the acquisition and insider trading behavior of Internet firms and from that vantage point argue that managers of Internet firms do not act as if they believe their stocks are irrationally overpriced. Schill and Zhou (2000) compare investors' valuations of Internet carve-outs with those of the parent. They find several examples of parents whose values in holdings of carved-out Internet subs significantly violate the law of one price by exceeding the market value of the entire parent over an extended period of time. Schwartz and Moon (2000) apply real option and capital budgeting theory to value Internet firms. Meulbroek (2000) finds that, in contrast to insider selling in the general population of firms, sales in Internet-based companies do not produce negative excess stock returns, suggesting that market participants do not on average interpret managers' sales as a sign of overvaluation.

Demers and Lev (2001) also examine the value-relevance of the cash burn rate and the efficiency of business-to-consumer Internet firms' stock prices to web traffic data. They conclude that cash burn is a significant value-driver, and that the reaction of Internet firms' stock prices to new web traffic data is not entirely consistent with strong form market efficiency. Trueman et al. (2001a) find that Internet analysts' revenue forecasts are unsophisticated in two ways. First, their revenue forecasts almost always underestimate actual revenues. Second, historical revenue growth has incremental predictive power over analysts' forecasts. Trueman et al. (2001b) observe persistent anomalies in Internet firms' stock returns around quarterly earnings announcements. They find a general run-up in prices in the days prior to the earnings announcement, followed by a price reversal lasting for several days. The magnitude of the market-adjusted returns associated with these price movements exceeds 11% over a 10-day period, and cannot be explained by earnings news disclosed or by changes in risk around the earnings announcements.

2.2. CONTRIBUTIONS OF THIS PAPER

2.2.1. *Comparing Internet and non-Internet stocks at different points in time*

The thesis of this paper is that if cross-sectional variation in the equity market values of Internet and non-Internet stocks can be consistently explained by similar factors at multiple points in time, then it is unlikely that the pricing of Internet stocks has been entirely irrational. For reasons of heterogeneity, I therefore analyze two types of Internet firms and two types of non-Internet firms. The two types of Internet firms are those with and without material business-to-consumer traffic. The two types of non-Internet firms are a random sample of publicly traded non-Internet firms, and a sample of non-Internet firms that went public at the same

time as Internet firms ("IPO-matched non-Internet firms"). The former sample permits a contrast with the population of publicly traded U.S. firms, both in terms of their underlying economics such as profitability and growth, as well as their equity pricing. The latter sample provides a control for time-dependent factors that may affect certain economic characteristics of Internet firms, such as the willingness of the stock market to let loss-reporting young firms go public.

I deliberately estimate cross-sectional valuation models for Internet and non-Internet firms at two quite different points in time: at the peak in U.S. Internet stocks (March 2000) and substantially after it (December 2000). My motivation for doing this is that any irrationality in the pricing of Internet stocks will arguably be greatest at the pricing peak in March 2000 but much less in December 2000, when the typical surviving Internet stock had lost some 80% of its peak pricing value. The combination of heterogeneity in the types of firms analyzed and in the dates on which the pricing analysis is done should maximize the ability of my tests to accurately assess the degree to which the prices of Internet and non-Internet stocks have been determined by similar versus dissimilar factors.

2.2.2. *Evaluating the role of supply and demand in the pricing of Internet stocks*

Conventional asset pricing models prescribe no role to supply and demand because prices are set by a combination of no-arbitrage conditions and the information sets available to rational agents about the probability distribution of firms' future cash flows. The appeal of these theoretical conditions has meant that relatively little empirical work has examined the impact of supply and demand. Using stock returns as the metric that captures the impact of supply and demand, prior research has investigated block trades (Scholes, 1972; Holthausen et al., 1987), additions to indices (Shleifer, 1986; Kaul et al., 1999), short sales (Dechow et al., 1999) and IPO lockups (Brav and Gompers, 2000). These studies find evidence of both temporary and permanent price effects associated with changes in the supply or demand of shares, even though those changes in supply and demand appear unrelated to revisions in firms' future cash flows or risk.

The Internet sector offers an appealing new lens through which to examine the pricing of supply and demand forces. The sector contains young firms, has grown rapidly, has experienced huge run-ups and deflations in prices, and has attracted large numbers of unsophisticated individual investors. It has also been alleged by influential voices on Wall Street to be an area of the market where supply and demand is materially important, particularly with regard to the extent of a firm's public float and the degree of short interest in the firm's stock.

A firm's public float is the number of freely traded shares in the hands of the general public, typically defined as the total number of shares outstanding less those held by insiders, 5% owners, and Rule 144 shares. Analysts and market commentators have suggested that one reason Internet stock prices rose so dramatically was the supply-demand imbalance caused by low public float:

> In their short trading lives, shares of Internet Capital Group and Akamai Technologies have climbed 1,916% and 804% respectively .... The word on the street is that [the enthusiasm for these startups] is all about growth potential .... But we'd like to point out that there's another force at work here, aiding and abetting the young guns' skyward ascents. In a nutshell, both companies have unusually small floats. That restricts supply and jacks up the trading price. [Float small but carry a big stock, *www.smartmoney.com*, 2 February 2000]

If Internet firms' stock prices are impacted by low float in this manner, then, I propose, all else being held equal, Internet firms' equity market values in the cross-section will be negatively correlated with the percentage of shares outstanding that are in public float.

