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Discussion of "The Internet downturn: Finding valuation factors in Spring 2000"

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Abstract

This article reviews 'The Internet downturn: Finding valuation factors in Spring 2000' by Keating, Lys, and Magee (KLM). Their paper contributes to a growing literature on the valuation of Internet firms, finding strong relations among market prices, accounting variables, and assorted 'new economy' measures of performance. I argue that their results tell us more about investors' (mis-)perceptions in Spring 2000 than about the underlying economics of Internet firms. Moreover, the valuations seem unlikely to repeat. KLM's findings may not generalize to other firms or time periods.

JEL classification: G14; M41

Keywords: Internet stock; Valuation; Market efficiency; Cross-sectional regression

1. Introduction

The Internet bubble of the late 1990s was remarkable by almost any measure. In 1999, 294 Internet firms went public, raising more than $20 billion (Demers and Lewellen, 2002).[1] By March 1, 2000, Internet firms had a combined market value of $1.7 trillion, reflecting a spectacular rise in stock prices: between January 1999 and February 2000, the Internet Stock Index (ISDEX) more than tripled in value.

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[1] For this purpose, a firm is classified as an Internet firm if most of its revenues depend on 'the existence of the Internet.' See Demers and Lewellen (2002) for details.

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Perhaps more impressive, however, was the subsequent fall in valuations. By the end of 2000, the ISDEX had returned to its level on January 1, 1999. It fell another 69% over the subsequent nine months, for a total decline of nearly 90%.

The rise and fall of Internet valuations raises many important questions, some with broad implications for finance and accounting research. What explained the rise in stock prices? Were valuations rational, given the information at the time? If not, why did investors continue to buy Internet stocks? Why didn't arbitrage force prices back to fundamental value? Was short-selling feasible and profitable? What types of firms were most overvalued? Which firms declined the most in Spring 2000 and what triggered their fall?

Keating, Lys, and Magee (KLM) focus on the last two questions. They show that accounting and 'new economy' variables can explain, in a statistical sense, much of the cross-sectional variation in prices and returns in Spring 2000. This article reviews and critiques their analysis. While KLM's paper lays a solid foundation for understanding Internet stocks, I argue that their specific conclusions are suspect for two reasons: (1) the regressions likely suffer from important omitted-variable and endogeneity problems; and (2) Internet valuations were, almost certainly, irrational—the tests probably tell us more about investors' misperceptions than about the underlying economics of Internet firms. I also discuss several methodological issues raised by their tests. The article concludes with a general discussion of accounting for intangible assets, motivated by some of KLM's results.

2. Summary of the paper

KLM's analysis is broken into two parts. The first part should not be too surprising or controversial: KLM argue that new disclosures during the sample window, March 13–May 26, were insufficient to explain the Spring 2000 crash.[2] They collect information on 10-K filings, earnings announcements, web traffic, going-concern opinions, and analyst forecasts. The data provide little evidence of large negative news: earnings surprises appear to be close to zero or positive, analysts forecasts and trade recommendations are stable, web traffic reveals no obvious problems, and only two firms out of 148 received negative going-concern opinions. Hence, KLM argue that the crash reflects a reassessment of existing information, not reaction to news.

The second part of the paper explores the cross section of prices and returns. KLM test whether cross-sectional variation in market value can be explained by traditional accounting variables and assorted 'new economy' measures.[3] The accounting variables include net income, book value of equity, analyst forecasts,

[2] This window covers the initial large price decline. The ISDEX dropped from 1100.40 on March 10 to 592.63 on May 26. It then rebounded somewhat and remained above 600 for the next 6 months.

[3] See, also, Demers and Lev (2001), Rajgopal et al. (2001), Trueman et al. (2002), and Ofek and Richardson (2002).

changes in contributed capital, and going-concern opinions.[4] (In some tests, net income is broken into gross profits, advertising and R&D expense, and other.) The new economy measures include supplier financing, cash-burn rates, non-cash transactions, employee option grants, and web traffic. The new economy variables are central to the paper, so it is important to understand what they are meant to capture:

2.1. Supplier financing (SF)

SF is essentially the negative of non-cash net working capital. It is supposed to measure 'supplier willingness to fund operations.' KLM predict that SF will be positively related to market value. The logic is that, with information asymmetry, suppliers' willingness to fund operations should be a positive signal to investors.

