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A Firm's Image – How Valuable Can It Be?

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Introduction

There are so many companies today that outsource everything from production, research and development, service centers and many more business activities. What is left of these companies in the way of tangible assets? In many cases, the intangible assets such as technology and customer lists are now the key value drivers for a company in a global based economy. As valuators, we must be aware of this trend and continue to learn and share our knowledge regarding the factors that impact the value of intangible assets.

This article endeavours to show that a **firm's image** can be considered as a **valuable intangible asset**. Although the results of a strong firm image are often difficult to quantify, we see them everyday in our own lives. Why do we seek employment at a particular firm? Why do we purchase a certain type of automobile or certain articles of clothing? There are other factors that influence the decisions regarding these questions, however one cannot omit the impact that a firm's image has and how it effects our daily decisions.

Firm Image

The role of image in economic activities was first discussed by Kenneth Boulding in the middle 1950's (Lindquist, 1975). He theorized that human behaviour is not entirely directed by explicit knowledge but also information is a product of perceived images. Since that time, image research has been extended to consumers, users and stores (McDougall & Fry, 1975); to products and services (Keller, 1993; Nagashima, 1977; Ofir, 1986) and to organizations and management (Dierickx & Cool, 1989; Lindquist, 1975). Of particular relevance to this discussion, management literature has shed light on the positive effects of firm's image (Dutton & Dukerich, 1991; Gatewood, Gowan & Lautenschlager, 1993; Dutton, Dukerich & Harqual, 1994;).value's relative contribution to the total present value of cash flows pursuant to various assumptions about the DCF model.

In general, these efforts suggest that a firm's image should be considered as a multidimensional construct that refers to individuals' rating of a firm's various attributes. These dimensions can be classified into tangible and intangible factors that affect image perceptions and serve as a means of understanding the often-ambiguous nature of the construct. In essence, image is a construct that can be attached to different referents (e.g. firm, brand, country-of-origin) and can be identified for different constituencies (e.g. the employees' image of the firm, external stakeholders' image of the firm).

Marketing literature that has addressed such topics as brand image and country of origin effects on consumer behaviour provides a good basis for conceptualizing the image construct and understanding the factors that might affect a firm's image (Jaffe & Nebenzahl, 1984; Keller, 1993). In general, image is conceptualized as the physical and psychological meaning assigned to a specific referent. For our

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purposes, image results from individuals' attempt to assign a meaning to experiences and this meaning affects future behaviour. As such, image is derived through the perception-based interaction of the referent (e.g. the firm's attributes), the individual perceiver and the situation. Thus, while this complex interaction suggests that image cannot be directly manipulated by the organization, it does identify the specific factors that must be studied (i.e. the organization, the individual perceiver, and the situation) and the perception process by which an image is derived.

The firm's image's value can be seen through at least three avenues. First, image as formed by the judgements of the organization's employees (and potential employees) is important because it represents these individuals' best guess at what characteristics non-members are likely to ascribe to on the grounds of their organizational affiliation (Crocker & Luthanen, 1990). **Thus, at the very least, firm image is an important component of a company's ability to attract, develop and keep talented people** (Gray, 1986). Image may also influence employees' performance through its ability to affect the amount and type of motivation employees' exhibit. (Crocker & Luthanen, 1990; Dutton & Dukerich, 1991).

Rynes (1991) suggested that given the small amount of information applicants have early in the job choice process, initial application decisions are heavily based on general impressions of organizational image. One empirical study by Belt and Paolillo (1982) determined the favourableness of twenty fast-food establishments and selected one very highly rated and one very poorly rated restaurant. Recruitment advertisements were written that manipulated the names of the two organizations and the specificity of required applicant qualifications. In this study's results, image was a main effect: applicant response to the organization with the better image was significantly higher. Based on this and other studies, there is empirical evidence to support Ryne's suggestion that corporate image is highly related to potential job applicant's intentions to pursue further contact with a firm (Gatewood, Gowan & Lautenschlager, 1993).

A second issue that reinforces the value of a firm's image is the link between an organization's objectives and the behaviours of constituencies who may be targets of efforts directed at achieving those objectives. For example, Gray & Smeltzer (1985) suggest that the effectiveness of a strategic effort is contingent upon the image held by the target of the strategy (e.g. customers). Specifically, they say that a negative impact perceived by any of the company's publics indicates either an inappropriate strategy or a failure to communicate that strategy effectively. Others state that image management is important toward any target group whose attitudes have some level of significance for an organization (Alvesson, 1990). **Thus, the success of any given strategy is contingent upon the perceptions held by those whom the firm wishes to attract or affect.**

In the early 1990's appalled customers left Nike products on the shelves when they found out that this sports giant was employing children to make shoes in illegal sweatshops in Indonesia. In essence, the company was perceived a certain way by their customers. As a result, sales suffered and Nike had to work on improving their image in order to mitigate any further damage. Nike agreed to sign up to a code of conduct that all its products would be made under ethical conditions. They also made a financial contribution to the International Youth Foundation in order to enhance their image amongst their clients. As a result of these efforts, Nike went on to be a powerhouse in the sports industry largely because of their perceived image in the eyes of consumers.

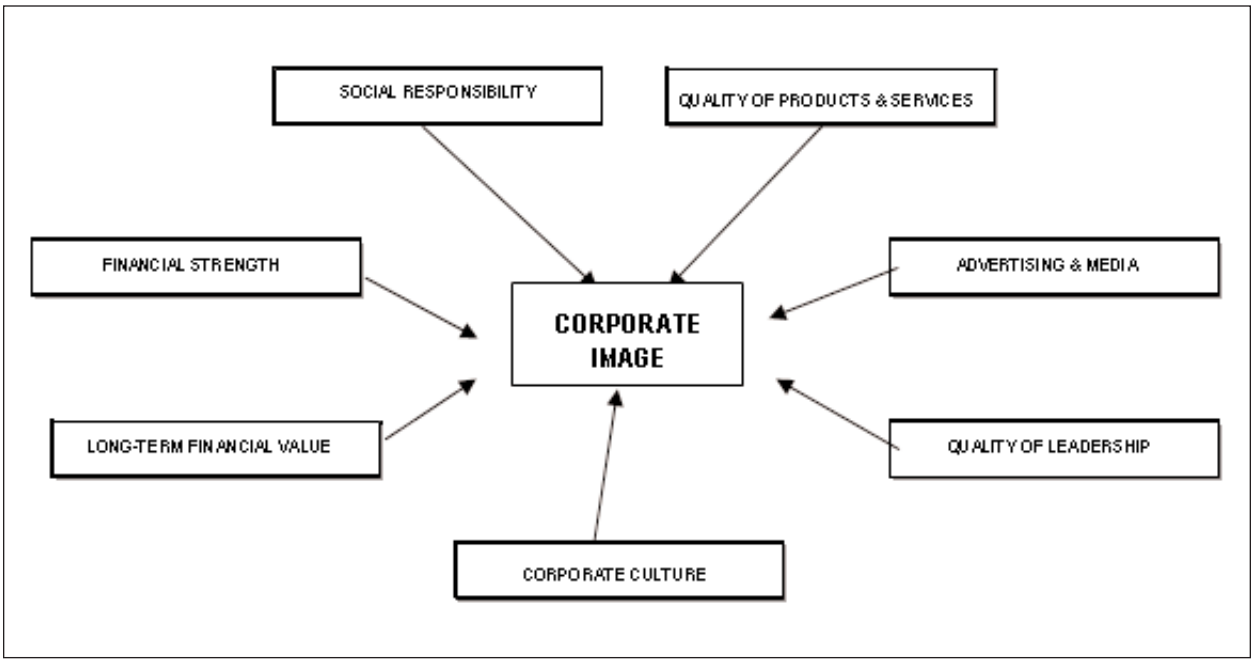
Finally, actions that lead to a positive image held by external stakeholders will decrease the risk and increase the expected return of existing strategic opportunities and it will increase the opportunities available to strategic decision-makers. Similar to the effect of increasing trust in a relationship, positive changes in image decrease the perceived uncertainty associated with a firm. As a result, companies will tend to gravitate towards firms with a positive image, **thus increasing the number of opportunities available to a firm.**

Firms with negative images will be at a competitive disadvantage because of the lower number of strategic opportunities available to them and the accompanying higher risk and lower return combinations of those that are available.

Thus, the above suggests that a firm's image is a potentially valuable intangible asset through its ability to attract, retain and motivate employees, through its ability to affect the success of the strategic effort of a firm and through its ability to affect the opportunities available to a firm.

Variables that Contribute to a Strong Firm Image

The strength of a firm's image as a valuable intangible asset relies on seven underlying variables: *social responsibility; quality of products and services; advertising and media; quality of leadership; corporate culture; long-term financial value; and financial strength*. This list is not exhaustive, rather it is based on practical business experience and a review of business and academic publications.



Social Responsibility – The perception of a firm's agenda pertaining to society plays an important role in the evaluation of a company's image. A high degree of social responsiveness indicates that a firm has been proactive in establishing powerful relationships in their community. The visibility and involvement is an investment in the company's image as a member of a community. Firms can signal their social concern by creating foundations, contributing to charity, volunteering their human resources and by adopting an employment equity plan. Managers presume that social responsiveness generates goodwill from employees, consumers, and other stakeholders that enhance the long-run profitability and viability of firms.

Quality of Products and Services – Today's business environment has shifted towards the client. Customer satisfaction and quality are key variables when evaluating the image of a corporation. In order to succeed in a global business environment, successful organizations must focus their resources on insuring an optimal level of product quality and customer service. To beat out competitors, companies know that they must incorporate their client's needs and wants into their product quality and performance.

The results of superior quality reflect positively on a firm's image. It also tends to enhance profitability. Winners of the Malcolm Baldridge National Quality Award, which represents companies in the U.S.A having the highest level of commitment to quality management, have regularly outperformed their peers in terms of return on investment. The Commerce Department in 1996 reported that an investment of $1,000 in the respective stocks of the Baldridge award winning companies would have outperformed the S&P stock index by approximately 3 to 1. In nearly all cases, these companies achieved greater customer satisfaction, increased market share and improved profitability (Evans & Lindsay, 1999).

The Strategic Planning Institute (1998) studied the impact of higher relative product quality and found a significant positive correlation between relative product quality and return on investment. In a subset sample of 525 mid-size business units, those with high relative product quality

characteristics earned nearly 59% more than the low-quality business units did. Their premium quality allowed them to charge a premium price. They also benefited from more repeat purchasing, consumer loyalty, and positive word of mouth. Another study indicated that companies can improve profits anywhere from 25% to 85% by reducing customer defections by 5% (Reichheld, F. & Sasser, J, 1990).

Advertising & Media – Using the media, companies attempt to influence constituents through positive and frequent encounters. The information is disseminated through networks of interpersonal relations or interlocking corporate ties and through press articles and mass media presentations. The media act as vehicles for advertising. They are also active agents through editorials and opinions that shape the future of the company. There is also a substantial investment that must be made to create a positive corporate image through visible spokespersons and innovative advertising. In most cases, messages delivered by attractive or popular sources achieve higher attention and recall. Credibility is also an important factor in the success of attracting a customer's attention (Kotler & Turner, 1998). Many firms continue to focus on advertising by spending important sums of money in order to create and reinforce their overall image.

Quality of Leadership – Successful global strategic leaders achieve reputations for trustworthiness through exemplary management practices by empowering and retaining employees and instilling shared pride. Great leaders are also masters at selecting, synthesizing and articulating an appropriate vision of the future (Bennis & Nanus, 1986). They earn reputations for credibility among investors by showing profitability to individual and institutional stockholders, maintaining a stable return on investment and nurturing financial growth prospects. Leaders obtain reputations for reliability among customers and suppliers by ensuring quality, service and innovation. They gain reputations for responsibility among community and public constituencies by prudently stewarding organizational, social and natural assets. A successful leader is a key player in establishing and reinforcing a strong firm image.

Corporate Culture – A corporate culture is a system of shared values and beliefs that interact with an organization's people, structure and systems to produce behavioural norms. These tools are so common in a system that they tend to perpetuate themselves. Corporate culture comes to shape in many ways. Some organisations instil values that promote a positive and strong corporate culture. Some of these values are employee involvement, customer delight, teamwork and empowerment. Other corporate cultures stem from a strong leader within an organization. A strong, widely internalized corporate culture helps energize people throughout the company to do their jobs in a strategy-supportive manner (Thompson & Strickland, 2001). It is also extremely difficult to replicate, thus contributing to a sustainable competitive advantage (Harvey, D & Brown, D, 1996).

