

**“Minimum Marketability Discounts” – 4th Edition**

**A Study of Discounts For Lack of Marketability**

**Based on LEAPS Put Options In November 2008**

by

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LEAPS

LEAPS (Long-Term Equity Anticipation Securities) are exchange listed options that grant “the buyer (holder) the right, but not the obligation, to buy, in the case of a call, or to sell, in the case of a put, a specified amount of the underlying asset at a predetermined price on or before a given date.”<sup>1</sup> During the option term, which ranges from 14 to 26 months, LEAPS are a form of insurance against price fluctuations in publicly-traded stocks. Specifically, the cost of a LEAPS put option, expressed as a percentage of the price of the underlying stock, measures the cost of price protection against a loss in value of the stock.

Purpose Of The Study

The risk of loss of value over time is a major component of the discount for lack of marketability for a closely-held stock. Our objective in studying LEAPS is to contribute to improved substantiation of the discount, which has long been a concern of both valuation practitioners and courts. The data collected in this and an earlier study enables us to understand how liquidity discounts vary:

- over time (the differences between one-year and two-year options)
- by valuation date (July-August 2006 compared to November 2008)
- by industry
- by company size (in sales revenues or total assets)
- by volatility or risk of the company (betas)
- by profitability
- by growth rates
- by rates of return to investors

Some of these characteristics are discussed in the 2006 study published in September 2007 titled “Minimum Marketability Discounts – 3<sup>rd</sup> Edition” and available at [www.dlom-info.com](http://www.dlom-info.com). This study repeats the studies of the effects of size and risk for the 2008 time period and adds an analysis of the effects of the industry and the valuation date on the costs of price protection.

2008 LEAPS Study

LEAPS are listed on several stock exchanges and are actively traded. They are American-style options that may be exercised at any time prior to the expiration date. LEAPS are issued in September, October and November each year<sup>2</sup> and expire on the third Saturday of January either two or three years later. For example, you could have purchased a LEAPS put option on Proctor and Gamble stock at a certain price in October 2008 that expires in January 2010 or a longer term option that expires in January 2011. As the Chicago Board of Exchange states, LEAPS put options “provide a medium to long-term insurance or hedge for stock owners in the event of a substantial decline in their stock.”<sup>3</sup>

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<sup>1</sup> The Options Clearing Corporation, [www.optionsclearing.com/publications/leaps/intro.jsp](http://www.optionsclearing.com/publications/leaps/intro.jsp).

<sup>2</sup> At the time of the 2006 study, new LEAPS were issued in May, June and July of each year. Thus, the maximum option period was 4 months longer than at present.

<sup>3</sup> Chicago Board of Exchange, [www.cboe.com/LearnCenter/FaqLEAPS.aspx](http://www.cboe.com/LearnCenter/FaqLEAPS.aspx)

This study is based on the costs of LEAPS put options at the end of November 2008.<sup>4</sup> The total universe of LEAPS at that time was about 1245. We excluded LEAPS on exchange-traded funds (41) and LEAPS on companies whose stock was selling below the \$2.50 minimum option limit (approximately 162 companies). Thus, this study includes the LEAPS put options of about 1036 companies. Not every stock had both one-year and two-year options. A few offered only a 2011 option, but many more offered only the 2010 option. Thus, company counts differ widely in the various categories studied.

For the companies in the study, we obtained the following information:

| <u>Data</u>                                     | <u>Source</u>  |
|---|--|
| Option “Asked” Price                            | Chicago Board of Exchange, Delayed Market Quotes<br><a href="http://www.cboe.com/DelayedQuoteTable.aspx">www.cboe.com/DelayedQuoteTable.aspx</a> |
| Underlying Stock Price                          | (Same source as for option price.)   |
| Net Revenues<br>(latest full year) <sup>5</sup> | Usually from Yahoo! Finance. When not available there, from the 10-K filings on the Securities and Exchange Commission’s Edgar website.          |
| Total Assets<br>(latest year end)               | Same source as for Revenues.   |
| Beta  | Yahoo! Finance   |
| Industry  | Yahoo! Finance (10 industry sectors and 235 separate industry sub-classifications).  |

