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MANAGEMENT OF INNOVATION
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RESEARCH CENTRE

WEB-BASED METRICS AND INTERNET STOCK PRICES

by

Nick Bontis, Ph.D.
and
Jason Mill

Management of Innovation and New Technology
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WORKING PAPER NO. 93
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McMaster University
MICHAEL G. DEGROOTE SCHOOL OF BUSINESS

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DR. NICK BONTIS, PH.D.
ASSISTANT PROFESSOR, STRATEGIC MANAGEMENT
DeGroote School of Business, McMaster University
1280 Main Street West, MGD #207
Hamilton, Ontario Canada L8S 4M4
Tel: (905) 525-9140 x23918 Fax: (905) 521-8995
nbontis@mcmaster.ca

and

JASON MILL
RESEARCH ASSOCIATE
DeGroote School of Business, McMaster University
1280 Main Street West, MGD #207
Hamilton, Ontario Canada L8S 4M4
milljb@mcmaster.ca

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WEB-BASED METRICS AND INTERNET STOCK PRICES

Abstract

The use of web-site metrics such as "number of page hits" is very popular. Web-site counters are widely used on personal home pages and corporate sites but offer little insight into the value created by investing in a web presence. The search for more effective web metrics is important to companies that are betting their entire business on Internet advertising and sales. The value of a web site is inherently related to the number of potential customers who come to the site for information and eventually purchase a product or execute a service. However, financial analysts are having difficulty in valuing e-businesses. The purpose of this paper is to conduct an evaluation of currently used web metrics. We intend to consider the relationship between stock prices and web metrics in addition to traditional accounting information for a sample of 15 top Internet companies. Specifically, we developed various regression models with the following four variables: unique visitors, revenues, gross margin and sales & marketing expenses. Our results support the hypothesis that web metrics do as good a job at explaining Internet stock prices as traditional accounting measures do. It appears that traditional accounting measures do not do an adequate job of explaining Internet stock prices. In sum, the predictive power of the web-based metric "unique visitors" appears to be a substantive and significant predictor of stock price.

Dr. Nick Bontis Bio

Dr. Bontis is Assistant Professor of Strategic Management at the DeGroote Business School, McMaster University. He is also Director of the Institute for Intellectual Capital Research, a consulting firm and research think tank that specializes in conducting knowledge management audits, intellectual capital valuations and organizational learning assessments for clients. Professor Bontis completed his doctoral education at the Ivey Business School, University of Western Ontario. He has won international acclaim for many of his academic research papers, book chapters and business management cases. He is a world renowned speaker and leading authority on explaining firm performance heterogeneity using knowledge-based perspectives.

Jason Mill Bio

Mr. Mill is a senior Engineering Physics & Management student at McMaster University in Hamilton, Ontario. He has worked with Dr. Nick Bontis as a research associate on several projects. He has two years of experience in Information Technology consulting as an AS/400 Product Specialist at IBM Canada, and has recently accepted a position with Nortel Networks as a Financial Analyst. His diverse educational background in business management and technology provide a strong base for e-commerce research. Mr. Mill's general interests lie in financial and strategic management, business performance analysis, and the management of technology.

WEB BASED METRICS AND INTERNET STOCK PRICES

If I were a Business School Professor in Finance, I would assign the following exam: 'How do you value Internet Companies?' and I would fail any student that did not leave the answer sheet blank.

Warren Buffet, Chairman & CEO of Berkshire Hathaway

Introduction

The *knowledge era* is upon us and the Internet is the catalyst that is accelerating the growing importance of information. In the new economy, knowledge management discriminates between the sustainable and unsustainable advantage of firms (Bontis, 1999). The efficient use of acquired knowledge is the ultimate core competency required for competitiveness and prosperity. The ever increasing popularity of fields such as intellectual capital (Bontis, 1996; 1998, Stewart, 1997; Sveiby, 1997), organizational learning (Crossan, Lane and White, 1999; Bontis, Crossan and Hulland, 2000) and knowledge management (Nonaka and Takeuchi, 1995; Bontis, Dragonetti, Jacobsen and Roos, 1999) clearly proves this trend and demonstrates the belief that the dissemination and use of information is of critical importance. The advent of the Internet has brought people together to share ideas, knowledge, products, and services. Inevitably, the driving force for the Internet will become profit as companies take advantage of the Internet as an advertising medium and as a unique business channel. The development of entirely new web-based businesses has spawned the phenomenon of the "net stock" also referred to as the "dot com". While these companies struggle in search of profitability, analysts struggle to justify the enormous market capitalizations that accompany them. Wooley (1999) highlights how earnings ratios are no longer useful:

> To get a chuckle (or a groan) out of an analyst, ask for the best way to value Internet stocks. Because so few of these companies make money, the traditional method of weighing the stock's share price against the company's earnings – the good old price to earnings ratio – doesn't work. (Wooley, 1999).