Short interest at any given time t is the number of a firm's shares of a firm that are short-sold as of time t. Shares may be short-sold by fund managers for portfolio optimization reasons or by speculators. By their nature, speculators will only sell short the stock of firms they believe are overvalued, not undervalued. I therefore propose that all else being held equal, Internet firms' equity market values in the cross-section at time t will be positively correlated with the percentage of shares outstanding that are short-sold at time t.

3. Data

3.1. INTERNET FIRMS

My sample of Internet firms comes from www.internet.com, a website that provides comprehensive information on the Internet industry in the U.S. and worldwide. Among the free data that www.internet.com provides is its InternetStockList™. Billed by www.internet.com as "a complete list of all publicly traded internet stocks," it consists of the 50 U.S. Internet firms in the Internet Stock Index (ISDEX™) also put out by www.internet.com plus a large number of smaller Internet firms.[2] For a firm to be included in the ISDEX™, www.internet.com relies primarily on the so-called 51% test, the goal of which is to distinguish firms that would not exist without the Internet.[3] This test requires that 51% or more of a firm's revenues are judged to come from or because of the Internet. www.internet.com argues that this separates "pure play" Internet companies from others who may

[2] Frequently asked questions about the ISDEX™ can be found at http://www.kcbt.com/isdexfaq.htm.

[3] Other items examined include "marketshare leadership (measured by revenues) and whether the firm represents the Internet diversity according to our seven subsections of the Internet industry enterprises." The subsectors are e-tailers and e-commerce, software, enablers, security, content and portals, high speed and infrastructure, and ISPs and access.

have Internet products but which would and do exist without the Internet generating a majority of their revenue.[4]

I define Internet firms to be the 271 firms displayed on the InternetStockList™ on 1 November 1999 plus Excite, Geocities and Netscape Communications (three firms that were no longer traded on 1 November 1999). My definition of Internet stocks attempts to balance the fact that there is no agreed-on definition of an Internet company, with the intuitively appealing criteria that www.internet.com applies to firms included in its ISDEX™, and to a lesser degree to firms that are permitted into its broader InternetStockList™. Since there are less stringent definitions of an Internet company that would lead to a larger sample, my sample of Internet firms may underestimate the true number of Internet firms.[5]

I separate Internet firms into those that do and do not experience material business-to-consumer web traffic by means of data obtained from www.pcdataonline.com. Before it went out of business in April 2001, PC Data Online tracked actual web usage information from and buying patterns of more than 120,000 participants who used their computers at home, school or work.[6] Under the Subscriber Reports section of their website, PC Data Online provided a variety of weekly and monthly data on their "Top Web Sites" and "Top Web Properties." These were listings of the websites and web properties that their participants visited most frequently. A web property is the combination of related web sites and pages owned by the same company. For example, CNET is the owner of not just www.cnet.com, but also www.download.com, www.software.com, and www.news.com. Due to their comprehensive nature, I use data pertaining to Internet firms' web properties. I define an Internet firm as having material web traffic if on the pricing date its web property is shown on PC Data Online's "Top Web Properties" list. On 2 March 2000 and 3 December 2000 – the two dates on which I assess the pricing of Internet versus non-Internet Stocks – PC Data Online's list of the "Top Web Properties" numbered 1,000 and 2,000 properties, respectively.

3.2. NON-INTERNET FIRMS

I create two groups of non-Internet U.S. firms to compare against Internet firms: a random sample of 274 publicly traded non-Internet firms and a sample of 213

[4] Internet stocks tend to be put onto www.internet.com's IPO Watch!™ list prior to their IPOs, followed by the Internet IPO index (IPODEX™) immediately after they go public. After a month or two of "seasoning," they then seem to become eligible to be added to the InternetStockList™. For example, on 16 February 2000 there were 47 firms listed on IPO Watch!™, 48 on the IPODEX™, and 255 on the InternetStockList™.

[5] For example, www.marketguide.com reported that its database of Internet companies numbered 632 on 16 February 2000. However, they do not report how they define an Internet company. As a result, their list contains firms such as MCI/Worldcom and Microsoft that are arguably not true Internet firms.

[6] PC Data Online recruited its participants through television advertising and random digit dialing telemarketing.

IPO-matched non-Internet firms. The former permits a contrast with the universe of publicly traded U.S. firms, while the latter provides a control for time-dependent factors that may affect certain economic characteristics of Internet firms. Characteristics such as institutional holdings, analyst ratings and analyst following are plausibly dependent on the length of time the firm has been publicly traded.

