Examining IPO Valuation Methods – Market Comparables and Discounted Cash Flow

By

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Executive Summary

Abstract

IPO underpricing and the motives behind it are the subject of much debate. In an effort to minimize the practice of underpricing and to probe the reasons behind it, this study compares the projected IPO offer range as given in the S1 prospectus against actual stock market performance one month after listing. The sample is a group of firms who went public in 2005. The study then closely examines the four specific firms whose offer ranges were either grossly inaccurate, or right on target. Using the financial information as given in the S1 prospectus, a comparable analysis and discounted cash flow analysis was conducted on these four firms, to recreate the pre-IPO valuation process of the investment bank. For the two firms with the highest level of underpricing, the study seeks to find which valuation methods yield a result closest to the stock price one month after listing. The study was able to mimic the IPO valuation process, leaving less value on the table than the underwriters actually left in 2005. More specifically, the study was able to improve the degree of underpricing for the firms most grossly mispriced, when an average of the best performing multiple was taken with the results of the discounted cash flow analysis. For the two most accurately priced firms, the study was not able to match the performance of the underwriters. Concerning multiples, the Price/Earnings multiple and the Enterprise Value/ LTM Revenue multiple proved to be the most accurate forecasters. The valuation *perspective* is one that makes use of information available at the point of the offering date, widely available to market participants, such as equity research reports, public financials and financial news.

This study is a continuation and United States extension of a study conducted by Deloof, Maeseneire and Inghelbrecht of Ghent University, who "investigate the valuation of 33 IPOs on the Brussels Stock Exchange in the 1993-2000 period."[1] They write, "We are not aware of any other papers that use 'real world' estimations to investigate the different valuation approaches."[2] The methodology for the US based study is based on similar methods given by Deloof, Maeseneire and Inghelbrecht. "Pre-IPO value estimations" by lead underwriting investment banks in the United States "are compared to the offer price and the stock price in the first month of listing."[3]

The use of the S1 prospectus, as Deloof, Maeseneire and Inghelbrecht describe, allow one to examine the proficiency of valuation models "as used by investment banks."[4] They note a paradox in examining valuation accuracy, "measured by academics" or measured by investment banks. Estimates of value by investment banks may be deemed less accurate due to ulterior motives, such as an incentive to report a high price. On the contrary, such estimates may be *more* accurate than that of academics, as investment banks have greater access to relevant information. It appears the underwriters of the two most accurately priced firms indeed had access to superior information. The results of this study suggest that some underwriters may intentionally underprice, while others do not appear to intentionally participate in this practice.

Methodology

[1] Deloof, Marc, De Maeseneire, Wouter and Inghelbrecht, Koen (2002) "The Valuation of IPOs by Investment Banks and the Stock Market: Empirical Evidence" EFMA 2002 London Meetings; EFA 2002 Berlin Meetings Discussion Paper.
[2] Ibid, 4.
[3] Ibid, 5.
[4] Ibid, 5.

The *Russell 2000 Index, Initial Public Offering Additions, 2005*[5] list provides the sample of firms. The Russell 2000 Index includes the smallest 2000 securities of the Russell 3000 Index. For the listed firms, the "pre-IPO value estimations" were extracted from the S1 prospectus. The average stock performance in the first month of listing was calculated for each firm. The initial return for each firm was calculated as "[average price in the first month of listing/offer price] -1."[6] The average of the expected price range given in the S1 prospectus constitutes the offer price. The initial return represents the return an investor would receive if the price range given in the S1 were correct, and the investor held the security for one month. A high value indicates significant mispricing or undervaluation on behalf of the investment bank *and* implies value left on the table.

Ignoring actual over and undervaluation in current market values, and contrary to Bhojraj and Lee of Cornell University, we *do* "assume that the current stock price is the appropriate normative benchmark by which to judge a multiple's (or other method's) performance."[7] Extended to this study, a high measure indicates significant mispricing or undervaluation on behalf of the investment bank.

In Table III of their study, Deloof, Maeseneire and Inghelbrecht reveal the specific valuation methods used by the lead Belgian underwriters. These methods are mentioned in each firm's prospectus, "All cases in which the use of a valuation method is mentioned in the prospectus are included in Table III."[8] For example, all 33 prospectuses

[5] Russell, Quarterly IPO Additions <http://www.russell.com/US/Indexes/US/IPOs.asp>
[6] Deloof, Marc, De Maeseneire, Wouter and Inghelbrecht, Koen (2002) "The Valuation of IPOs by Investment Banks and the Stock Market: Empirical Evidence" EFMA 2002 London Meetings; EFA 2002 Berlin Meetings Discussion Paper.
[7] Bhojraj, Sanjeev and Lee, Charles M. C. (2002) "Who Is My Peer? A Valuation-Based Approach to the Selection of Comparable Firms." *Journal of Accounting Research* 40, 407-439.
[8] Deloof, Marc, De Maeseneire, Wouter and Inghelbrecht, Koen (2002) "The Valuation of IPOs by Investment Banks and the Stock Market: Empirical Evidence" EFMA 2002 London Meetings; EFA 2002 Berlin Meetings Discussion Paper.

cite the discounted cash flow method. Twenty-three of thirty-three cite using the dividend discount model, and thirty-one of thirty-three cite multiples. The multiples are then broken down by type.

Composing a similar table to that of Table III in the Belgian study is problematic, as the S1 prospectuses in the US do not explicitly cite a valuation method, as Belgian underwriters appear to. Therefore, in order to mimic the Belgian study and examine specific methods, it is necessary to run a selection of the companies given in the *Russell 2000 IPO Addition* list through various types of valuation models.

Returning to this study, four firms in the sample of forty-one ran through the financial modeling process. The modeling process began with the company whose predicted range least resembled the aftermarket performance. This is the firm with the highest initial return; we may crudely deem the S1 offer range the least accurate for this given firm. Next, the firm with the "most accurate" performance, or lowest degree of mispricing was examined within the models. Finally, the firm with the next "most accurate" and next "least accurate" returns ran through the modeling process. These firms are deemed the "runner ups." This process seeks to loosely re-create the pre-IPO valuation process. The multiples closely examined are listed in the Ghent University study: Price/Earnings, Enterprise Value/EBITDA, Enterprise Value/Revenue and Enterprise Value/EBIT.

Specifically, the comparable company analysis involved compiling financial data from the S1 prospectus. Comparable firm identification involved locating specific competitors named in the S1 prospectus. Calculating diluted shares outstanding for the given firm and for the comparable firm was required, with an identification of the

comparable firm's outstanding options, warrants and potentially dilutive securities. These securities entered the Black Scholes model for each firm, using the comparable firm's level of volatility. Finally, equity research allowed an extension of the analysis beyond the multiples based on the comparable firm. The second part of the study involved running selected income statement data through a discounted cash flow analysis. *Damodaran Online* by Professor Damodaran gave the industry specific discounted rate, and a sensitivity analysis clustered around this value.

Conclusion

The conclusion of the study compares each of the multiples' performance against each other, and against the performance of the discounted cash flow. The broad objective is to mimic and improve the valuation process that occurred in 2005, in retrospect. The specific objective is to see which methods are in line with the given offer range and with the actual performance in the first month of listing. The goal is a minimization of the amount of value left on the table, or to decrease the level of mispricing as compared to the S1 offer range. The conclusion will also look at the correlation between the number of shares offered in each IPO and the level of underpricing.

Full Study

A Notion of Value

> *""Value is in the eye of the beholder." A seller typically ascribes more value to his object for sale than the buyer would ascribe to it. Hence value is a relative notion. However, there is a school of thought that value can be absolute regardless of what the buyer or the seller thinks the object is worth. Thus the "art and science" of valuation has seen a constant debate between what something is worth versus what the market thinks it's worth and versus what a strategic or motivated buyer think it's worth."*[9]

Sample

The Russell 2000 Index, Initial Public Offering Additions, September 30, 2005 provides the sample of companies for the analysis. Forty-eight firms were listed. The S1 prospectuses of each firm were examined for an initial offering price range, along with any mention of pricing methodology used. Of those firms who report a methodology, public comparables are commonly cited. The stock performance in the first month of listing was recorded for each firm in the list. Of the forty-eight in the sample, forty-one prospectuses provide an offer price range, readily accessible financials and easily obtainable historical pricing information. Thus, the sample is reduced to forty-one firms.

[9] Spence, Keith (2002). "An Overview of Valuation Practices and the Development of a Canadian Code for the Valuation of Mineral Properties." Validating the Valuation, Toronto, Canada.