In general, Internet stocks have not, thus far at least, been subject to the requirement of current profitability. Investors are content to wait for the future on the chance they will own a piece of the new economy. In the short term, however, we are left with the challenge of putting a price on that chance. Davis et al. (1999) identified 20 traditional industries that will become dinosaurs in the Internet revolution unless they change the fundamental premise of their businesses. They cite such industries as insurance, newspapers, travel agents and car dealers. They argue that these industries must embrace new e-commerce ideals and displace traditional business models in order to survive the web revolution. In the event that the new model will be realized by only a few companies, investors must stake their claims now because the market is moving too quickly to wait for a clearer direction to unfold.

Internet stocks are different from their traditional counterparts. The untapped potential of the web makes them different. Fox and Hodges (1999) warn that web-based companies are not following the traditional rules of the game. The winners have ignored financial performance and focused on moving quickly; spending any amount of money necessary to build a vision, and claiming as much Internet-market share as possible. That market share is not measured in revenue; in many cases there is no revenue. Internet-market share is measured by people. The more people that visit a site, the more times they each visit, and the longer they stay all make a site more attractive to advertisers and investors and creates greater untapped potential as those people are slowly converted to customers.

Although the remarkable growth of e-commerce has been embraced by many businesses, analysts are still sceptical at our ability in measuring the success of such web-based ventures. The use of web-site metrics such as "number of page hits" is very popular. Web-site counters are widely used on personal home pages and corporate sites but offer little insight into the value created by investing in a web presence. The search for better web metrics is most important to companies that are betting their entire business on Internet advertising and sales.

E-businesses such as Yahoo, Amazon.com, eBay, and E*trade depend solely on business conducted over the web and/or advertising revenue. The ability to report meaningful web metrics to customers, advertisers, web users, and investors is crucial. The value of a web site is inherently related to the number of potential customers who come to the site for information and eventually purchase a product or execute a service. However, financial analysts are having difficulty in valuing e-businesses and thus justify observed stock prices. Nocera (1999) reports that Lise Buyer, a leading Internet analyst at Credit Suisse First Boston has simply abandoned traditional valuation models for Internet stocks.

TRADITIONAL METHOD OF STOCK EVALUATION

Fundamental analysis fails in the case of Internet stocks. This comes as no surprise since the determination of stock value is based on discounted future cash flows and virtually all Internet stocks are operating at a perpetual loss. Fox and Hodges (1999) emphasize how customary financial measures are difficult to interpret for Internet stocks:

> Internet stocks aren't like other stocks. Figuring out whether any stock is reasonably priced is something of a crapshoot, but for most companies there are at least some widely agreed upon yardsticks: book value, current earnings, projected earnings growth. Internet companies have no tangible assets, they boast little or nothing in the way of earnings, and their future growth is impossible to predict reliably. So investors can't use their customary yardsticks (Fox and Hodges, 1999).

Furthermore, it is not clear when positive cash flows can be expected given that spending on development, growth, and acquisitions continues to outpace revenue growth. Short term survival is funded by large cash reserves raised from lucrative IPO's (initial public offerings) and additional stock offerings made after the share price has been driven up by the market. In a recent study Lashinsky (1999) concluded that the Internet companies typically have 6 quarters of

cash at their given expense rates and those that have carved out a niche can often raise much more. Amazon.com had nearly 16 quarters of cash at the time of the study which was plenty of time to hold on but still a risky proposition.

As usual, Internet stocks are considered very risky ventures and often come with high expected returns. The Capital Asset Pricing Model predicts the high required returns for risky Internet stocks as expected. However, traditional financial measures such as earnings and dividends are not useful for Internet stocks. Given that Internet stocks cannot be compared using traditional metrics a new basis of comparison is needed.

Web Metrics

Television has the Nielsen ratings and radio has Arbitron, the web is no different (Vonder Haar, 1999). Many measurements have been used to demonstrate the popularity of web sites, the earliest of which was the hit. Web sites boasted "millions served" but it was immediately obvious that the number of hits was a poor, and highly subjective, measure of web site value. The number of hits depended heavily on web site design, a single page could have several hits, and the number of hits did not discount page refreshes or a user backing up and reloading pages that had previously been viewed. There is more than a little room for manipulating the number of hits a single user will generate in a session.

The sophistication of web metrics has improved significantly since the early days of the simplistic counting of hits. Various web metrics have been developed that attempt to provide more meaningful measures of web performance that can be more directly related pricing of web advertising. These second generation web metrics include: click-throughs, unique visitors, reach, length of stay, registered users, and repeat visits.

