Financial Analysts' Role in the 1996-2000 Internet Bubble

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May 2005
Comments welcome.

We thank seminar participants at the University of Waterloo for helpful comments on an earlier version of the paper. We thank Maureen McNichols and Jerry Sun for their help in constructing the sector classifications.

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Abstract

We investigate financial analysts' role in the 1996-2000 "Internet Bubble," comparing their recommendations in this sector to those for other new companies in the same period. Our research addresses the following two questions: (1) were financial analysts relatively more optimistic about Internet stocks than about other new issues during 1996-2000? and (2) did their relative optimism for Internet stocks (if it existed) inflate the prices of these stocks, creating or fueling the Internet Bubble? By using other new issues in this time period as our comparison group, we control for analysts' documented optimism when initiating coverage and around equity issues. We find evidence that analysts made higher recommendations for Internet stocks than for other new issues, beginning in 1998. We also find a significant relation between analyst optimism and subsequent stock returns, particularly in the Internet sector.

1. Introduction

Following the success of several early Internet initial public offerings (IPOs) such as Yahoo (1996), Amazon (1997), and eBay (1998), an increasing number of Internet firms went public. From January 1999 to February 2000, a total of 298 Internet companies went public, more than doubling the number of existing Internet stocks. More astounding than the growth of in the number of public companies in the sector was the dramatic rise in share values for Internet stocks. Liu and Song (2001) cite results compiled by Pegasus Research International, showing that the two-year 1998-9 return on an Internet index (INTDEX) exceeded 125%, compared with 85% growth in the NASDAQ index and 19.5% in the S&P 500 index. Internet stocks' remarkable rise was eclipsed by their monumental failure in early 2000. Hiriam (2000) reports that the 51% drop in the NASDAQ index during 2000 was the largest decline since the Great Depression.

Seeking explanations for the apparent "bubble" of the late 1990s, some financial observers blamed financial analysts for misleading investors. For example, Malkiel (2002) writing in the Wall Street Journal, says, "there has been no credible proposal to deal with the issue of corrupted research, which surely contributed to the bubble..." To provide evidence for or against this claim, we investigate financial analysts' role during 1996-2000, addressing two related research questions: (1) Were financial analysts more optimistic for Internet stocks than for other IPO stocks during this period? and (2) Did their relative optimism (if it existed) inflate the prices of Internet stocks to create or fuel the Internet Bubble?

Our main contributions are to compare the Internet sector against other new companies going public in the same period, and to link the degree of optimism to stock returns. Liu and Song (2001) examine analyst forecasts for Internet stocks immediately before and after the

market crash in March 2000. Finding significantly more optimistic forecasts before than after, they conclude that analysts contributed to the bubble. Past research, however, documents that analysts exhibit greater optimism at the initiation of coverage of a stock (e.g. McNichols and O'Brien, 1997) and immediately following the stock's IPO (e.g. Bradley, Jordan and Ritter, 2003). The fact that a large concentration of Internet companies went public in 1999 introduces a competing explanation for their results, and motivates our use of non-Internet IPO companies in this time period as our comparison group. In addition, we relate analysts' relative optimism to the stocks' performance, both before and after the recommendation.

Results of our logistic regression model show that analysts' relative optimism for Internet stocks does not appear until 1998, and that they make similar IPO-year recommendations for Internet and other high-tech stocks throughout the 1996-2000 period. Their IPO-year optimism for both these sectors exceeds that for non-tech new issues beginning in 1998. For slightly more seasoned issues, however, analysts clearly recommended Internet stocks above either other technology or non-tech stocks.

We examine the link between optimism and stock returns, within sectors and across them. Within the Internet sector, we find a strong relation between the level of analysts' optimism at the end of one quarter and the market-adjusted stock returns earned in the following quarter, suggesting that analysts played a role in the unusual stock performance during this period. We also find the sensitivity of stock returns to prior analyst recommendations to be higher in the Internet sector than in our other two sectors, whether during the IPO year or later. The remainder of this paper is organized as follows: Section 2 reviews related literature and develops hypotheses about analysts' relative optimism for Internet stocks during 1996-2000. Section 3 describes the sample and research design. Section 4 presents our results, and section 5 concludes

the study.

2. Literature Review and Hypotheses

2.1 Analysts' Optimism

Many empirical studies over decades of research report that analysts produce optimistic forecasts (e.g. Barefield and Comiskey, 1975; Abarbanell, 1991; Lim, 1998). Researchers suggest various motives for the optimism, including analysts' fear of jeopardizing investment banking business, desire to maintain access to management information, or incentives to generate trading commissions. This general background of optimism indicates that optimism, per se, cannot explain the extraordinary market behavior of the late 1990s.

The IPO literature also finds evidence of analyst optimism. Bradley et al. (2003) find that analysts almost always initiate coverage with a buy or strong buy recommendation following an IPO. Dechow et al. (1997) and Rajan and Servaes (1997) find that analysts systematically over-estimate long-term growth around equity offerings. Similarly, Michaely and Womack (1999) argue that underwriter analysts give IPO stocks a "booster shot" of positive recommendations within the first year after the IPO. These studies suggest an "IPO effect" - analysts report more optimistically around the stock's initial equity offerings. Given that the first Internet stocks went public in the mid-1990s, with a great many emerging in 1999, we expect IPO effects to play a role in analyst optimism about these stocks.