2.2. Cash-burn rate (CBurn)

CBurn is defined as the negative of operating and investing cashflows divided by cash and short-term investments. It is a liquidity, or cash availability, measure. A large positive number means that the firm is expected to consume its cash resources very quickly. KLM predict that CBurn will be negatively related to both market value and returns during Spring 2000 (see also Demers and Lev, 2001). The logic is that firms with more cash depend less on imperfect, and possibly finicky, capital markets (consistent with Myers and Majluf, 1984).

2.3. Non-cash transactions (OptGr and CBDiff)

Internet firms often use stock and options to pay suppliers, in what KLM refer to as 'non-cash transactions.' CBDiff is calculated like CBurn above except that it contains non-cash transactions in the numerator (estimating what the firm's incremental cashflows would be if it had to use cash to pay all suppliers). CBDiff is predicted to be positively related to value if it signals good information or if non-cash transactions are an efficient way to conserve cash; CBDiff is predicted to be negatively related to value if it signals financial vulnerability. KLM also include employee option grants in the regressions and, again, the predicted sign is ambiguous: KLM predict a positive coefficient if options mitigate agency problems or if options signal positive information. They predict a negative sign if option grants are viewed as an expense.

2.4. Empirical results

KLM's basic findings are straightforward. Together, the financial and new economy variables explain a significant fraction of the cross-sectional variation in

[4] Contributed capital represents 'resources that have been given to the firm, either in cash or in goods and services, in exchange for equity and equity-related claims.' It equals shareholders equity minus retained earnings plus cumulative option grants to employees.

market value, both before and after the crash. The regression R^2 is 40% on March 13 and 33% on May 26. Perhaps surprisingly, the financial variables seem to provide more information than the new economy measures. Further, if net income is broken into its components (gross profits, advertising and R&D expense, and other), the R^2's increase to roughly 70% and the dominance of the financial variables becomes clearer. The results are generally consistent with KLM's view that agency and information problems are important.

3. If prices were rational

It is convenient to break my discussion into two parts. I initially assume, like KLM, that the stock market is efficient. I later question whether this is a good description of Internet prices in Spring 2000.

To begin, assume that prices really did reflect fundamentals. At face value, the motivation for KLM's new economy variables seems clear. Supplier financing *should* signal positive information about the firm, assuming that suppliers are informed and put a significant amount of capital at risk. Cash availability *should* create value if market imperfections mean that external financing is costly. Non-cash transactions *should* signal information about financial vulnerability or private information. Options grants *should* align manager and stockholder incentives, signal managerial confidence in the firm, and possibly reduce turnover. They also surely represent an expense omitted from the income statement.

However, taking these arguments to the data is problematic for two related, but distinct, reasons. First, the variables are endogenous choice variables; it is not at all clear that the arguments above should translate into a *cross-sectional* relation with value. Consider, for example, option grants. Suppose they really do align managers' and stockholders' interests. Does this mean that, cross sectionally, we should find that firms with more option grants have higher values? No. If firms act rationally, then each firm chooses option grants to maximize value. The cross-sectional relation between value and option grants is indeterminate, depending on the underlying production function, or technology, of the firms.[5] KLM's argument makes a clear prediction only if most firms use too few options: in that case, we would expect that firms with more options have higher values. But that view seems hard to justify and the paper makes no attempt to do so.

The second problem is caused by omitted variables. The types of firms that have high supplier financing, cash burn rates, and non-cash transactions are likely to differ in many dimensions from firms with low values of each variable: Firms that rely heavily on supplier financing are likely to sell different types of products than firms with low supplier financing. Akamai is likely to have a different cash-burn rate

[5] Take a simple example. Suppose that firms choose option grants (G), capital (K), and research spending (R) to produce a single good X : $X = G^{\alpha}K^{\gamma}R^{\lambda}$. Firms differ only with respect to the parameters α, γ, and λ. The cross-sectional relation between option grants and profits (i.e., market value) can be either positive or negative, depending on the distribution of parameters across firms.

than Webvan, which sells a different product, requires a different set of investments, and faces different competition. Amazon undoubtedly has more non-cash transactions and higher option grants than GM. In all three cases, market values are likely to differ across firms, but the differences might be driven simply by the underlying assets and business strategies of the firms. It seems difficult to pinpoint precisely what the explanatory variables capture (let alone make inferences about causality, which often seem implicit in the paper's conclusions).