The random sample is chosen from the set of all firms publicly traded on the NYSE, AMEX and NASDAQ on 31 December 1998 according to the Center for Research in Security Prices (CRSP). The set of IPO-matched non-Internet firms was identified via CRSP, www.ipomaven.com and www.ipocentral.com. To be included, the non-Internet firm had to have gone public within a few trading days of its Internet firm counterpart. Since Internet IPOs tend to bunch together, and a non-Internet IPO could be included only once in the non-Internet IPO set, it was possible to obtain a non-Internet IPO match for only 213 of the 274 Internet firms.

4. Comparisons of economic fundamentals

Tables 1 and 2 report summary statistics on a variety of economic characteristics separately for Internet and non-Internet firms. In each table, statistics are reported for Internet firms with immaterial web traffic in Panel A, web-traffic-intensive Internet firms in panel B, randomly selected non-Internet firms in panel C, and IPO-matched non-Internet firms in panel D. Table 1 compares and contrasts general information, while Table 2 focuses on earnings and revenues. Data in Tables 1 and 2 were recorded from www.marketguide.com and www.stocksheet.com on 2 March 2000 using Excel's dynamic external Web Query tool, which allows one to copy a web page into an Excel worksheet. Selected items on the web page can then be located and saved in a separate Excel file.

4.1. GENERAL CHARACTERISTICS

At the peak of Internet values in March 2000, Internet firms were strikingly different from non-Internet firms (Table 1). Compared to both randomly selected and IPO-matched non-Internet firms, the median Internet firm had a much larger market capitalization yet employed many fewer people. The median Internet firm also had greater systematic risk, more institutions holding its stock, a smaller fraction of its stock held by institutions, a much faster rate of turnover in its public float, and a greater fraction of its public float sold short.

4.2. FINANCIAL STATEMENT DATA

The juxtaposition of the large market values of Internet firms with their lack of profits has been amply highlighted by the financial press. Table 2 quantifies and compares the profitability of Internet and non-Internet firms and reveals that at the peak of Internet valuations, the past, present and expected future reported

Table I. General information on Internet and non-Internet firms as of 2 March 2000[a]

		Equity market value ($ mil.)	No. of employees at end of last fiscal year	Beta[f]	No. of institns. holding stock[g]	% of stock held by institns.[h]	% of stock in public float[i]	No. of trading days for float to turn over[j]	% of public float shorted[k]	Mean analyst rating[l]
Panel A:	Median	861	175	1.88	60	16%	33%	22	1.6%	1.5
	Min.	18	6	−0.15	1	0	5	3	0	1.0
B2B	Max.	454,167	21,000	5.07	2,848	87	98	180	17	3.0
Internet firms[b]	# obs.	173	167	29	171	174	174	167	171	156
	% < 0	0	0	4	0	0	0	0	0	0
Panel B:	Median	829	200	2.68	64	17%	35%	19	4.0%	1.5
	Min.	40	24	1.24	2	0	9	6	0	1.0
B2C	Max.	136,050	12,100	3.99	1,850	62	98	306	25	3.0
Internet firms[c]	# obs.	86	86	20	85	86	186	82	86	183
	% < 0	0	0	0	0	0	0	0	0	0
Panel C:	Median	102	417	0.75	35	26%	62%	116	0.4%	2.0
	Min.	0.4	2	−3.00	1	0	1	2	0	1.0
Random sample of	Max.	122,025	156,700	2.92	2,142	95	99	1,045	17.8	4.0
non-Internet firms[d]	# obs.	274	270	257	271	274	274	243	221	185
	% < 0	0	0	9	0	0	0	0	0	0
Panel D:	Median	405	357	1.12	42	21%	36%	58	0.3%	1.6
	Min.	0.4	6	−2.17	1	0	6	2	0	1.0
IPO-matched	Max.	40,062	36,900	2.83	455	83	99	7,100	28.1	3.0
non-Internet firms[e]										

Table I. Continued.

	Equity market value ($ mil.)	No. of employees at end of last fiscal year	Beta[f]	No. of institns. holding stock[g]	% of stock held by institns.[h]	% of stock in public float[i]	No. of trading days for float to turn over[j]	% of public float shorted[k]	Mean analyst rating[l]
# obs.	185	182	37	185	183	185	180	171	165
% < 0	0	0	8	0	0	0	0	0	0

[a]All data were taken from www.marketguide.com on 2 March 2000 (where available) using a dynamic web data pull in Excel, unless otherwise noted.

[b]Internet firms are defined as firms listed on www.internet.com's InternetStockList™ ("Complete list of all publicly traded Internet stocks") on 1 November 1999 plus 3 firms from earlier listings that were no longer traded on 1 November 1999 (Excite, Geocities and Netscape). Business-to-business, or B2B, firms are those for which PC Data Online recorded zero or immaterial business-to-household web traffic in February 2000. Zero or immaterial means that the firm's web properties were not listed in PC Data Online's top 1,000 most visited web properties.

[c]Business-to-consumer, or B2C, firms are those for which there was material business-to-household web traffic in February 2000.