### Discount Calculations

We recorded the underlying stock price and the strike prices<sup>6</sup> of each LEAPS put option on specific dates in November 2008. The percentage costs of the put options were calculated as the cost of the option divided by the stock price. The calculation utilized what we call a “Distance Weighted Option Cost” based on the relationship between the actual stock price and the next higher and lower strike prices. For example, say Company X’s stock price of \$36.06 per share is between the \$35.00 put option (for 2010) at a cost of \$5.10 and the \$40.00 put option at a cost of \$7.90. We calculated the cost of a put option for \$36.06 as a straight-line percentage increase in the actual option cost difference between \$35.00 and \$40.00. Thus, the stock price, \$36.06, is \$1.06 above the \$35.00 strike price, or 21.2% of the \$5.00 difference in strike prices ( $\$1.06 \div \$5.00$ ). The difference in put option costs is \$2.80 ( $\$7.90 - \$5.10$ ). So we add 21.2% of the difference ( $\$2.80 \times .212 = \$0.59$ ) to the lower option cost (\$5.10) to arrive at a “Distance Weighted Option Cost” of \$5.69. Dividing that by the stock price results in a percentage cost of 15.8% ( $\$5.69 \div \$36.06$ ).

<sup>4</sup> Almost all between November 24 and December 1, 2008.

<sup>5</sup> In most cases, the latest full year reported ended December 31, 2007.

<sup>6</sup> A strike price is the price at which the option may be exercised; i.e., the price at which the buyer of a put option can sell the underlying shares.

## Analysis and Summary Results

Our objective was to determine what factors influenced the costs of price protection or the size of discounts for lack of marketability and to what extent. Our analysis was limited to means, medians and ranges of the middle 50% of occurrences. Important results were:

a) Valuation Date:

Discounts change over time and are not constant in size. Discounts in November 2008 were double or greater discounts in October 2006.

b) Holding Period:

The median cost/discount for all companies in the 2006 study was 13.9% for the 18-month LEAPS put option and 17.4% for the 30-month option, an increase of 3.5%. In 2008, the median cost for all companies increased to 33.5% for the 14-month option and 40.6% for the 26-month option, an increase 7.2%.

c) Industry:

Discounts vary by industry. The differences are more pronounced as the definition of the industry becomes more specific or more detailed.

d) Company Size:

The results of the 2006 study are repeated. Company size has a clear and major affect on discounts: the smaller the company, in revenues or assets, the larger the discount. In November 2008, discounts for companies with less than \$1 billion in revenues often were from 35% to 50%.

e) Company Risk:

The results of the 2006 study are repeated. Company risk has a major affect on discounts. The greater the risk, as measured by the company's beta, the greater the discount.

Following sections of this report show the study data and discuss conclusions in greater detail. The first section, pages 5 through 13, report the results of the 2008 study. The second section, pages 14 and 15, make some comparisons between the 2006 and 2008 studies.

### Cost of Price Protection/Discount By Revenue Size

Chart I shows the results of our analysis by company revenue size. As in the 2006 study, company size has a very significant effect on discounts, specifically the smaller a company's revenues the larger the discount for lack of marketability.

Even for companies with sales of \$10 billion and up, the cost of price protection for 14 months (the 2010 option) is frequently from 25% to 35%. The cost for 26 months (the 2011 option) is often from 30% to 40%. Looking down either the "2010 Option" column or the "2011 Option" column, clearly the costs/discounts increase as company revenue sizes decrease. An investor's cost of price protection for stocks of companies with revenues of \$100 million and under is from 60% to 70% greater than the cost of price protection for stocks of companies with revenues of \$10 billion and up.

The column headed "Increase '11 > '10" is the absolute percentage increase in cost for an additional 12 months of price protection (from the 2010 LEAPS to the 2011 LEAPS). It is clear that the costs of the additional 12 months of protection increase as company revenue size decreases.

### Cost of Price Protection/Discount By Total Asset Size

Chart II shows the results of this analysis. The conclusions of the asset size analysis are the same as for revenues: discounts increase as the size of total assets is smaller. For companies with less than \$1 billion in assets, discounts often are in the range of 30% to 50%.