The bottom line is that, even if Internet prices were rational, I am not sure that the variables capture the intended effects. Some support for my concerns can be found in KLM's empirical results. In the March valuation regression, the coefficient on R&D expense is 34.8 (but not significant) and the coefficient on option grants is 27.1 (significant). Taken literally, the estimates suggest that an extra dollar of R&D increases value by \$34.8 and an extra dollar of option grants increase value by \$27.1. These values are simply too large. They also suggest, implausibly, if taken at face value, that firms spend far too little on people and R&D.

4. If prices were irrational

The discussion above assumes that prices reflect the underlying economics of Internet firms. In most applications I would support that assumption, but the Internet sector in Spring 2000 provides an exception. Ex post, it is obvious that prices were wrong: ISDEX, a popular index of Internet stocks, lost 90% of its value in the 18 months after March 2000. But that observation might be viewed as unfair. Given information available at the time, could a rational investor have believed that prices were right? In my opinion, the answer is no.

I present three pieces of evidence that prices were too high.[6] Fig. 1 shows price-to-sales ratios for KLM's Internet sample (Panel A) and for all non-Internet stocks on CRSP/Compustat (Panel B) in March 2000. The difference between the histograms is striking. In the whole population, 47.7% of firms have P/S ratios less than one and 82.5% have P/S ratios less than five. In the Internet sample, only one firm has a P/S ratio less than one, 6.5% have P/S ratios less than five, and the median P/S ratio is 46.3. If we combine the firms into a portfolio (total market value divided by total sales), the P/S ratio for the whole market is 1.51 and for the Internet sample is 53.8. While this is by no means irrefutable evidence, the P/S ratios seem to imbed unreasonable expectations of growth. For example, if we think that Internet P/S ratios will converge in 20 years to the population value, sales *for the entire sector* need to grow 19.6% annually if prices don't change. If prices instead grow by 10%, sales need to grow 31.5% annually.[7] Historically, fewer than 2% of firms achieve 28% sales growth for even *ten* years (Chan et al., 2002).

[6] Ofek and Richardson (2002) provide a more complete discussion of mispricing in the Internet sector.

[7] These calculations are conservative (i.e., reduce the appearance of overpricing) because they assume that growth is financed entirely with internal funds or with debt. If firms also issue new equity, part of the sales in 20 years would belong to future shareholders.