McNichols and O'Brien (1997) document that analysts selectively cover firms that they perceive as having favorable future prospects, and exhibit more optimism at the initiation of coverage, even after they omit IPO stocks from their analysis. This result indicates that the life-cycle effects of analysts' selective coverage may confound time-series comparisons within

companies.

2.2 Internet Stock Overpricing

The literature on Internet pricing generally suggests irrationality. Cooper et al. (2000) document a "dotcom effect," in which firms that changed their names to include ".com" or "Internet" experience high abnormal returns surrounding their announcement. Along the same lines, Cornell and Liu (2000) identify several cases in which the market value of a parent company was less than the market value of its Internet subsidiary. To explain these phenomena, Hand (2000) argues that the apparently irrational pricing of Internet stocks, namely, the negative correlation between market value and earnings, may be due to different valuation models underlying Internet stock pricing. Trueman et al. (2000) go a step further, documenting that for portal Internet firms, net income is negatively related to market value; but when they decompose net income, they find market value is positively related to both gross profit and research and development expenditures.

The lack of past earnings histories or well-established valuation models for Internet stocks allegedly made forecasting the earnings and future growth potential of these stocks difficult. Motivated by the idea that analysts' irrational forecasts and recommendations for Internet stocks fueled the Internet Bubble, Liu and Song (2001) provide empirical evidence on analysts' contribution to the bubble. They find analysts' quarterly earnings forecasts for Internet stocks to be significantly more optimistic in the two quarters prior to the March 2000 crash than in the one quarter after. They conclude that financial analysts could be held accountable for creating the bubble.

We re-examine Liu and Song's (2001) question, using the cross-sectional benchmark of other IPO stocks in the same period to control for analysts' general optimism, IPO effects, and

the time-period effects that may confound their results. If analysts behave similarly for Internet and for other stocks, then their behavior cannot explain Internet stocks' unusual market valuations. We further examine their relative optimism for Internet stocks in relation to later prices of these stocks, to examine the cause-effect relation.

2.3 Hypotheses

Taking into consideration analysts' over-optimism for stocks in general and for IPO stocks in particular, we investigate the extent of their relative optimism for Internet stocks, as compared with non-Internet IPO stocks. Stated in alternative form, our first hypothesis is:

> H1: During January 1996 through February 2000, analysts made relatively more optimistic stock recommendations for Internet stocks than for other stocks that went public during the same period.

We examine recommendations rather than earnings forecasts because we are concerned with analysts' relative optimism across companies. Earnings and earnings forecasts lack a clear metric for comparisons across companies, because of differences in the level, volatility and accounting quality of earnings numbers across firms and sectors. Moreover, given the unusual relation between the earnings and valuations of Internet stocks in this period, we chose not to speculate on how to benchmark analyst optimism for these firms' earnings. Recommendations, on the other hand, fall on a uniform 5-point scale designed to guide investment decisions, inherently a cross-firm comparison.

We define three industry sectors: Internet, Technology other than Internet, and Non-technology, as we explain in section 3. We compare analysts' relative optimism across the three sectors, for stocks that went public between January 1996 and February 2000. Our three-sector classification allows us to investigate whether the late-1990s phenomena were Internet-specific

or extended to all high-tech IPOs, or to all IPOs.

We separate the IPO year from later years to distinguish IPO effects, and we also examine sub-periods within this time period. Further, we document the relation between prior stock performance and recommendation optimism.

We investigate the market impact of analysts' relative optimism through our second hypothesis:

> H2: Analysts' optimistic recommendations for Internet stocks inflated the prices of these stocks, relative to other newly public stocks during January 1996 – February 2000.

We use both firm- and sector-level analyses to examine this hypothesis. If investors were driven by analysts' optimistic recommendations to inflate the values of Internet stocks, then we expect that analyst optimism will lead stock returns. We examine, quarter-by-quarter, how analyst optimism predicts future returns in this period, and look for differences across sectors. We separate the IPO year from other years and examine subperiods within our sample time frame, as we did for our first hypothesis.

3. Research Design

3.1 Sample Selection

We obtain an initial list of 2,552 firms that went public between January 1, 1996 and February 29, 2000 from the Securities Data Corporation (SDC) database. To define the industry sectors, we first classify companies into 1,261 high-tech and 1,291 non-tech (N) firms, using SDC's "high-tech industry" field. We then divide the high-tech IPO firms into 438 Internet (I) and 823 non-Internet technology firms (T), by selecting firms that have the keyword "Internet" in either the SDC "high-tech industry" or "long business description" fields. Our Internet

classification thus depends on companies' self-descriptions.

Schultz and Zaman (2001) and Zuckerman and Rao (2004) use an approach similar to ours to identify Internet stocks. Many other researchers, including Bartov, Mohanram and Seethamraju (2001), Demers and Lev (2001), Hand (2000), Liu and Song (2001), and Trueman and Zhang (2000) use the InternetStockList (http://www.internet.com). The InternetStockList classifies companies that went public prior to September 1999, and we could not replicate the methodology. We therefore chose a replicable methodology that would allow us to classify IPOs through February 2000. Of the 323 firms on the InternetStockList, our classification scheme places 206 or 64% in our Internet sector, 41 or 13% in our Technology sector, and 14 or 3% in our Non-tech sector. The remaining 62 InternetStockList firms either did not have a perm number in the Center for Research in Securities Prices (CRSP) database to enable matching, or did not have an IPO listed on SDC in this period. Misclassified firms will diminish our ability to find differences among the sectors, if any exist. The fact that we do find significant differences across sectors mitigates this concern somewhat.