Long-Term Financial Value - Investors' expectations regarding a company's performances have increased exponentially with the returns investors' were receiving in the latter part of the 1990's. However, an argument can be made for a company that can consistently deliver solid results over the medium to long-term. Management's challenge is to have a long-term view in decision-making. Some of the ratios that measure long-term financial value are as follows:

- Return on Equity
- Return on Assets
- Gross Profit margin

We can see that companies that focus on long-term financial value enjoy a strong following amongst customers, investors and lenders.

Financial Strength – A company has a duty towards its stakeholders to make prudent, strategic financial decisions to grow their respective businesses. Many business models in the 90's dot.com gave way towards investor speculation and outrageous market capitalizations. A company requires a solid financial foundation in order to grow and prosper. This foundation also impacts the firm's image and how customers perceive it.

Some of the measures of financial soundness come in the form of financial ratios and analysis. A few important financial ratios (indicators) are as follows:

- Current Ratio
- Quick Ratio

- Long-term debt to equity ratio
- Interest Coverage Ratio

Many more ratios can be applied. The important issue is to benchmark these indicators to leaders within specific industries or with a total index (i.e. S&P 500) to be able to assess a company's strengths.

As previously mentioned, the variables highlighted above do not make up an exhaustive list, rather they are some of the more important variables that can have a positive impact on a firm's image. It is important for valuators to have a basic understanding of these variables and how they impact a firm's image.

Can a Firm's Image be Transferred?

In most cases, a firm's image is specific to the firm to which it is attached. It can not be easily earned, purchased, or transferred (Dierickx & Cool, 1989). In the context of an acquisition or merger, the specifics may not allow for a direct transfer of a firm's image. That is, the corporate image is not likely to remain intact under new ownership. The factors surrounding the acquisition or merger and the image of the purchasing organization or the new ownership group are likely to interact with the existing image to produce new perceptions about the purchased organization. Earning a positive image requires time and a continuous focus on the contributory variables mentioned above.

Conclusion

As valuators, we are well versed in preparing financial models and analyzing financial statements. However, we must go beyond our formal training in finance and accounting and seek knowledge in the softer areas of an organization to fully understand the nature of intangible assets such as a firm's image. By looking into other disciplines such as psychology, sociology and anthropology, we can combine concepts into new ideas that we can use in our approach towards valuation mandates involving intangible assets.

A firm's image through its ability to attract, retain and motivate employees, through its ability to affect the success of the strategic efforts of a firm and through its ability to affect the business opportunities available to a firm is a valuable intangible asset.

Based on today's global competitive landscape, more decision-makers will focus on their firm's image while crafting their strategic posture vis-á-vis competitors. Given the fact that an image is hard to replicate, it may represent one of the only investment opportunities available that can provide a sustainable competitive advantage for a firm. This is a rather valuable asset in a global economy where the notion of "sustainability" is often hard to find!

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An Analysis of the Relationship of Publicly Traded Stock Multiples to Closely Held Firm Value Multiples

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Abstract

The purpose of this study was to examine if there was a statistically significant difference between price to earnings (P/E) ratios and price to gross sales (P/G) ratios based on the size of companies and selected standard industrial classification (SIC) codes by the leading two digits of the SIC code. Approximately 18,000 cases of privately held business sales transactions were compared to nearly 20,000 randomly selected public stock price data to compare and test.

A Kruskal-Wallis nonparametric test, Multivariate analysis of variance (MANOVA) tests and t tests were utilized to investigate for significant differences in P/E and P/G ratios based on size and SIC code. The findings of the study were that there was a statistically significant difference in P/E and P/G ratios based both on size and selected SIC codes.

Part One: Purpose of the Study

The purpose of the study was to examine the relationships between price to gross (P/G) and price to earnings (P/E) ratios between large publicly traded companies and small, closely held businesses. In addition, the P/G and P/E ratios of large and small companies were further examined by selected SIC codes to determine if different industries had significant differences in P/G and P/E multiples among themselves based on size.

The review of the literature indicates that valuations of large, publicly traded firms and small closely held businesses are founded in the same theoretical basis. Valuators and analysts use publicly traded firm data as indicators of risk measurement and pricing due primarily to the ease of access to vast amounts of data. Coupled with the ease of data acquisition are the tenets of the efficient market hypothesis (EMH) which postulate that market prices are reflective of accurate estimates of value. This leads to conclusions that publicly traded firm data and certain multiples can be used to also accurately estimate small closely held businesses. For example, one technique, the guideline company method, specifically uses data generally from publicly traded firms to establish multiples of value. After adjusting certain financial data of the guideline companies or the subject company being valued, the guideline company multiples of value are applied to the subject company to estimate value.

A valid argument can be made that publicly traded firms have different risk criteria, time horizons, and investment goals than small businesses. This could well be indicated in different proportions of valuation multiples, which may render the guideline company method

subject to error. The ultimate purpose of the study is to examine historical price to earnings (P/E) and price to gross sales (P/G) of large publicly traded firms versus small company multiples to ascertain if there is a statistically significant difference between the two classes. The hypothesis is that if the multiples are different, then the use of publicly traded data to value small businesses may result in erroneous conclusions due to lack of correlation between the two sets of data.

Research Hypothesis

It is expected that an analysis of publicly traded stock multiples, measured by price to earnings (P/E) and price to gross (P/G) multiples will be statistically different from the same multiples derived from past sales transactions of small closely held businesses.

Importance of the Study

The research into the relationship between publicly traded stocks and small closely held business values is significant in either confirming or negating the use of publicly traded market data to predict and estimate small business values. If the hypothesis that publicly traded stock data is significantly different than small business transactional values is true, further examination by business valuators as to the reliability and validity of the use of publicly traded market data as a source for small business valuation will be required.

Thus, the guideline company method may be a reliable valuation tool, but only for closely held businesses that would better match the investment goals, time horizon, and risk analysis utilized by the public markets. This may call for further stratification and more specific definition(s) of what small businesses are, as opposed to publicly traded firms. In addition, the study should help identify which approaches may be more applicable under differing circumstances to valuation theory in its entirety. For example, another market based type method may be more reliable as a predictor of business value than the guideline company method dependent on business size or type.

Finally, the study should provide a starting point for other potential areas of research in similar topics related to business valuation. For example, if the efficient market hypothesis (EMH) is not valid, then publicly traded market data may be valued based as much on psychological anticipation than on economic and financial reality. Perhaps small business sales are bought and sold in the same manner. The business valuation profession may well have to factor in more theories underlying behavioral finance than is currently being done. Certainly, the study should provide food for thought with regard to current assumptions in valuation theory and process.

Part Two: Methodology

Research Design

The research design to be used is correlational as defined by Isaac & Michael (1997). The study was intended to investigate the extent to which variations in one factor correspond with variations in one or more factors based on correlation coefficients and other statistical tests. There are also descriptive statistical measures to describe such measures as central tendency, i.e., mean, median, and mode.

The research focused on certain multiples that are considered to be indicators of price or value in business valuation. The primary independent variable was whether a company was a large publicly traded firm or a small closely held business. This independent variable is labeled "size". A secondary independent variable was the Standard Industrial Classification (SIC) code, a several digit number to classify firm by industry type. The dependent variables were P/E and P/G ratios. The primary intent of the research was to analyze a sample of approximately 19 years of data from publicly traded stocks and a sample of about the same time frame for small, closely held business transactions. Statistical tests were utilized to determine if there were statistically significant differences between the two sets of data using firm size as the independent variable (i.e., publicly held stocks versus small businesses). If the tests showed significant differences between small and large companies, inferences could be made that using one set of data to predict the other would probably be spurious.

The scales involved are ratio scales for the P/E, and P/G ratios. Size is a nominal variable coded by either a 0 or 1. The SIC code is also a nominal variable stated as a several digit number as received from the data sources.

Selection of Subjects

The data was obtained from two databases on CD-ROM's in Microsoft Excel format. The first is the Standard & Poor's (S&P) Compustat database, which keeps extensive records on publicly traded stocks in all organized markets dating back to

1963. This data is gathered by S&P for purposes needed by consulting firms, market research firms, governmental use, and academic study. The Compustat database includes data on approximately 10,000 to 15,000 firms depending on the years studied. The data obtained from S&P consists of a random sample of 1,000 publicly traded firms' financial data covering the time period of 1982 to 2000. The data includes year-end stock price, sales, net income, earnings before interest and taxes (EBIT), P/E ratio, P/G ratio, P/EBIT ratio, SIC code, and year of data. Thus, this sample will result in 1,000 firms times 19 years of data for a total of 19,000 data points.

The second database comes from a private, nationally known organization that compiles data on small, closely held business sale transactions. This database has been compiled by the Institute of Business Appraisers (IBA) in Plantation, Florida and consists of approximately 18,000 records of small business sales transactions since 1978. The data in the IBA database consists of SIC code, annual sales, annual net earnings as defined by IBA, owner's compensation, P/E ratio, P/G ratio, sales price, geographic location, and year of sale.

The Compustat data set represents a large sample of the population of all publicly traded stocks in the US. The IBA database is a large sample of the population of small business sale transactions since 1978 across about 600 SIC codes.

Assumptions and Limitations

The statistical tests to be used include assumptions of normality and homogeneity of variance or that the procedures are robust to violations of these assumptions.

The research design is correlational. Perhaps the largest limitation to correlational design is that is does not prove causation (Ravid, 2000). Thus, even if the two data sets are not statistically correlated, the conclusion of absolute cause or proof cannot be drawn.

The random sample of 1,000 publicly traded firms' prices and other data may not be totally reflective of the entire market. It is also possible that using year-end data may not result in the average price of the stocks during the course of the year. Some analysts argue that year-end selling for tax prices can "artificially" deflate year-end stock prices only to see them rebound in January. This is known as the "January effect" (Bodie, Kane, & Marcus, 1998). The "January effect" is an observation and not an empirically proven fact. Therefore, the use of the year-end prices can be argued to be representative of the market's determination of the stock's price at that moment.

Another limitation is the use of data from 1982 through 2000 as opposed to using all data available from 1963. This limitation exists as the 19 year time period may have captured an unusual time period for the publicly traded markets and may not include several business cycles or external events that occurred prior to 1982. Conversely, this long of a time frame should provide a representative "sample" of time and does capture at least different economic periods which provides a view of market data in good times and bad. In addition, the IBA database transaction data starts in about 1978. This "pairing" of data should provide similar market perceptions of publicly traded shares and small business sale transactions over a representative investment time horizon.

There are limitations on the use of the IBA database also. While the IBA database contains about 18,000 data points, it does not include all small business transactions. Thus, while it is the largest database of its kind, it may not totally reflect the entire population of small business sales.

An important limitation is that the study compares publicly traded stock prices which are minority interests while the IBA database consists of controlling interests in small, privately held companies. This could lead to an inference that two different data sets were being compared. No attempt is made to add a premium for control to publicly held stock prices or a discount for lack of control to the controlling interests in the small, privately held companies. If this attempt had been made, it would make the difference between the two data sets greater thus reinforcing the findings using the data on an as-is basis. Additionally, such an attempt could be construed as arbitrary given the size of the two sets of data. In addition, some theorists conclude that the stock price of a publicly traded firm already reflects the expected value of control (Damodaran, 2006). Essentially, any potential premium for control in a large publicly traded stock is already factored into the price as after a majority block is bought or sold, all shareholders gain or lose equally.

Another limitation is the accuracy of the IBA database. The IBA depends on reports from business brokers, realtors, accountants, and small business owners. There is a possibility that the data reported to the IBA is not totally accurate for

a number of reasons including privacy issues, transcription error, or incorrect accounting methods. For example, the net earnings reported by companies may not be in accordance with US GAAP possibly invalidating the P/E computation. In addition, in order to "smooth" the net earnings figure and avoid issues of excess owner's compensation, the IBA requests that net earnings be reported as net earnings before tax, interest, and owner's compensation. The IBA admits that it is occasionally difficult to obtain this precise definition of net earnings from the data reporters. In order to account for the IBA definition of earnings, the P/EBIT ratio of the Compustat data was used as the measure of price to earnings to more accurately draw conclusions between the price to earnings figures of small versus large companies.