The various web metrics that have been used along with the pros and cons of each are summarized in Table 1 (Vonder Haar, 1999). Currently, companies such as MediaMetrix, Service Metrics, and Nielsen's NetRatings offer services to track and report web site performance statistics that web-businesses can use to demonstrate their popularity, Internet-market share, or advertising potential to investors and advertisers.

Combinations of the above and additional metrics are currently offered by MediaMetrix in their Key Measures Report[1]. These reports are most valuable to companies that are not able to track, report or benchmark the metrics themselves. The MediaMetrix measures include: 1) unique visitors; 2) reach; 3) average usage days per user; 4) average unique pages per user per day and month; 5) average minutes spent per person per page, per day and per month; 6) age and gender composition; and 7) demographic composition.

The web metrics most relevant to a particular web site or advertiser looking for prime web space are those that accurately reflect the type of business or message to be presented. Clearly, not all web metrics are created equal and many do not find common relevance across the diverse range of web sites analysts and investors wish to compare. Of the web metrics discussed above the

[1] Go to web-site at http://www.mediametrix.com

number of unique visitors provides the most generally applicable and unbiased measure of web site value. It is a specific and well defined measure, is not subject to server or Internet performance levels and is generally applicable across most web sites. Thus, unique visitors may provide a relevant and highly valuable measurement for comparing and valuing Internet stocks that do not lend themselves to traditional metrics and valuation methods.

Literature Review

The academic literature in this field is very sparse. This is attributable to the novelty of the measurement techniques that have only recently gained widespread use and to the limited number of firms available for study. We believe that this field is only at the embryonic stage of an exciting research trajectory that will yield a significantly higher number of publications in the near future. As reported by Hand (1999), very few studies in Internet stock valuation have been published in academic literature. Hand examined the claim that larger losses in Internet stocks translated to higher stock prices (Hand, 1999). Wysocki (1998) examined the cross-sectional and time-series determinants of message-posting volume on stock message boards on the Web. In 1999 Wysocki used pre-announcement and announcement period message-posting activity on *The Motley Fool* stock chat boards to test Kim and Verrecchia's (1997) predictions on the relation between trading volume during an earnings announcement and the amount of investor private information prior to and during the earnings announcement.

In another study, Cooper, Dimitrov and Rau (1999) document a striking abnormal return of 125% for the ten days surrounding the announcement by a firm that it is changing its name to an Internet related ".com" one. Schill and Zhou (1999) compare investors' valuations of Internet carve-outs with those of the parent. They find several examples of parents whose value in holdings of carved-out Internet subsidiaries violate the law-of-one-price by exceeding the market value of the entire parent. Such violations are large and remain over an extended period of time. Related to the the Internet subsidiary is the emergence of the "tracking stock". Several companies, Donaldson Lufkin & Jenrette (DLJ Direct) and Disney (Go Network) for example, have sold the "net" part of their businesses to the public by spinning them off into separate companies. Doing so, allows these companies to unlock the value of the underlying business and capture the price-to-hype ratios of an Internet company without giving up control or profits (Adamson, 2000).

HYPOTHESIS DEVELOPMENT

The goal of this paper is to assess the importance of web metrics in predicting Internet stock prices. Pundits allege that conventional accounting data, such as earnings and book values, have little or no relevance to Internet firms' stock prices because the vast majority of Internet firms have never reported a profit. Traditional pricing models based on accounting information, such as Ohlson's equity valuation model, posit that a firm's stock price is a linear function of book equity, net income, net dividends and other information that helps predict future abnormal earnings but is not yet incorporated in current financial statements (Ohlson, 1995).

We predict that web-based metrics do as good a job in predicting Internet stock prices as compared to traditional valuation models based on accounting information. In this context, consider the following regression model:

$$P_{it} = \beta_0 + \beta_1 REV_{it} + \beta_2 MAR_{it} + \beta_3 SLM_{it} + \beta_4 UNQ_{it}$$

where P_{it} is the stock price P of firm *i* at time *t*, β represents the standardized coefficient of each variable, REV is the firm's revenues, MAR is the firm's gross margin, SLM is the firm's selling & marketing expenses and UNQ is equal to the number of unique visitors to the firm's web site.

The equation above contains both traditional accounting variables (e.g., REV, MAR, and SLM) as well as the web-based metric that describes the number of unique visitors (e.g., UNQ). Given that Internet market share is linked directly to the number of distinct users that visit a web site, economic value is thought to be created by the number of "unique users" that a web site can attract. Based on our previous discussion, we hypothesize the following:

H1 Web-site metrics will do as good a job at explaining Internet stock prices as traditional accounting measures do.