[d]Randomly selected from the set of all firms publicly traded at 31 December 1998 per the Center for Research in Security Prices (CRSP).

[e]Non-Internet firms that went public within a few trading days of the Internet firms per CRSP, www.ipomaven.com and www.ipocentral.com.

[f]The slope of the 60 month regression line of the percentage price change of the stock relative to the percentage price change of the S&P 500. Not calculated if there are less than 24 months of data available.

[g]Number of institutions (pension funds, mutual funds, etc.) that report an investment position in the firm's stock.

[h]Shares held by institutions divided by total shares outstanding.

[i]Public float divided by total shares outstanding. Public float is the number of freely traded shares in the hands of the public, defined as total shares outstanding less shares held by insiders, 5% owners, and Rule 144 shares.

[j]Public float divided by average daily trading volume. Average daily trading volume is total trading volume over the prior 3 months divided by 66.

[k]Number of shares sold short divided by total shares outstanding (as of 8 March 2000 from a dynamic web data pull on 1 May 2000; else if missing on 8 March 2000, as of 10 January 2000 from a dynamic web data pull on 2 March 2000).

[l]Analyst ratings are coded as: Strong buy = 1, Buy = 2, Hold = 3, Underperform = 4, Sell = 5. Ratings are as of 3 February 2000.

Table II. Earnings and revenues of Internet and non-Internet firms as of 2 March 2000[a]

		Mean forecast $ EPS 2000[f]	Mean forecast $ EPS 2001[f]	Forecast long-term EPS growth[g]	Actual 1-year revenue growth[h]	Actual 3-year revenue growth[h]	No. of analysts forecasting for 2001[i]	Std. dev. $ EPS 2000 forecasts[j]	Std. dev. $ EPS 2001 forecasts[j]	Std. dev. long-term EPS growth forecasts[j]
Panel A:	Median	−0.75	−0.22	51%	108%	116%	4	0.05	0.09	13%
	Min.	−5.07	−7.03	15	−51	−66	0	0.01	0.01	1
B2B	Max.	1.56	2.01	118	1,000	1,000	39	1.05	2.25	89
Internet firms[b]	# obs.	155	146	124	151	87	174	143	119	80
	% <0	74	57	0	7	3	0	0	0	0
Panel B:	Median	−1.22	−0.65	53%	140%	178%	5	0.05	0.13	17%
	Min.	−4.90	−4.51	25	−57	−39	0	0.01	0.01	3
B2C	Max.	1.39	2.05	201	1,000	1,000	39	1.18	1.10	37
Internet firms[c]	# obs.	80	79	69	77	47	86	80	72	44
	% < 0	81	68	0	4	4	0	0	0	0
Panel C:	Median	0.86	1.25	17%	11%	14%	1.5	0.05	0.07	3%
	Min.	−12.54	−2.28	3	−97	−61	0	0.01	0.01	1
Random sample of	Max.	6.20	6.92	69	877	897	30	1.82	1.07	26
non-Internet firms[d]	# obs.	183	137	135	269	261	183	130	98	97
	% < 0	13	9	0	22	16	0	0	0	0
Panel D:	Median	0.46	0.71	30%	48%	36%	3	0.03	0.06	5%
	Min.	−6.87	−8.58	8	−53	−45	0	0.01	0.01	1
IPO-matched	Max.	5.06	5.80	117	1,000	1,000	23	0.52	0.61	51
non-Internet firms[e]										

Table II. Continued.

	Mean forecast $ EPS 2000[f]	Mean forecast $ EPS 2001[f]	Forecast long-term EPS growth[g]	Actual 1-year revenue growth[h]	Actual 3-year revenue growth[h]	No. of analysts forecasting for 2001[i]	Std. dev. $ EPS 2000 forecasts[j]	Std. dev. $ EPS 2001 forecasts[j]	Std. dev. long-term EPS growth forecasts[j]
# obs.	160	145	132	158	125	160	135	110	92
% < 0	26	20	0	10	7	0	0	0	0

[a] All data were taken from www.marketguide.com on 2 March 2000 (where available) using a dynamic web data pull in Excel, unless otherwise noted.

[b] Internet firms are defined as firms listed on www.internet.com's InternetStockList™ ("Complete list of all publicly traded Internet stocks") on 1 November 1999 plus 3 firms from earlier listings that were no longer traded on 1 November 1999 (Excite, Geocities and Netscape). Business-to-business, or B2B, firms are those for which PC Data Online recorded zero or immaterial business-to-household web traffic in February 2000. Zero or immaterial means that the firm's web properties were not listed in PC Data Online's top 1,000 most visited web properties.

[c] Business-to-consumer, or B2C, firms are those for which there was material business-to-household web traffic in February 2000.

[d] Randomly selected from the set of all firms publicly traded at 31 December 1998 per the Center for Research in Security Prices (CRSP).

[e] Non-Internet firms that went public within a few trading days of the Internet firms per CRSP, www.ipomaven.com and www.ipocentral.com.