The research is based on the assumption that both databases are accurately assembled and represent the two populations from which they are derived. The extent to which the findings can be generalized to the populations of market data are based on these assumptions and limitations.

Procedures

The data for publicly traded companies were obtained from the S&P Compustat database on a CD-ROM in Microsoft Excel format. This consists of a random sample of 1,000 firms' data from 1982 to 2000. The specific data obtained on each firm for each year were:

1. SIC Code.
2. Annual Gross Sales.
3. Earnings before interest and taxes (EBIT).
4. Net Income after taxes.
5. Stock Price at end of year.
6. Price to gross sales ratio (P/G).
7. Price to earnings ratio (P/E).
8. Price to earnings before interest and taxes ratio (P/EBIT).
9. Year of data.
10. Net Worth or Owners' equity.

The data for small closely held businesses were obtained from the IBA database on a CD-ROM in Microsoft Excel format. Specifically, the IBA data consisted of reported sales transactions from 1978 through 2000 of small businesses. The data consisted of:

1. SIC Code and a short description.
2. Annual gross sales.
3. Annual earnings as defined by the IBA.
4. Owner's compensation.
5. Sales price of business.
6. Price to gross earnings (P/G) ratio.
7. Price to earnings (P/E) ratio.
8. Geographic location of sale.
9. Year and month of sale.

The Compustat data numbered 1,000 firms' times 19 years equals 19,000 data points. The IBA data numbered approximately 18,000 reported sales transactions.

The IBA data were examined first for any missing P/E and P/G figures. Cases that did not have either a P/E and P/G figures were eliminated from the database. This resulted in a database of 11,612 small company cases and 18,955 large company cases.

This allowed for a total sample, prior to elimination of outliers, of 30,567 cases of the P/E and P/G ratios classified by size to obtain inferences of any statistically significant differences between the two sizes of companies. After elimination of outliers which resulted in deletion of 2,525 small company cases and 5,143 large company cases, a sample of cleaned data resulted in 9,087 small companies and 13,812 large company cases. Distributions, after elimination of outliers (cleaning), resulted in distributions approximating normality.

Data Processing and Analysis

All hypotheses were tested at the $\alpha = .05$ level of significance using multivariate analysis of variance (MANOVA's), t tests, and the non-parametric Kruskal-Wallis test. The $\alpha = .05$ level of significance means that the probability of rejecting the null hypothesis when it is true is less than .05 or 5%. The purpose of a MANOVA is to test a null hypothesis that the vectors of means of multiple dependent variables are equal across groups using one or more independent variables (Hair et al., 1998). The MANOVA is similar to the analysis of variance (ANOVA) with the exception that the ANOVA is a univariate procedure testing one dependent variable. The reason for the use of the MANOVA in this study was to test for equality of means of P/E and P/G as dependent variables. The primary independent variable was

the "size" of the company, coded 0 for small, closely held firms and 1 for large, publicly traded companies. A secondary independent variable used was the SIC code for selected industries to which a company belonged.

The Kruskal-Wallis non-parametric test of independent samples was used to confirm the findings of the MANOVA. The Kruskal-Wallis test is not dependent on the assumption of normality as is the MANOVA. Thus, the finding of the Kruskal-Wallis test validates the robustness of the MANOVA conclusions.

The primary intent of the statistical analysis was to ascertain if P/E and P/G multiples were significantly equal across the two sizes of businesses. Secondarily, the analysis was conducted to measure if SIC code classification played any role in determining equivalency of the P/E and P/G multiples as categorized by the "size" category.

The hypotheses are stated in the null form for statistical analysis.

$H_0$1: There is no statistically significant difference between P/E and P/G ratios of large, publicly traded firms and small, closely held companies measured by data over approximately the last 20 years.

The first alternate hypothesis is, therefore:

H_A1: There is a statistically significant difference between P/E and P/G ratios of large, publicly traded firms and small, closely held companies measured by data over approximately the last 20 years.

$H_0$2: There is no statistically significant difference between P/E and P/G ratios of large, publicly traded firms and small, closely held companies measured by data over approximately the last 20 years as categorized by several selected SIC classifications.

The second alternate hypothesis is, therefore:

H_A2: There is a statistically significant difference between P/E and P/G ratios of large, publicly traded firms and small, closely held companies measured by data over approximately the last 20 years as categorized by several selected SIC classification.

Part Three: Summary of the Results

All statistical analyses and tests confirmed the rejection of the null hypotheses. Based on the samples derived, the P/E and P/G ratios of large publicly traded firms do not appear to be suitable predictors of value for small, closely held businesses.

Examination of all data prior to elimination of outliers indicated that both distributions were not normally distributed and were highly concentrated within a relevant range. The P/E's of small companies had a mean of 3.48 while large companies' mean score was 5.39. The P/G means were .564 for small companies and 12.149 for large companies. The following table shows the percentile distribution of small and large company P/E's and P/G's considering all data:

Table 1: P/E and P/G Percentile Scores of All Data

			Percentiles						
		Size	5	10	25	50	75	90	95
Weighted Average(Definition 1)	P_E	Small	0.5800	0.8300	1.2569	1.8700	2.8900	5.7240	10..7500
		Large	-11.6512	-0.1348	4.2450	7.0130	10.8730	17.3998	27.0564
	P_G	Small	0.100	0.150	0.260	0.420	0.640	0.970	1.230
		Large	0.141	0.210	0.397	0.759	1.432	2.874	4.962
Tukey's Hinges	P_E	Small			1.2575	1.8700	2.8900		
		Large			4.2455	7.0130	10.8725		
	P_G	Small			0.260	0.420	0.640		
		Large			0.397	0.759	1.432		

The small company distribution was highly positively skewed with a high, narrow concentration about the mean. Tukey's Hinges are simply an averaged computation of the 25^{th} to 75^{th} percentile scores providing a theoretically more precise measure of these values. The large company distribution was highly negatively skewed and also highly concentrated about the mean. Thus it was apparent that P/E and P/G values that fell outside of the 5^{th} to 95^{th} percentiles were not truly relevant to the study of the "true" picture of the data. The Kruskal-Wallis test, a nonparametric equivalent to a univariate analysis of variance (ANOVA), resulted in Chi-square statistics of 8,169 for P/E based on size and 3,391 for P/G based on size. Both of these results resulted in a p value of $< .005$ leading to strong rejection of the null hypotheses that the P/E's and P/G's were equivalent across the size independent variable at the $\alpha = .05$ level.

Exploration of the entire database and elimination of outliers resulted in the deletion of 2,525 small company cases and 5,143 large company cases. The mean P/E ratio for small companies, after deletion of outliers (cleaned), was 1.71 and 6.92 for large companies. The mean P/G ratio for small companies was .409 and .747 for large companies. The following table shows the percentile distribution for data cleaned of outliers:

Table 2: P/E and P/G Percentile Scores of Data after cleaning.

			Percentiles						
		Size	5	10	25	50	75	90	95
Weighted Average(Definition 1)	P_E	Small	0.5900	0.7900	1.1500	1.6300	2.2000	2.8200	3.1700
		Large	2.1160	2.9589	4.5013	6.5655	9.1378	11.6831	13.1084
	P_G	Small	9.00E-02	0.140	0.240	0.380	0.550	0.730	0.850
		Large	0.131	0.194	0.351	0.643	1.061	1.484	1.727
Tukey's Hinges	P_E	Small			1.1500	1.6300	2.2000		
		Large			4.5015	6.5655	9.1375		
	P_G	Small			0.240	0.380	0.550		
		Large			0.351	0.643	1.061		

The distributions of the cleaned data appeared to approximate normality enabling statistical tests which rely on assumptions of normality. Multivariate statistical tests of the cleaned data were significant at the $\alpha = .05$ level with observed power of 1.00. The between subjects effects test indicated that both P/E and P/G ratios differed by size at the $\alpha = .05$ level. The interpretation of the MANOVA was that 47.3% of the variance was attributable to size for the P/E ratio while 14.2% of the variance was attributable to size for the P/G ratio. The t tests performed comparing P/E and P/G ratios based on size both had p values of $< .005$ which were highly significant at the $\alpha = .05$ level.

The final part of the analysis was to test the null hypotheses that P/E and P/G ratios were equal across both size and three SIC codes. Three SIC codes were selected due to ample sample size. These were SIC codes 2700, 5100, and 7300. The first test was a three by two MANOVA with P/E and P/G as the dependent variables and size and SIC code as independent variables. The multivariate tests were all highly significant at the $\alpha = .05$ level. Size appears to play the largest role in explanation of the variance with n^2 values of .593 for size and .167 for SIC code. The interaction of size and SIC code was also significant but did not explain as much of the variance with a n^2 of .084. The n^2 value (eta squared) describes the percentage of variance explained across variables.

The between subjects test indicated that size and SIC code, taken collectively, explain 66.9% of the variance in the P/E ratio and 45.0% of the variance in the P/G ratio. All between subjects effects were highly significant at the $\alpha = .05$ level.

All post hoc tests were highly significant at the $\alpha = .05$ level indicating that none of the SIC codes was an accurate predictor of the P/E or P/G ratio for the others.

Finally, six t tests were performed, two for each of the three SIC codes to test for the effects of size. These tests were utilized to corroborate

the findings of the MANOVA. Each SIC code was tested independently for the effect of size on both the P/E and P/G ratio. All six t tests were highly significant at the $\alpha = .05$ level leading to the conclusion that the P/E and P/G ratios were significantly different with each SIC code studied individually.

The conclusions of all tests and analyses were that based on the assumptions and delimitations stated in Chapter One, the null hypotheses that P/E and P/G ratios of small and large companies were equivalent were rejected.

Part Four: Summary, Conclusions and Recommendations

Summary of the Literature and Purpose

The problem investigated is the reliance that business valuators place on multiples of large publicly traded companies as guidelines for small closely held businesses. These multiples were the price to earnings ratio (P/E) and price to gross sales (P/G) ratio. Many business valuators use the P/E and P/G ratios of selected large publicly traded firms to estimate value of small businesses by multiplying the P/E or P/G ratio to the small company's earnings or gross sales measure. Due to differing investment reasons, time horizon, and psychology of the small business owner, the use of large company multiples may not be truly comparable to the small business. Thus, if the large publicly traded markets are not truly comparable to small companies, an approach using large company multiples will probably not produce valid results,

Numerous empirical studies were reviewed of valuation approaches and their related methods with regard to accuracy of the valuation process. LeClair (1990) performed a study, which indicated that the adjusted book value method was inferior to the capitalization of earnings method. Harper and Rose (1993) conducted a study that showed that a combination of methods yielded better results than reliance on a single method. Certain industries may be valued more accurately by one method rather than another (Hochberg, 1993). Hickman and Petry (1990) claim that a market capital formula (MCF) has showed promise as an indicator of value in numerous court cases. Waldron and Hubbard (1991) conducted an interesting study whereby 30 valuation experts were asked to value a previously sold business. Only seven used the DCF method while eleven used the market approach by applying P/E or P/G multiples of comparable firms to the subject firm's earnings and sales figures. Interestingly, none of the valuation experts came close to the true purchase price implying either faulty assumptions or valuation technique.

Fishman, Pratt, Griffith, and Wilson (2001) provide an excellent overview of the guideline company method, a market approach that relies on comparable firm's price multiples to value a given business. The use of the guideline company method is predicated on the heretofore discussed assumption that publicly traded multiples are reliable indicators of a company's true value. Another market approach is the Direct Market Data Method (DMDM) founded by Ray Miles of the Institute of Business Appraisers (IBA) in Florida. This method relies on the use of data on previously sold small businesses. This data also establishes price multiples including P/E and P/G to use as indicators of value of a small business based on the previous sales transactions. Miles calls this method a "market" based method while the guideline company method is a "company" method. This means that that the DMDM attempts to fit a business to a particular market while the guideline company method attempts to find several similar companies to the subject and then apply those companies' price multiples to the subject company. Perhaps the key difference is the reliance on publicly traded stock multiples for valuation of the subject in the guideline company method as opposed to the reliance on small business sales data with the DMDM. The purpose of the study was to ascertain if the multiples between large and small firms were indeed correlated.