In other words, we expect the following three conditions to hold true:

I: β_1, β_2, β_3, and $\beta_4 > 0$
II: the final specified model should be robust
III: β_4 should be substantive and significant

where:

β_1 = variable coefficient for REV (revenues)
β_2 = variable coefficient for MAR (gross margin)
β_3 = variable coefficient for SLM (sales & marketing expenses)
β_4 = variable coefficient for UNQ (unique visitors)

METHODOLOGY

Data Collection

To test the aforementioned hypothesis we collected data for 15 of the top Internet firms that were publicly trading. We coded monthly stock price, financial statement and unique visitor data. Although at the time this study was conducted (October, 1999) there were over 250 net stocks listed, a significant proportion of these had gone public within the last couple of quarters leaving only a handful that were publicly trading at the beginning of calendar 1999. This issue limited the size of our sample significantly.

Two separate sources of data were combined in order to complete the overall sample of 10 periods of data for each of 15 firms. The financial statement data was collected from Credit

Suisse First Boston[2] and this was combined with the web-based unique visitor data which was collected by MediaMetrix. Both of these sources follow the ISDEX Internet Stock Index[3] which represents the most comprehensive listing of Internet companies. Hand (1999) reports that the ISDEX is one of the most widely recognized Internet indices reported by such media centres as *The Wall Street Journal*, *Reuters*, *Dow Jones Newswire* and *CNBC*. The ISDEX represents over 90% of the capitalization of the Internet stock universe on an ongoing basis. Companies in the e-commerce sector must attract at least 51% of their revenues from the Internet to qualify for listing.

Descriptive Statistics

Table 2 provides selected information for the sample of 15 companies on a firm-by-firm basis. The 15 companies are sorted based on the number of unique users reported on September, 17, 1999 for the end of the previous month. For example, Yahoo (YHOO) had the largest user base in our sample with over 40 million unique users as compared to Cyberian Outpost (COOL) with approximately 331 thousand unique customers. The greatest change in user base from our earliest report date of October, 29, 1998 was Beyond.com (BYND) which increased the number of its unique customers by a remarkable 387%.

Table 2 also shows the closing stock price, and market capitalization for each stock. The accompanying change values measure the difference as reported from October, 29, 1988 to September, 17, 1999. The largest gain in stock price was by eBay (EBAY) with an astounding 430%. Financial accounting data is represented by revenue, gross margin and sales & marketing expenses. These figures are annualized based on the previous quarter in millions of dollars. The most significant growth for each of these values was by At Home (ATHM) with a spectacular 3,940% increase in gross margin. Please refer to Appendix A for a more detailed description of each company in this study.

Table 3 summarizes descriptive statistics in addition to highlighting the correlation matrix of the key variables. Two key features stand out in Tables 3. First, there is almost perfect correlation among the three accounting measures REV (revenues), MAR (gross margin) and SLM (sales & marketing expenses). Second, UNQ (unique users) has the highest correlation ($r = 0.469$) with PRICE (stock price). We decided to use the four aforementioned measures in this study for the following reasons:

- revenues are generally synonymous with the size of companies and are often used as measures of comparison from one organization to the next;
- gross margin is more important in the context of Internet stocks because so few are profitable right now;
- sales & marketing expenses are leading indicators for the amount of investment net stocks are throwing into attracting new customers via on-line advertising, and

[2] Report authored by Lise Buyer, Internet Analyst – CSFB Equity Research
[3] http://www.internetnews.com/stocks/list/

- unique visitors is a close proxy for the number of unique on-line customers a particular company has attracted.

Measuring revenue and gross margin is an obvious approach for tracking stock prices taught in most fundamental securities courses. Himelstein (1999) describes why sales & marketing expenses should also be followed in the case of Internet stocks:

> For five quarters running, CNET Inc. has done what few Internet companies have done: shown a profit. But now Chairman and Chief Executive Halsey M. Minor is chucking his conservative, money-making approach. On June 30, Minor announced that he will plunge into the red with a $100 million ad campaign aimed at making CNET's name as synonymous with technology as ESPN is with sports. Says Minor: 'This is a bold play for a dominant position. In putting growth ahead of profit, Minor hopes to emulate the success of other Web companies such as Amazon.com Inc. The online retailer is one of the top companies in cyberspace and the darling of investors – even though it won't make a dime until 2001 at the earliest' (Himelstein, 1999).

Sparks (1999) makes the same case for the importance of sales & marketing expenses:

> While hundreds of Internet companies are using a variety of ploys to become the market leader, heavy spending on marketing seems to be the real key to achieving dominance (Sparks, 1999).