Sample of Firms: Russell 3000 Index, Initial Public Offering Additions
Average S1 Price Range & Industry

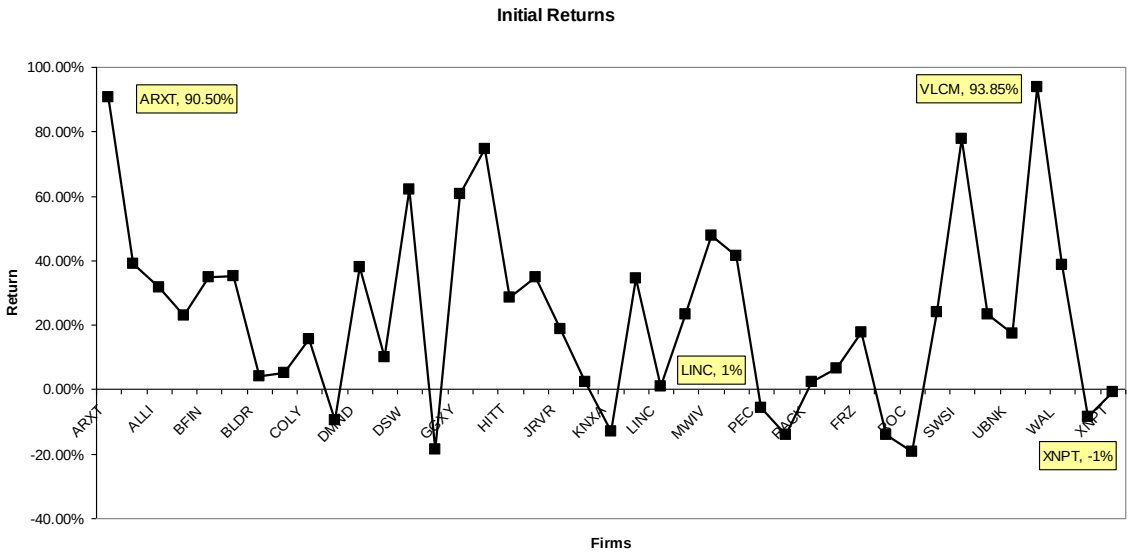
Ticker	Company	Average Price Range	SIC	Specific Industry	General Industry
ARXT	Adams Respiratory Therapy	15	2834	Pharmaceutical Preparations	Manufacturing
AATI	Advanced Analogic Tech	9	3674	Semiconductors & Related Devices	Manufacturing
ALLI	Allion Healthcare	13	5122	Wholesale-Drugs, Proprietaries & Druggists' Sundries	Wholesale trade
ALJ	Alon USA Energy	15	2911	Petroleum Refining	Manufacturing
BFIN	Bank Financial Corp	10	6035	Savings Institution, Federally Chartered	Finance, Insurance & Real Estate
BRNC	Bronco Drilling Co Inc	15	1381	Drilling Oil & Gas Wells	Mining
BLDR	Builders First Source	16	5211	Retail-Lumber & Other Building Materials Dealers	Retail Trade
CF	CF Industries Holdings	16	2870	Agricultural Chemicals	Manufacturing
COLY	Coley Pharmaceutical GRP	15	2834	Pharmaceutical Preparations	Manufacturing
CNSL	Consolidated Comm	15	4813	Telephone Communications (No Radiotelephone)	Transportation & Public Utilities
DMND	Diamond Foods	15	2090	Miscellaneous Food Preparations & Kindred Products	Manufacturing
DRC	Dresser Rand Group Inc	20	3510	Engines & Turbines	Manufacturing
DSW	DSW	16	5661	Retail-Shoe Stores	Retail Trade
EVVV	EV 3 Inc	17	3841	Surgical & Medical Instruments & Apparatus	Manufacturing
GGXY	Golf Galaxy Inc.	12	5940	Retail-Miscellaneous Shopping Goods Stores	Retail Trade
HPY	Heartland Payment Sys	15	7389	Services-Business Services	Services
HITT	Hittite Microwave Corp	15	3674	Semiconductors & Related Devices	Manufacturing
ITC	ITC holdings corp	20	4911	Electric Services	Transportation & Public Utilities
JRVR	James River Group Inc	17	6331	Fire, Marine & Casualty Insurance	Finance, Insurance & Real Estate
KFI	K&F Industries Holdings	17	3728	Aircraft Parts & Auxiliary Equipment	Manufacturing
KNXA	Kenexa Corp	15	7372	Services-Prepackaged Software	Services
LHCG	LHC Group	13	8082	Services-Home Health Care Services	Services
LINC	Lincoln Educational Svs	20	8200	Services-Educational Services	Services
MFB	Maidenform Brands	15	5311	Retail-Department Stores	Retail Trade
MWIV	MWI Veterinary Supply	15	5047	Wholesale-Medical, Dental & Hospital Equipment & Supplies	Wholesale trade
NSR	Neustar Inc	19	4899	Communications Services	Transportation & Public Utilities
PEC	Pike Electric Corp	15	1731	Electrical Work	Construction
PORK	Premium Standard Farms	16	2011	Meat Packing Plants	Manufacturing
RACK	Rackable Systems Inc	12	3571	Electronic Computers	Manufacturing
ROLL	RBC Bearings	15	3562	Ball & Roller Bearings	Manufacturing
FRZ	Reddy Ice Holdings Inc	17	2090	Miscellaneous Food Preparations & Kindred Products	Manufacturing
RFX	Refco Inc	20	6200	Security & Commodity Brokers, Dealers, Exchanges & Services	Finance, Insurance & Real Estate
RUTX	Republic Companies Group	16	6331	Fire, Marine & Casualty Insurance	Finance, Insurance & Real Estate
ROC	Rockwood Holdings Inc	24.5	2800	Chemicals & Allied Products	Manufacturing
RUTH	Ruth's Chris Steak House	16	5812	Retail-Eating Places	Retail Trade
SWSI	Superior Well Services	12	1389	Oil & Gas Field Services	Mining
UNCA	Unica Corp	10	7372	Services-Prepackaged Software	Services
UBNK	United Financial Bancorp	10	6035	Savings Institution	Finance, Insurance & Real Estate
VLCM	Volcom Inc	16	2300	Apparel & Other Finishd Prods of Fabrics	Manufacturing
WAL	Western Alliance Bancorp	20	6022	State Commercial Banks	Finance, Insurance & Real Estate
WRSP	Worldspace Inc	20	4832	Radio Broadcasting Stations	Transportation & Public Utilities
XNPT	Xenoport Inc.	10.5	2834	Pharmaceutical Preparations	Manufacturing

Sample	
Underpriced (Postive Returns)	78%
Overpriced (Negative Returns)	22%

The sample firms are listed above, along with their average offer price, their SIC code and corresponding industry classification. The initial returns of each of the forty-one firms were examined. The average of the offer price range, as given in the S1 prospectus, represents our initial value. The average performance one month after listing is compared to this initial value. 78% of the sample firms exhibited positive returns, and 22% exhibited negative returns compared to their performance one month after listing. The

average return for all forty-one firms is 23%. The maximum return observed is 93.85%, and the minimum return is -.762%.

Losers & Winners



Summary of Winners & Losers			
Firm	**S1 Price**	**Price 1 Month**	**Level Mispricing**
VLCM	$16.00	$31.02	93.85%
ARXT	$15.00	$28.58	90.50%
XNPT	$10.50	$10.42	-0.762%
LINC	$20.00	$20.15	0.764%

The winners and losers of this exercise are exhibited in the charts above. The 93.85%, as shown by Volcom Inc. (VLCM), indicates significant mispricing by the investment bank as given in the S1 prospectus. Volcom Inc. designs clothing for skateboarding and related sports. The offering was underwritten by Wachovia Securities, D.A Davidson & Co. and Piper Jaffray. In this specific case, the average offer range was $16.00, and the average price in the first month of listing was $31.02. Therefore, the range given in the S1 prospectus was a significant underpricing of the apparel firm's stock.

The -.762% shown by Xenoport Inc. (XNPT) indicates accurate pricing as given in the S1 prospectus. Here, no range was provided, rather a straight price of $10.50 was given. The average price in the first month of listing was $10.42 for this pharmaceutical preparations firm. The underwriters for Xenoport Inc. were Morgan Stanley, Deutsche Bank Securities, Pacific Growth Equities LLC and Lazard Capital Markets.

Runners Up

It is worthwhile to mention the secondary losers and winners, as they are minimal percentage points behind the winner and loser. Adams Respiratory Therapeutics Inc. (ARXT), a pharmaceutical preparations firm, shows 90.5% initial returns. For this firm, $15.00 was the average range in the S1, and the average price in the first month of listing was $28.58. It is interesting to note that of the three pharmaceutical preparations firm in the sample, with identical SIC codes, Xenoport Inc. shows the most accurate S1 pricing, while Adams Respiratory Therapeutics Inc. trails closely behind the most inaccurately priced. ARXT's underwriters were Merrill Lynch & Co., Morgan Stanley, Deutsche Bank, and RBC Capital Markets.