Conclusions

The conclusions of the study are that all the null hypotheses of equality of P/E and P/G ratios of large versus small companies are strongly rejected. Thus, based on the assumptions and limitations of the study, the use of large publicly traded stock multiples to value small businesses may not produce valid results due to the lack of correlation between the two sets of data.

There is a vast difference in the sizes of the companies studied. The mean size determined by market price of the small companies is $ 2,530,000. The mean size determined by market price of the large companies is $ 2,791,000,000! The range of the small company market prices ranged from 0.00 to a high of $ 894,118,000. The range of the large company market prices ranged from 0.00 to a high of $ 508,326,000,000! Thus

the average large company is approximately 1,100 times larger than the average small company. While there is no strict definition of small business as determined by market capitalization, most valuators consider businesses with less than about $ 20,000,000 of annual sales as being small companies. Conversely, a large publicly traded firm can have a market price of virtually nothing up to market capitalization of billions of dollars. Nevertheless, companies must meet differing but specific market capitalization amounts to be listed on public exchanges. While the exact definition of what constitutes a small company versus a large company is beyond the scope of this study, it is quite evident that these two samples differentiate large and small companies, however defined.

The following table shows a summary of differences in mean P/E and P/G ratios as determined by size and SIC codes along with the percentage differences between each category:

Comparisons of Means

	All Data—Cleaned	
	P/E	**P/G**
Small	1.71	0.409
Large	6.92	0.747
Percent Difference	405%	183%
	Three SIC Codes	
Small SIC Code 2700	1.97	0.53
Large SIC Code 2700	8.67	1.12
Percent Difference	440%	211%
Small SIC Code 5100	1.65	0.284
Large SIC Code 5100	5.64	0.216
Percent Difference	342%	76%
Small SIC Code 7300	1.52	0.429
Large SIC Code 7300	7.87	0.572
Percent Difference	518%	133%

The mean score of large company P/E ratios considering all data after cleaning is 4.05 times larger than the mean score for small companies. The mean score of large company P/G ratios considering all data is 1.83 times larger than that of small companies.

The mean score of P/E ratios of large companies categorized by SIC code ranges from 3.42 to 5.18 times greater than the P/E's of small companies. The mean score of the P/G ratios for large companies was 2.11 times greater for SIC code 2700 and 1.33 times greater for SIC code 7300 than those for small companies. Interestingly, the P/G ratio for large companies of SIC Code 5100 was only 76% of the P/G ratio for small companies.

As discussed, all findings were statistically significant at the = .05 level indicating that the rejection of the null hypotheses is warranted. The significance levels of all tests suggested strong rejection of the null hypotheses as reported p values were .005 for all tests. The conclusion of the study is that, based on the assumptions and limitations heretofore cited, large, publicly traded company, minority interest price multiples are not correlated with small, privately held, control interest sales transactions.

Implications for Practice

The findings of this study are possibly quite important for the practice of business valuation. The market approach, and particularly, the guideline company method is a viable and frequently used technique to value small businesses. However, the reliance on large publicly traded company price multiples has been shown to be a tenuous predictor of small company values based on the findings of this study. The purpose of this study is in no way intended to undermine the validity of the guideline company method's inherent logic. Conversely, the findings of this study definitely call for a very cautious approach when using

the guideline company method relying on large publicly traded stock multiples as small company predictors of value. In short, if a valuator is estimating the value of a small restaurant, reliance on P/E and P/G multiples of large, national restaurant chains such as McDonald's or Burger King may, and probably will, yield distorted results of the actual fair market value of the small restaurant.

The findings of this study indicate that large company multiples are evidently not correlated with small business values. In order to use the guideline company method or any method using other company multiples as estimators of value, extensive investigation will need to be done to ensure that the multiples are reliable measures of the subject company's risk characteristics, investment goals, and strategic objectives. Reliance on similarity of SIC code has been shown to be insufficient research in this study's findings. In addition, the size of the company has been shown to play a significant role in value difference. Therefore, mere reliance on similar SIC codes or industry may evidently produce impressive results that do not reflect economic reality without further examination of other variables or without consideration of size.

Implications for Research

The possibilities for further research are extensive! As in any research project, this study contains numerous limitations and many assumptions. It is quite possible that some, perhaps many, SIC codes are accurate predictors of industry multiples of value. A study of more SIC codes may reveal that some industries' multiples are accurate predictors of value.

Another fascinating study would be an examination of different stratification of size of companies for value inferences. For example, perhaps firms within more narrow ranges of market capitalization or gross annual sales would show no statistically significant differences between P/E and P/G multiples. This could lead to reliable usage of certain size companies, within those ranges, as valid predictors of value. Perhaps size is more important than SIC code or industry when predicting values of small companies. Further research may even show that size is as, or more important, than industry type when attempting to predict value.

A great deal more research needs to be done on the efficient market hypothesis (EMH). The conclusion that the EMH is only partially reliable is academically reprehensible. The evidence uncovered in the review of the literature indicates that the market occasionally, even often, reacts irrationally and does not suggest the true economic value of many businesses. Market prices may be what an entity is trading for but does not mean it's really worth the price paid. There is clear evidence in the study of the market that publicly traded stocks have been over and undervalued on numerous occasions.

A final area of research could be a study of time effects on prices and the resultant pricing multiples. While the scope of this study was to examine large versus small firms, taken as two complete data sets, testing a proposed 20 year investment horizon, it could be that the data would be more similar (or different) over shorter or longer time periods. For example, analyzing the data on a year by year basis may produce different results.

Thus, while this study has attempted to produce accurate, valid results, the limitations of the findings preclude drawing any further generalizations than those constrained by those same limitations. The possibilities for further research are quite broad.

Recommendations

Based on the review of the literature, the analysis and the conclusions derived, the following recommendations are in order:

When using the guideline company method to value a small business, the valuator is advised to extensively research the comparable companies to be used. This research should include investigation of congruence of investment objectives and time horizon as well as the impact of size of the comparable companies on the subject being valued. The findings of this study indicate that reliance in similarity of industry type may not be suitable research. In addition, the size of the comparable companies appears to have an impact on the value. The findings indicate that large publicly traded companies have different price multiples than small companies.

Further research is needed on as many SIC codes as possible to further compare price multiples of companies in similar industries. Intuitively, it would seem that firms in similar industries would share similar risk and return objectives and results. However, intervening variables such as size of company and other factors inherent to a particular firm may make this contention false.

An important area of further research involves the study of pricing multiples based on stratification of size of company. The analysis of data in this study shows that large company pricing multiples are different than small company price multiples. Studies involving narrower strata of company size may reveal interesting and cogent results.

Interestingly, the difference between P/E ratios was greater than the difference of the P/G ratios. This may be due to accounting anomalies not examined in this study. Further research may reveal that the P/G ratio is a more reliable indicator of value than the P/E ratio. In fact, the P/E ratio may be a spurious multiple due to the numerous impacts that managers and individual companies can have on earnings figures.

Finally, the valuation community must spend more time examining the efficient market hypotheses (EMH). Research indicates that the market mechanism does price stocks fairly efficiently. However, Damodaran's comments on the use of the discounted cash flow model cited in the review of the literature are both disturbing and logical. If analysts and valuators would have been "looking behind the numbers" in late 1999 and early 2000, many publicly traded stocks would have been found to have been overvalued by the market. The use of P/E and P/G ratios of overvalued stocks to estimate values of other stocks is simply a compounding of an existing problem. The P/E and P/G ratios are only valid if the price is valid. The findings in this study confirm the apparent differences between P/E and P/G multiples based on size and selected SIC codes. Blind usage of these multiples without regard to verifying market accuracy, investment objectives of firms, and the impact of company size is analogous to "throwing darts" to establish value.

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Identifying a Preferred IP Damages Measure by Understanding the Differences Between "Lost Profits" and "Diminution in Business Value"

By Michael A. Mullins

This article originally appeared in the Summer 2006 issue of the Willamette Management Associates Insights. It is printed here with permission of Willamette Management Associates, www.willamette.com.

Editorial Committee Comment:

Although this article is based on, and refers to numerous US statutes and tax regulations, we consider the issues, approaches and considerations discussed to be relevant for litigation and valuation purposes in Canada as well.

The lost profits damages measure and the diminution in business value damage measures can involve some very similar-as well as some very different-assumptions, inputs, and calculations. A practitioner with an understanding of the similarities and differences between these two damages measures can develop a basis to select the damages measure that best corresponds with a particular set of facts and circumstances.

Introduction

This discussion summarizes the differences between two generally accepted measures of damages in intellectual property (IP) litigation:

1. lost profits and
2. the diminution in business value.

The quantification of IP lost profits and economic damages often arises in litigation claims related to: infringement, expropriation, lender liability, breach of contract, bankruptcy, and other deprivation-related controversy matters.

There is not a great deal of professional guidance addressing the application of these IP damage measures. The book *Recovery of Damages and Lost Profits*[1] summarizes the case law related to the estimation of lost profits in many circumstances. The measure of IP damages known as diminution in business value has also been the topic of important case law.

Both the lost profits and the diminution in business value damage measures attempt to calculate the loss of economic income to the infringed party following a "damages event." Because the two measures can be based largely on an income approach[2] analysis, they share numerous analytical assumptions, inputs, and calculations.

Conversely, there also exist a number of different inputs and assumptions between the two damages measures. By having an awareness of the differences in the two measures and an understanding the circumstances of the particular infringement dispute, it may be possible to select which measure is the preferred measure to calculate economic damages and/or lost profits.

Attributes of Intellectual Property[3]

IP is a special class of intangible assets. IP manifests all of the economic existence and economic value attributes of other tangible assets. However, because of its special status, IP is generally registered under, and protected by, specific federal and state statutes.

The protection of this legal registration provides economic motivation for IP innovators during the creative process. This legal registration also provides protection for IP creators during the commercialization process. It is believed that the information content of IP requires this special protection in order for an IP owner to realize economic value of these special intangible assets.

There are four legally recognized types of IP: trademarks, copyrights, patents, and trade secrets. For economic analysis purposes, these four legal types of IP may be grouped into these five functional categories:

1. marketing-related, such as trademarks, trade names, and service marks,
2. technology-related, such as product and process patents and patent applications,
3. artistic-related, such as literary and musical copyrights,
4. data processing-related, such as computer software copyrights and computer chip masks and masters, and

[1] Robert J. Dunn, *Recovery of Damages for Lost Profits*, 6th ed. (Westport, CT: Lawpress Corporation, 2005).

[2] "Income approach" is defined by the AICPA as "a general way of determining a value indication of a business, business ownership interest, security, or intangible asset using one or more methods that convert anticipated benefits into a present single amount."

[3] Jacob P. Roosma, James L. Kerr, and Robert F. Reilly, "Intellectual Property Lost Profits and Economic Damages." Willamette Management Associates *Insights*, Summer 2002, p. 5.

5. engineering-related, such as industrial designs and trade secrets.

Defining Infringement Damages

As summarized in the book Intellectual Property Infringement Damages, the definitions of infringement damages can be different to some extent for patents, trademarks, and copyrights.[4]

Therefore, before a practitioner can calculate a measure of lost profits or diminution to business value, it is important to clarify those definitions in order to arrive at the appropriate measure of lost profit damages.

Patent Infringement

Title 35, Section 284 of the U.S. Code (1970) states that:

Upon finding for the claimant the court shall award the claimant damages adequate to compensate for the infringement, but in no event less than a reasonable royalty for the use of the invention by the infringer, together with interest and costs as fixed by the court.

Trademark Infringement

Title 17 of the U.S. Code, Section 1117 states that: "(a) the plaintiff shall be entitled to recover (1) defendant's profits, (2) any damages sustained by the plaintiff, and (3) the costs of the action....In assessing profits the plaintiff shall be required to prove the defendant's sales only; defendant must prove all elements of costs or deduction claimed."

Copyright Infringement

Title 17 of the U.S. Code, Section 504 states that:

(a) In general an infringer of copyright is liable for either (1) the copyright owner's actual damages and any additional profits of the infringer, as provided for by sub-section (b); or (2) statutory damages, as provided by sub-section (c).

(b) Actual Damages and Profits-The copyright owner is entitled to recover the actual damage suffered by him or her as a result of the infringement, and any profits of the infringer that are attributable to the infringement, and are not taken into account in computing the actual damages. In establishing the infringer's profits, the copyright owner is required to present proof only of the infringer's gross revenue, and the infringer is required to prove his or her deductible expenses and the elements of profit attributable to factors other than the copyrighted work.