It is important to emphasize that many other accounting and web-based measures could have been selected but leading Internet analysts Lise Buyer at CSFB and Steve Harmon at eHarmon.com both affirm that these are the most closely watched by the investment community. Nocera (1999) points out that Steve Harmon is committed to using web-based metrics :

> (He) never had to capitulate on valuations. That's because he had decided from the very beginning that using the valuation 'metrics' of the past for Internet stocks made no sense. So he decided to invent some metrics that he could apply to Internet companies (Nocera, 1999)

One final important note worth highlighting is that the 15 Internet companies were clustered into three categories. This is illustrated in Table 2. This was required in order to make logical comparisons of the UNQ variable. The first category includes Internet companies with *unique users* such as Yahoo and Lycos. These sites are so-called web portals and act as launching pads for on-line activity which include functionality such as personalized web pages and search engines. Most of the revenue generation at these sites comes from advertising dollars.

The second category includes Internet companies with *unique customers* such as Amazon.com and eBay. These e-commerce sites attract actual credit-card yielding customers who are willing to purchase or auction products over the web. A significant amount of the revenue generated at this sites comes directly from the consumer as is the case with Amazon.com or as a service fee as is the case with eBay.

Finally, the third cluster of companies represent online Internet service providers such as American Online and Earthlink who attract *unique subscribers*. This set of companies bring the consumer to the Internet by providing consumer with home access to the web. These companies receive actual monthly payments in the form of subscription rates.

Since the UNQ figure has slightly different definitions cross these three segments of net stocks, we felt that it was important to control for this subtle but importance difference in our research methodology.

RESULTS

Triple-digit growth figures are commonplace for this sample of companies as illustrated in Table 2. Therein lies the problem. The spectacular growth of these companies over the relative short period of time they were studied should be considered a blip in the normal rise of the equity markets. In fact, it is this meteoric phenomenon that leads us to re-examining how we are valuing stock price fluctuations for this specific sector.

Table 4 highlights the regression results of our study. First, the Base Model considers the two control variables only. C1 and C1 represent the two dummy variables that account for the three clusters of companies. The base model has a relatively low explanatory power (R^2 = 3.6%) and is insignificant ($F = 2.755$, $p > 0.05$).

Model 1 builds on the previous model by simultaneously inserting all three of the traditional accounting measures: REV (revenues), MAR (gross margin) and SLM (sales & marketing). Although the explanatory power (R^2 = 22.8%) and significance ($F = 8.502$, $p < 0.001$) were improved over the base model, this model has two fatal flaws. First, the beta coefficient for REV is *negative* ($\beta_1 = -2.669$, $p < 0.001$). Second, the VIF (variance inflation factors) for each of these three variables is significantly *greater than 10* (REV = 40.7, MAR = 39.5, SLM = 20.6). The regression results of Model 1 show that there is an inverse relationship between revenues and stock price. This is counterintuitive to the general pattern we see in equities where over the long-term both revenues and stock prices rise. The results here call into question the fundamental relationships we come to expect with stocks. In this particular sample of 15 Internet companies over the period we studied, there was an unexpected relationship between revenues and stock price. The second flaw of this model is that the high VIF values confirm a multicollinearity problem that exists among those three financial variables. This was expected based on the high correlations of each variable found in Table 3 and may explain the unorthodox direction of the REV coefficient. Perhaps this problem can be mitigated by inserting only one financial indicator at a time coupled with the UNQ variable. The next three models test exactly that.

Models 2 through 4 examine the relationship of both traditional and web-based measures by inserting one financial measure together with the UNQ variable. In Model 2 we inserted the REV and UNQ variables simultaneously to the base model. The explanatory power (R^2 = 29.8%) and significance ($F = 15.413$, $p < 0.001$) of this model are relatively strong for predicting stock price. Since only one financial variable is used in this model there is no multicollinearity

which is confirmed with adequate VIF values for all variables. Also, the introduction of the UNQ variable ($\beta_4 = 0.806$, $p < 0.001$) shows a positive and significant relationship with stock price. However, the interesting observation in this model is that the REV beta coefficient ($\beta_1 = -0.304$, $p < 0.001$) is significant but *negative*. As explained earlier, this result is not expected and highly suspect.

It seems that for the period of this study and among these 15 companies, the web-based variable UNQ was a positive and accurate predictor of stock price whereas REV acted in an inverse relationship with stock price. The same phenomenon is present in Models 3 and 4. Model 3 shows the MAR variable with a negative coefficient ($\beta_2 = -0.232$, $p < 0.05$) and Model 4 shows the SLM variable with a negative coefficient ($\beta_3 = -0.263$, $p < 0.01$) even though UNQ is positive and significant in all models.

In the case of Models 2, 3, and 4 we find the web-based variable (UNQ) is positively associated with stock price. This makes intuitive sense since as the number of unique visitors for each Internet firm fluctuated widely from month to month during this period, so did stock prices. Interestingly, the accounting measures (REV, MAR, and SLM) were not positively associated with stock price. It seems that stock price fluctuations were inversely related to the financial growth of these companies. These results lend credence to the heated commentary in the public press surrounding the illogical valuations of Internet firms. We decided to test Model 5 to determine whether or not a solely web-based model was valid.