### Cost of Price Protection/Discount By Yahoo.Finance Beta

Chart III shows that the costs of price protection increase significantly as a company's beta increases. The betas used are those presented in Yahoo Finance. They are described as "...a measure of an investment's relative volatility. The higher the beta, the more sharply the value of the investment can be expected to fluctuate in relation to a market index. For example, Standard & Poor's 500-stock index has a beta coefficient (or base) of 1.0..."<sup>7</sup> The same Yahoo definition goes on to say, "Betas as low as 0.5 and as high as 4 are fairly common, depending on the sector and size of the company." As Chart III shows, even within a beta range of 0.66 to 1.83 (the second through fourth quintiles of all companies), the costs of price protection for 26 months (the 2011 option) are frequently from 30% to 50% of the value of the underlying stock.

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<sup>7</sup> <http://finance.yahoo.com/personal-finance/glossary>

Chart I  
Cost of Price Protection By Revenue Size

|  | <u>2010</u><br><u>Option</u> | <u>2011</u><br><u>Option</u> | <u>Increase</u><br><u>'11 &gt; '10</u> |
|--|------------------------------|------------------------------|--|
| <u>All companies</u>                               |                              |                              |  |
| Mean   | 36.4%                        | 43.2%                        | 6.9%                                   |
| Median   | 33.5%                        | 40.6%                        | 7.2%                                   |
| 25% percentile                                     | 27.4%                        | 34.0%                        | 6.5%                                   |
| 75% percentile                                     | 41.7%                        | 49.2%                        | 7.5%                                   |
| No. of companies                                   | 1036                         | 623                          |  |
| <br><u>Revenues of \$10 Billion or Greater</u>     |                              |                              |  |
| Mean   | 30.9%                        | 37.1%                        | 6.3%                                   |
| Median   | 28.4%                        | 35.0%                        | 6.6%                                   |
| 25% percentile                                     | 23.5%                        | 29.0%                        | 5.5%                                   |
| 75% percentile                                     | 36.2%                        | 42.9%                        | 6.7%                                   |
| No. of companies                                   | 257                          | 216                          |  |
| <br><u>Revenues of \$1 Billion to \$10 Billion</u> |                              |                              |  |
| Mean   | 35.7%                        | 43.9%                        | 8.2%                                   |
| Median   | 33.6%                        | 41.4%                        | 7.8%                                   |
| 25% percentile                                     | 28.4%                        | 35.8%                        | 7.4%                                   |
| 75% percentile                                     | 40.4%                        | 50.1%                        | 9.7%                                   |
| No. of companies                                   | 460                          | 281                          |  |
| <br><u>Revenues Under \$1 Billion</u>              |                              |                              |  |
| Mean   | 41.9%                        | 52.3%                        | 10.4%                                  |
| Median   | 38.0%                        | 47.9%                        | 9.9%                                   |
| 25% percentile                                     | 31.7%                        | 39.3%                        | 7.6%                                   |
| 75% percentile                                     | 48.6%                        | 62.3%                        | 13.7%                                  |
| No. of companies                                   | 319                          | 126                          |  |
| <br><u>Revenues Under \$500 million</u>            |                              |                              |  |
| Mean   | 42.5%                        | 53.7%                        | 11.2%                                  |
| Median   | 39.5%                        | 50.1%                        | 10.5%                                  |
| 25% percentile                                     | 32.2%                        | 40.8%                        | 8.6%                                   |
| 75% percentile                                     | 49.2%                        | 61.5%                        | 12.4%                                  |
| No. of companies                                   | 212                          | 79                           |  |
| <br><u>Revenues Under \$100 million</u>            |                              |                              |  |
| Mean   | 50.7%                        | 64.6%                        | 13.9%                                  |
| Median   | 47.2%                        | 61.5%                        | 14.3%                                  |
| 25% percentile                                     | 38.0%                        | 51.6%                        | 13.6%                                  |
| 75% percentile                                     | 62.4%                        | 70.8%                        | 8.4%                                   |
| No. of companies                                   | 67                           | 24                           |  |