(c) the copyright owner may elect, at anytime before final judgment is rendered, to recover, instead of actual damages and profits, an award of statutory damages for all infringement in the sum of not less than $250 or more than $10,000 as the court considers just.

IP Infringement Damage Measures[5]

Two commonly used methods for quantifying intellectual property damages are:

1. the diminution in the value of a business "before and after" method, and
2. the lost profits "but for" method.

Directly or indirectly, each of these damage analysis methods estimates a value by either:

1. the decrease in the value of the IP (or the IP owner/operator business enterprise) related to the damage event or
2. the value (albeit negative) of the IP damage event itself.

In each of these methods, the damage event could be: an infringement, breach of contract/license/joint venture agreement, breach of employment/noncompete confidentiality agreement, breach of a commercialization/development agreement, a business interruption or tort, a lender liability failure to perform, fraud or misrepresentation related to a sale/transfer, and so on.

The "before and after" method quantifies damages by comparing:

1. the value of the subject IP before the damage event to
2. the value of the subject IP after the damage event.

The difference, of course, is the economic effect of the damage event.

This method requires a valuation of the subject copyright, patent, trademark, or trade secret just

[4] Russell L. Parr, *Intellectual Property* Infringement Damages, 2nd ed. (New York: John Wiley & Sons, 1999).

[5] Stephen R. Bissell and Karen J. Damiano, "Failed IT Projects: Dealing with Technology When Estimating Economic Damages." Willamette Management Associates *Insights*, Special Issue 2003, p. 30.

before the damage event (or series of events) occurs. Then, this method requires a valuation of the subject copyright, patent, trademark, or trade secret after the damaging event (or series of events) has occurred.

Ideally, the "after" valuation is prepared as of a date after the damage event has ceased. The difference between the "before and after" values is one measure of the damage to the subject IP.

This difference in IP values between two dates may not be the only damage suffered by the IP owner/operator. In addition to the decrease in IP value, the owner may have:

1. lost profits during the period of the damage events,
2. incurred damage remediation costs during the damage event period, and
3. incurred legal/administrative costs to prosecute the party responsible for the damage event.

The "but for" method quantifies damages directly-by estimating what amount of economic income would have been earned by the IP owner "but for" the damage event.

The "but for" method typically involves (1) a backward looking projection of economic income that would have been earned from the IP use/ownership "but for" the damage event and (2) a forward looking projection of economic income that would have been earned from the IP use/ownership "but for" the damage event.

The backward projection starts when the first damage event occurs and continues to the date of the analysis (often trial date in a litigation matter or the date of a damage expert's report). The forward projection starts at the analysis date (for example, the trial date) and continues until both:

1. the damage event stops and
2. there is no more expected residual effect of the damage event.

Typically, the result of the backward projection is future valued to the analysis date, and the result of the forward projection is present valued to the analysis date. The total amount of damages is the sum of:

1. the future value of the backward projection and
2. the present value of the future projection.

The "but for" method is one measure of the damages to the subject IP. Again, the IP owner may have incurred other losses due to the damage event, such as legal fees, expert witness fees, court costs, and so on.

The above-described IP economic damage methods are generally comparable to the generally accepted IP valuation approaches. Conceptually, this is not surprising. This is because IP economic damages are typically measured:

1. indirectly-as a decrement in the value of the subject IP or
2. directly-as the value (albeit negative) of the damage event itself.

The income approach is often used in both damage methods. The income approach analysis estimates the present value of the economic income the IP owner/operator could have earned "but for" and "before and after" the damages event.

In both IP economic damage methods, economic income can be defined in many different ways. Economic income can be measured by increases/decreases in units (volume) sold, price per unit, market share (absolute or relative), market size, or by being/not being first to market.

Economic income can be measured by increases/decreases in fixed/variable production expenses, fixed/variable selling and administrative expenses, or fixed/variable research and development expenses. And, economic income can be measured by increases/decreases in capital expenditures, working capital investments, or interest expenses.

Finally, economic income can be measured by either:

1. a change in the absolute dollar amount or
2. a change (acceleration or deceleration) in the timing of any of the above economic variables.

Since (1) both IP economic damages methods are often used in IP economic damages analyses and (2) the two damages methods typically use similar measures of economic income, the remainder of this discussion will highlight and discuss some of the differences in the application of methods to quantify IP economic damages using:

1. the lost profit method and
2. the diminution in the business value method.

Table 1 illustrates several of the significant procedural differences in the application of these two damages measures.

Table 1

Differences Between Lost Profit Analysis and Diminution of Business Value Analysis*

Procedural Difference	Lost Profit Analysis	Diminution in Business Value Analysis
Scope of Valuation	Difference between "but for" and actual profits	Difference between the business value "prior to" the dispute and business value "after" the impairing event
Standard of Valuation	Determined by jurisdiction	Normally fair market value
Time of Performance of Analysis	Performed after the "damages event," backward and forward looking	Performed before and after the "damages" event," forward looking only
Guidelines for the Analysis	Driven by law, varies by jurisdiction, few published cases addressing technical issues	Driven by law, varies by jurisdiction, few published cases addressing technical issues and governed by generally accepted valuation practice
Premise of Value	Usually limited duration	Generally a going concern
Yield Capitalization Rate	Considers the required returns and risks of the assets contributing to the lost profits after the "damages event"	Considers total required return and risk of all the assets of the business prior to and after the "damages event"
Revenue and Cost	Incremental revenue and costs	Total revenue and costs of the business

* Taken from Robert F. Reilly and Robert P. Schweihs, The Handbook of Business Valuation and Intellectual Property Analysis (New York: McGraw-Hill, 2004), p. 330.

Scope of Valuation

Economic damages analysis is typically performed sometime after the damaging event occurred. Therefore, financial and operational information after the damaging event (valuation date) is both available and acceptable (or necessary) to consider in the lost profit analysis. Subsequent information is generally not included in a typical "before and after" business valuation analysis in a nonlitigation circumstance.

Standard of Value

The standard of value in a typical nonlitigation "before and after" business valuation is based on the standard of fair market value (FMV) as defined in Revenue Ruling 59-60. The FMV standard supports the business value based on the hypothetical negotiation between a willing buyer and a willing seller.

The lost profits method does not rely on the FMV standard, and it may be based on the level of profitability the seller has achieved even if greater than what the buyer or infringer is able to achieve. It is also possible that the potential increased profitability of an infringer above what the plaintiff had realized could influence the infringement damage calculation upward.[6]

Time of Performance of Analysis

Economic damages analysis is typically performed some time after the damaging event occurred. Therefore, financial and operational information after the damaging event (valuation date) is both available and acceptable (or necessary) to consider in the analysis. Subsequent information is generally not included in a typical business valuation analysis.

Duration of Analysis and Premise of Value

The duration of the damages period is an important consideration when applying business valuation methods to calculate economic damages. If the damages are determined to be permanent and irreplaceable, then calculations that consider the perpetuity assumption may be appropriate to calculate lost profits.

[6] Christian Tregillis and Michael Thompson, *Differences Between Lost Profits and Diminution in Business Value as a Measure of Damages* (monograph) (Harborside, NJ: American Institute of Certified Public Accountants).

However, if the damaging period is only for a specific period of time, then calculations that include perpetuity should not be used. In the "before and after" analysis it is necessary to value the business at both an historical date before the damages event and after the damages event. This historical value may be brought forward to a present value using prejudgment interest rates.

Yield Capitalization Rate[7]

Within the diminution of business value analysis it is appropriate to use either a yield capitalization rate or a direct capitalization rate. This rate is a measure of the required rate of return on a particular assembled bundle of operating assets. The yield or direct capitalization rate is a weighted average of the expected rates of return on each type of asset within the total bundle of assets of a business enterprise.

Within a lost profits "but for" analysis, it is appropriate to use a required rate of return that reflects the expected rate of return particular to the subject assets-and not the entire business enterprise.

It is also very important that, in a lost profit "but for" analysis, the level of risk associated with the lost profit cash flow is taken into consideration in the formation of the appropriate required return.

Guidelines for Analysis

Reporting requirements of expert reports on economic damages are set by the courts. Federal, state, and local jurisdictions can all have different rules. The most widely accepted rules are those applied by federal courts and specified in the Federal Rules of Civil Procedure (FRCP).

The FRCP requires an expert report to include:

1. a description of the opinions that the expert will offer at trial,
2. a list of all the documents considered in reaching those opinions,
3. a disclosure of all the cases the expert has testified in during the previous four years,
4. all publications authored by the expert during the previous ten years, and
5. a disclosure of how much the expert has been paid to prepare the report.

In contrast to business valuation reports, there is no legal requirement, in either the FRCP or any state rules of civil procedure, that economic damages reports comply with (1) the Uniform Standards of Professional Appraisal Practice or (2) the standards set forth by other professional organizations, such as the American Society of Appraisers (ASA) or the American Institute of Certified Public Accountants (AICPA).

SUMMARY AND CONCLUSION

Intellectual property economic damages sometimes involve the application of generally accepted valuation approaches and methods. Both lost profits analysis and diminution of business value analysis rely on income approach analysis methods.

This discussion summarized some of the important differences between the two damages measures. Damages experts need not consider more than one approach or method. And, they need not limit their examination to data available prior to the valuation date.

The reporting requirements of an economic damages assignment are not governed by the Uniform Standards of Professional Appraisal Practice. They are more likely governed by the legal rules of the jurisdiction in which the testimony will be heard.

Economic damages are typically suffered during a distinct period of time. Therefore, the lost profits damages analysis usually does not rely on a perpetuity assumption that is typically part of a diminution of business value analysis. Furthermore, although not discussed within this article, the treatment of income taxes in the damages analysis may be different from that in the diminution of business value analysis.

The particular facts and circumstances of the infringement situation may require a lost profits calculation or a diminution of business value analysis, or in some cases a combination of the two measures. As a result, the practitioner should

[7] Timothy J. Meinhart, "Intellectual Property Discount Rates and Capitalization Rates" (Chapter 15) in *The Handbook of Business Valuation and Intellectual Property Analysis*, Robert F. Reilly and Robert P. Schweihs, eds. (New York: McGraw-Hill, 2004).

be very informed of the theoretical and procedural differences between the two damages measures-in order to better select which measure should be applied in a particular circumstance.

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Growth in the Constant Growth Model

By James R. Morris, Professor of Finance, University of Colorado at Denver, December 2005

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Abstract

This article discusses the conditions that justify the use of the constant growth model. The constant growth model is very sensitive to the assumptions regarding the firm's operating ratios, capital structure, and dividend policy. If the constant growth model is used and these factors are not coordinated and consistent, the valuation estimate using the equity method will not agree with the valuation estimate obtained with the invested capital method. On the other hand, if all the factors are coordinated, or "in sync," these two methods will generate identical values when the constant growth model is used. Data presented at the end of the article suggests that only a small proportion of companies have growth rates that would make them good candidates to be valued using the constant growth model.

Introduction

Growth is part of almost every discussion of value, and in appraising the value of a firm, the growth forecast is one of the most pivotal inputs. The importance of growth is evident in the constant growth model that is used in many firm valuations. The constant growth model is

$$\text{Value}_0 = \text{Cash Flow}_1 / (k - g) \quad (1)$$

where k is the discount rate, and g is the growth rate of the cash flow expected to prevail over the perpetual life of the firm. When faced with the task of valuing a growing firm, many appraisers probably resort to the use of the constant growth model shown in (1). They use this either directly, as the value at the valuation date, or indirectly, in conjunction with a period-by-period valuation using the constant growth model for the value at the horizon. The point is that many valuations frequently rely on using the constant growth model at some stage of the valuation.

In constant growth formula (1), the growth rate's importance is equal to the discount rate. A one percentage point increase in growth has the same impact on value as a one percentage point decrease in the discount rate. Yet, despite the obvious importance of growth in estimating value, little effort is devoted to estimating, or even understanding growth. We have forty years of highly technical research that has been devoted to improving our estimates of the discount rate, k. But we have relatively little guidance for estimating or even understanding the growth rate. Given the importance of growth in the valuation process, more effort needs to be devoted to enhancing our understanding and ability to forecast growth. The purpose of this article is to add a little to this understanding. In the first part of the article, we will discuss the conditions necessary to have consistent values from the invested capital and equity valuation methods when we use the constant growth model. In the last section we briefly summarize growth data so we have a better idea of what growth rates companies have experienced and what rates are applicable to the constant growth model.