The winner noted above, Xenoport Inc., is closely trailed by Lincoln Educational Services Corporation (LINC) with an initial return of .764%. This educational services firm reported an S1 average of $20.00, and the average price in the first month of listing was $20.15. LINC's underwriters were Merrill Lynch & Co., Banc of America Securities LLC, Lehman Brothers, Harris Nesbitt, Jefferies & Company, Inc. and Robert W. Baird & Co. The chart below summarizes the underwriters for each firm. The first two firms comprise the "winners," and the last two firms comprise the "losers." It is interesting to

note that the bulge bracket banks are found on both sides of the underpricing phenomenon.

	Underwriting Firm
VLCM	Wachovia Securities, D.A Davidson & Co., Piper Jaffray
ARXT	Merrill Lynch & Co., Morgan Stanley, Deutsche Bank, RBC Capital Markets
XNPT	Morgan Stanley, Deutsche Bank Securities, Pacific Growth Equities LLC, Lazard Capital Markets
LINC	Merrill Lynch & Co., Banc of America Securities LLC, Lehman Brothers, Harriss Nesbitt, Jefferies & Company, Inc. and Robert W. Baird & Co.

The Underpricing Phenomenon

While this study concerns valuation methods more so than the underpricing phenomenon, the topic nonetheless is relevant and warrants a discussion. Of the firms in the study, 78% were underpriced thirty days after listing compared to the initial offer range. Aggarwal, Krigman and Womack of the Tuck School of Business at Dartmouth view underpricing as a strategic and intentional activity by the firm's managers. They note, "the historical norm for first day underpricing in developed countries has been about 15%," rising to 50% "in the late 1990s, especially for internet firms."[10]

Concerning managerial incentives to underprice an offering, they find a positive correlation between first day underpricing and higher ownership by managers. They point to an "information momentum" that leads managers to underprice, even though substantial profits are lost. They argue that the manager is attempting to maximize his personal wealth, after the lock up period expires. Aggarwal, Krigman and Womack explain:

> *Our idea of information momentum is that by underpricing the issue, the large run-up in the stock price on the first day attracts interest from research analysts and the media. Analysts provide more recommendations and research reports for*

[10] Aggarwal, Rajesh, Laurie Krigman, and Kent Womack (2002) "Strategic IPO Underpricing, Information Momentum, and Lockup Expiration Selling," *Journal of Financial Economics* 66, 105-137.

the hottest IPOs. This enhanced coverage brings the stock to the attention of more investors, shifting out the demand curve for the stock. The owner-manager then exploits this additional demand when he sells shares at the expiration of the lock up period.[11]

The writers note the loss the firm bears as a result of underpricing, in the form of forgone profits from the IPO. They cite Ritter, (1991) who further notes that this specific loss in profit leads to the long-run underperformance typical of IPOs. The investment bank underwriting the issue, like the manager, has incentives to underprice. Aggarwal, Krigman and Womack note the need to "minimize their risk of holding unallocated shares"[12] along with the compensation of clients who supply the bank with substantial business. Carter and Manaster cite Rock (1986) who "suggests that IPO returns are required by uninformed investors as compensation for the risk of trading against superior information."[13] Habib and Ljungqvist note that "Some IPOs are more underpriced than others because their owners have less reason to care about underpricing."[14] This idea examines the extent to which "issuers care about underpricing." They note, "issuers care about underpricing primarily to the extent that they [personally] participate in the offering. The more shares they sell, the greater their incentive to decrease underpricing."[15] This idea will be applied to this study to provide an additional perspective in the conclusion.

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[11] Aggarwal, Rajesh, Laurie Krigman, and Kent Womack (2002) "Strategic IPO Underpricing, Information Momentum, and Lockup Expiration Selling," *Journal of Financial Economics* 66, 105-137.
[12] Ibid, 66.
[13] Carter, Richard B., and Manaster, Steven (1990) "Initial Public Offerings and Underwriter Reputation," *Journal of Finance* 45, 1045-1068.
14 Habib, M., and A. Ljungqvist, (2001) "Underpricing and Entrepreneurial Wealth Losses: Theory and Evidence," *Review of Financial Studies* 438, 433-458.
[15] Ibid, 436.

Concerning the general issue of underpricing, it appears that there is a player in each party who is incentivized to underprice. The investment bank views underpricing as a form of compensation. The insider, or manager, has personal wealth incentives, and the outsider, or hired party (investment bank) is incentivized as well. Although this study will probe the valuation processes of several firms who went public in 2005, these qualitative reasons bear an influence as well.

Comparables Methodology

> Bhojraj and Lee explain the simple methodology adopted in comparable analysis: *In relative valuation, an analyst applies the market multiple from a "comparable firm" to a target firm's corresponding accounting number: Our estimated price = (Their market multiple) X (Our accounting number).*[16]

Before delving into the comparable analysis for the four selected firms, an academic perspective on choosing a comparable firm adds several interesting points into the analysis. "Who Is My Peer? A Valuation Based Approach to the Selection of Comparable Firms" by Bhojraj and Lee of Cornell University's School of Management examines "the efficacy of the selected comparable firms in predicting future enterprise-value-to-sales and price-to-book ratios."[17] They begin by alluding to the obvious benefit of using multiples in equity valuation, as opposed to other methods such as a discounted cash flow analysis. They note that although multiples "forfeit some of the benefits of a more complete, but more complex, pro forma analysis, [multiples] obtain a convenient

[16] Bhojraj, Sanjeev and Lee, Charles M. C. (2002) "Who Is My Peer? A Valuation-Based Approach to the Selection of Comparable Firms." *Journal of Accounting Research* 40, 407-439. 412.
[17] Ibid, 40.

valuation heuristic that produces satisfactory results without incurring extensive time and effort costs."[18]

Examining the life cycle of a firm is also necessary to predict when comparables will best perform. A study by Keith Spence, "An Overview of Valuation Practices and the Development of a Canadian Code for the Valuation of Mineral Properties" analyzes this concept. Spence notes that market comparables are heavily used when a firm is in the "Very early stage" or "Early stage." Market comparables are employed throughout the entire life cycle of a firm. However, from "Late stage exploration" through a "Late stage producing mine," market comparables are used as a secondary measure, next to the discounted cash flow method.[19] This point is fairly obvious, as discounting a stream of cash flows for an early stage company is quite unfeasible, rendering market comparables as the only available method.

Concerning the stock options of each firm undergoing the IPO process, the Black-Scholes Option Pricing Model was used to account for the value of outstanding options. The inputs to the model are the comparable firm's level of volatility, the risk free rate at the time of the offering, the time to maturity of each option class, and the S1 price of the firm going public. The model allows for the inclusion of diluted securities into the valuation of the firm going public. The key input of this model is the *comparables'* level of volatility. This process solves the problem of accounting for dilutive securities, for the firm going public does not have a stock price with which to compare the option's exercise price. The volatility for each comparable firm is based on data from the Center

[18] Bhojraj, Sanjeev and Lee, Charles M. C. (2002) "Who Is My Peer? A Valuation-Based Approach to the Selection of Comparable Firms." *Journal of Accounting Research* 40 (1), 407-439. 412.
[19] Spence, Keith (2002). "An Overview of Valuation Practices and the Development of a Canadian Code for the Valuation of Mineral Properties." *Validating the Valuation*, Toronto, Canada.

for Research in Security Prices (CRSP) for the period October 1, 2004 to September 30, 2005. The value of the outstanding options, representing a liability, will then be added to the enterprise value of each firm.

A comparable company analysis will now be conducted on Volcom Inc. (VLCM), the firm whose offer range was least accurate within the sample. On June 29th of 2005, *Reuters News* noted that Volcom Inc's IPO "priced above expectations,"[20] with an offer price of $19.00 per share, above the S1 range of $15.00 to $17.00 per share. To ensure consistency, we will use the S1 range in this study, as it is provided for most firms in the sample. However, it is worthy to mention that the price of $19.00, which eventually became Volcom Inc.'s IPO offer, would modify our measure of the investment bank's accuracy. Using the average S1 range of $16.00, Volcom Inc.'s initial return or level of mispricing is at a 93.8% level, while the true offer price of $19.00 would reduce this value to 63.2%.

Modeling the Loser

In their S1, Volcom Inc. names Billabong Ltd. (BBG.AU) and Quiksilver Inc. (ZQK) as competitors. Public information is available for Quiksilver Inc., which will be used as the primary comparable firm. Additionally, analyst reports on Quiksilver Inc. are used in the comparable valuation, specifically a CIBC World Markets report (December 17, 2004) and a JP Morgan Report (December 21, 2004) that provides expected EPS data.