[f] Fiscal 2000 (2001) refers to the first (second) fiscal year for which I/B/E/S reports analyst forecasts. Forecasts are for diluted EPS, excluding extraordinary items and discontinued operations.

[g] Compound annual growth rate forecasted for EPS, excluding extraordinary items and discontinued operations over the next 5 years. A positive growth rate from a negative base figure (as is the case for most Internet firms) is clearly problematic. Attempts to determine exactly what analysts mean when they forecast positive EPS growths for Internet companies proved unsuccessful.

[h] Revenue growth rates greater than 1000% were set to 1000%.

[i] Only defined for those firms where equity market value is non-missing.

[j] Only defined for those firms where there are 3 or more analyst forecasts of the item.

profitability of Internet firms was dramatically less than both non-Internet firms in general and IPO-matched non-Internet firms. For example, of web-traffic-intensive Internet firms, 81% were forecasted to report a bottom line loss in fiscal 2001, as compared to 13% for randomly selected non-Internet firms and 26% for IPO-matched non-Internet firms.

It should be noted that while the lack of profitability of Internet firms is at odds with that of non-Internet firms, it is not unique historically. Amir and Lev (1996) report that for the 40 quarters beginning 1984:Q1 and ending 1993:Q4, 69% of reported quarterly EPS of the 14 independent cellular telephone companies they examined were negative. They also report that the corresponding figure for 44 biotechnology companies over the same period was 72%. This compares to 87% of Internet firms reporting negative EPS for fiscal 1998, suggesting that Internet firms may not be that much more unprofitable than have been other groups of firms in earlier technology-based, high-growth industries.

Running partially contrary to Internet firms' dismal projected profitability at 2 March 2000 are analysts' forecasts that the median Internet firm would enjoy an earnings growth rate of 52% over the next five years ("long-term growth rate in EPS"). This compares to 17% for typical non-Internet firms and 30% for IPO-matched non-Internet firms.[7] Such favorable expectations for the long-term profitability of Internet firms may stem in part from the dramatically higher revenue growth rates that Internet firms have experienced. The median Internet firm's most recent one-year and three-year annual revenue growth rates are ten times those of non-Internet firms in general, and two to three times those of IPO-matched non-Internet firms. However, there is also more uncertainty about Internet firms' growth, in that the standard deviations of analysts' forecasts of long-term EPS growth rates are larger for Internet firms than for non-Internet firms.

5. Regressions

5.1. VARIABLE DEFINITIONS

Table 3 reports the definitions of variables used in the regressions before they are rank-transformed. The market value of equity, *MVE*, is the closing price on either 2 March 2000 or 3 December 2000 multiplied by the number of shares outstanding. Mean analyst forecasts of earnings in fiscal 2001 and the long-run growth in earnings are denoted *FNI* and *FLTG*, respectively. Following Hand (2001), who finds that positive (negative) current earnings for Internet firms are typically positively (negatively) priced, *FNI* is decomposed into its positive and negative components, *PFNI* and *NFNI*, respectively. That is, *PFNI* is set to *FNI* if $FNI > 0$ and zero otherwise, while *NFNI* is set to *FNI* if $FNI < 0$ and zero otherwise. In order to

[7] A positive growth rate from a negative base figure (as is the case for most Internet firms) is clearly problematic. Attempts to determine what analysts mean when they forecast positive EPS growths for Internet companies proved unsuccessful.

ensure consistent comparisons across Internet and non-Internet firms, and because some non-Internet firms may be highly intangible-intensive and therefore likely like Internet firms to report book income losses because of large investments in intangibles (rather than poor operating performance), I construct the variables *PFNI* and *NFNI* for Internet and non-Internet firms alike. I also permit firms with negative forecasted 2001 earnings to have a separate intercept in order that differences in intercepts do not inadvertently get embedded within slope coefficients in the regressions.

Four types of web traffic data are taken from PC Data Online, where available. These are the number of unique visitors in the relevant time period, *VISITORS*; the percentage of households reached, *REACH*; the total number of pages viewed by the PC Data Online panel, *PAGEV*; and the number of hours the PC Data Online panel spent viewing the pages, *HOURS*. PC Data Online weighted information from its participants according to the demographic parameters of the Canadian and U.S. Internet user population, *POP*, where *POP* is estimated via a quarterly enumeration study using random digit dialing sampling techniques. On 2 March 2000 and 3 December 2000, the Internet user population estimated by PC Data Online was those U.S. and Canadian households viewing the Internet using PCs with Windows 95/98/NT as their operating system. The estimated population did not include corporate usage. Thus, the number shown by PC Data Online for *VISITORS* to the web property "AOL Sites" in February 2000, for example, is an estimate of the total number of household-based Canadian and U.S. unique visitors to all AOL web sites in February 2000.