I. Constant Growth in the Valuation of Invested Capital and Equity

The constant growth model can be used for either the equity method or the invested capital method of valuation. The cash flows, discount rates and the growth rates must match the method. For the equity approach with constant growth, the cash flow is the cash flow to equity, denoted as CFE, and the discount rate is the equity investor's required return, k_E. With the invested capital method, the cash flow is the cash flow to invested capital, denoted as CFIC, and the discount rate is the weighted average cost of capital, k_{WACC} . Of course, the perpetual growth in the formula is the annual growth in the respective cash flows, denoted by g_{CFE} , and g_{CFIC}. When all the inputs are correctly defined and are "in sync," we

should get values that are the same which ever method we use. That is, using the notation we have introduced, we should obtain the same estimate of equity value from both methods:

Equity Method:
Equity $Value_0$ =
$CFE_1 / (k_E - g_{CFE})$ (2)

Invested Capital Method:
Equity $Value_0$ =
$[CFIC_1 / (k_{WACC} - g_{CFIC})] -$ Debt 0 (3)

The difficulty we might encounter is that we may not get the same values with the two methods. We seem to have done all the computations right, used the right formulas, yet end up with two different values. We aren't quite sure why we get two different values, but if they aren't too far apart, we pick one and proceed – chalking the difference up to rounding error. But the problem is probably not rounding error. The problem is that the constant growth model is very sensitive to the inputs, and all the inputs must be precisely "in sync" to get consistent estimates from the two methods.

For the constant growth model to yield consistent values, all the assumptions and forecasts about the firm have to be "in sync." The crucial assumptions and factors where the mistakes are most likely to occur include the following:

1. The growth rate must be sustainable forever, and, of course, must be less than the discount rate.[1]
2. Cash flow to equity and cash flow to invested capital must be consistent.
3. Interest rates and costs of capital are expected to be the same every period forever.
4. Assumptions use to calculate cost of equity must be consistent with the assumptions used to calculate the weighted average cost of capital.
5. The firm's operating ratios (profit margins, asset turnover, etc.) are stable.
6. The capital structure is stable, with the proportional mix of debt and equity, in market value terms, being the same every period, forever.
7. The capital structure, dividend policy, and the growth rates must be consistent.

A critical reader can be excused for saying "Of course, it's obvious that everything needs to be consistent." However, I suspect that a few valuations occasionally fail to show the level of consistency necessary for the models to work correctly and yield consistent results.

To see how errors might occur, let's consider the following example. Exhibit 1 shows financial statements for the Mythic Corporation. The balance sheet applies to time t = 0, and the income statements and cash flows are forecasts for year 1 that ends at t = 1. Assume that Sales, CFIC, and CFE are all forecasted to grow at 7% annually forever. The operating ratios such as profit margin and asset turnover are expected to be stable. Note that all of the equity cash flow is paid out as a dividend, and the dividend payout ratio is 80% (1,231.2 / 1,539.0). Assume that the capital asset pricing model applies, and that the Hamada adjustment of beta is appropriate based on market value leverage ratios. The risk free interest rate is $k_F = 4\%$, the market risk premium is $(k_M - k_F) = 5\%$, and Mythic's equity would have a beta of 1.0 if it had no debt.

Using this data, we will calculate the value of equity using the equity method assuming constant growth. Then we will calculate the value of equity using the invested capital approach. Hopefully, we will get the same equity value using both methods. Since the correct application of either method requires that the capital structure weights in our cost of capital calculations be based on market values, and the market values are the things we are estimating, the problem is circular, and will require some iterations.

For the equity method, we will start the iterative process using book value capital ratios, and iterate until we converge on the value of equity where the capital ratios and the computed equity value agree. At each iteration, the value of equity is calculated as

Equity $Value_0 = 1{,}231.2 / (k_E - .07)$,

where k_E changes as we adjust the market value based Debt/Equity as input for beta. Exhibit 2 shows the results of this iterative process. After 6 iterations, the estimated value of equity converges to $57,069[2]. Note that this converged value is 62% greater than the $35,180.4 that we get using book value weights in iteration 1.

Exhibit 1
Mythic Corporation

Balance Sheet

	Time 0
Current Assets	2,500.0
Net Fixed Assets	7,500.0
Total Assets	10,000.0
Current Liabilities	1,000.0
Debt	3,000.0
Equity	6,000.0
Liabilities & Equity	10,000.0

Income Statement

	Period 0
Sales	10,700.0
Operating Costs	6,955.0
EBITDA	3,745.0
Depreciation	1,000.0
EBIT	2,745.0
Interest	180.0
Earnings Before Tax	2,565.0
Income Tax	1,026.0
Net Income	1,539.0
Dividends	1,231.2

Cash Flow to Invested Capital

EBITDA		3,745.0
Depreciation		1,000.0
EBIT		2,745.0
Tax	(EBIT * T)	1,098.0
Operating Cash Flow	(EBIT (1 - T) + Depr)	2,647.0
NWC Investment		1050.0
Capital Investment + Depr		15,252.0
Cash Flow to Invested Capital (CFIC)		1,017.0

Equity Cash Flow

Net Income	1,539.0
Depreciation	1,000.0
Cash Flow from Earnings	2,539.0
NWC Investment	105.0
Capital Investment + Depr	1,525.0
Debt Issued	322.2
Cash Flow to Equity (CFE)	1,2321.2

For the equity method, we will start the iterative process using book value capital ratios, and iterate until we converge on the value of equity where the capital ratios and the computed equity value agree. At each iteration, the value of equity is calculated as

Equity Value 0 = 1,231.2 / (k E - .07),

where k E changes as we adjust the market value based Debt/Equity as input for beta. Exhibit 2 shows the results of this iterative process. After 6 iterations, the estimated value of equity converges to $57,069[2]. Note that this converged value is 62% greater than the $35,180.4 that we get using book value weights in iteration 1.

Exhibit 2

Equity Method
Iterations to Converge on Equity Value
Dividend Payout @ 80%

	Iteration	1	2	3	4	5	6
Row							
1	Equity Value Assumed	$6,000.0	$35,180.4	$54,586.4	$56,879.9	$57,055.1	$57,068.0
2	Debt/Equity	50.00%	8.53%	5.50%	5.27%	5.26%	5.26%
3	Beta - Leveraged	1.300	1.051	1.033	1.032	1.032	1.032
4	k_E	10.500%	9.256%	9.165%	9.158%	9.158%	9.158%
5	Derived Equity Value	35,180.4	54,586.4	56,879.9	57,055.1	57,068.0	57,069.0

Next, we use the same iterative process to estimate value of invested capital and the value of equity. Exhibit 3 shows the equity value converge to $51,450.8, which differs by 37% from the $81,751.3 we got in iteration 1 using book values. But more important for our present discussion is the fact that this converged value using the invested capital method disagrees with the converged value we got with the equity method. With the equity method, we got equity value of $57,069, and with the invested capital method we got $51,450.8 - a difference of about 10%.

Exhibit 3

Invested Capital Method
Iterations to Converge on Equity Value

	Iteration	1	2	3	4	5	6	7	8
Row									
1	Equity Value Assumed	6,000.0	81,751.3	50,106.6	51,548.5	51,443.8	51,451.2	51,450.7	51,450.8
2	Debt/Equity	50.00%	3.67%	5.99%	5.82%	5.83%	5.83%	5.83%	5.83%
3	Debt/Invested Capital	33.33%	3.54%	5.65%	5.50%	5.51%	5.51%	5.51%	5.51%
4	Beta - Leveraged	1.300	1.022	1.036	1.035	1.035	1.035	1.035	1.035
5	k_E	10.500%	9.110%	9.180%	9.175%	9.175%	9.175%	9.175%	9.175%
6	WACC	8.200%	8.915%	8.864%	8.868%	8.868%	8.868%	8.868%	8.868%
7	Value of Invested Capital	84,751.3	53,106.6	54,548.5	54,443.8	54,451.2	54,450.7	54,450.8	54,450.8
8	Derived Equity Value	81,751.3	50,106.6	51,548.5	51,443.8	51,451.2	51,450.7	51,450.8	51,450.8

The difference between the results from the two methods is not due to improper calculations or rounding error. The difference is due to the fact that our forecast assumptions are inconsistent with the requirements of a constant growth model. The constant growth model is a very picky mistress. If you don't live by her rules, she will give you inconsistent results.

Where did we go astray in this case? Which rules did we break? Luckily, we managed not to break all of them. But unluckily, we broke some that are hardest to detect. We violated assumptions 6 and 7 in the list above. Growth, capital structure, and dividend policy are all interrelated, so they have to be consistent. These are the items that are hardest to keep consistent, or to even be aware that they are inconsistent.

In this example, we projected 7% growth in cash flow to both invested capital and equity, we assumed the capital structure would be 33.3% debt (in book value terms[3]) every period forever, and we assumed that we had an 80% dividend payout ratio. In addition, it is assumed that there is a constant, stable relation between assets and sales, so that assets need to grow at the same rate as sales. In this case, we assumed that the turnover of total assets (Sales 0 / Total Assets 0) must be 1.0 every period. These seemingly reasonable forecasts and assumptions are inconsistent. For this firm's sales to grow at 7% requires that assets increase at the same rate. This, in turn, requires investment and financing. To maintain a stable mix of debt and equity requires that new debt and new equity be added in a fixed, constant proportion each period. Some, or all, of the equity financing must come from retained earnings. This implies that the dividend policy must be tailored to the growth rate and the proportional debt-equity mix. In the constant growth context, growth, capital structure, and dividend policy have to work together. If one is not consistent with the others, the constant growth model yields inconsistent results, and is inappropriate to the situation.

This example was set up with the book value capital structure assumed to be 33.3% debt, with all the other operating ratios for the firm stable over time. If we hold the growth rate constant, the 80% dividend payout will not leave sufficient retained earnings to keep the capital structure stable. At this growth rate, the firm will have to issue proportionally too much debt, and the proportion of debt will continually increase. In this case, the Debt/Total Capital (book values) will increase from 33.3% at t = 0 to 38.5% by year 5, and continue to increase after that. This doesn't seem like much, but it violates a basic assumption for the using WACC in the constant growth model, and is enough to lead to the inconsistent value estimates noted above.

Dividend Payout

To have everything work "in sync," what has to give? What can we adjust so the model is valid? We can adjust any or all of the items: growth rate, capital structure, or dividend payout. Let's consider dividend payout. To keep everything in balance, meet our financing needs, and maintain a stable debt-equity mix, the payout would have to be 72.7% of earnings. Higher payout would provide insufficient equity, lower payout would provide too much equity. Either way, the debt-equity mix would change. The payout of 72.7% leaves just enough retained earnings to keep the debt-to-total capital ratio at 33.3% – forever. You might ask why couldn't we have a higher payout and issue new shares to maintain the equity financing? The answer is that issuing new equity simply offsets the higher payout. In the absence of transaction costs, paying out $3 per share and issuing $1 of new equity is the same as paying a dividend of $2 and not issuing any new shares. In terms of payout or retention ratios, it is the net payout that matters - particularly in the perpetuity context of the constant growth model.

How do we know that 72.7% dividend payout will work? Two reasons: first, we will try it out; and second, a little algebraic manipulation can prove the case. Let's look at the Mythic example. Keep all other factors the same, but change the dividend payout to 72.7%. With net income in period 1 of $1,539, the dividend will be $1,118.9 (72.7% x 1,539) and the value of equity with the equity method will be calculated as

$$\text{Equity Value}_0 = 1{,}118.9 / (k_E - .07).$$

The cash flow to invested capital is unchanged, so the value of equity with the invested capital method will calculated as

$$\text{Equity Value}_0 = [\, 1{,}017 / (k_{WACC} - .07) \,] - 3{,}000 ,$$

where the debt at t = 0 is $3,000. The data for the invested capital approach is not affected by the payout ratio so long as the capital structure and other factors are also unchanged. Consequently, the value of invested capital method will provide the same correct value as in Exhibit 3, $51,450.8. To get the value of equity, we will have to iterate as we did in Exhibit 2. Without showing all the steps, the value of equity with the equity method will be as shown in Exhibit 4, where the values now agree between both methods - the value of equity is $51,450.8.