In Model 5 we inserted the UNQ variable to the base model without any traditional financial measures. The explanatory power ($R^2 = 24.5\%$) and significance ($F = 15.768$, $p < 0.001$) of this model was on par with the others. In fact, the *F-stat* of this model is the highest of all. As predicted, the UNQ standardized coefficient ($\beta_4 = 0.607$, $p < 0.001$) is still positive, substantive and significant.

Table 5 depicts an evaluation of each model based on the three conditions we specified earlier. First, we were hoping to find positive β coefficients for each variable as hypothesized. Every model except Model 5 had at least one variable that was not in the anticipated direction. Second, we were hoping to validate a robust model without any multicollinearity problems. Model 2 suffered from this due to the high correlations among the financial accounting variables (REV, MAR and SLM). Finally, our third condition was to find a model that specified a positive, substantive and significant β coefficient for the UNQ variable.

Model 5 is the only model that meets all three conditions while still remaining relatively strong in its explanatory power and overall significance. Based on these results we support the following hypothesis:

H1 Web-site metrics will do as good a job at explaining Internet stock prices as traditional accounting measures do.

DISCUSSION

As with any study, there are limitations to this research. The small sample of 15 companies and only 10 data periods spanning one year limits the generalizability of the analysis. However, the Internet stock phenomenon is relatively new and little data is available. In fact, many Internet stocks have been traded publicly for less than a full year and, thus, cannot be included at this time.

A second limitation to the analysis is the definition of gross margin used among public companies. The determination and accounting calculation of gross margin varies from company to company and is not expected to be precisely consistent among the included set. This is not a major limitation, however, considering that gross margin was almost perfectly correlated with revenue ($r = 0.98$, Table 3) which is more consistently defined among companies.

Implications and Future Directions

Analysts and investors alike are drowning in information overload. Individuals who study stocks from home have access to enormous amounts of financial facts and figures never before available to amateurs. Furthermore, a remarkable increase in day-traders is adding to the overall thirst for stock research. All of this is taking place in a jungle-like virtual environment in which investors hunger for a little piece of these unprecedented – and still swelling – technology-based issues.

With all of this extra information thrust upon us, are we arguing that financial measures are no longer useful for predicting stock prices? Of course not. It is not our intention to discount the importance of financial accounting measures. After all, stock prices – in theory – should represent the economic value inherent in each business and financial accounting is a generally accepted language for business. The results of this study merely highlight the importance of alternative means for Internet stock price evaluation. Web-based metrics are an important tool that can yield critical insight into the potential viability of an Internet company.

This research can be further advanced in the following ways. First, as time continues we will have access to more data both in terms of the number of Internet companies worth studying and in terms of the length of period for which we can accumulate data. Second, we may consider hybrid measures that combine both financial and web-based metrics such as: 1) gross margin per user, or 2) sales & marketing expense per subscriber revenue. In both cases, researchers, analysts and the net firms themselves will be able to determine cost/benefit analyses using these measures. For example, using the second measure we can answer the following question: are we spending too much money to attract a new customer?

Researchers will also benefit from web-based metric development innovations that will create new measures for analysis. For example, we could measure the click-through rates of certain banner ads and determine the ability for that online advertising to generate new customers. Alternatively, we could measure the amount of time each unique visitor spends in security-cache mode. Security-cache mode in a web-browser is automatically turned on when a consumer is

about to make a credit-card purchase. This would help us consider the following situation in determining which Internet company is better to invest in:

> Internet company A had an overall average online time of 4 hours for every unique customer during month X. Each customer spent 15 minutes of that time in security-cache mode. Internet company B had an overall online time of 2 hours for every unique customer with 30 minutes in security-cache mode.

Based on the previous scenario, is it better that more value-added time is spent actually purchasing (company B) or that customers spend more time looking for items to purchase (company A)? The answer is not that obvious because although company B may be in the best situation today, company A may provide the greater long-term revenue potential because of the larger product/service selection. There are also tangential implications for security design and navigation when such measures are available for study.

Another possible advantage of web-based metrics over traditional metrics based on financial results is the potential for daily reporting. Web-based metrics can be collected in real-time and be made available to management and the public at much shorter intervals for analysis. Investors will have the latest information on web-based metrics and will not have to wait for quarterly reports or audited statements. In the future, it is probable that Internet companies will be required to disclose standard web-based metrics in quarterly and annual reports along with other measures of financial performance.

CONCLUSION

Internet business models are in a state a flux as this nascent industry continues to suffer from growing pains. What we do know is that financial indicators are hardly predictive and that profitability is many years away.