As shown in Table 1, Panel A, IPOs in the three sectors cluster by years through the sample period. Over 50% of non-Internet IPOs took place in 1996 and 1997, while over 60% of the Internet IPOs took place in 1999 and 2000. Thus, IPO-year effects and time-period effects are not independent in this sample. For this reason, we separately examine subperiods for both IPO years and non-IPO years.

Figure 1 shows the return behaviour of IPO stocks in our three sectors during this period. The figure illustrates that Technology and Internet IPOs outperformed Non-tech IPOs, but that this out-performance began after mid-1998. The cumulative returns to Technology and Internet IPOs from February 1996 to February 2000, inclusive, are not statistically different, while both

significantly exceed the cumulative returns to Non-tech IPOs. Figure 1 motivates our separately examining early and late subperiods within our sample period, and anticipating that the Technology and Internet sectors will be similar to each other, and different from the Non-tech sector.

3.2 Empirical Methods

We collect analyst recommendations and stock return data for our 2,552 IPO stocks from First Call and CRSP respectively. We use CRSP's historical cusip list and perm numbers to match firms across different databases. Table 2 shows that, after omitting recommendations that the database codes as deleted, First Call contains 23,611 recommendations between January 1, 1996 and February 29, 2000 for 1,930 companies, or approximately 76% of our initial sample. We describe the further selection for our two hypotheses below.

To investigate Hypothesis 1, regarding analysts' relative optimism for Internet stocks during our sample period, we first examine frequency tables of the analysts' recommendations by sector, within the IPO year and afterwards, and year-by-year. For this examination, we consider all new recommendations by any analyst, omitting reiterations of the same recommendation that occur within one year of the previous recommendation. Table 2 shows that this eliminates no firms, and roughly 11% of recommendations.

To further examine Hypothesis 1, we use a logistic regression to condition analysts' optimism on the recent stock performance. Amir et al. (1999) find that analysts primarily react to changes in market values, rather than cause them. The past performance variable allows us to test whether the stock's recent past performance confounds sector differences in optimism. We specify our logistic regression as follows:

$$\Pr(Buy_{ijt}) = \beta_{0S} + \beta_{1S} R_{j,[a,t-1]} + \varepsilon_{1ijt}, \qquad (1)$$

where:

Buy_{ijt} = 1 if analyst i assigned a rating of either 1 or 2 (strong buy or buy) to stock j at time t; 0 if the rating assigned was 3, 4, or 5 (hold, sell, or strong sell);

S = the company's sector: Internet, Technology excluding Internet, or Non-tech;

$R_{j,[a,t-1]}$ = firm j's cumulative stock return between dates a and t-1. For recommendations within one year after the IPO, a is the IPO date, and we annualize the return, as $R_{j,[a,t-1]} = \left(\frac{\prod_{\tau=a}^{(t-1)} (1+r_{j\tau})}{n} * 250 \right) - 1$, where n is the number of trading days prior to the recommendation. For recommendations more than one year after the IPO, a is 366 calendar days prior to the recommendation.

In this logistic regression model, we test H1, whether analysts were more optimistic about Internet stocks, conditional on prior stock return, by testing $\beta_{0I} = \beta_{0T}$, and $\beta_{0I} = \beta_{0N}$. We estimate the regression separately for recommendations made within one year after the IPO date, and those beyond one year, to distinguish IPO-year effects. If past returns drive analysts' recommendations, then we expect the β_{1S} to be positive. We annualize the IPO-year returns, to account for the fact that recommendations during this first year have different-length return histories, depending on their distance from the IPO date. This allows us to avoid having IPO-year returns reflect inconsistent time intervals. In doing so, we implicitly assume that analysts extrapolate short-interval returns. This may have the effect of increasing the variation in prior returns for the IPO-year observations, relative to analysts' true, but unobservable, prediction model.

We test H2, that analyst optimism inflated stock prices, using the company-quarter as our unit of analysis. We examine the average of analyst recommendations made during the prior quarter for each firm, and regress market-adjusted returns over the current quarter on analysts'

relative optimism, by sector. Table 2 indicates that, relative to the sample for H1, we lose 59 firms and 735 firm-quarters because of a lack of adjacent-quarter recommendation and return data.

For the company-quarter analysis, we estimate, separately for the IPO year and later years:

$$CAR_{jq} = \alpha_{0S} + \alpha_{1S} Avgrec_{jq-1}[+CAR_{jq-1}] + \varepsilon_{2\,jq}, \qquad (2)$$

where:

$CAR_{jq} = \prod_{t=1}^{3}\left(\frac{1+R_{jt}}{1+R_{mt}}\right) - 1$; t indexes months in quarter q; R_{mt} is the monthly return on the CRSP equal-weighted stock index.

$Avgrec_{jq} = \frac{1}{N}\sum_{i=1}^{N} rec_{ijq}$; rec_{ijq} is analyst i's latest recommendation for firm j made during quarter q. N is the number of recommendations available for firm j from different analysts i at the end of the quarter q.