Since household reach is defined as simply *VISITORS* divided by *POP*, I focus my empirical tests on *VISITORS*, *PAGEV* and *HOURS*. Panels A and B of Table 4 report descriptive statistics on and Pearson and Spearman correlations among *REACH*, *VISITORS*, *PAGEV* and *HOURS*. Table 4 reveals that the distribution of each web metric is highly right-skewed, and that different types of web metrics are very strongly positively correlated. Regressions using prices and financial data on 2 March 2000 (3 December 2000) employ web traffic information for the month of February (November) 2000.

The data used to construct proxies for the percentage of a firm's outstanding shares in public float and short interest were taken from www.marketguide.com. The percentage of outstanding shares in public float, *FLOAT*, is the number of freely traded shares in the hands of the public (defined as total shares outstanding less shares held by insiders, 5% owners, and Rule 144 shares) divided by total shares outstanding. The percentage of outstanding shares sold short, *SHORTINT*, is the number of shares sold short divided by total shares outstanding. Even though the dependent variable, equity market value, is not deflated, I express public float and short interest as a fraction of total shares outstanding to mitigate bias that could be created by reverse causality. That is, it is plausible to argue that a large market value causally results in greater public float and/or a greater amount of short interest: for example, it is likely that the larger the firm, the more liquid is the

Table III. Data definitions for variables used in regressions, prior to rank transformations

Variable	Label	Units	Description and/or computation details
Economic fundamentals (from www.marketguide.com)			
Equity market value	*MVE*	$mil	Closing price on 2 March 2000 or 3 December 2000 multiplied by the number of common shares outstanding at that time.
Forecasted one-year-ahead earnings	*FNI*	$mil	Mean analyst forecast on 2 March 2000 or 3 December 2000 for fiscal 2001 earnings.
Positive *FNI*	*PFNI*	$mil	Set to *FNI* if $FNI \geq 0$, zero otherwise.
Negative *FNI*	*NFNI*	$mil	Set to *FNI* if $FNI < 0$, zero otherwise.
Dummy on negative *FNI*	*DumNFNI*	0, 1	Set to 1 if $FNI < 0$, zero otherwise.
Long-term forecasted earnings growth	*FLTG*	%	Compound annual growth rate forecasted by www.marketguide.com for EPS excluding extraordinary items and discontinued operations over the next five years, on 2 March 2000 or 3 December 2000.
Web metrics (from www.pcdataonline.com)			
Unique visitors	*VISITORS*	000s	Number of web-active PC Data Online participants who visited a particular web property in February or November 2000.
Reach	*REACH*	%	*VISITORS* ÷ *POP*, where *POP* is the total estimated U.S. + Canadian Internet user population.
Page views	*PAGEV*	000s	Total pages viewed by web-active PC Data Online participants for a specific web property.
Hours viewed	*HOURS*	000s	Total hours that a specific web property is viewed by web-active PC Data Online participants.
Supply and demand forces (from www.marketguide.com)			
Public float	*FLOAT*	%	Public float ÷ total shares outstanding. Public float is the number of freely traded shares in the hands of the public, defined as total shares outstanding less shares held by insiders, 5% owners, and Rule 144 shares.
Short interest	*SHORTINT*	%	Shares sold short as of 8 March 2000 or 8 December 2000 ÷ total shares outstanding.

Table IV. Descriptive statistics for and correlations among web traffic measures for the 79 (61) Internet firms listed by PC Data Online as being in the top 1,000 (2,000) web properties in their database in February 2000 (November 2000)[a]

	REACH	*VISITORS*	*PAGEV*	*HOURS.*
Panel A: Descriptive statistics for web traffic measures[b]				
Min.	0.1%	0.9	1	<0.01
Median	3.9%	2.6	59	0.5
Max.	69.6%	46.7	13,630	175.1
Panel B: Pearson (Spearman) correlations are above (below) the diagonal				
REACH		1.00	0.87	0.83
VISITORS	1.00		0.87	0.83
PAGEV	0.91	0.91		0.95
HOURS	0.86	0.86	0.94	

[a] Internet firms on www.internet.com's InternetStockList™ at 1 November 1999 with valid regression data and positive web traffic.

[b] Variable definitions are provided in Table 3. Data for *VISITORS*, *PAGEV* and *HOURS* are in units of 000s.

market for its shares, the cheaper it is to sell short, and the more short sales activity arises.[8]

5.2. REGRESSION METHODS

My regression method differs from approaches used in prior work in that I employ ranked data rather than data that are either unscaled or scaled by shares, total assets, revenues or book equity. I use ranked data for two reasons. First, scatter plots of both raw and deflated data reveal the presence of significant numbers of extreme observations (regardless of the deflator). The rank transformation substantially mitigates the influence of outliers and directly addresses the problem of scale bias as defined by Easton and Sommers (2000), in which regression coefficients are dominated by the largest firms in a sample. Second, deflation can create more problems than it solves. For example, the number of shares is arbitrary and is therefore not a meaningful scalar. Total assets and book equity are problematic because they are often close to zero, being driven there by the biased accounting experienced by Internet firms when their large investments in marketing and R&D intangibles have to be immediately expensed. I view the benefits of rank regression as outweighing the costs, among which is that it is difficult to compute elasticities or offer cardinal economic interpretations of the coefficients.