Our choice of Quiksilver Inc. as a comparable for Volcom Inc.'s valuation is relevant to the discussion. No time consuming analysis was used to determine Volcom's comparable firm, rather Quiksilver Inc. was chosen because it was explicitly listed as a

[20] "Volcom Prices at $19/share, above expectations." *Reuters News*. 29 June 2005

competitor in Volcom Inc.'s S1. Due to the time constraints of the study and the quantity of firms to be examined, the most explicit comparable is used. The two firms operate closely in the same overall industry, an important criteria for Bhojraj and Lee. They note:

> *Alford [1992] examines the relative valuation accuracy of EPS multiples when comparable firms are selected on the basis of industry, size, leverage, and earnings growth. He finds that valuation errors decline when the industry definition used to select comparable firms is narrowed to two or three-digit SIC codes.*[21]

Our comparable choice fills Alford's two-digit criteria, with Volcom Inc.'s SIC code of 2300 and Quiksilver's code of 2320.

In September 2004, Quiksilver's EBITDA reached a nine-year high and the firm's free cash flow increased 391%, as reported by CashFlowNews.com. Volcom Inc. does not have any outstanding options, so the Black Scholes model is not used.

Volcom Inc.'s average price within the first month of listing was $31.02, and the average offer range in the S1 was $16.00. A simple comparable analysis is performed on both Volcom Inc. and Quiksilver Inc., accounting for Quiksilver Inc.'s outstanding options.

General Multiples	ZQK	VLCM Metric	Value	Implied Metric	Value	Price
EV/LTM Revenue	1.30x	Revenue	123.635	EV	160.772	$38.40
EV/LTM EBITDA	12.90x	EBITDA	27.6	EV	356.1117	$85.05
EV/LTM EBIT	16.32x	EBIT	27.209	EV	443.986	$106.04
P/E	18.22x	EPS (LTM)	1.42	PRICE	25.87776	$25.88

[21] Bhojraj, Sanjeev and Lee, Charles M. C. (2002) "Who Is My Peer? A Valuation-Based Approach to the Selection of Comparable Firms." *Journal of Accounting Research* 40 (1), 407-439.

Revenue, EBITDA, EBIT and EPS are adjusted to represent a LTM value. Based on the chart above, in this context, Enterprise Value/LTM Revenue yields a high, but semi-logical price of $38.40 for a share of Volcom Inc. We can say that this price is at a 24% level of mispricing using the average price one month after listing, with $31.02, as the base value. While an IPO at this price would have been irrational and likely undersubscribed, it is interesting to note which multiples are able to forecast value one month after listing. Enterprise Value/LTM EBITDA yields a high price that deviates from reality, as does Enterprise Value/EBIT. The Price/Earnings multiple is the most accurate of the multiples, yielding a price of $25.88, which is at a 17% level of mispricing. This is a significant improvement concerning the level of underpricing, compared to the 93.05% actually accomplished by the underwriters.

In further examining the P/E ratio, a simple comparison to Quiksilver Inc.'s 2004 P/E ratio, as given by analyst research reports, would have put Volcom Inc. far closer to its actual market performance. In 2004, Volcom Inc.'s LTM diluted net income per share was $1.42.[22] A CIBC equity research report gives our comparable firm, Quiksilver Inc., a P/E ratio of 21.7x in 2004, and JP Morgan equity research report assigns Quiksilver Inc. a P/E ratio of 20.8x in the same year. An average of these two analyst report values yields a P/E ratio of 21.25x for Quiksilver Inc. Applying this multiple to Volcom Inc.'s EPS of $1.42, we get a price of $30.18 for share of Volcom Inc. This represents a 3% level of mispricing.

2004 P/E	ZQK Multiple	VLCM Metric	VLCM Value	Implied Metric	Value
CIBC	21.70x				
JPM	20.80x				
Average	21.25x	EPS (LTM)	1.42	PRICE	$30.18

[22] Volcom Inc., "General form for registration of securities under the Securities Act of 1933." *U.S Securities and Exchange Commission*. 16 June 2005 <http://sec.gov>

Such a simple exercise essentially yields the average offer price one month after listing. Again, it must be mentioned that an IPO at this level would likely be undersubscribed; the price deemed too high. The analysis merely attempts to guess which multiples the underwriters actually used. It is perhaps logical to question why the underwriters used such a low offer range, considering these exact analyst reports were available as the pre-IPO valuation exercises were being conducted.

The *2005* projected P/E ratios, given in the same analyst reports, yield a price of $25.49, at an 18% level of mispricing. It appears a simple P/E comparison with Quiksilver Inc.'s 2004 P/E ratios would have given an accurate measure of Volcom Inc.'s share price at a 3% level of mispricing. Using the 2005 P/E ratios would have given a less accurate, but still logical price at an 18% level of mispricing.

2005 P/E	ZQK Multiple	VLCM Metric	VLCM Value	Implied Metric	Value
CIBC	18.10x				
JPM	17.80x				
Average	17.95x	EPS (LTM)	1.42	PRICE	$25.49

To move from Quiksilver Inc.'s P/E to a more general value, Professor Damodaran gives a P/E value of 31.27 for the "Apparel" industry. Using this higher multiple in place of Quiksilver's more conservative P/E value yields $44.40 per share for Volcom, at a 43% level of mispricing. It appears that our analysis becomes further away from the average price one month after listing as we move from 2004 P/E multiples, to 2005 P/E multiples, to industry specific P/E multiples.

Damadoran Online	ZQK Multiple	VLCM Metric	VLCM Value	Implied Metric	Value
Apparel P/E	31.27	EPS (LTM)	1.42	Price	$44.40

Of the general multiples, the P/E multiple appears to perform most accurately in this context, with a time horizon extending one month after the IPO. Specifically, the previous year P/E multiple of the given comparable firm, as given by equity research, yields a more accurate representation of what the stock will do within one month of listing, as opposed to the expected P/E within the following year. It should also be noted that the P/E multiples as given by research reports yielded a more accurate result than the calculated P/E multiple of the comparable firm. In this context, within the retail industry, it appears that Enterprise Value/ LTM Revenue multiple perform behind the P/E multiple in predicting performance one month after listing. The chart below summarizes the methods and their performance for Volcom Inc.

Level of Mispricing	
EV/LTM Revenue	24%
EV/LTM EBITDA	174%
EV/LTM EBIT	242%
P/E	-17%
2004 Research P/E	-3%

Volcom Inc.'s comparable analysis does not fully agree with Bhojraj and Lee's results. They write that Enterprise Value/Sales and Price/Book are the "two most reliably positive multiples,"[23] provided the appropriate set of comparables is chosen. However, the P/E ratio in this context, specifically the current year's value, is the most accurate. Bhojraj and Lee also note that that "the best firms for the EVS ratio are not necessarily the best firms for the P/E ratio."[24] This is evident in our results for Volcom Inc., as our P/E ratios performed dramatically differently from our Enterprise Value multiples.

[23] Bhojraj, Sanjeev and Lee, Charles M. C. (2002) "Who Is My Peer? A Valuation-Based Approach to the Selection of Comparable Firms." *Journal of Accounting Research* 40 (1), 407-439. 413

[24] Bhojraj, Sanjeev and Lee, Charles M. C. (2002) "Who Is My Peer? A Valuation-Based Approach to the Selection of Comparable Firms." *Journal of Accounting Research* 40 (1), 407-439. 410

Modeling the Winner

The next comparable analysis will be conducted on Xenoport Inc., a biopharmaceutical firm. This firm is notable in this study as it had the lowest level of mispricing, at -.762%, based on the measures employed. Xenoport Inc. offered 5.0 million shares of its common stock. Volcom Inc. similarly offered just over 4.0 million shares. It will be interesting to reproduce the Volcom Inc. analysis that was conducted in the retail realm, to a biopharmaceutical firm.

Xenoport Inc. names their competitors in their S1 prospectus as GlaxoSmithKline plc, Eli Lilly and Company, and Pfizer. Xenoport Inc. notes, "Many of our competitors have significantly greater financial resources and expertise in research and development, manufacturing, preclinical testing…than we do."[25] This is relevant for our comparable analysis, as Xenoport Inc.'s research & development costs are about three times the value of their revenue. This causes their EBITDA value to be largely negative.

The chart below summarizes the value of Xenoport Inc.'s stock options that is added to enterprise value. Each class of shares ran through a simple Black-Scholes Option Pricing Model. The value of XNPT's outstanding options is $13.7 million. The volatility component is that of Eli Lilly (LLY) at 1.39%.