Chart II  
Cost of Price Protection By Asset Size

|  | <u>2010</u><br>Option | <u>2011</u><br>Option | <u>Increase</u><br>'11 > '10 |
|--|-----------------------|-----------------------|------------------------------|
| <u>All companies:</u>                            |                       |                       |                              |
| Mean   | 36.4%                 | 43.4%                 | 7.0%                         |
| Median   | 33.5%                 | 40.8%                 | 7.3%                         |
| 25% percenile                                    | 27.4%                 | 34.0%                 | 6.5%                         |
| 75% percenile                                    | 41.7%                 | 50.0%                 | 8.3%                         |
| No. of companies                                 | 1036                  | 628                   |                              |
| <br><u>Assets of \$10 Billion or More</u>        |                       |                       |                              |
| Mean   | 32.4%                 | 38.7%                 | 6.3%                         |
| Median   | 29.8%                 | 36.1%                 | 6.3%                         |
| 25% percenile                                    | 24.2%                 | 30.1%                 | 5.9%                         |
| 75% percenile                                    | 37.8%                 | 44.3%                 | 6.5%                         |
| No. of companies                                 | 332                   | 268                   |                              |
| <br><u>Assets of \$1 Billion to \$10 Billion</u> |                       |                       |                              |
| Mean   | 36.4%                 | 45.1%                 | 8.7%                         |
| Median   | 34.0%                 | 42.2%                 | 8.3%                         |
| 25% percenile                                    | 28.6%                 | 36.3%                 | 7.7%                         |
| 75% percenile                                    | 41.3%                 | 51.4%                 | 10.1%                        |
| No. of companies                                 | 458                   | 276                   |                              |
| <br><u>Assets Under \$1 Billion</u>              |                       |                       |                              |
| Mean   | 41.7%                 | 52.5%                 | 10.8%                        |
| Median   | 37.8%                 | 49.2%                 | 11.4%                        |
| 25% percenile                                    | 32.0%                 | 40.0%                 | 8.1%                         |
| 75% percenile                                    | 48.4%                 | 59.2%                 | 10.7%                        |
| No. of companies                                 | 246                   | 84                    |                              |
| <br><u>Assets Under \$500 million</u>            |                       |                       |                              |
| Mean   | 45.7%                 | 58.5%                 | 12.8%                        |
| Median   | 43.0%                 | 54.5%                 | 11.5%                        |
| 25% percenile                                    | 33.7%                 | 45.9%                 | 12.3%                        |
| 75% percenile                                    | 53.4%                 | 68.9%                 | 15.5%                        |
| No. of companies                                 | 137                   | 47                    |                              |

Chart III  
Cost of Price Protection By Company Beta

|  | <u>2010</u><br>Option | <u>2011</u><br>Option | <u>Increase</u><br>'11 > '10 |
|--|-----------------------|-----------------------|------------------------------|
| <u>All Companies:</u>                            |                       |                       |                              |
| Mean   | 36.4%                 | 43.2%                 | 6.9%                         |
| Median   | 33.5%                 | 40.6%                 | 7.2%                         |
| 25% percenile                                    | 27.4%                 | 34.0%                 | 6.5%                         |
| 75% percenile                                    | 41.7%                 | 49.2%                 | 7.5%                         |
| No. of companies                                 | 1036                  | 623                   |                              |
| <br><u>Beta: Negative to 0.66 (1st Quintile)</u> |                       |                       |                              |
| Mean   | 32.7%                 | 37.2%                 | 4.5%                         |
| Median   | 29.8%                 | 35.5%                 | 5.6%                         |
| 25% percenile                                    | 22.5%                 | 27.0%                 | 4.5%                         |
| 75% percenile                                    | 38.3%                 | 42.6%                 | 4.3%                         |
| No. of companies                                 | 207                   | 125                   |                              |
| <br><u>Beta: 0.66 to 1.00 (2nd Quintile)</u>     |                       |                       |                              |
| Mean   | 32.5%                 | 39.9%                 | 7.4%                         |
| Median   | 30.9%                 | 37.1%                 | 6.3%                         |
| 25% percenile                                    | 24.7%                 | 31.5%                 | 6.8%                         |
| 75% percenile                                    | 37.9%                 | 45.0%                 | 7.1%                         |
| No. of companies                                 | 207                   | 121                   |                              |
| <br><u>Beta: 1.00 to 1.34 (3rd Quintile)</u>     |                       |                       |                              |
| Mean   | 35.3%                 | 42.2%                 | 6.9%                         |
| Median   | 33.4%                 | 40.2%                 | 6.7%                         |
| 25% percenile                                    | 27.8%                 | 34.2%                 | 6.3%                         |
| 75% percenile                                    | 39.9%                 | 47.6%                 | 7.7%                         |
| No. of companies                                 | 207                   | 145                   |                              |
| <br><u>Beta: 1.34 to 1.83 (4th Quintile)</u>     |                       |                       |                              |
| Mean   | 38.1%                 | 46.4%                 | 8.3%                         |
| Median   | 35.8%                 | 43.3%                 | 7.4%                         |
| 25% percenile                                    | 30.0%                 | 35.9%                 | 5.9%                         |
| 75% percenile                                    | 42.9%                 | 51.4%                 | 8.6%                         |
| No. of companies                                 | 207                   | 113                   |                              |
| <br><u>Beta: 1.83 to 6.54 (5th Quintile)</u>     |                       |                       |                              |
| Mean   | 43.4%                 | 51.2%                 | 7.9%                         |
| Median   | 39.5%                 | 47.2%                 | 7.7%                         |
| 25% percenile                                    | 32.5%                 | 39.9%                 | 7.3%                         |
| 75% percenile                                    | 49.2%                 | 59.2%                 | 10.0%                        |
| No. of companies                                 | 208                   | 119                   |                              |