Exhibit 4

Equity Method
Iterations to Converge on Equity Value
Dividend Payout @ 72.7%

	Iteration	1	******	8
Row				
1	Equity Value Assumed	$6,000.00		$51,450.7
2	Debt/Equity	50.00%		5.83%
3	Beta - Leveraged	1.300		1.035
4	k_E	10.500%		9.175%
5	Derived Equity Value	31,970.2		51,450.8

You might ask 'why use the equity method if the invested capital method worked correctly in the first place?' The answer is that you can use either method, but all the factors have to agree. If the dividend payout really was 80%, with all other elements unchanged, the invested capital method in Exhibit 3 would not be correct. The reason is that with a payout of 80%, the capital structure would not be stable at 7% growth. The validity of the invested capital value in Exhibit 3 depends on the stable capital structure.

Where does the payout of 72.7% come from, and why does it work? As noted above, the stable payout can be derived with a little

algebraic manipulation[2] that yields the following formula in terms of the retention ratio:

$$\text{Retention Ratio} = \left[\frac{\text{Equity}_0}{\text{Total Assets}_0}\right]\left[\frac{\text{Total Assets}_0}{\text{Sales}_0}\right]\left[\frac{g_s}{(1+g_s)}\right]/(\text{NetProfitMargin}) \qquad (4)$$

$$\text{Retention Ratio} = \left[\frac{6{,}000}{10{,}000}\right]\left[\frac{10{,}000}{10{,}000}\right]\left[\frac{.07}{(1.07)}\right]/(.144) = .273$$

$$\text{Payout Ratio} = 1-.273 = .727$$

In this formula, the ratios are in terms of book values on the same date. For example,

[Total Assets$_0$ / Sales$_0$] = 10,000 / 10,000 refers to assets and sales both at the end of period 0, in contrast to Sales shown in Exhibit 1 of $10,700 that are at the end of period 1, after the 7% growth in sales has occurred. The derivation of this formula assumes that the structure of the firm (asset turnover, net profit margin, and capital ratios) is stable in the long run, and calculates the retention ratio necessary to maintain a constant debt ratio and equity-to-total asset ratio. For a given structure and growth rate, the payout ratio is unique. While this is not the only dividend policy the firm can use, it is the only dividend policy that will support 7% sales growth and a stable capital structure. To support faster growth, with the same margin, debt ratio, and asset turnover, the payout would have to be reduced, and vice-versa for slower growth. The point is, if you use a constant growth model, you must have a stable situation. That requires that the firm structure (asset turnover, profit margin, capital ratios, and dividend payout) be stable and consistent over time.

Investment

Investment is another of the items that must be 'in sync' for the constant growth model to be valid. Investment in new assets enters into the constant growth model in two ways. First, assets must grow to provide the base for increased sales and cash flows. Second, the calculation of cash flows available to invested capital and equity must take account of the funds spent for the asset investment.

In our Mythic Corporation example, the cash flow calculations in Exhibit 1 summarized the firm's investment which is based on the following detail:

Net Working Capital:		
Increase in Current Assets	$ 175	
Less: Increase in Spontaneous Current Liabilities	70	
Investment in Net Working Capital		$ 105
Capital Investment:		
Replacement of Depreciated Assets	$1,000	
Net New Capital Expenditures	525	
Gross Capital Investment		$1,525
Total Gross Investment		$1,630

The $1,630 is the gross investment in the sense that it includes $1,000 for 'Replacement of Depreciated Assets,' that is included as part of the expenditure to offset the inclusion of Depreciation as part of the operating cash flow. On a net basis, the total amount spent on net working capital and fixed assets was $630.

These investments are the amounts necessary to keep the firm growing and 'in sync.'
In this case, it is assumed that, in the long run, the firm will maintain a constant ratio of total assets to sales, and some of its liabilities will increase spontaneously as sales increase. With these relationships stable over time, the net investment is calculated as

$$\text{Net Investment}_t = \left\{ \left[\frac{\text{Total Assets}}{\text{Sales}} \right] - \left[\frac{\text{Spontaneous Current Liabilities}}{\text{Sales}} \right] \right\} (\text{Sales}_{t-1})\, g_s$$

For Mythic in period 1 this would be

$$\text{Net Investment}_1 = \left\{ \left[\frac{10{,}000}{10{,}000} \right] - \left[\frac{1{,}000}{10{,}000} \right] \right\} (10{,}000)\, .07 = \$630\,,$$

where period 0 sales were $10,000, and the sales growth rate is 7%.

The point of this example is that this investment is necessary for sales to grow at 7%, and cash flows to invested capital and to equity both must take account of the investment. In the context of the constant growth model, whatever long run growth rate is assumed, the investment expenditures in the cash flow calculations must be consistent with the growth, and vice-versa.

Sustainable Growth

Whereas the firm structure and policies must be 'in sync' with the growth rate, it follows that the growth rate must also be consistent with the structure and policies. The long run growth rate that is consistent with structure and policies is the sustainable growth rate.

Formula (4) for the retention ratio may look slightly familiar because it is closely related to the sustainable growth formula developed by Higgins, which is

$$g^* = \frac{\left\{ (\text{Net Profit Margin})(\text{Retention Ratio}) \left[\frac{\text{Total Assets}_0}{\text{Equity}_0} \right] \right\}}{\left[\frac{\text{Total Assets}_0}{\text{Sales}_0} \right] - \left\{ (\text{Net Profit Margin})(\text{Retention Ratio}) \left[\frac{\text{Total Assets}_0}{\text{Equity}_0} \right] \right\}}\,, \qquad (5)$$

where these ratios are in terms of book values. For Mythic Corporation this is

$$g^* = \frac{(.144)(.273) \left[\frac{10{,}000}{6{,}000} \right]}{\left[\frac{10{,}000}{10{,}000} \right] - \left\{ (.144)(.273) \left[\frac{10{,}000}{6{,}000} \right] \right\}} = .07$$

Higgins' sustainable growth represents the highest rate of sales growth that a firm can support and still have its operating ratios, capital structure, and dividend payout stable. In this scheme, all new equity financing comes from retained earnings, and debt financing is constrained so the debt-to-equity ratio is constant over time. This does not mean the firm could not grow at a different rate - it could grow at a faster or slower rate. But to support a different sales growth rate, something has to give. If, over time, the asset-to-sales ratio, cost structure, profit margin, and dividend payout ratio are stable, more rapid growth will require the firm to finance the asset growth with debt in such a way that the debt ratios will increase.

When we use the constant growth model (1), we are assuming that the cash flow will grow at rate g forever. This rate cannot be chosen arbitrarily. It must be a rate that is attainable, can be sustained in the long run, and is consistent with the firm's operating characteristics and financial policies. Higgins's sustainable growth fits these criteria perfectly. A growth rate that differs substantially from this sustainable rate should be used only with careful justification. One should be able to explain how the firm can grow at a given rate that is consistent with a stable debt-equity mix, with sufficient stability in other characteristics that the growth can continue forever at the same average rate.

Note the term 'average rate' in the previous paragraph. In spite of the sensitivity of the constant growth model, it is not necessary that the growth rate actually be the same every period in the future. It is permissible for the actual growth rate to fluctuate from period to period. However, it is necessary for the actual growth to be distributed evenly around an expected or mean growth rate that is the g used in the formula. That is, the long run growth, g, in the constant growth model should be an 'unbiased' estimate of the mean rate of future growth, and actual growth in each period should be as likely to be above g as below. If there is a systematic pattern to growth - increasing, decreasing, or following a systematic cycle, then the firm has not reached the point of stability where we are justified in using the constant growth model.

II. Growth Experience

What about the prescription to use the growth rate of the economy as the long run growth rate? Or perhaps the inflation rate plus population growth? These rates might turn out to be correct, but there is nothing automatic about them. To use these system-wide rates for a particular firm also needs some justification other than just saying everyone uses these rates. One would really need to explain why these rates apply to the specific industry and firm, and when the firm is expected to reach the point where it just keeps pace with the economy. As a first step, it may be helpful to be reminded of growth rates actually experienced in the past.

Exhibit 5 presents data summarizing economy-wide growth rates for the U.S. from 1930 through 2004. The average annual growth rates in row 1 are arithmetic averages of the annual rates over the period indicated, and the standard deviations also are based on annual observations. The compound average growth in row 3 is the geometric mean based on the beginning and ending years of the series.

Exhibit 5

Growth Rates for Selected Aggregate U.S. Data[6]

		Population	GDP	Real GDP	Inflation	Inflation	Corporate	Dividends
					GDP Deflator	CPI	Profits	
1	Averge Annual Growth Rate, 1930 - 2004	1.18%	6.77%	3.55%	3.06%	3.36%	7.13%	8.05%
2	Standard Deviation of Annual Growth, 1930 - 2004	0.35%	7.30%	5.17%	3.74%	4.39%	4.14%	5.89%
3	Compound Average Growth, 1930 - 2004	1.18%	6.51%	3.42%	2.99%	3.26%	7.11%	7.84%
4	Average Annual Growth by Decades							
5	1930 - 1939	0.73%	-0.24%	1.32%	-1.93%	-2.05%	n/a	n/a
6	1940 - 1949	1.31%	11.66%	5.97%	5.45%	5.56%	n/a	n/a
7	1950 - 1959	1.73%	6.68%	4.15%	2.42%	2.12%	7.30%	5.98%
8	1960 - 1969	1.36%	6.89%	4.44%	2.35%	2.53%	7.46%	6.79%
9	1970 - 1979	1.05%	10.06%	3.26%	6.61%	7.55%	9.99%	9.21%
10	1980 - 1989	0.95%	7.93%	3.07%	4.75%	5.26%	7.77%	10.75%
11	1990 - 1999	1.22%	5.39%	3.11%	2.22%	2.95%	5.69%	8.04%
12	2000 - 2004	1.03%	4.84%	2.59%	2.20%	2.49%	4.05%	8.06%

Various prescriptions for long run growth of a firm's cash flows have been suggested based on various broad economic trends. At the low end would be growth in population plus inflation. If we base the forecast on past annual averages, this would be 1.18% + 3.36% = 4.54% (using CPI). Note that both population growth and inflation have trended down since their earlier peaks. At the upper end of average aggregate growth would be GDP, or Real GDP plus inflation. These would be 6.77% and 6.61%, respectively. Still higher would be the growth in aggregate profits or dividends, which were 7.13% and 8.05%, respectively. Because Corporate Profits and Dividends are aggregated data, they reflect the growth in the business sector, including growth in the number of firms, so one should be cautious in applying those growth figures to a single firm.

While these figures help give us some perspective about growth rates, the range of values we get using the different versions should cause us to be careful. Arbitrary choice of one or the other historical growth rates would lead to wide variations in the estimated value of a particular firm.

The growth experience of individual firms gives us another basis for comparison and projection for future growth in our valuations. We can turn to other studies growth. One of the more thorough, recent studies of growth was that by Chan, Karceski and Lakonishok[7] (noted as CKL). CKL examined growth for a sample consisting of all firms with data in the Compustat database for the period from 1951 to 1997. On average there were about 2,900 firms in the sample, but with the growth in the number of companies in the database, there were as few as 359 in the first year, and about 6,800 in the last year. They calculated average annual growth for each company over 1, 5 and 10 year periods, and summarized the results by showing growth data averaged over all firms in the sample. The variables considered were sales per share, operating income before depreciation (EBITDA) per share, and net income available to common before extraordinary items (per share). Exhibit 6 summarizes selected results from CKL's Table 1. These growth rates are the averages annual rates across all firms in the sample for all possible 10 year holding periods.