Class	Call Price	Shares	XNPT Options Value
1	$14.44	833	$12,032
2	$13.88	116,586	$1,617,722
3	$13.71	201,247	$2,759,614
4	$13.14	692,561	$9,097,637
5	$12.63	15,598	$196,947
6	$11.05	360,191	$3,981,675
7	$10.10	16,000	$161,530
		Value Options	$13,683,954

[25] Xenoport Inc., "General form for registration of securities under the Securities Act of 1933." *U.S Securities and Exchange Commission*. 27 May 2005 <http://sec.gov>

As mentioned previously by Spence, market comparables are most widely relied upon when a mining firm is at an early stage of development. It is likely that this will prove true for Xenoport Inc., as cash flows are difficult to project. In their S1 prospectus Xenoport Inc. notes, "We are a development stage company with a limited operating history and have incurred significant losses since our inception… We expect our research and development expenses to continue to increase as we continue to expand our development programs…[26]

Using market comparables to value Xenoport Inc. proved to be difficult as Xenoport Inc.'s LTM EBITDA, EBIT and EPS values are largely negative. Eli Lilly's LTM revenue is 1330 times that of Xenoport. It is important to note that both Xenoport and Eli Lilly have significant research and development costs that are subtracted from gross profit in the EBITDA calculation. While Eli Lilly's 2004 R&D costs represent 19% of 2004 Revenue, Xenoport Inc.'s 2004 R&D represents 332% of their 2004 Revenue. Despite the large difference in revenue, the magnitude of Xenoport Inc.'s R&D spending, and Xenoport Inc.'s negative earnings, the EV/LTM Revenue metric provides a logical valuation.

General Multiples	LLY	XNPT Metric	Value	Implied Metric	Value	Price
EV/LTM Revenue	4.28x	Revenue	10.488	EV	44.92355	$8.98

Eli Lilly's Enterprise Value/LTM Revenue, at 4.28x, provides quite an accurate metric with which to derive a price for Xenoport Inc. The output of the Enterprise Value/LTM Revenue comparable is a price of $8.98 at a 14% level of mispricing, using

[26] Xenoport Inc., "General form for registration of securities under the Securities Act of 1933." *U.S Securities and Exchange Commission*. 27 May 2005 <http://sec.gov>

$10.42, the stock price one month after listing as our base value. This valuation, however, in no way rivals the level of mispricing achieved by the investment bank. The EV/LTM EBITDA and P/E multiples prove to be useless in this analysis. Equity research reports also typically provide the former and latter multiples, as opposed to EV/Revenue multiples, therefore the comparable analysis is significantly reduced. The EV/LTM Revenue multiple likely performed well as the revenue figure does not account for the disparate levels of R&D spending between the two firms. Essentially the EV/LTM Revenue valuation ignores R&D spending in its entirety.

To compare Xenoport Inc.'s results with Volcom Inc., the EV/LTM Revenue multiple also performed quite reasonably for Volcom Inc., with a 24% level of mispricing. In the context of this study, the EV/Revenue multiple performs quite accurately compared with the more widely used and quoted EV/EBITDA multiple.

Modeling the Winner – Runner Up

Adams Respiratory Therapeutics Inc. (ARXT), the runner up for the most inaccurate pricing, shows 90.5% initial returns. In creating a comparable model for this firm, several key points should be noted. This pharmaceutical preparations firm "do[es] not have any outstanding debt."[27] They also have several classes of preferred stock and warrants. These potentially dilutive securities will enter the model through the Black Scholes Option Pricing Model. By conducting a simple Black Scholes option pricing model on each class of shares, ARXT's value of outstanding options totaled $43.3 million and is detailed below. The level of volatility was that of Schering Plough (SGP) at 1.4%.

[27] Adams Respiratory Therapeutics, Inc., "General form for registration of securities under the Securities Act of 1933." *U.S Securities and Exchange Commission*. 19 June 2005 <http://sec.gov>

Class	Call Price	Shares	ARXT Options Value
1	$14.69	2,038,766	$29,955,284
2	$14.03	452,614	$6,350,141
3	$13.50	91,261	$1,232,295
4	$12.98	15,795	$205,036
5	$11.72	476,857	$5,587,287
6	$11.59	24,385	$282,581
7	$11.69	323,096	$3,778,267
8	$10.88	12,116	$131,829
9	$7.54	133,381	$1,005,973
		Value Options	$43,330,043

Concerning their competitors, Adams Respiratory Therapeutics Inc. believes their primary products, " Mucinex SE and Mucinex DM… compete primarily with products with strong brand awareness marketed by large pharmaceutical companies,"[28] such as Pfizer Inc., The Proctor & Gamble Company, McNeil PPC Inc., Wyeth, Novartis AG, Schering Plough-Corp. and Bayer AG.

The comparable firm selected for Adams Respiratory Therapeutics Inc. is Schering Plough. Like in the situation with Xenoport Inc., Adams Respiratory Therapeutics Inc.'s comparable firm has negative EBITDA, EBIT and EPS. Thus most of the Enterprise Value multiples are eliminated, as well as the P/E ratio. The only multiple that is unaffected is the Enterprise Value/ LTM Revenue multiple. Using Schering Plough's EV/Revenue of .81x yields a price of $20.31 for Adams Respiratory Therapeutics Inc., at a -29% level of mispricing. This is certainly an improvement over the 90.5% returns seen after one month of listing. Therefore, it is questionable why the underwriters for Adams Respiratory Therapeutics Inc. chose $15 as the average range in the S1.

General Multiples	SGP	ARXT Metric	Value	Implied Metric	Value	Price
EV/LTM Revenue	0.81x	Revenue	133.381	EV	108.30	$20.31

[28] Adams Respiratory Therapeutics, Inc., "General form for registration of securities under the Securities Act of 1933." *U.S Securities and Exchange Commission*. 19 June 2005 <http://sec.gov>

Modeling the Loser – Runner Up

Lincoln Educational Services Corporation, with an initial return of .764%, is the runner up for the most accurate S1 pricing. This educational services firm does not directly name any competitors in their S1, and therefore a comparable firm must be chosen based on other criteria. Based on Lincoln Educational's SIC code of 8200 (Educational Services), Strayer Education (STRA) was chosen as both Strayer Education and Lincoln Educational Services Corp. target adults seeking higher education. Lincoln Educational Services Corp. writes in their S1, "We are a leading and diversified for-profit provider of career-oriented post-secondary education" and "offer recent high school graduates and working adults degree and diploma programs…"[29] Similarly, Strayer Education is a "post-secondary education services corporation," targeting "working adults in today's economy."[30] Strayer Education does not have any debt in its capital structure.

Concerning Lincoln Educational Services Corp.'s outstanding options, the chart below summarizes the $32.0 million value that is added to Lincoln Educational Services Corp.'s enterprise value. The volatility of Strayer Education (2.31%) is a key component of the model.

Class	Call Price	Shares	LINC Options Value
1	$18.72	161,500	$3,023,725
2	$17.71	1,364,120	$24,164,750
3	$15.77	93,000	$1,466,937
4	$10.46	275,375	$2,879,480
5	$4.02	128,500	$516,849
		Value Options	$32,051,741

[29] Lincoln Educational Services Corp., "General form for registration of securities under the Securities Act of 1933." *U.S Securities and Exchange Commission*. 21 June 2005 <http://sec.gov>
[30] Strayer Education Inc., "General form for registration of securities under the Securities Act of 1933." *U.S Securities and Exchange Commission*. 28 July 2005 <http://sec.gov>

The comparable analysis on Lincoln Educational Services Corp. again reveals the accuracy of the P/E ratio. The Enterprise Value ratios give unreasonable results, but the P/E ratio, in relation to Strayer Education's P/E ratio, yields a price of $17.09, which is at a 15% level of mispricing. Continuing with a P/E ratio analysis, using Professor Damodaran's industry P/E for "Educational Services" of 43.58x yields a price of $22.06, at a 12% level of mispricing.

Damadoran Online	Multiple	LINC Metric	LINC Value	Implied Metric	Value
Educational Services P/E	43.58x	EPS (LTM)	0.52	Price	$22.66

Analyst reports also fared quite well, though not as well as the two measures mentioned above. Using an average of the 2005 Expected P/E ratios from CIBC, Piper Jaffray and Jeffries and Company yields a price of $14.04, at a 30% level of mispricing. The 2004 Actual P/E values for Strayer Education, given in the same equity research reports yield $16.07, at a 20% level of mispricing.