### Costs of Price Protection/Discounts By Industry

A major purpose of this 2008 study is to determine the extent, if any, to which a company's industry affects the costs of price protection and discounts for its stock. We used the industry definitions of Yahoo Finance, which divides industries into nine sectors (our term) and 235 separate industry classifications. The nine sectors are:

|                 |                  |
|-----------------|------------------|
| Basic Materials | Conglomerates    |
| Consumer Goods  | Services         |
| Financial       | Technology       |
| Healthcare      | Industrial Goods |
| Utilities       |                  |

With the exception of "Conglomerates," each sector has a number of sub-classifications, often containing companies quite different in nature. For example, within the Services sector there are 60 sub-classifications ranging from airlines to department stores to restaurants. Sub-classifications within the Financial sector range from money center banks to REITs to accident and health insurance companies, and the 32 Technology sub-classifications vary from "Telecom Services" to "Healthcare Information Services."

Our industry analysis was limited to the 1036 companies for which 2010 put options (14 months into the future) were available, because there were many fewer (623) companies for which 2011 put options (26 months into the future) were offered for sale. Naturally, the costs of price protection/discounts were significantly higher for the longer 2011 options (an additional 12 months).

The conclusions of the analyses by industry are:

- a) costs of price protection or discounts do vary by industry sector; however,
- b) costs/discounts vary much more as the sectors are broken down further into industry sub-classifications; and,
- c) even within sub-classifications, discounts often vary significantly by company, which suggests that,
- d) the most appropriate way to use LEAPS to support a discount for lack of marketability is by a guideline company approach.

Chart IV shows the analysis by the nine broad industry sectors. With the exception of the "Conglomerates" and "Utilities" categories, median discounts were from 31% to 38%, although the range of the middle 50% of companies in each sector varied widely.

Chart IV

2010 LEAPS Put OptionsBy Industry Sector

| <u>Industries</u> | <u>No. of Co.'s</u> | <u>Medians</u> | <u>Averages</u> | <u>25th %ile</u> | <u>75th %ile</u> | <u>Relation to Median</u> |                  |
|-------------------|---------------------|----------------|-----------------|------------------|------------------|---------------------------|------------------|
|                   |                     |                |                 |                  |                  | <u>25th %ile</u>          | <u>75th %ile</u> |
| All Companies     | 1036                | 33.5%          | 36.4%           | 27.4%            | 41.7%            | -6.1%                     | 8.2%             |
| Basic Materials   | 144                 | 36.0%          | 38.6%           | 31.6%            | 42.1%            | -4.4%                     | 6.1%             |
| Conglomerates     | 7                   | 24.6%          | 31.2%           | 21.2%            | 32.8%            | -3.4%                     | 8.2%             |
| Consumer Goods    | 92                  | 30.9%          | 34.6%           | 24.1%            | 40.9%            | -6.8%                     | 10.0%            |
| Financial         | 106                 | 37.9%          | 41.6%           | 31.7%            | 44.4%            | -6.2%                     | 6.5%             |
| Healthcare        | 144                 | 32.6%          | 36.5%           | 23.9%            | 44.7%            | -8.7%                     | 12.1%            |
| Industrial Goods  | 68                  | 33.5%          | 35.3%           | 26.8%            | 41.7%            | -6.7%                     | 8.2%             |
| Services          | 204                 | 33.9%          | 37.1%           | 28.0%            | 43.3%            | -5.9%                     | 9.4%             |
| Technology        | 246                 | 32.0%          | 34.5%           | 27.2%            | 39.1%            | -4.8%                     | 7.1%             |
| Utilities         | 25                  | 23.6%          | 25.2%           | 20.9%            | 25.3%            | -2.7%                     | 1.7%             |