We test H2 by examining whether future returns, company-by-company within sector, increase with the degree of optimism. Because First Call codes Strong Buy recommendations as 1 and Strong Sell as 5, more optimistic recommendations have lower numerical values. If returns increase with analysts' prior optimism, therefore, we will find, $\alpha_{1S} < 0$, $S \in \{I,T,N\}$ in equation (2). We further test whether the Internet sector's returns display greater sensitivity to analyst recommendations than other sectors, $\alpha_{1I} = \alpha_{1T}$ and $\alpha_{1I} = \alpha_{1N}$ versus $\alpha_{1I} < \alpha_{1T}$ and $\alpha_{1I} < \alpha_{1N}$. In the IPO year, we limit the analysis to the three quarters following the IPO quarter, because we have analyst recommendation data for very few firms prior to the IPO.

We include the lagged value of the dependent variable in an alternate specification of (2). This allows us to test whether analyst optimism is incrementally important, after controlling for the stock's recent performance. If analysts' recommendations primarily reflect recent stock performance and do not influence or predict future performance, then we will find no

incremental effect of analyst optimism when we control for the prior quarter's stock performance.

4. Results

4.1 H1: Analyst optimism

Table 3 and Figure 2 display frequency distributions of analyst recommendations across the five categories from Strong Buy to Strong Sell. Prior research (e.g. McNichols and O'Brien (1997) documents analysts' avoidance of the Sell and Strong Sell categories evident in our data. We partition recommendations on whether they occur within one year after the IPO or not, and on industry sector, as we defined above. Figure 2 Panel A displays analysts' optimism during the IPO year, relative to later in the stocks' life, confirming the IPO effect documented in prior research exists in our sample. Figure 2 Panel B displays analysts' optimism by sector. Analysts' optimism in the Internet sector, relative to the Technology and Non-tech sectors, is most evident from the Hold and Sell categories. More than 20% of Technology and Non-tech recommendations fall in these less favorable categories, as compared with 16% in the Internet sector.

Table 4 reports our logistic regression results testing H1, that analysts are more likely to issue buy recommendations for Internet IPOs than for other sectors' IPOs in this period. Panel A shows the results of estimating equation (1) separately for recommendations within one year of the IPO and for all later recommendations. In the IPO year, the Internet sector has the highest intercept, indicating a higher likelihood of a Buy recommendation, conditional on past stock returns. IPOs in both the Internet and the Tech sectors have significantly higher likelihood of a buy recommendation than those in the Non-tech sector, but the Internet and Tech sectors are not statistically distinguishable from each other. In non-IPO years, we again find the intercept for Internet stocks the highest of the three. In this case, however, Internet stocks are significantly

more likely to get a buy recommendation, conditional on past returns, than either Tech or Non-tech stocks. Tech and Non-tech stocks are statistically similar in non-IPO years. Interestingly, past returns contribute significantly to the likelihood of a buy recommendation in all three sectors, and in both IPO and non-IPO years, with the Non-tech sector showing the strongest relation.

Because IPOs in the different sectors cluster by year, as we show in Table 1, we repeat the same tests by calendar year, and report the results in Panel B of Table 4. For the sake of brevity, we omit the coefficient estimates and focus on the tests of differences across sectors. Here we confirm the Panel A result that Internet and Tech stocks are equally likely to receive a buy recommendation in the IPO year, in all our sample years. Their IPO-year chance of a buy recommendation differs from that of stocks in the Non-tech sector, however, only during 1998 and 1999. We find no differences in the first two months of 2000, but this is likely due to the small sample size and limited time period.

For non-IPO years, in all calendar years except 1997, we find results confirming Panel A, that Internet stocks are significantly more likely to receive buy recommendations than Tech and Non-tech stocks, while the latter two groups do not differ. Because we begin sampling IPOs in 1996, we have no non-IPO stocks in this year. Internet stocks are statistically indistinguishable from either other sector in 1997, perhaps because of the small sample of Internet stocks.

Taken together, we interpret these results as providing evidence that analysts exhibit greater optimism in their recommendations for Internet companies during the Internet "bubble" period, but with limitations. First, within the IPO year, analysts display similar optimism for Internet and other Tech stocks throughout the period. In comparison with Non-tech stocks, greater IPO-year optimism is evident beginning in 1998, but not in earlier years. For slightly

more seasoned stocks, analysts make more optimistic recommendations in the Internet sector than in both the non-Internet Tech and Non-tech sectors beginning in 1998. These results appear to mesh with the graphical evidence in Figure 1, which shows that Internet stocks' out-performance of other IPO stocks begins in 1998, and also shows some similarity between the Internet and Tech sectors. In our next section, we examine the link between analysts' recommendations and stock returns more explicitly.

4.2 H2: The relation between analyst optimism and subsequent returns

Our test of H2 use ordinary least squares regressions of equation (2): cumulative average residuals measured over firm-quarters, regressed on sector indicators and the average analyst recommendation for the firm available at the beginning of the quarter. We interact the average recommendation with the sector indicators, to allow tests of whether analyst recommendations influenced future returns differently in different sectors. Because the distributions of sector IPOs vary across years, as we show in Table 1, we estimate the three quarters following the IPO quarter (labeled IPO year) separately from later quarters (labeled non-IPO years). We also assess the influence of analyst recommendations, conditional on stock returns during the previous quarter.