The current boom in Internet stocks is akin to the California gold rush of 150 years ago. Day-traders are picking up net stocks quicker than prospectors bought barren mountainside. Today's IPO celebrations have been compared to miners striking gold. In today's market, investors are playing a game of Russian roulette by betting on potential winners. The feeding frenzy attracts all sorts of sharks. No one truly knows when or if the bubble will burst. However, like geologists arguing over the best way to prospect for gold, we argue for a better way to find leading indicators for Internet stock price valuation.

The negative coefficients for the traditional metrics (revenue, gross margin, and sales & marketing expenses) show that – during the period of this study – the market very likely ignored the traditional financial indicators available for the companies included in the analysis. Furthermore, it is unclear whether the market directly considered the increases in unique visitors as a performance indicator or that the share price and the number of unique visitors both increased with the "hype" of a particular company as opposed to any financial fundamentals. In retrospect, this distinction is not as important as the fact the predictive power of the web-based metric appears to be positive, substantive and significant.

Nevertheless, after all of the analysis, we resort to suggesting that investing in Internet stocks is similar to gambling in a casino. Graham and Dodd (1951) originally said it best way back in 1934:

> Unseasoned companies in new fields of activity provide no sound basis for the determination of intrinsic value. The risks inherent in the business, and uncertain management, and uncertain access to traditional capital combine to make an analytical determination of value unlikely if not impossible. Analysts serve their discipline best by identifying such companies as highly speculative and by not attempting to value them, even though we recognize there will be pressure to make valuations of initial public offering and other unseasoned issues. The buyer of such securities is not making an investment, but a bet, on a new technology, a new market, a new service, or a new innovation in an established business market. Winning in such situations can produce very rich rewards, but they are in an odd setting, rather than a valuation process. (Graham and Dodd, 1934:1st edition)

TABLE 1: SUMMARY OF WEB METRICS

WEB METRIC	DESCRIPTION
HIT	One count per request for data. Highly subjective and easily manipulated.
PAGE VIEW	One count per HTML page. A better measure of an advertising opportunity given that advertising banners are changed with each new page served.
CLICK-THROUGH	Tracks the number and percentage of customers that follow an advertising link. Sites with higher click through numbers/percentages can drive higher advertising revenue. Specific to advertising potential.
UNIQUE VISITORS	Counts unique IP addresses to determine the number of individuals viewing a site. A useful metric to an advertiser that wants to expose as many people as possible to their product.
REACH	The percentage of the Internet population visiting a particular site per month. Based on sample user-groups. Internet population is not well defined or accurately known.
LENGTH OF STAY	The average length of stay can identify sites who's users spend little time per page and are not likely to read ads versus those sites that attract users that absorb the information presented. Could be affected by transfer rates and overall internet performance; slow transfer rates would artificially improve this metric.
REGISTERED USERS	Number of users who have registered by providing name, age, and/or other demographic data. The use of cookies and other tools can accurately identify the users who are visiting a site or viewing an ad. User specific ads can be viewed. Provides greater user information, however, many users will not register.
REPEAT VISITS	A measure of the number of times a user may view a specific advertising banner.

Vonder Haar (1999)

TABLE 2: SAMPLE HIGHLIGHTS

STOCK SYMBOL	UNIQUE USERS		STOCK PRICE		MARKET CAPITALIZATION		REVENUES		GROSS MARGIN		SALES & MARKETING	
	17-Sep-99	Change	17-Sep-99	Change	17-Sep-99	Change	17-Sep-99	Change	17-Sep-99	Change	17-Sep-99	Change
Internet Companies with Unique Users												
YHOO	40,237	49%	$163.13	149%	42,251	244%	461	115%	398	107%	171	86%
LCOS	29,379	57%	$44.44	107%	3,880	144%	180	137%	143	197%	96	99%
SEEK	20,262	83%	$28.75	-13%	1,800	73%	145	88%	76	20%	112	121%
CNET	8,514	36%	$38.31	283%	2,793	313%	102	77%	65	122%	28	76%
SPLN	4,050	54%	$26.06	86%	584	120%	52	75%	25	87%	33	73%
Internet Companies with Unique Customers												
AMZN	10,700	139%	$63.81	203%	21,517	241%	1,258	105%	270	94%	344	129%
EBAY	5,600	367%	$141.00	430%	18,133	472%	198	283%	154	256%	92	319%
ONSL	1,382	68%	$15.19	-15%	298	-12%	326	41%	10	-61%	39	51%
BYND	1,300	387%	$14.81	85%	533	144%	105	170%	16	174%	83	156%
EGGS	1,100	355%	$7.56	5%	233	33%	162	16%	12	-23%	38	37%
COOL	331	106%	$8.25	-33%	190	-30%	131	92%	14	104%	38	78%
Online Internet Service Providers												
AOL	19,600	45%	$43.00	168%	95,460	230%	5,508	60%	2,544	103%	856	104%
ELNK	1,335	64%	$40.13	2%	1,288	16%	312	57%	178	57%	90	127%
MSPG	1,228	170%	$27.13	36%	1,720	67%	343	199%	226	173%	58	199%
ATHM	620	195%	$38.44	71%	14,142	160%	402	626%	252	3940%	172	766%
Average		**145%**		**104%**		**148%**		**143%**		**357%**		**161%**