Within each of these industry sectors are sub-classifications. Charts V and VI are detailed breakdowns of the sub-classifications of two sectors: Technology and Healthcare. Reviewing the Technology sector first (Chart V), the median discount or cost of price protection for all 246 companies is 32.0%. However, medians of the 32 sub-classifications vary from over 40% to lows in the mid-20%. For example, sub-classification #28, Semiconductor – Memory Chips, has one of the highest median discounts, 41.4%, while sub-classification #1, Application Software, has one of the lowest, 27.1%.

Moreover, the spreads of the 25<sup>th</sup> and 75<sup>th</sup> percentiles (the middle 50% of companies) from the medians of the sub-classifications vary widely, indicating more or less homogeneity among the risks of companies in that sub-classification. For example, in sub-classification #5, Computer Peripherals, the 25<sup>th</sup> and 75<sup>th</sup> percentiles vary only 7% and 8% from the median of 30.1%, while in sub-classification #32, Wireless Communications, the 25<sup>th</sup> and 75<sup>th</sup> percentiles vary 15% and 19% from the median. These facts strongly suggest that an analysis of LEAPS put options to support a discount for lack of marketability must be as detailed as is permitted by the data available. Such a conclusion supports what is clear to an experienced business valuator: that two entities even in the same business, like a McDonald's restaurant and a Burger King restaurant, can have very different values, risks and outlooks.