2005 Expected P/E	STRA Multiple	LINC Metric	LINC Value	Implied Metric	Value
CIBC	27.40x				
Piper Jaffray	27.20x				
Jeffries & Company, Inc.	26.40x				
Average	27.00x	EPS (LTM)	0.52	PRICE	$14.04

2004 Actual P/E	STRA Multiple	LINC Metric	LINC Value	Implied Metric	Value
CIBC	30.90x				
JPM	30.90x				
Jeffries & Company, Inc.	30.90x				
Average	30.90x	EPS (LTM)	0.52	PRICE	$16.07

It appears that Professor Damodaran's P/E value gave the most accurate results, followed by a direct comparison with Lincoln's comparable firm. The 2004 Actual P/E ratio and the 2005 Expected P/E ratio follow behind. The output for Lincoln's comparable analysis is displayed below, with the P/E based on Professor Damodaran's industry P/E taking the lead.

Level of Mispricing	
P/E	-15%
2004 Research P/E	-30%
2005 Research P/E	-20%
Damodaran P/E	12%

Comparables Results Summarized

The chart below illustrates the winning multiple for each firm that minimized the level of mispricing.

Firm	Winning Multiple	Level of Mispricing
VLCM	2004 Analyst P/E	3%
XNPT	EV/LTM Revenue	24%
ARXT	EV/ LTM Revenue	-29%
LINC	Damodaran P/E	12%

It is interesting that the simple models in the study produced the closest results for Volcom Inc. to its price on month after listing, considering it was the highest underpriced firm in the study. Though our sample size for the modeling portion of the study is small, we may perhaps generalize that P/E multiples provide a good indication of a firm's stock one month after listing, followed by the EV/LTM Revenue multiple, which is additionally useful when a firm or its comparable has negative earnings. The comparable firm P/E is the runner-up method as represented in the chart below.

Reasonable Multiples			
Firm	**Winning Multiple**	**Runner Up Multiple**	**Level of Mispricing**
VLCM	2004 Analyst P/E		3%
		Comparable P/E	17%
XNPT	EV/LTM Revenue		24%
ARXT	EV/ LTM Revenue		-29%
LINC	Damodaran P/E		12%
		Comparable P/E	15%
		Average Level Mispricing:	7%

Looking at the "reasonable multiples" for each firm that emerged from the comparable analysis, the chart above illustrates that on average, the level of mispricing in predicting performance one month after a firm's IPO can be minimized by using a simple

comparable analysis. Within the context of this study, the EV/ LTM Revenue and several versions of the P/E multiple emerged as the most accurate. It is not the firm's, nor the investment bank's intention to price the IPO near the one-month-after-listing value. However, attempting to price the IPO near this range will minimize the value left on the table, as Ritter explains, "reduces long-run value per share."[31] The comparable valuation process essentially provides a proposal for a future full study that would ideally model every firm in the sample.

Discounted Cash Flow Methodology

As mentioned earlier by Spence, the discounted cash flow analysis is the primary method for the valuation of mineral properties in the middle of a firm's life cycle, from "Late stage exploration" through a "Late stage producing mine." Although Spence's study is limited to the mining industry, we may extend it to other industries as well. In Spence's study, the fact that market comparables became secondary to the discounted cash flow measure as soon as cash flows where available to be discounted suggest that the DCF method is preferable.

A discounted cash flow analysis is conducted using Volcom Inc.'s S1 financials. Historical and LTM Revenue is the first input in the model. Using the LTM Revenue in 2005, 2006 revenue through 2009 revenue is projected using a conservative growth rate of the previous year's revenue growth, with the addition of five percent. Projected EBITDA is calculated using the average of the historical EBITDA margins each year.

Volcom Inc.'s income tax circumstances deserve a mention. Prior to January 2002, Volcom Inc. elected treatment as an S Corporation, and therefore had not been

[31] Aggarwal, Rajesh, Laurie Krigman, and Kent Womack (2002) "Strategic IPO Underpricing, Information Momentum, and Lockup Expiration Selling," *Journal of Financial Economics* 66, 105-137.

subject to Federal or state income taxes, other than the California franchise tax of 1.5% on corporate income.[32] The S1 notes that "Prior to the completion of this offering, we will terminate our S corporation status and we will become a C corporation for Federal and state income tax purposes."[33] Volcom Inc. provides "Pro forma net income" data that reflects the income tax provision had the firm not been exempt. Thus 41.7% is the tax rate used for all future years in the discounted cash flow model.

Concerning the discount rate, for simplicity and for the sake of time, a sensitivity analysis is adopted that clusters around an appropriate starting point. Further research on this topic may warrant a detailed weighted average cost of capital calculation for each company in question.

It is interesting to note that even a discounted cash flow analysis makes use of multiples, as Bhojraj and Lee point out. "Even advocates of projected discounted cash flow (DCF) valuation methods frequently resort to using market multiples when estimating terminal values."[34] The DCF model indeed uses a multiple of Volcom's EBITDA to eventually arrive at the enterprise value.

Enterprise Value					
	Terminal EBITDA Multiple				
	3.0x	4.0x	5.0x	6.0x	7.0x
4.2%	$176.9	$208.1	$239.3	$270.5	$301.7
5.2%	$170.8	$200.5	$230.2	$259.9	$289.5
6.2%	$165.0	$193.3	$221.5	$249.8	$278.0
7.2%	$159.6	$186.4	$213.3	$240.2	$267.1
8.2%	$154.4	$180.0	$205.6	$231.2	$256.8
9.2%	$149.4	$173.8	$198.2	$222.6	$247.0
10.2%	$144.7	$168.0	$191.2	$214.5	$237.8

[32] Volcom Inc., "General form for registration of securities under the Securities Act of 1933." *U.S Securities and Exchange Commission*. 16 June 2005 <http://sec.gov>
[33] Ibid.
[34] Bhojraj, Sanjeev and Lee, Charles M. C. (2002) "Who Is My Peer? A Valuation-Based Approach to the Selection of Comparable Firms." *Journal of Accounting Research* 40 (1), 407-439. 412

An examination of the Enterprise Value output of the model, along with the implied offer price, is made clear with a two variable sensitivity analysis.

The two-variable data table above allows one to examine the effect of the discount rate (vertical) against the terminal value multiple of EBITDA (horizontal). For example, at 5.0x, the terminal value figure is multiplied by 5, which is then discounted and added to the present value of the cash flow to yield the enterprise value. For the sensitivity analysis, we examine the two values around 5.0x in each direction, in increments of 1.0x.

The base discount rate is 7.23%, provided by Professor Damodaran's website as an appropriate discount rate for the Apparel industry. We examine the three values in each direction around our base, in increments of 1.0%.

The Enterprise Value range as given by the chart above spans $144.7 through $301.7. Returning for a moment to the comparable analysis, it is interesting to note that the EV multiples in the "General Multiples' exhibit spans a range of $160.77 through $443.99. The discounted cash flow analysis provides a similar but more conservative range.

Examining the price range output from the discounted cash flow analysis yields a price of $34.6 through $72.1. Though these values would be inappropriately high and optimistic for an IPO, the bottom of the range is not dramatically far from Volcom's stock performance one month after listing. Such a valuation for the IPO would not provide the expected first day "pop," though examining the lower portion of the range might have prevented leaving so much value on the table.

Implied Price					
	Terminal EBITDA Multiple				
	3.0x	4.0x	5.0x	6.0x	7.0x
4.2%	$42.2	$49.7	$57.2	$64.6	$72.1
5.2%	$40.8	$47.9	$55.0	$62.1	$69.1
6.2%	$39.4	$46.2	$52.9	$59.7	$66.4
7.2%	$38.1	$44.5	$51.0	$57.4	$63.8
8.2%	$36.9	$43.0	$49.1	$55.2	$61.3
9.2%	$35.7	$41.5	$47.3	$53.2	$59.0
10.2%	$34.6	$40.1	$45.7	$51.2	$56.8

The bottom value, $34.6, as given by the DCF, represents a 12% level of mispricing. While this does not beat the 2004 Analyst P/E at a 3% level of mispricing, it is the next most accurate measure. It is an improvement over Volcom Inc.'s comparable P/E multiple at a 17% level of mispricing. Clearly, the valuation exercises conducted in this study, in retrospect, were able to improve the actual level of mispricing accomplished in 2005.

Due to the fact that Xenoport Inc.'s LTM EBITDA, EBIT and EPS are negative, a discounted cash flow analysis cannot be conducted in the same manner that was conducted for Volcom Inc.