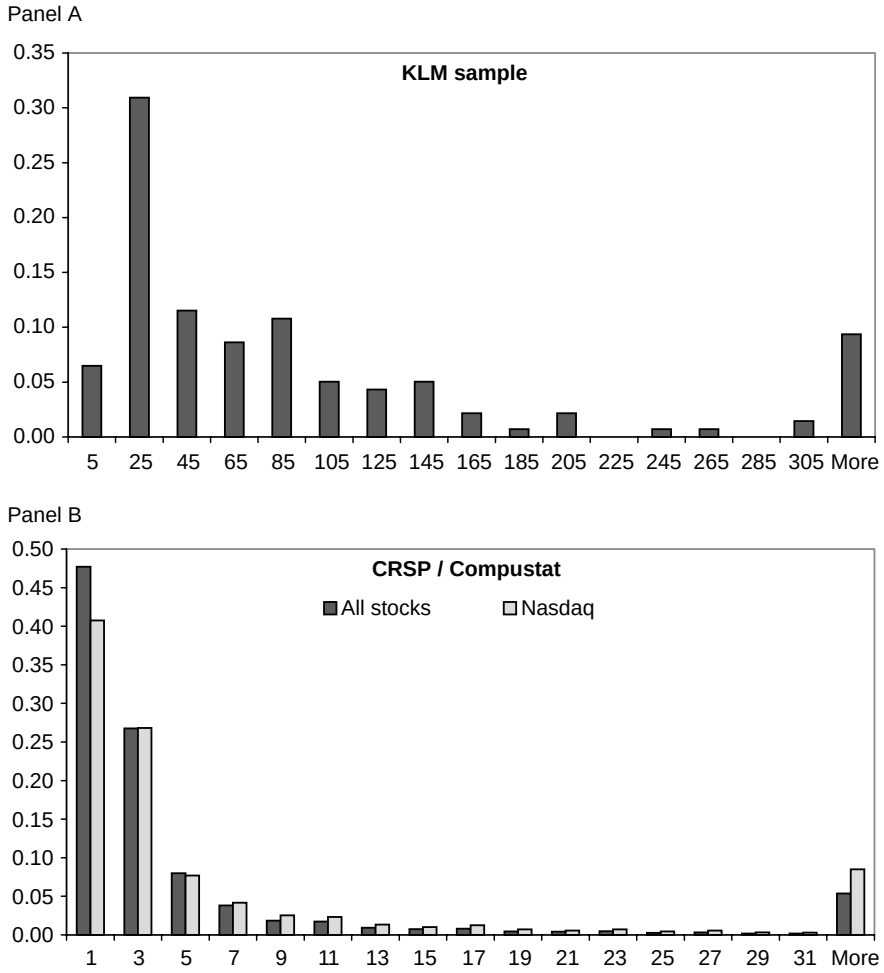

Fig. 1. Histogram, price-to-sales ratios for Internet and non-Internet stocks, March 2000. The figure shows price-to-sales ratios for KLM's Internet sample (Panel A) and for all stocks on CRSP/Compustat (Panel B) in March 2000. The x-axis shows the cutoff value of each price-to-sales bin; the y-axis shows the fraction of firms falling in each bin. Thus, 30.9% of Internet stocks have price-to-sales ratios between 5 and 25, while 47.7% of all firms have price-to-sales ratios less than one.

As a second piece of evidence, Table 1 compares the Internet firms to four other technology firms: Cisco, Intel, IBM, and Microsoft. The four firms are selected as profitable, high-growth firms whose operating performance might be similar to the Internet sample. In fact, at least three of the firms (Cisco, Intel, and Microsoft) seem to have considerable market power and might be expected to trade at a premium relative to Internet stocks. The table shows that the opposite is true: the Internet firms are valued more highly, as a group, than each of the benchmark firms. At the same time, the Internet firms have considerably lower sales, gross profits, and net

Table 1
Summary statistics for Internet stocks and selected companies, March 2000

The table shows financial data ($ billions) for KLM's sample of Internet stocks and for Cisco, Intel, IBM, and Microsoft. The market value of equity is obtained from CRSP for March 13, 2000 and accounting data is taken from Compustat for fiscal year 1999.

	KLM	Cisco	Intel	IBM	Microsoft
Market value	651.6	445.5	408.0	194.1	505.7
Book value	34.7	11.7	35.8	21.6	27.5
Sales	12.1	12.2	29.4	87.5	19.7
Costs of good sold	7.3	3.8	9.1	49.5	2.3
Gross profits	4.8	8.4	20.3	38.1	17.4
SG&A[a]	8.8	4.4	7.0	21.9	6.9
Advertising + R&D[a]	2.4	2.1	5.2	6.3	3.0
Operating profits	−7.0	3.5	10.2	10.1	10.0
Net income	−7.2	2.1	7.3	7.7	7.8

[a] SG&A: selling, general, and administrative expense; R&D: research and development expense.

income, and they spend less on advertising and R&D. Thus, even relative to other high-tech firms, the Internet stocks seem to be overvalued.

Finally, consider how different assumptions about earnings growth affect current value. Suppose that long-term growth rates equal 6% and the discount rate for Internet stocks is 10%. Suppose, further, that profits margins (net income/sales) might be either 5% or 10%.[8] Assume profits begin immediately, are fully reinvested in the firm in the short run, and are partially retained in the long run to finance growth.[9] Table 2 reports the present value of dividends for the Internet sample under different assumptions about short-run growth rates: 20% or 30% growth for either 10, 15, or 20 years. The table shows, perhaps not surprisingly, that it is very difficult to justify observed market prices. If profit margins are 5% and the *entire sector* grows 30% annually for 20 years, fundamental value is only $368 billion, compared with an observed market value of $652 billion. Other, more reasonable, assumptions about growth rates imply even greater mispricing.

In short, Internet prices in Spring 2000 appear wildly too high. KLM interpret the regressions as telling us about the economics of Internet firms, but they probably tell us more about investors' irrationality. This does not mean that the results are uninteresting. To the contrary, they potentially convey a lot of information about how investors formed their beliefs.