Table 5 displays our results, which support the notion that analyst optimism for Internet stocks drove returns upward. Recall that the First Call database codes more favorable analyst recommendations with lower values, so we hypothesize a negative relation between prior recommendations and current stock returns. We find a strong negative relation in the Internet sector, confirming that more optimistic recommendations within this sector preceded higher stock returns. We find this negative relation generally, although the result is often not statistically significant for Technology stocks. We do not interpret this as general evidence of

analysts' stock-picking ability, because we based our research question and sample design on hindsight about the unusual return patterns of this particular period of time and these firms. We interpret the negative relation between recommendations and future returns within sector as providing a link between our H1 results about analysts' greater optimism for Internet firms after 1998 and the visual evidence of return performance in Figure 1.

Our tests in Table 5 Panel B of differences across sectors show that Internet stock returns are significantly more sensitive to prior analyst recommendations than either Technology or Non-tech stock returns. Interestingly, in our IPO-year tests of H1, we find no difference between Internet and Technology IPOs in analysts' optimism. In Table 5 we find that Technology stocks' IPO-year returns are insensitive to analyst recommendations, while Internet returns are highly sensitive, indicating that investors made different judgments about IPO stocks in these two sectors.

When we control for the prior quarter's stock return, in the second and fourth columns of Table 5, we find negligible change in the sensitivity of Internet stock returns to analyst optimism, which remains statistically significant in both IPO and non-IPO years. In contrast, we find the sensitivity for Technology stocks during non-IPO years affected substantially, changing the coefficient on analyst optimism from a statistically significant –0.05 to a statistically insignificant –0.02. For these firm-quarters, lagged stock performance has a strong effect on current stock performance (t=10.19). Although we selected the sample years and characteristics primarily based on hindsight related to Internet stocks, we have evidently captured a period of strong intertemporal dependence in non-Internet Technology stock returns as well. This intertemporal dependence outweighs any effect of analyst optimism for these stocks.

Overall, our results on H2 support the view that analysts contributed to an Internet

Bubble. Within sectors, investors generally bid up the values of stocks that analysts rated favorably, with stocks in the Internet sector showing the greatest sensitivity to prior recommendations, whether or not we control for past stock returns.

5. Conclusion

In this paper we investigate the role financial analysts played in the unusual performance of Internet stocks during 1996-2000 by empirically examining the extent and impact of their relative optimism for the Internet stocks, relative to other new issues in the same period. By comparing Internet stocks with other newly public stocks, we can control for a tendency by analysts to promote new issues. We can also establish whether our results are specific to Internet stocks, or extend as well to other Technology companies, or to all new issues.

We find a pattern of analyst recommendation optimism across sectors that mirrors the relative stock price performance of the sectors' stocks. Prior to 1998, we find little evidence of differential optimism by sector, and no evidence of Internet stocks earning superior returns. We relate analyst optimism on individual stocks, measured at the beginning of a calendar quarter, to the stocks returns over that quarter, both within and across sectors. We show that more favorable analyst recommendations are associated with higher stock returns within each of our three sectors, Internet, Technology excluding Internet, and Non-tech. We find the strongest association between prior recommendations and current returns in the Internet sector, suggesting that analyst optimism for these stocks may have fueled investors' hopes.

Our study cannot prove that analysts caused the Internet Bubble, nor can it prove that analysts acted with intent to mislead investors. No statistical evidence can prove a cause, but we believe we have both established that analysts recommended Internet stocks more highly than

other new issues in this time period, and demonstrated a link between the degree of their optimism and subsequent returns.

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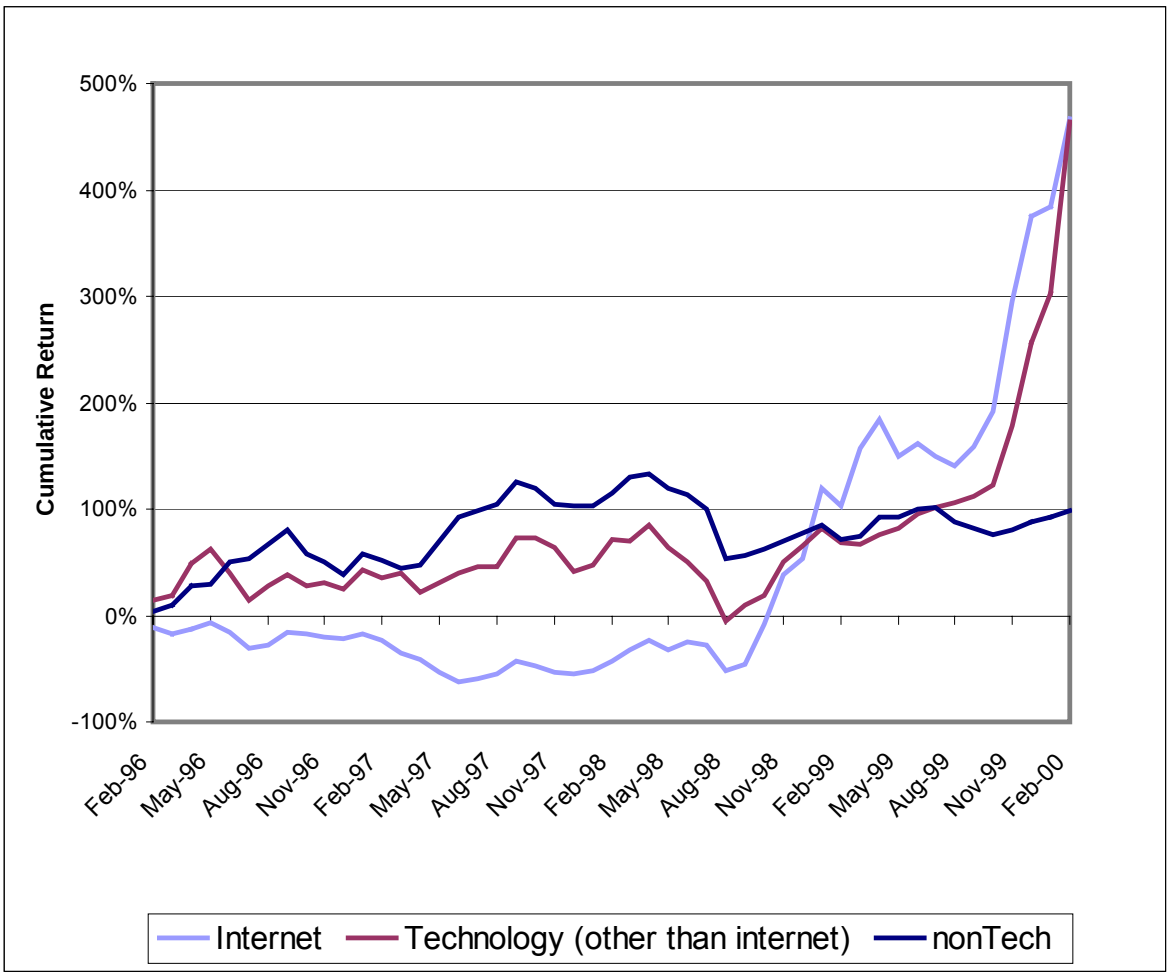
Figure 1: The Cumulative Average Monthly Return of IPO Stocks, by Sector, between February 1996 and February 2000, inclusive. Average monthly return in month m is the average, across all stocks in the sector that went public between February 1996 and February 2000 and that trade in month m. The cumulative return for sector S is $CR_{S,t} = \prod_{t=199601}^{t}(1+R_{S,t})-1$, where t indexes months. The z-statistics for differences between cumulative returns at February 2000 use a time-series standard error of monthly sector differences.