I also diverge from conventional accounting-based value-relevance regressions motivated by Ohlson (1995) by not including the book value of common equity as an independent variable. Including book equity would make regression results

[8] Similar results are obtained if short interest is deflated by public float rather than by total shares outstanding.

subject to the criticism that for many Internet companies, the book value of equity and the market value of equity are mechanically linked. To illustrate this, suppose that two years after being founded, an Internet company has 100 shares outstanding and zero book equity ($50 of contributed capital offset by $50 of accumulated losses). Suppose further that the firm then goes public by selling 10% of its existing shares to the public for $500. At that point its market value is $5,000 and its book equity is $500. However, the book equity figure is entirely determined by, and reflective of, the IPO price. As a result, the inclusion of book equity for Internet firms runs the high risk of simply regressing current market value on earlier market value.[9]

5.3. REGRESSION RESULTS

Table 5 summarizes the results of cross-sectional regressions between the equity market values of Internet and non-Internet firms and accounting data, web traffic (where available) and supply and demand forces. Due to data limitations, particularly with regard to forecasted 2001 earnings and the forecasted long-term growth rate in earnings, the number of observations reported in the regressions in Table 5 are substantially fewer than the number of firms in the initial samples described in Tables 1 and 2. Parameter estimates and associated t-statistics for Internet firms are reported in panels A and B, while panels C and D show the results for randomly selected and IPO-matched non-Internet firms, respectively.[10] From Table 5, I note the following findings.

First, despite the large differences in economic fundamentals reported in Tables 1 and 2, similar factors explain cross-sectional variation in the pricing of Internet firms with immaterial web traffic and non-Internet firms both at and substantially after the peak in the Internet market. On each of 2 March 2000 and 3 December 2000, the equity market values of Internet firms with immaterial web traffic, firms that are randomly selected, and firms that went public at the same time as Internet firms are significantly increasing in positive forecasted fiscal 2001 earnings and significantly increasing in the forecasted long-run earnings growth rate, but significantly decreasing in negative forecasted fiscal 2001 earnings. The strong, persistently negative pricing of losses (i.e., the negative relationship between losses and equity market value) almost certainly arises not because the market perversely rewards poor operating performance, but because losses typically reflect the expensing of significant investments in intangible assets under U.S. accounting rules (Hand, 2001; Zhang, 2000). Hand (2001) documents that Internet firms are highly

[9] Consistent with this viewpoint, book equity receives little or no attention in the financial press when it comes to evaluating Internet stocks. This is in sharp contrast to the high attention paid to book income and its components.

[10] The regression results obtained from March 2000 and December 2000 are robust in the sense that similar findings emerge if one compares the pricing of Internet and non-Internet stocks in February 2000 and November 2000, or April 2000 and December 2000.

Table V. OLS rank regressions of the equity market values of Internet and non-Internet firms on analysts' fiscal 2001 earnings forecasts, web traffic, and proxies for supply and demand factors. Regressions are estimated on 2 March 2000 and 3 December 2000.[a]

Date	Int.	*DumNFNI*	*PFNI*	*NFNI*	*FLTG*	*VISITORS*	*FLOAT*	*SHORTINT*	#obs.	Adj. R^2
Panel A: Internet firms with zero or immaterial business-to-consumer web traffic										
2 Mar. 2000	−91	161	1.38	−0.56	0.24		−0.09	0.10	144	29.4%
	(−3.0)	(5.0)	(5.2)	(−3.4)	(3.2)		(−1.2)	(1.3)		
3 Dec. 2000	−61	101	1.28	−0.42	0.13		0.08	0.12	120	47.6%
	(−2.9)	(4.5)	(5.7)	(−2.5)	2.0		(1.1)	(1.7)		
Panel B: Internet firms with positive business-to-consumer web traffic										
2 Mar. 2000	−1	38	0.64	−0.66	0.03	0.28	0.12	−0.10	79	53.1%
	(−0.0)	(1.2)	(1.4)	(−4.5)	(0.4)	(3.3)	(1.4)	(−1.1)		
3 Dec. 2000	−47	66	1.55	−0.28	0.03	0.35	−0.01	−0.02	62	53.1%
	(−2.4)	(3.3)	(3.9)	(−1.5)	(0.4)	(3.7)	(−0.1)	(−0.2)		
Panel C: Random sample of NYSE + AMEX + NASDAQ firms										
2 Mar. 2000	−23	70	1.04	−3.89	0.19		−0.02	0.10	128	79.5%
	(−3.8)[b]	(6.2)	(18.7)	(−2.8)	(4.1)		(−0.5)	(2.3)		
3 Dec. 2000	−24	90	1.00	−5.51	0.11		0.06	0.14	123	86.7%
	(−5.5)	(10.5)	(22.0)	(−6.2)	(2.9)		(1.8)	(3.6)		
Panel D: Non-Internet firms that went public at the same time as Internet firms										
2 Mar. 2000	−46	110	0.90	−2.03	0.39		−0.00	0.08	138	50.8%
	(−4.0)	(8.1)	(10.0)	(−3.1)	(5.2)		(−0.0)	(2.7)		
3 Dec. 2000	−40	93	1.03	−2.06	0.28		−0.00	0.14	129	65.7%
	(−5.0)	(8.6)	(13.1)	(−4.2)	(4.3)		(−0.0)	(2.2)		

[a] *t*-statistic relative to a null of zero.