Two additional observations follow from this discussion. The extreme mispricing of Internet stocks seems unlikely to repeat; KLM's findings might not generalize to

[8] These estimates for long-term growth and profit margins seem reasonable given historical data. Over the last 50 years, real dividends on the S&P 500 index have grown 1.3% annually and real earnings have grown 2.8% annually. Profit margins have averaged 5.4% for all stocks since 1963 and 4.5% for Nasdaq stocks since 1973. Margins for retail firms are lower, averaging 1.9% (Ofek and Richardson, 2002).

[9] If margins are constant, Brealey and Myers (2000, p. 68) show that growth = ROE × the plowback ratio (with no external financing, earnings and book equity grow only through retained earnings). Here, ROE increases in the short run because earnings grow faster than book values.

Table 2
Earnings growth and value.

The table shows the value of KLM's Internet sample under different assumptions about short-term growth rates. The discount rate is 10% and the long-term growth rate is 6%. Earnings are fully reinvested in the short run, but partially paid out as dividends in the long run at a rate sufficient to internally finance long-term growth (Brealey and Myers, 2000, p. 68). Profit margin equals net income divided by sales.

Short-run growth rate	Years of abnormal growth	Value ($ billions)
Panel A: Profit margin = 5%		
20%	10 years	7.7
	15	30.4
	20	58.6
30%	10 years	50.0
	15	150.2
	20	368.0
Panel B: Profit margin = 10%		
20%	10 years	37.4
	15	74.6
	20	125.7
30%	10 years	122.0
	15	314.1
	20	744.5

other firms or time periods. Moreover, the irrational view suggests that the great mystery of Internet stocks is not why they crashed in Spring 2000, but why prices rose so dramatically in the first place. Instead of focusing just on the crash, we might be able to learn more by analyzing the price run-up as well.

5. Statistical issues

The empirical tests raise a number of statistical issues that often crop up in valuation studies. To briefly review, KLM estimate two sets of cross-sectional regressions: (1) They regress market values on firm characteristics; KLM specify separate equations for March 13 and May 26, estimating them simultaneously using seemingly unrelated regressions (SUR). (2) They regress returns from March to May on firm characteristics; KLM estimate the returns model using generalized least squares (GLS), with a covariance matrix estimated using out-of-sample daily stock returns.

There are a couple of things noteworthy about the price-level regressions. First, the SUR procedure recognizes, appropriately, that the residuals in March and May are highly correlated (if a firm plots above the regression line in March, then it will likely do so again in May). Second, the SUR allows the coefficients to be different in the two months. A change in the coefficients is almost mechanical since

prices, the dependent variable, drop by 60% on average between the two dates. In fact, if all prices dropped by exactly 60%, the coefficients would drop precisely the same amount. KLM's regressions for March and May clearly show this effect.

Perhaps more interesting, the return regressions adjust for cross-correlation among the residuals. At the same time, the price-level regressions do not. This inconsistency forces us to consider which approach is correct. The literature is full of warnings that empirical tests, much like the ones in the current paper, should adjust for correlation among the residuals because prices are influenced by common factors. The obvious conclusion, then, is that cross-correlation is indeed important for KLM's tests. In my opinion, that conclusion is wrong.

To understand why, it is useful to consider a classic case in which cross-correlations *are* important: tests of the CAPM. The CAPM says that expected returns are proportional to market betas. It is often tested by regressing, cross-sectionally, realized returns on betas and other firm characteristics. Since the model predicts a linear relation between *expected* returns and betas, while the regression uses *realized* returns, the regression residuals are simply the difference between the two, unexpected returns. In this case, the residuals are cross-sectionally correlated because firms' unexpected returns are influenced by common factors.

The same type of argument does not apply in the current paper. Consider the levels regressions. KLM test whether prices *in Spring 2000* are cross-sectionally correlated with various firm characteristics. The italics in the previous sentence are crucial: we are not trying to explain prices in general, but only for the two specific dates chosen in the paper. (In fact, the estimation specifically recognizes that the coefficients for one date do not generalize to other dates.) How prices arrived at their current values is not important for the tests—we don't care about the time-series process or that prices are influenced by common factors. Instead, we care only about the actual prices observed on March 13 (or May 26). Take a simple analogy. Suppose we would like to test whether the average size of Internet firms on March 13 is greater than $100 million. Average size can be estimated by regressing market values on a constant (that is, throw out the other independent variables in the March regression). The important question is: What is the source of randomness in this regression? Is cross-correlation in market values important for testing the hypothesis? I see no reason that it is. Thus, KLM appropriately ignore cross-correlation in the levels regressions.