Concerning a discounted cash flow analysis for Adams Respiratory Therapeutics Inc., the firm has a 39% tax rate for the nine months ended March 31, 2005, and at June 30, 2004, had $25.7 million of Net Operating Losses (NOLs) which is included in the model, added to the Enterprise Value. Concerning the discount rate, the base discount rate of 7.95% is provided by Professor Damaodaran's website as an appropriate discount rate for the Pharmaceutical industry. Revenue growth is noteworthy, as revenue jumps from $14.04 million in 2003 to $61.29 million in 2004. ARXT attributes this growth to their marketing efforts to physicians, expansion of their trade sale department, their consumer advertising campaign and FDA removal of competitive products that resulted

in "Mucinex SE being the only long-acting, single-ingredient guaifenesin product available in the United States."[35]

The results of the DCF for ARXT are as follows: If one includes the present value of the NOLs, the implied share price at the lowest end of the sensitivity analysis is $38.2, at a 34% level of mispricing compared to the $28.58 price one month after listing. If one removes the NOLs from the analysis, the implied share price at the lowest end of the

Implied Price					
	Terminal EBITDA Multiple (No NOL)				
	3.0x	**4.0x**	**5.0x**	**6.0x**	**7.0x**
4.95%	$43.3	$51.0	$58.7	$66.4	$74.1
5.95%	$41.8	$49.1	$56.5	$63.8	$71.1
6.95%	$40.4	$47.4	$54.3	$61.3	$68.3
7.95%	$39.0	$45.7	$52.3	$58.9	$65.6
8.95%	$37.7	$44.1	$50.4	$56.7	$63.0
9.95%	$36.5	$42.5	$48.6	$54.6	$60.6
10.95%	$35.3	$41.1	$46.8	$52.6	$58.3

sensitivity analysis is $35.3 at a 24% level of mispricing. The analysis is maintaining the EBITDA multiples at the same level as the VLCM analysis, at 1.0 increments around 5.0.

Tweaking the terminal EBITDA multiple improves this valuation in relation to the share price one month after listing. Beginning at 2.0x rather than at 3.0x , the bottom range of the sensitivity analysis yields $29.6, at a 4% level of mispricing. This significantly improves our analysis, though we still rely on choosing the bottom range of the sensitivity analysis output. For this runner up loser, the comparable analysis was able to improve upon the performance of the underwriters.

[35] Adams Respiratory Therapeutics, Inc., "General form for registration of securities under the Securities Act of 1933." *U.S Securities and Exchange Commission*. 19 June 2005 <http://sec.gov>

Implied Price					
	Terminal EBITDA Multiple (No NOL)				
	2.0x	**3.0x**	**4.0x**	**5.0x**	**6.0x**
4.95%	$35.7	$43.3	$51.0	$58.7	$66.4
5.95%	$34.5	$41.8	$49.1	$56.5	$63.8
6.95%	$33.4	$40.4	$47.4	$54.3	$61.3
7.95%	$32.4	$39.0	$45.7	$52.3	$58.9
8.95%	$31.4	$37.7	$44.1	$50.4	$56.7
9.95%	$30.5	$36.5	$42.5	$48.6	$54.6
10.95%	$29.6	$35.3	$41.1	$46.8	$52.6

The final discounted cash flow analysis is conducted on Lincoln Educational Services Corp. LINC's tax rate is 39%, and Professor Damodaran's website provides a base discount rate of 9.52% for the Educational Services Industry. The sensitivity analysis provides a somewhat accurate valuation for LINC. The bottom range of the sensitivity analysis at a 3.0x EBITDA multiple and 11.02% discount rate yields $13.59, which is at a –31% level of mispricing. While it is important to look at the bottom range of the sensitivity analysis for LINC, as we applied the same analysis for the other firms, a more accurate measure is found in the middle of the sensitivity table. At a 9.52% discount rate, which is provided by Professor Damodaran, and a 4.0x EBITDA multiple, the implied price is $21.2 which is at a 5% level of mispricing. Though the analysis came close to the actual price one month after listing, the study was not able to improve upon the underwriter's performance in 2005.

The performance of the discounted cash flow exercises were revealing, especially in relation to the multiples. For Volcom Inc., the DCF performed second to the 2004 analyst P/E at a 12% level of mispricing. For both Adams Respiratory Therapeutics Inc. and Lincoln Educational Services Corp., the discounted cash flow performed better than any multiple, at a 4% and 5% level of mispricing, respectively. It is interesting to note that these values were at the lower end of the sensitivity analysis, with the lowest EBITDA multiple and highest discount rate, with the exception of Lincoln Educational

Services Corp. An average of the entire output of the sensitivity analysis would produce a much higher level of mispricing and would represent a significant overvaluation of each firm's shares.

Implied Price					
	Terminal EBITDA Multiple (No NOL)				
	3.0x	4.0x	5.0x	6.0x	7.0x
8.02%	$14.9	$19.7	$24.4	$29.2	$34.0
8.52%	$15.6	$20.6	$25.7	$30.7	$35.7
9.02%	$16.0	$21.2	$26.3	$31.4	$36.6
9.52%	$16.0	$21.2	$26.3	$31.4	$36.6
10.02%	$15.6	$20.6	$25.7	$30.7	$35.7
10.52%	$14.9	$19.7	$24.4	$29.2	$34.0
11.02%	$13.9	$18.3	$22.7	$27.2	$31.6

Dividend Discount Model Methodology

Though this study is limited to testing comparable valuation methods and the discounted cash flow method, a mention of the dividend discount model is relevant. Though the four selected pre-IPO firms from the sample do not have a dividend stream to analyze, the discussion brings several valuation concepts to the table. A study by Richard Barker, "Survey and Market-based Evidence of Industry-dependence in Analysts' Preferences Between the Dividend Yield and Price-earnings Ratio Valuation Models," of Cambridge University, serves as an introduction.

> *As is well known, dividends are the cash flow returns on an equity investment, and the equilibrium share price equals the discounted value of expected future dividends:*[36]
>
> $$P_t = \sum_{\tau=1}^{\infty} E_t[d_{t+\tau}](1+k)^{-\tau}$$

[36] Barker, R.G. (1999), "Survey and Market-based Evidence of Industry-dependence in Analysts' Preference Between the Dividend Yield and Price-earnings Ratio Valuation Models, *Journal of Business Finance and Accounting*, Volume 26, Nos. 3 and 4, April/May, 395.

Equation (1), which may be called the dividend discount model, can be greatly simplified by assuming that the infinite dividend stream grows at a constant rate g, (Gordon 1959):[37]

$$P_t = \frac{d_{t+1}}{k - g}.$$

Barker notes that those in finance literature typically associate the dividend discount model with "the basis of share price determination…[38]The model, however, is perhaps less important in practice by those outside the academic realm, such as investment banks. Barker concurs:

> *This theoretical position does, however, stand in contrast to survey evidence which suggests that stock market participants place heavy reliance upon the dividend yield rather than the dividend discount model as a basis of valuing shares.*[39]

The simplicity of the dividend discount model is both an attribute and a drawback. The easy use, intuitive model "is designed to synthesize a large quantity of information into a single estimate of value."[40] Concerning the model's drawbacks, Barker notes:

> *If future outcomes are uncertain, then any estimation of growth and risk may not be sufficiently well-informed that the assumptions underlying the simple dividend discount model can be rejected.*[41]

Thus, the output of the dividend discount model, the "estimate of share price generated by a dividend discount model…will be unhelpfully sensitive to the assumptions that the

[37] Ibid, 395.
[38] Ibid, 396.
[39] Ibid, 396.
[40] Ibid, 397.
[41] Ibid, 397.

model makes."[42] Barker gives sales growth estimation as an example of one such assumption.

Relative Importance of Models in Various Industries

Richard Barker's study provides an interesting table entitled "Analysts' Ranking of Valuation Models by Stock Market Sector." Five general sectors are represented, *Services, Industrials, Consumer Good, Financials* and *Utilities*. Valuation models were ranked from most important (score of 1) to least important (score of 6). Interestingly, multiples appear to play a much larger role in the analysts' toolbox than other methods. In all of the sectors with the exception of *Utilities*, the discounted cash flow method received a 4.5 to 5.75 score, rendering it relatively unimportant. In the *Utilities* sector, it received a 2.75. The Price/Earnings Ratio fared well, with a median rank score of 1-2 in all sectors except *Utilities.* The P/E model proved to be particularly useful in this study as well, when it was available. In the *Utilities* sector, the Price/Earnings ratio scored a mean rank of 3.75. Though this study is not large enough to generalize about industry patterns, the insight is relevant.