NOTE: Change values represent percentage difference from starting date of study: October, 29, 1998. Unique Users (number of unique visitors in previous month in thousands)., Stock Price (the monthly stock price adjusted for splits and dividends as reported on the day of CSFB's Internet Valuation Update), Market Capitalization (the monthly market capitalization reported on the day of CSFB's Internet Valuation Update), Revenues (annualized revenues of previous quarter in millions of dollars), Gross Margin (annualized gross margin of previous quarter in millions of dollars), Sales & Marketing (annualized sales & marketing expenses of previous quarter in millions of dollars).

TABLE 3: DESCRIPTIVE STATISTICS

DESCRIPTIVE STATISTICS			PEARSON CORRELATION MATRIX				
	Mean	Std. Deviation	PRICE	REV	MAR	SLM	UNQ
PRICE	48.4	38.6	1.000				
REV	479.8	1068.8	0.016	1.000			
MAR	198.6	452.7	0.097	0.980	1.000		
SLM	102.3	160.8	0.102	0.969	0.966	1.000	
UNQ	7735.2	10111.0	0.469	0.259	0.337	0.370	1.000

NOTE: PRICE (the monthly stock price adjusted for splits and dividends as reported on the day of CSFB's Internet Valuation Update), REV (annualized revenues of previous quarter in millions of dollars), MAR (annualized gross margin of previous quarter in millions of dollars), SLM (annualized sales and marketing expenses of previous quarter in millions of dollars) and UNQ (number of unique visitors in previous month in thousands).

TABLE 4: REGRESSION RESULTS

	BASE MODEL		MODEL 1		MODEL 2		MODEL 3		MODEL 4		MODEL 5	
	β [1]	t [2]	β [1]	t [2]	β [1]	t [2]	β [1]	t [2]	β [1]	t [2]	β [1]	t [2]
CONTROL VARIABLES												
C1	-0.157	1.688	-0.058	0.602	0.415	3.473***	0.354	2.884**	-0.157	1.688	0.170	1.748
C2	0.209	2.251**	0.050	0.519	0.397	3.435***	0.337	2.934**	-0.209	2.251*	0.232	2.147*
ACCOUNTING VARIABLES												
REV			-2.669	5.710***	-0.304	3.329***						
MAR			1.900	4.128***			-0.232	2.397*				
SLM			0.882	2.654**					-0.263	2.753**		
WEB VARIABLE												
UNQ					0.806	7.320***	0.767	6.647***	0.809	6.803***	0.607	6.350***
RESULTS												
R-Squared	3.6%		22.8%		29.8%		27.4%		28.2%		24.5%	
F-Stat	2.755		8.502		15.413		13.647		14.254		15.768	
SIG. OF Δ [3]			0.000		0.000		0.000		0.000		0.000	

[1] Standardized beta (β) coefficient.

[2] T-statistic, significance values * p-value < 0.05, ** p-value < 0.01, *** p-value <0.001

[3] Significance of F-change considers Model 1 through 5 versus the Base Model.

NOTE: Model predictors include: C1 and C2 (2 dummy variables for three types of net firms), REV (annualized revenues of previous quarter in millions of dollars), MAR (annualized gross margin of previous quarter in millions of dollars), SLM (annualized sales and marketing expenses of previous quarter in millions of dollars) and UNQ (number of unique visitors in previous month in thousands). The dependent variable in each model is the monthly stock price adjusted for splits and dividends as reported on the day of CSFB's Internet Valuation Update.

Multicollinearity problems existed with Model 1. VIF (variance inflation factor) values were greater than 10: REV= 40.7, MAR = 39.5, SLM = 20.6.

TABLE 5: MODEL RESULTS

CONDITION	MODEL 1	MODEL 2	MODEL 3	MODEL 4	MODEL 5
I	✗	✗	✗	✗	✓
II	✗	✓	✓	✓	✓
III	✗	✗	✗	✗	✓

NOTE: Conditions
I: β_1, β_2, β_3, and $\beta_4 > 0$
II: the final specified model should be robust
III: β_4 should be substantive and significant

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Director; Dr. C. K. Bart, Ph.D., C.A.
MINT - Research Centre
Michael G. DeGroote School of Business
McMaster University, 1280 Main St. W.
Hamilton ON Canada L8S 4M4

Phone: 905-525-9140, Ext. 24105
Fax: 905-521-8995
email: mint@mcmaster.ca
www: http://mint.mcmaster.ca/