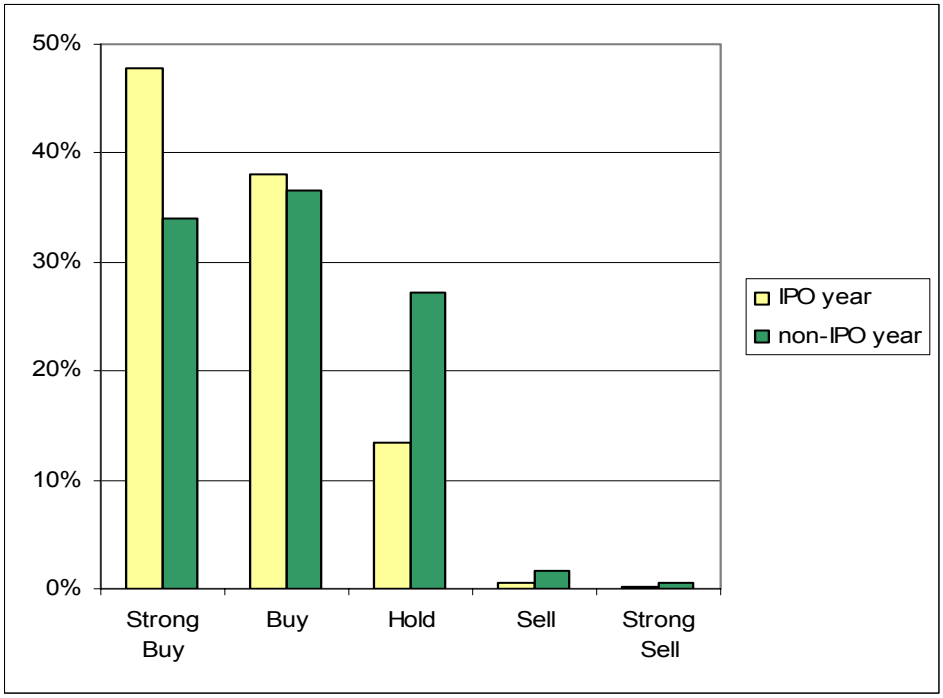


Z-statistics on sector differences in cumulative returns at February 2000:

z(Internet-Tech)	0.02
z(Internet-Non-tech)	2.89
z(Tech-Non-tech)	4.73

Figure 2: Distributions of analyst recommendations for IPO firms during 1996-2000.

Panel A: Recommendations within one year of the IPO, versus later recommendations.



Panel B: Recommendations, by industry sector.