[b] Internet firms are from www.internet.com's InternetStockList™ at 1 November 1999. Variable definitions are provided in Table 3.

intangible-intensive, with profitable (unprofitable) Internet firms spending a median of 35% (86%) of revenues on R&D and selling and marketing over the period 1997:Q1–2000:Q3.

In contrast to these results, the pricing of book income for web-traffic-intensive firms differs from that of other firms both before and after the peak of the Internet market. For example, at the Internet pricing peak, the equity market values of web-traffic-intensive Internet firms are unrelated to positive forecasted fiscal 2001 earnings and unrelated to the forecasted long-run earnings growth rate, but are significantly negatively related to negative forecasted fiscal 2001 earnings. After the peak, positive earnings become significantly positively priced, but negative earnings are no longer significantly negatively priced. The differences between the coefficients on both positive and negative forecasted fiscal 2001 earnings have 2-tailed p-values of 0.15. Forecasted long-term earnings growth remains value-irrelevant on both dates.

The shift in the pricing of losses is consistent with the view of the financial press that the market was no longer willing to view web-traffic-intensive Internet firms' expenditures on R&D and marketing intangibles as assets. The shift in the pricing of profits is consistent with the market rewarding those firms that were on a clear path to profitability in the form of positive forecasted fiscal 2001 earnings.

Beyond earnings, panel B indicates that web traffic is significantly positively priced at the margin both at and after the Internet pricing peak. However, there is no evidence that two proxies for supply and demand forces – the degree of public float and short interest – are value-relevant for Internet firms. Lower public float does not seem to push up a firm's equity market value, nor is a greater amount of short interest indicative of overvaluation. Public float is also value-irrelevant for non-Internet firms, as is short interest for IPO-matched firms. The only indication of any value-relevance for supply and demand factors is the consistently significantly positive relation between the degree of short interest and equity market values for randomly selected non-Internet firms. I do not have an explanation for the reason this exception arises, although the consistency and strength of the relation between short interest and equity market values for non-Internet firms suggests that short interest may be an indicator of overvaluation for future research to consider.

Overall, my conclusion is that while there are some noteworthy pricing differences, there are enough similarities in the cross-sectional pricing of Internet and non-Internet firms to make it unlikely that the pricing of Internet stocks during 2000 was entirely irrational. Moreover, any irrationality in the prices of Internet stocks cannot be linked to public float or short interest.

5.4. CAVEATS

Although my interpretation of the regressions reported in Table 5 views the cross-section of U.S. Internet stock prices in early 2000 being inconsistent with entirely irrational pricing, two key caveats deserve mention. First, my analysis and infer-

ences are limited to the cross-section of Internet stock prices. Casual observation of the levels of Internet firms' equity market values relative to the levels of reasonable intrinsic values points to the majority of Internet stocks being particularly overvalued in early 2000. However, as emphasized by Lee (2001), the combination of costly arbitrage and severe noise trading makes it eminently possible for equity prices to be systematically too high or too low while at the same time the cross-section of prices embed sensible economic correlations. Internet stocks probably represent such a situation. Second, while they are informative, cross-sectional regressions can make only weak statements about how rational prices are. For example, I argue in Hand (2001) that losses are negatively priced because the market views huge, strategy-dominant expenditures on intangibles as assets rather than expenses. However, testing whether losses are *rationally* negatively priced would seem to require a detailed analysis of future stock returns and/or the ex post facto cash flows arising from the expenditures.

6. Conclusions

In this paper I have sought to assess the degree of similarity in the cross-sectional pricing of Internet and non-Internet stocks during the tumultuous year of 2000. Despite large differences in their economic fundamentals, I found that the equity market values of Internet firms with immaterial web traffic, firms that are randomly selected, and firms that went public at the same time as Internet firms are similarly related to analysts' forecasts of earnings in 2001 and the long-term rate of growth in earnings. This was not the case for web-traffic-intensive firms.

I also found that at the peak of Internet prices in March 2000 the market rewarded losses of web-traffic-intensive firms but did not reward profits, while after the peak the market reversed its view, rewarding profits but not losses. Beyond earnings, web traffic was significantly positively priced both at and after the peak in pricing. However, there is no evidence that two proxies for supply and demand forces – the degree of public float and short interest – have been systematically value-relevant for Internet firms. Overall, I conclude that there are enough similarities in the cross-sectional pricing of Internet and non-Internet firms to make it unlikely that the pricing of Internet stocks during 2000 was entirely irrational. In addition, any irrationality in the prices of Internet stocks cannot be linked to public float and short interest.

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