I am similarly skeptical about the need for cross-correlation adjustments in the return regressions. In the CAPM example, cross-correlation is important because we are interested in expected returns but we test the model with realized returns. That is not true here: we are specifically interested in realized returns. The residuals do not correspond to unexpected returns, but instead to the portion of realized returns that cannot be explained by the independent variables. There seems little reason to worry about common factors. Thus, KLM's tests, which do adjust for cross-correlation, seem excessively conservative. The correlation among returns is low for their sample, however, so the adjustment should have only a minor effect on the results (the average pairwise correlation is 0.108).

6. Conclusions

This review tries to provide an alternative perspective on KLM's tests and conclusions. As such, it tends to emphasize what I perceive as weaknesses in their analysis. These concerns should not be overstated. All-in-all, the paper is creative and thought provoking. It analyzes an important and puzzling set of empirical facts, it offers several novel explanations for what we see, and it lays a solid empirical foundation for understanding Internet valuations. Without question, KLM explain (in a statistical sense) a remarkable fraction of the cross-sectional variation in prices and returns in Spring 2000. Our differences generally concern interpretation. KLM suggest that agency costs and information asymmetries help explain Internet valuations. That might be true, but I think their results tell us more about investors' misperceptions.

To close, I offer a few observations on accounting for intangible assets, motivated indirectly by KLM's results. Many analysts have suggested that accounting has not kept pace in recent years. As KLM note, the 'unusual relationship between stock prices and reported financial statement information' led some market observers to conclude that the 'extant financial reporting model was unable to recognize intangible assets.' The implication is that the accounting system needs to be fixed. To me, the experience of Internet firms provides little support for this view.

Leaving aside philosophical issues (i.e., what is the role of accounting?), there are two important empirical facts to consider. First, and most obviously, if valuations were irrational, then the 'unusual relationship' between prices and accounting information says little about problems with the accounting system. Second, even if valuations were right, the experience of Internet firms suggests that common prescriptions—like capitalizing marketing or R&D costs—could be misguided. In KLM's sample, total market value on March 13 was $652 billion, book value was $34.7 billion, and advertising plus R&D expense (for 1999) was a mere $2.4 billion. Capitalizing marketing and R&D costs would do almost nothing to close the gap between market and book values. More importantly, the numbers suggest that most of the value created by Internet firms has very little to do with direct expenditures (the kind that might be captured by the accounting system). Instead, value seems to be largely created by good timing, good decisions, or simply good fortune. The idea that value is *purchased*—by investing in technology, brands, or human capital—is not supported by the data. Of course, the connection between value and intangible investments might be stronger for other firms. My point is simply that Internet firms do not provide compelling evidence that the accounting system needs to be fixed.

References

Brealey, R., Myers, S., 2000. Principles of Corporate Finance, 6th Ed. Irwin/McGraw-Hill, New york.

Demers, E., Lev, B., 2001. A rude awakening: Internet shakeout in 2000. Review of Accounting Studies 6, 331–359.

Demers, E., Lewellen, K., 2002. The marketing role of IPOs: evidence from Internet stocks. Journal of Financial Economics, forthcoming.

Chan, L., Karceski, J., Lakonishok, J., 2002. The level and persistence of growth rates. Journal of Finance, forthcoming

Myers, S., Majluf, N., 1984. Corporate financing and investment decisions when firms have information that investors do not have. Journal of Financial Economics 13, 187–222.

Ofek, E., Richardson, M., 2002. DotCom mania: market inefficiency in the internet sector. Working paper, New York University, New York.

Rajgopal, S., Venkatachalam, M., Kotha, S., 2001. Why is web traffic value-relevant for Internet firms?. Working paper, University of Washington, Seattle, WA.

Trueman, B., Wong, F., Zhang, X.-J., 2002. The eyeballs have it: searching for the value in Internet stocks. Journal of Accounting Research 38 (Supp.), 137–162.