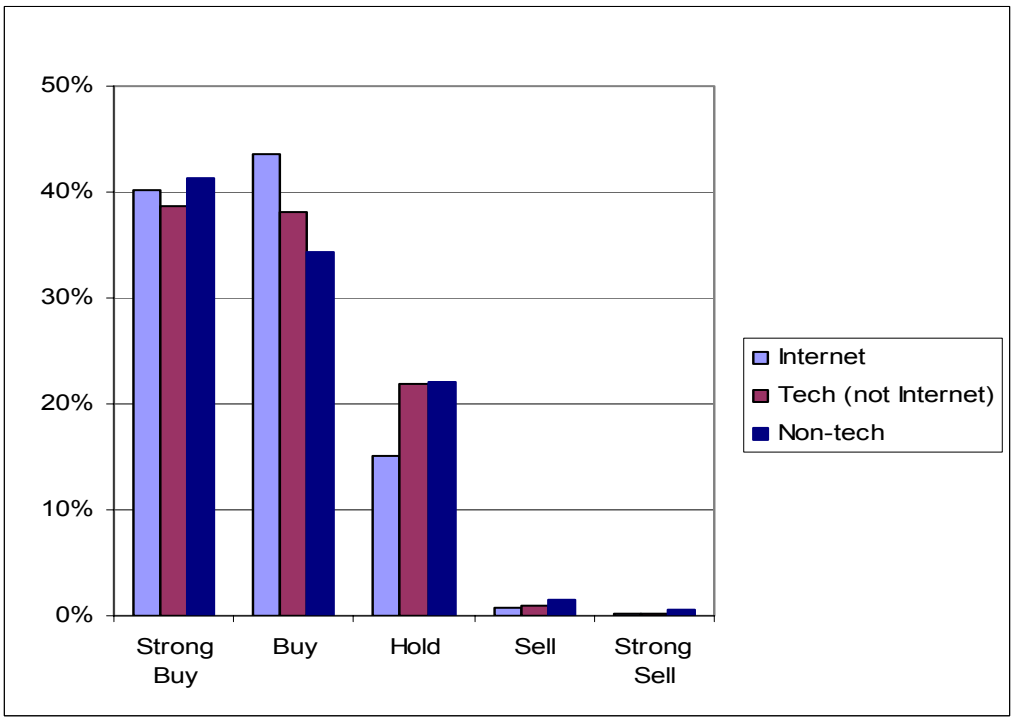


Table 1: Initial public offerings between January 1996 and February 2000, inclusive, from Securities Data Corporation (SDC), classified as Internet, Non-tech and Tech, excluding Internet. The Internet sector includes all companies that SDC codes with a high-tech industry description, that also use the word "Internet" in either the SDC high-tech industry or long business description. We classify all other high-tech companies in the sector called Tech, not Internet, and all companies with no high-tech industry as Non-tech.

	Number of IPOs by sector and year				Percent of sector IPOs by year		
Year	**Internet**	**Non-tech**	**Tech, not Internet**	**Total**	**Internet**	**Non-tech**	**Tech, not Internet**
1996	51	490	332	873	11.6%	38.0%	40.3%
1997	41	383	212	636	9.4%	29.7%	25.8%
1998	48	249	100	397	11.0%	19.3%	12.2%
1999	263	152	155	570	60.0%	11.8%	18.8%
2000	35	17	24	76	8.0%	1.3%	2.9%
Total	438	1291	823	2,552	100.0%	100.0%	100.0%

Table 2: Sample Selection Statistics.

	Number of firms	**Number of firm-quarters**	**Number of Recommendations**
IPO stocks in the SDC database between January 1996 and February 2000, inclusive.	2,552	n/a	n/a
SDC Cusip listed in CRSP historical cusip list.	2,457	n/a	n/a
Valid First Call recommendations available during January 1996 through February 2000.	1,930	10,352	23,611
Observations available for H1, after eliminating re-iterations.	1,930	9,680	21,016
Observations available for H2, after merging prior-quarter recommendation data with current-quarter returns data.	1,871	8,945	n/a

Table 3: Distributions of analyst recommendations for the full sample, by IPO versus non-IPO year, and by sector. Recommendations in the First Call database for companies with IPOs during January 1996-February 2000. "IPO year" indicates the analyst's recommendation date is within one year of the IPO date, and "non-IPO year" is all other recommendations. The Internet sector includes all companies that SDC codes with a high-tech industry description, that also use the word "Internet" in either the SDC high-tech industry or long business description. We classify all other high-tech companies in the sector called Tech, not Internet, and all companies with no high-tech industry as Non-tech.

		Strong Buy	Buy	Hold	Sell	Strong Sell	Total
Full sample	#	8,453	7,830	4,403	244	86	21,016
	%	40.2%	37.3%	21.0%	1.2%	0.4%	100.0%
IPO year	#	4,537	3,624	1,267	58	16	9,502
	%	47.7%	38.1%	13.3%	0.6%	0.2%	100.0%
non-IPO year	#	3,916	4,206	3,136	186	70	11,514
	%	34.0%	36.5%	27.2%	1.6%	0.6%	100.0%
Internet	#	1,331	1,442	499	26	7	3,305
	%	40.3%	43.6%	15.1%	0.8%	0.2%	100.0%
NNHT	#	3,040	2,996	1,718	74	21	7,849
	%	38.7%	38.2%	21.9%	0.9%	0.3%	100.0%
non-Tech	#	4,082	3,392	2,186	144	58	9,862
	%	41.4%	34.4%	22.2%	1.5%	0.6%	100.0%

Table 4: Logistic regressions of the likelihood of an analyst buy recommendation on prior stock returns and sector, by IPO-year status. We estimate the model $\Pr(Buy_{ijt}) = \beta_{0S} + \beta_{1S} R_{j,[a,t-1]} + \varepsilon_{1ijt}$, where S = the company's sector, separately for recommendations within one year of the IPO date and those beyond one year. I, T and N denote indicator variables for the Internet, Technology excluding Internet, and Non-tech sectors respectively, as described in Table 1. R denotes the stock return for a period of one year ending the day before the recommendation date. When the stock did not trade for the full year, we annualize the part-year return.