Spence's study on mineral property valuation stresses the importance of using multiple valuation methods. He writes, "in fact the norm was to use three methods of valuation." Spence continues, "One must use multiple methods, obtain a range of values and then apply judgment to choose an appropriate value…"[43] Indeed, the combination of the multiple's performance and that of the discounted cash flow analysis was able to minimize mispricing. Interestingly, Spence concludes, "The survey also showed the

[42] Ibid, 396.
[43] Spence, Keith (2002). "An Overview of Valuation Practices and the Development of a Canadian Code for the Valuation of Mineral Properties." *Validating the Valuation*, Toronto, Canada.

dominant use of Market Comparables, regardless of the stage of development of the property."[44]

Similar Studies, Positing Multiple Reasons for Underpricing

In the article "Why Don't Issuers Get Upset About Leaving Money on the Table in IPOs?," Kent Daniel provides *Microsoft* as an opening case study. Concerning *Microsoft's* IPO in March 1986, he cites their preliminary prospectus with a price range of $16.0-$19.0, and tracks the events that lead to Microsoft's first day close at $27.75. Daniel provides some interesting points that are related to this study. He notes, "both the investment bankers and Microsoft clearly understood that the IPO was likely to be underpriced by $4-$6 a share given the [revised] offering price of $21. Daniel explains this, citing issuers "loss-averse preferences." Concerning the issuers, Daniel explains, "they have gained a lot on their shares, and the underpricing is a relatively small "loss," so they "irrationally" aggregate the two and are still relatively happy.[45]

Habib and Ljungqvist note "the more shares they sell, the greater their incentive to decrease underpricing."[46] They suggest, "the incentive to reduce underpricing should be greater for issuers selling more shares," implying that "underpricing should decrease in the number of shares sold."[47] This study adds an interesting perspective to this study. Habib and Ljungqvist's study is conducted after-the-IPO, while this study is based on information available at the time of the IPO. To further extend this idea, Habib and

[44] Ibid, 3.
[45] Daniel, Kent, (2002) Discussion of "Why Don't Issuers Get Upset about Leaving Money on the Table in IPOs?". Review of Financial Studies, 15, 445- 454.
[46] Habib, M., and A. Ljungqvist, 2001, "Underpricing and Entrepreneurial Wealth Losses: Theory and Evidence," *Review of Financial Studies* 436, 433-458.
[47] Ibid, 436.

Level of Mispricing and Shares Offered (millions)						
ARXT	90.50%	7.0790		LHCG	34%	4.000
AATI	39%	10.6000		LINC	0.764%	4.000
ALLI	32%	4.0000		MFB	23%	12.794
ALJ	23%	8.5000		MWIV	48%	4.333
BFIN	35%	23.0000		NSR	41%	25.000
BRNC	35%	4.7000		PEC	-6%	13.500
BLDR	4%	11.2500		PORK	-14%	12.500
CF	5%	41.2500		RACK	2%	6.250
COLY	16%	6.0000		ROLL	6%	8.288
CNSL	-9%	15.6667		FRZ	18%	10.200
DMND	38%	6.0000		RUTX	-14%	6.000
DRC	10%	22.5000		ROC	-19%	20.408
DSW	62%	14.0625		RUTH	24%	13.000
EVVV	-19%	11.7650		SWSI	78%	5.000
GGXY	60%	3.3330		UNCA	23%	4.800
HPY	75%	6.7500		UBNK	17%	7.849
HITT	28%	4.5000		VLCM	93.8%	4.888
ITC	35%	12.5000		WAL	39%	3.750
JRVR	19%	4.4440		WRSP	-8%	11.868
KFI	2%	18.0000		XNPT	-0.762%	5.000
KNXA	-13%	5.0000				

Ljungqvist's data is based on information revealed subsequent to the offering. This study, however, makes use of information available at the time of the offering, to market participants at the point of the offering date. Therefore, it is interesting to test a notion that was found in retrospect, with a study that is making use of presently available information, with a blind eye to the future. The table above illustrates the level of mispricing for each firm in the sample, along with the number of shares offered.

According to Habib and Ljungqvist, the firms offering the higher number of shares have an incentive to decrease underpricing. The notion is neither confirmed nor rejected by the findings of this study. It is interesting to note in the chart above that the firm offering the most shares at 41.25 million has only a 5% level of mispricing. While this finding agrees with Habib and Ljungqvist's study, the next highest firm at 25 million shares has a 41% level of mispricing, in line with remainder of the top five firms with the highest number of shares. Running a regression on the level of mispricing versus number

of shares offered, the adjusted R squared reveals that the number of shares offered explains only 3.94% of the variation in mispricing.

Regression Statistics	
Multiple R	25.2%
R Square	6.4%
Adjusted R Square	3.95%
Standard Error	0.29
Observations	41

Conclusion

The tables below represent the findings of this study. Of the "Losers," The study was able to improve the degree of underpricing when an average of the best multiple's level of mispricing is taken with the discounted cash flow's level of mispricing. Therefore, for both of the "Losers," Volcom Inc. and Adams Respiratory Therapeutics Inc., the study was able to mimic the IPO valuation process which left less money on the table than the underwriters actually left in 2005.

Losers		
VLCM	IPO	93.9%
	2004 Analyst P/E	3%
	Discounted Cash Flow	12%
	Study Average	8%
ARXT	IPO	90.5%
	Discounted Cash Flow	4%
	EV/LTM Revenue	-29%
	Study Average	-13%

Winners		
XNPT	IPO	-0.762%
	EV/LTM Revenue	24%
	DCF Not Applicable	
	Study Average	24%
LINC	IPO	0.764%
	Discounted Cash Flow	5%
	Damodaran P/E	12%
	Study Average	9%

The valuation of the winners, however, was not improved by the study. Thus one may conclude the underwriting firms of Xenoport Inc. and Lincoln Educational Services Corp. had access to superior information and may have possessed knowledge outside of that which was readily available during the period leading up to the IPO.

Concerning the methods themselves, the study finds that the discounted cash flow method heavily overvalues the IPO firm. In two of the three cases, the absolute bottom

value of the sensitivity analysis proved to be the most accurate outcomes of the discounted cash flow model. The "absolute bottom" implies the highest discount rate and lowest EBITDA multiple.

The valuation of "Losers" was improved in both instances by a discounted cash flow analysis in conjunction with multiples. Concerning the multiples themselves, the Price/Earnings multiple and the Enterprise Value/ LTM Revenue proved to be the most accurate.

Comparing the results of this study with those of Deloof, Maeseneire and Inghelbrecht of Ghent University, the P/E ratio emerges victorious in both studies. However, they find the "price/earning and price/cash flow multiples using forecasted earnings and cash flows for the year after the IPO lead to more accurate valuations than multiples using forecasted earnings and cash flows for the IPO year."[48] While the four firms in this study do not comprise a sample large enough to generalize, the P/E multiple in the *current* IPO year proved to be more accurate in the case of Volcom Inc., contrary to Deloof, Maeseneire and Inghelbrecht.

The relationship between the number of shares offered and the level of underpricing was deemed weak by a regression on the sample. While this reason for underpricing may not be evident in this sample, it is clear that a variety of qualitative or outside information exists that caused the underwriters of the "winning" firms to price the firms so accurately. Similarly, the underwriters of the "losers" must have had reasons to underprice the firms, as a simple comparable analysis and discounted cash flow for each provided far more accurate results. It is clear with these two losers, Volcom Inc. and

[48] Deloof, Marc, De Maeseneire, Wouter and Inghelbrecht, Koen (2002) "The Valuation of IPOs by Investment Banks and the Stock Market: Empirical Evidence" EFMA 2002 London Meetings; EFA 2002 Berlin Meetings Discussion Paper.

Adams Respiratory Therapeutics Inc., that another force had influence on the offering price, given that this simple study was able to achieve far more accurate results.

In looking at the long run performance of the four firms analyzed in this study, all firms with the exception of Lincoln Educational Services Corp. have performed well since their IPO, and since one month after listing.

Measuring Underpricing Today			
Firm	Price 04.20	Level Mispricing	Performance Since 1 Month
VLCM	35.22	120%	14%
ARXT	39.5	163%	38%
XNPT	23.38	123%	124%
LINC	16.99	-15%	-16%

It is common to see long run underperformance with IPOs, however Volcom Inc., Adam's Respiratory Therapeutics Inc. and Xenoport Inc. appear to be performing strongly. Concerning long-run IPO underperformance, Aggarwal, Krigman and Womack provide three reasons. Firstly, the "information momentum" leads to or is in itself a "short run distortion in the demand curve that reverses when prices return to fundamental values…" Secondly, they point to insiders selling their positions, and the consequential slide of demand and price. Thirdly, as alluded to earlier by Ritter, the underpricing phenomenon itself and the lost potential proceeds "reduces long-run value per share."[49] Clearly, the force Ritter describes has not come into play for Volcom Inc. and Adams Respiratory Therapeutics Inc., the "losers," who were both heavily underpriced during their IPOs. It is clear that there was information unbeknownst to the outsider that caused these two firms to be priced so low, and then perform well subsequently. While this study reveals several general patterns in the IPO valuation process, one may generalize that

[49] Aggarwal, Rajesh, Laurie Krigman , Kent Womack (2002) "Strategic IPO Underpricing, Information Momentum, and Lockup Expiration Selling," *Journal of Financial Economics* 113, 105-137.

majority of the information used in pricing an IPO remains both qualitative and exclusive.

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