Exhibit 6

Distribution of Selected Growth Rates
From Table 1 of Chan, Karceski, and Lakonishok

	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile
Sales Growth	0.1%	5.5%	10.2%	13.8%	18%
EBITDA Growth	-2.3%	4.1%	9.5%	14.1%	19.4%
Income Per Share Growth	-3.1%	3.9%	9.7%	14.7%	20.4%

The most representative number is the median (50th percentile), which shows sales per share growing at about 10.2% per year, and income per share at about 9.7%. As they point out, these figures tend to have an upward bias due to survivorship, the exclusion of firms when the income numbers were negative, and their method of tracking the number of shares that assumes dividends were reinvested. CKL summarize their results by noting that "Our median estimate of the growth rate of operating performance corresponds closely to the growth rate of gross domestic product over the sample period." "After deducting the dividend yield ... as well as inflation, the growth in real income before extraordinary items is roughly 3.5% per year. This is consistent with the historical growth rate in real gross domestic product...." (p. 649)

While this data provides some perspective on growth rates, we should be cautious in interpreting it. A given firm might jump randomly from the 10th percentile to the 90th, or possibly even settle for a substantial period at the 25th percentile. With that possibility in mind, CKL examined the data for evidence of persistence in growth rates. They performed several tests to determine whether firms with above median growth rates in one period tended to stay in the upper half of the distribution in subsequent periods. They found that "While there is persistence in sales growth, there is no evidence of persistence in terms of growth in the

bottom line as reflected by [EBITDA] and [net income]. Instead, the number of firms delivering sustained high growth in profits is not much different from what is expected by chance." ... "This finding is what would be expected from economic theory: Competitive pressures ultimately dissipate excess earnings, so profitability growth reverts to a normal rate" (p. 663)[8]

CKL's search for growth persistence focused on high growth. They did not look at the lower end of the spectrum to find whether firms with slower growth fit the mold of the constant growth model with long lasting but steady growth. To gain additional perspective on firms with slower growth that might fit the requirements for constant growth, I examined growth for firms listed on the Compustat Research Insight data base with data for the 19 year period, 1986 - 2004. The base sample consisted of 3,920 companies. Average annual growth over the sample period was calculated for each company for sales, EBITDA, income before extraordinary items, net income, earnings per share (EPS), total dividends, and dividends per share.[10]

Exhibit 7 shows, for each variable, the growth rates at selected percentiles of the growth data sorted in ascending order from the lowest to highest average annual growth rate. For example, with average annual sales growth calculated for each of 3,919 companies, the data was sorted from lowest to highest. Ten percent of the companies had average sales growth of 2.27% or less, and 25% of the companies had average sales growth of 6.41% or less. The 50th percentile, or median, is the best measure of central tendency: 50% of the companies had sales growth of 13.7% or less. Note that the median growth of net income, EPS, total dividends, and dividend per share all are in the 7% to 8% range, which fits with our conception of growth rates that potentially fit in a constant growth model.

The distribution of growth rates in Exhibit 7 does not show us how many companies experienced growth at rates that would reasonably fit into a constant growth model. Exhibit 8 is intended to give us some of that information. Based on the idea that growth over an infinite horizon should be positive, but less than the long run growth rate of the economy, we would expect that constant growth would have to be between 0% and about 7% or 8%. Certainly, we

Exhibit 7

Distribution of Growth Rates
At Selected Percentiles

Growth Variable	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile	Number of Companies in the Sample [11]
Sales	2.27%	6.41%	13.7%	26.4%	49.2%	3,919
EBITDA	-38.9%	3.32%	14.8%	37.7%	90.3%	3,920
Income Before Extra. Items	-304.1%	-56.1%	10.53%	49.21%	157.1%	3,917
Net Income	-317.2%	-71.3%	7.24%	47.9%	158.3%	3,918
Earnings Per Share	-268.9%	-62.5%	7.52%	38.7%	121.5%	3,705
Dividend	-33.6%	-0.98%	8.18%	25.9%	97.7%	1,960
Dividend Per Share	-37.5%	-2.07%	7.64%	23.5%	87.8%	1,741

would not expect a firm to experience growth in excess of 10% over an infinite horizon. Exhibit 8 shows the percentage of companies in the sample that exhibited average annual growth in selected intervals between 0% and 10%. For example, of the 3,919 companies for which average annual sales growth was calculated, 3.55% (139 companies) had average annual sales growth between 0% and 2%; and 6.23% of the companies had average annual sales growth between 2% and 4%. The next to last column is the cumulative proportion of companies that had average annual sales growth between 1% and 10%. When we consider growth of the income variables (income before extraordinary items, net income, or earnings per share), only about 8% to 9% of the companies experienced average growth between 0% and 10% per year.

About 28% of the companies in the dividend sample exhibited average annual dividend growth in the 0% to 10% range. This proportion appears to be large relative to the earnings growth figures. However, half of the base sample of companies were eliminated because of missing data or because they paid no dividends. The companies for which dividend data was available tend to be the more stable companies, so a larger proportion of these companies have dividend growth rates that would be in the constant growth range

Exhibit 8

Percentage of Companies
With Growth Within The Interval Indicated

Growth Variable	Growth Rate Interval					Cumulative %	Number of Companies In Sample
	0 – 2%	2% - 4%	4% - 6%	6% - 8%	8% - 10%		
Sales	3.55%	6.23%	7.81%	8.78%	7.55%	33.92%	3,919
EBITDA	2.63%	4.01%	4.69%	4.44%	5.28%	21.05%	3,920
Income Before Extra. Items	1.17%	1.48%	1.91%	2.3%	1.79%	8.65%	3,917
NI	1.3%	2.3%	1.05%	1.63%	1.97%	8.25%	3,918
Earnings Per Share	1.57%	1.38%	1.86%	2.38%	2.0%	9.19%	3,705
Dividend	3.32%	5.92%	6.58%	6.73%	5.31%	27.86%	1,960
Dividend Per Share	5.57%	6.03%	5.97%	6.32%	4.31%	28.2%	1,741

This data tends to support the inference that there is a relatively small number of companies that fit the requirements of a constant growth valuation model. Many of the companies that happened to experience growth rates in the constant growth range would not be expected to stay in that category in the long run. They may speedup or slow down, or disappear.

Because of that, the proportion of companies that actually fit the constant growth model is probably considerably smaller than is represented by Exhibit 8.

None of this data will tell the appraiser what growth rate to use for a particular company. Hopefully, it will give an idea of the range of rates that is plausible, and also hopefully, it will provide a caution against using the constant growth model in a situation in which it does not apply.

Conclusion

The objective of this article has been to provide the reader with a little better understanding of how and when the constant growth model can be validly used. The first section shows that we can use the constant growth model with either the equity method or the invested capital method. Either method will provide valid estimates of value only if all the assumptions and forecasts are consistent. The assumptions that must be consistent include the firm's operating ratios, particularly asset turnover and profit margins, capital structure, dividend payout, and, of course,

the growth rate. These factors need to be "in sync" so that the expected growth is the same each period, forever. This does not require that the actual growth must turn out to be the same every period, but it does require that the expected growth is an unbiased estimate of actual future growth. In this context, unbiased means that growth in any period is equally likely to be above or below the mean. Stable long run growth is more likely for a firm with stable operating ratios. However, this does not really require that every ratio be the same every year. Rather, it requires that the operating ratios average out over time so the result is growth that is, on the average, smooth, stable, and with an unbiased mean.

It is well known that the constant growth model requires that growth be less than the discount rate, and that growth should not exceed the growth of the company's economic environment. As a reminder of what long run growth rates are plausible, we briefly reviewed past growth for U.S. economic aggregates. The economy has experienced average annual growth of about 6% or 7%. This suggests that the constant growth model would normally apply to companies whose long run growth is expected to be in the range of 0% to about 7% per year. Growth rates over the last 19 years were calculated for a large sample of companies. What we found was that only a small proportion of companies had average growth rates in a range appropriate for a constant growth model. This suggests that only a minority of companies would have long run growth in a range that would be appropriate for the constant growth model. Our cautionary conclusion is that the constant growth model should be applied with great care only to those situations where it fits the facts and forecasts.

End Notes

[1] The constant growth model is based on expected values. So the growth rate can vary period-to-period. However, the expected (mean) growth rate must be the same every year.

[2] If our model is not too complex, we can bypass the manual iteration process that is shown in Exhibit 2 by using Excel's iterative calculation method in Tools > Options > Iteration.

[3] The assumption that the book value capital weights are do not change over time is consistent with market value weights also being constant over time. The reason is that in the stable world of the growth model, the market-to-book ratios will also be constant over time.

[4] To derive expression (4) we will use the following definitions and assumptions.

In each period, t , the following operating ratios of the firm are assumed to be constant.

P = (Net Income$_t$ / Sales$_t$), the net profit margin in period t;

R = (Retained Earnings$_t$ / Net Income$_t$), the earnings retention ratio;

L = (Debt$_t$ / Equity$_t$), the debt-to-equity ratio, in book value terms;

A = (Total Assets$_t$ / Sales$_t$), the asset intensity ratio, the inverse of turnover of total assets. To support sales, the firm's assets must maintain a constant proportion, A, to sales, which implies that assets must grow at the same rate as sales.

$A \bullet (Sales_1 – Sales_0) = A \bullet Sales_0 \bullet g$ is Total Investment is period 1, where

g = growth in sales = $(Sales_1 – Sales_0) / Sales_0$.

Equity financing is provided entirely by retained earnings, which in period 1 is

Retained Earnings$_1$ = $R \bullet P \bullet Sales_1$.

Debt financing provides the remainder of the required financing for total investment. To maintain the debt-equity ratio at a constant level over time, the new debt in period 1 will be

Debt Financing$_1$ = $L \bullet$ Equity Financing$_1$ = $L \bullet R \bullet P \bullet Sales_1$

Equality of investment and financing requires

Total Investment = Equity Financing + Debt Financing

$A \bullet Sales_0 \bullet g = [R \bullet P \bullet Sales_1] + [L \bullet R \bullet P \bullet$ Sales 1 $] = [R \bullet P \bullet Sales_1] \bullet (1 + L)$

$A \bullet Sales_0 \bullet g = Sales_0 (1 + g) [R \bullet P \bullet (1 + L)]$.

Assume g , P, and L are held constant, and solve for retention ratio, R, we have:

$R = [g / (1 + g)] [A / (P ? (1 + L))]$.

Noting that $(1 + L) = [1 + (Debt/Equity)] =$ (Debt + Equity)/ Equity = Total Assets / Equity,

so that $[1 / (1 + L)]$ = Equity / Total Assets, we have

$R = [g / (1 + g)] ?\{A [1/ (1 + L)] / P\}$
$= [g / (1 + g)] ?\{A [$ Equity / Total Assets $]\}/ P$

Retention Ratio = $[g / (1 + g)] \bullet ($ Total Assets / Sales)? [Equity / Total Assets]/ (Net Profit Margin).

[5] Higgins, Robert C., "How Much Growth Can a Firm Afford?, Financial Management, (Fall 1977), pp. 7 - 16. A revised formula for sustainable growth is presented in Higgins, Robert C.,

Analysis for Financial Management, 6th Edition, McGraw-Hill, 2001, p. 119. We use the older formula because the revised version yields consistent results only when the firm is actually growing at the sustainable rate.

[6] Data from U.S. Bureau of Economic Analysis, www.bea.doc.gov/bea/, and the Federal Reserve Bank of St. Louis, http://research.stlouisfed.org/fred2/.

[7] Chan, Louis, Jason Karceski, and Josef Lakonishok, "The Level and Persistence of Growth Rates," Journal of Finance, (April 2003), pp.643 - 684.

[8] Other evidence of the lack of persistence of high performance is provided by Fama and French, who find evidence of mean reversion in firms' return on assets. What this means is that when a firm's return on assets deviates above or below its long run mean, there is a tendency for it to revert back toward its mean. Fama, Eugene, and Kenneth French, "Forecasting Profitability and Earnings," *Journal of Business*, (April 2000), pp. 161- 175.

[9] Companies included in the sample were from the Standard & Poor's Research Insight (Compustat) database, annual data from 1985 to 2004. The sample excluded financial companies (SIC 6000 to 6999). To be included in the base sample, a company had to have at least 5 years of sales data and sales over $1million in year 2000. In addition, companies were eliminated from the sample if average sales growth exceeded 1,000%. Growth was calculated only from a positive base. That is, growth was not calculated if the earnings were negative in that year.

[10] For each company, growth was calculated for each year for which data was available. The average (mean) and standard deviation of the rate of growth over the sample period was calculated for each company. The number of years of growth included in each company's average varied according to the number of years of data available for each company.

[11] For each growth variable, the number of companies in the sample is different because companies were eliminated when data was missing for that particular variable.

Description of Author's Professional Activities:

James Morris is a Professor of Finance at the University of Colorado at Denver, where he teaches courses in business valuation and financial modeling. He is a candidate member of ASA, and holds a Ph.D. in Finance from University of California, Berkeley. In addition to teaching, he provides valuation services to the business community.