Panel A: Estimates pooled across calendar years, by IPO-year status, and Wald tests of pairwise differences among sector intercepts

	Parameter	Estimate	Std. Error	Wald stat.	p-value
IPO year:	I	1.73	0.08	446.0	<.0001
# obs. = 9,502	T	1.61	0.06	851.9	<.0001
	N	1.45	0.05	800.1	<.0001
	I*R	0.09	0.02	13.4	0.0003
	T*R	0.10	0.02	16.7	<.0001
	N*R	0.56	0.06	95.8	<.0001
	Hypothesis tests:				
	I = T			1.5	0.2145
	I = N			8.3	0.0040
	T = N			4.3	0.0382
	Parameter	**Estimate**	**Std. Error**	**Wald stat.**	**p-value**
non-IPO years:	I	1.14	0.08	188.9	<.0001
# obs. = 11,514	T	0.71	0.03	419.1	<.0001
	N	0.66	0.03	512.0	<.0001
	I*R	0.10	0.03	13.4	0.0003
	T*R	0.52	0.04	164.5	<.0001
	N*R	0.67	0.05	190.7	<.0001
	Hypothesis tests:				
	I = T			23.0	<.0001
	I = N			28.9	<.0001
	T = N			0.9	0.3535

Table 4 (continued)

Panel B: Wald tests of pairwise difference among sector intercepts, for logistic regressions run separately by IPO year status and calendar year.

IPO year:	**1996**		**1997**		**1998**	
test:	**Wald**	**p-val**	**Wald**	**p-val**	**Wald**	**p-val**
I = T	0.0	0.9071	1.5	0.2151	1.9	0.1628
I = N	1.3	0.2581	0.1	0.7431	7.2	0.0075
T = N	3.5	0.0627	2.4	0.1213	3.1	0.0799
# observations:	1,631		2,409		2,409	

IPO year:	**1999**		**2000**	
test:	**Wald**	**p-val**	**Wald**	**p-val**
I = T	1.1	0.2947	0.0	0.9513
I = N	14.1	0.0002	1.1	0.2865
T = N	6.5	0.0107	0.9	0.3334
# observations:	2,496		557	

non-IPO year:	**1996**		**1997**		**1998**	
test:	**Wald**	**p-val**	**Wald**	**p-val**	**Wald**	**p-val**
I = T	n/a		0.0	0.9193	9.3	0.0023
I = N	n/a		2.1	0.1486	11.0	0.0009
T = N	n/a		10.3	0.0013	0.3	0.6123
# observations:			1,233		3,918	

non-IPO year:	**1999**		**2000**	
test:	**Wald**	**p-val**	**Wald**	**p-val**
I = T	10.6	0.0012	6.6	0.0102
I = N	9.5	0.0020	9.7	0.0018
T = N	0.2	0.6375	0.4	0.5525
# observations:	5,441		922	

Table 5: Ordinary least squares regressions of firm-quarter excess stock return on lagged average analyst stock recommendations, lagged excess stock return and sector, by IPO-year status. We estimate $CAR_{jq} = \alpha_{0S} + \alpha_{1S} Avgrec_{jq-1}[+CAR_{jq-1}] + \varepsilon_{2\,jq}$, where S = the company's sector. The dependent variable is the cumulative market-adjusted return for firm j during calendar quarter q. We estimate the model separately for the three quarters following the IPO date quarter (IPO year) and for those beyond (non-IPO years). I, T and N denote indicator variables for the Internet, Technology excluding Internet, and Non-tech sectors respectively, as described in Table 1. Avgrec denotes the average across analysts of outstanding recommendations for the firm at the beginning of the quarter. Lag(CAR) denotes the cumulative market-adjusted return for the prior quarter.

Panel A: Coefficient estimates, with t-statistics in parentheses

	IPO year		non-IPO years	
Parameter	**# obs. = 3,075**	**# obs. = 2,674**	**# obs. = 5,870**	**# obs. = 5,870**
I	0.55	0.58	0.44	0.40
	(8.81)	(8.67)	(7.22)	(6.53)
T	0.06	0.04	0.20	0.13
	(1.59)	(1.02)	(7.24)	(4.46)
N	0.05	0.05	0.06	0.05
	(1.44)	(1.35)	(2.77)	(2.40)
I*Avgrec	-0.14	-0.15	-0.09	-0.09
	(-3.88)	(-3.97)	(-3.04)	(-2.78)
T*Avgrec	0.00	0.00	-0.05	-0.02
	(-0.03)	(0.03)	(-3.78)	(-1.22)
N*Avgrec	-0.04	-0.04	-0.03	-0.03
	(-1.82)	(-1.74)	(-3.07)	(-2.51)
I*lag(CAR)		0.10		0.10
		(3.14)		(2.55)
T*lag(CAR)		0.04		0.24
		(1.01)		(10.19)
N*lag(CAR)		0.04		0.07
		(0.77)		(2.45)

Table 5: (continued)

Panel B: t-statistics for additional tests

	IPO year		non-IPO years	
	excl. lag(CAR)	**incl. lag(CAR)**	**excl. lag(CAR)**	**incl. lag(CAR)**
I*Avgrec = T*Avgrec	3.19	3.32	1.31	2.06
I*Avgrec = N*Avgrec	2.48	2.62	1.89	1.81
T*Avgrec = N*Avgrec	1.14	1.14	1.05	0.60