Chart V  
2010 LEAPS Options  
Technology Industry

| Sub-<br>Classif. | Description                       | No.<br>Co.'s | Avg.<br>Disct. | Median<br>Disct. | 25th<br>%-ile | 75th<br>%-ile | Relation to Median |               |
|------------------|-----------------------------------|--------------|----------------|------------------|---------------|---------------|--------------------|---------------|
|                  |                                   |              |                |                  |               |               | 25th<br>%-ile      | 75th<br>%-ile |
|                  | All Companies                     | 246          | 34.5%          | 32.0%            | 27.2%         | 39.1%         | -4.8%              | 7.1%          |
| 32               | Wireless Communications           | 12           | 39.3%          | 39.1%            | 33.3%         | 46.6%         | -5.8%              | 7.5%          |
| 31               | Telecom Services - Foreign        | 4            | 34.5%          | 31.5%            | 29.2%         | 36.9%         | -2.3%              | 5.4%          |
| 30               | Telecom Services - Domestic       | 10           | 35.4%          | 34.7%            | 26.7%         | 39.9%         | -8.0%              | 5.2%          |
| 29               | Technical & System Software       | 7            | 35.8%          | 32.5%            | 31.9%         | 42.4%         | -0.6%              | 9.9%          |
| 28               | Semiconductor-Memory Chips        | 13           | 41.2%          | 41.4%            | 35.1%         | 47.3%         | -6.3%              | 6.0%          |
| 27               | Semiconductor-Eqpt. & Matis.      | 14           | 31.5%          | 30.9%            | 29.3%         | 33.1%         | -1.5%              | 2.2%          |
| 26               | Semiconductor-Specialized         | 16           | 38.4%          | 35.8%            | 27.9%         | 42.4%         | -7.9%              | 6.6%          |
| 25               | Semiconductor-Integ. Circuits     | 14           | 39.7%          | 34.6%            | 29.2%         | 45.8%         | -5.5%              | 11.1%         |
| 24               | Semiconductor-Broad Line          | 10           | 31.9%          | 30.9%            | 28.5%         | 32.8%         | -2.4%              | 2.0%          |
| 23               | Security Software & Services      | 3            | 28.4%          | 24.1%            |               |               |                    |               |
| 22               | Scientific & Technical Instrumts. | 15           | 33.5%          | 32.3%            | 27.9%         | 35.6%         | -4.4%              | 3.3%          |
| 21               | Processing Systems & Prod.        | 2            | 26.7%          |                  |               |               |                    |               |
| 20               | Printed Circuit Boards            | 4            | 37.8%          | 35.2%            | 30.1%         | 42.9%         | -5.1%              | 7.7%          |
| 19               | Personal Computers                | 2            | 29.2%          |                  |               |               |                    |               |
| 18               | Networking & Comm. Devices        | 4            | 39.4%          | 29.9%            | 26.8%         | 42.5%         | -3.1%              | 12.6%         |
| 17               | Multimed.& Graphics Software      | 5            | 34.5%          | 36.5%            | 31.1%         | 37.1%         | -5.5%              | 0.5%          |
| 16               | Long Distance Carriers            | 1            |                |                  |               |               |                    |               |
| 15               | Internet Software & Services      | 14           | 33.1%          | 28.5%            | 27.5%         | 32.3%         | -1.0%              | 3.8%          |
| 14               | Internet Service Providers        | 2            | 40.0%          |                  |               |               |                    |               |
| 13               | Internet Information Providers    | 13           | 34.6%          | 35.1%            | 32.5%         | 37.4%         | -2.6%              | 2.3%          |
| 12               | Information Tech. Services        | 6            | 30.7%          | 30.0%            | 22.1%         | 34.3%         | -7.9%              | 4.3%          |
| 11               | Info. Delivery Services           | 0            |                |                  |               |               |                    |               |
| 10               | Healthcare Info. Services         | 4            | 29.2%          | 27.7%            | 24.2%         | 32.8%         | -3.6%              | 5.0%          |
| 9                | Diversified Electronics           | 7            | 47.4%          | 45.8%            | 35.1%         | 60.2%         | -10.7%             | 14.4%         |
| 8                | Diversified Computer Systems      | 5            | 32.0%          | 31.7%            | 23.4%         | 39.9%         | -8.3%              | 8.3%          |
| 7                | Diversif. Commun. Systems         | 9            | 33.0%          | 28.2%            | 26.5%         | 36.9%         | -1.7%              | 8.7%          |
| 6                | Data Storage Devices              | 6            | 37.6%          | 32.1%            | 28.0%         | 37.9%         | -4.1%              | 5.8%          |
| 5                | Computer Peripherals              | 7            | 31.2%          | 30.1%            | 28.1%         | 32.6%         | -2.0%              | 2.4%          |
| 4                | Computer Based Systems            | 2            | 30.6%          |                  |               |               |                    |               |
| 3                | Communication Equipment           | 15           | 33.4%          | 33.9%            | 25.9%         | 40.1%         | -8.0%              | 6.2%          |
| 2                | Bsns. Software & Services         | 16           | 30.9%          | 30.4%            | 26.6%         | 35.1%         | -3.8%              | 4.7%          |
| 1                | Application Software              | 13           | 29.0%          | 27.1%            | 24.3%         | 31.2%         | -2.8%              | 4.1%          |

The results of an analysis of the Healthcare industry are the same, as is evident in Chart VI:

Chart VI  
2010 LEAPS Options  
Healthcare Industry

| Sub-<br>Classif. | Description                 | No.<br>Co.'s | Avg.<br>Disct. | Median<br>Disct. | 25th<br>%-ile | 75th<br>%-ile | Relation to Median: |               |
|------------------|-----------------------------|--------------|----------------|------------------|---------------|---------------|---------------------|---------------|
|                  |                             |              |                |                  |               |               | 25th<br>%-ile       | 75th<br>%-ile |
|                  | All Companies               | 144          | 36.5%          | 32.6%            | 23.9%         | 44.7%         | -8.7%               | 12.1%         |
| 16               | Specialized Health Services | 3            | 34.2%          | 30.9%            |               |               |                     |               |
| 15               | Medical Practitioners       | 1            |                |                  |               |               |                     |               |
| 14               | Medical Labs & Research     | 5            | 28.9%          | 32.2%            | 17.7%         | 37.2%         | -14.5%              | 5.0%          |
| 13               | Med. Instruments & Supplies | 18           | 32.7%          | 30.2%            | 22.2%         | 35.2%         | -8.1%               | 4.9%          |
| 12               | Med. Appliances & Eqpt.     | 13           | 28.0%          | 28.5%            | 22.1%         | 31.7%         | -6.4%               | 3.2%          |
| 11               | Long-Term Care Facilities   | 1            |                |                  |               |               |                     |               |
| 10               | Hospitals                   | 2            | 38.1%          |                  |               |               |                     |               |
| 9                | Home Health Care            | 1            |                |                  |               |               |                     |               |
| 8                | Health Care Plans           | 10           | 34.5%          | 32.0%            | 31.2%         | 35.4%         | -0.8%               | 3.5%          |
| 7                | Drugs - Generic             | 3            | 31.4%          | 35.7%            |               |               |                     |               |
| 6                | Drug Related Products       | 4            | 35.3%          | 34.6%            |               |               |                     |               |
| 5                | Drug Manufacturers - Other  | 21           | 37.8%          | 33.6%            | 23.4%         | 42.9%         | -10.2%              | 9.3%          |
| 4                | Drug Manufacturers - Major  | 13           | 25.1%          | 22.5%            | 21.2%         | 24.5%         | -1.2%               | 2.1%          |
| 3                | Drug Delivery               | 5            | 45.4%          | 47.5%            | 45.1%         | 47.7%         | -2.4%               | 0.3%          |
| 2                | Diagnostic Substances       | 7            | 31.6%          | 30.7%            | 25.6%         | 33.9%         | -5.1%               | 3.2%          |
| 1                | Biotechnology               | 37           | 46.5%          | 45.3%            | 33.0%         | 56.0%         | -12.2%              | 10.7%         |

There are very wide differences between the medians of various sub-classifications of the industry, from the mid-40% range of biotech or drug delivery companies to the mid-20% range for major drug manufacturers or for manufacturers of medical appliances and equipment.<sup>8</sup> Also, it is clear that some industry sub-classifications are more homogeneous than others. For instance, the sub-classification, “Drug Manufacturers – Other,” has a much wider spread of the middle 50% of companies around the median percentage than does “Drug Delivery.” As with the Technology industry, the facts here suggest that an analysis of LEAPS put options to support a discount for lack of marketability must be as detailed as is permitted by the data available.

<sup>8</sup> It is possible that some of the differences are explained by company size. For example, major drug manufacturers are, by definition, large or very large companies, while biotechnology companies frequently are small or very small. This study sheds no light on that question.

### Comparisons of The 2008 Study And The 2006 Study

As described earlier, this study expands on and updates a similar study done on LEAPS put options sold in July and August 2006. Chart VII shows several comparisons between the two studies. Clearly, the economic travails in the U.S. in late 2008 and the myriad of economic risks associated with it have contributed to greatly increased costs of price protection. To see the risks, as viewed by LEAPS market makers, note that:

- 1) The introduction date of new LEAPS in 2011 now is (by Chicago Board of Exchange practice) four months later than it was in 2006. Thus, the “Months to Expiration” of the option, or in appraiser parlance the maximum holding period, is four months shorter in 2008 than it was in 2006;
- 2) In 2006, virtually all companies (99%) that had 2008 options traded also had 2009 options traded. In 2008, of the 1036 companies that had 2010 options traded, only 60% had 2011 options. In other words, in 2008, market makers were unwilling to offer options of many companies due to risks of the longer holding period.
- 3) The cost of the additional 12 months of price protection increased dramatically in 2008. In 2006 the median additional cost of 29 months of price protection (the 2009 option percentage minus the 2008 option percentage) was 3.5%. In 2008, that additional cost had increased to 7.2%. As company size decreases, and as company risk increases, the relative costs of the 2010 and 2011 options increased proportionately in almost all cases.

The results of the two studies indicate several facts about the costs of price protection and about discounts for lack of marketability that are important for valuers:

- a) Costs of price protection/discounts vary by date. They are not constant in size over time. Thus, it is important that a discount for lack of marketability analysis be valuation date specific.
- b) As the Mandelbaum case described, discounts do vary by company size and by specific company and industry risk;
- c) It is important that any analysis of the costs of price protection using LEAPS be as specific and as detailed as allowed by the data available because discounts vary by company and by industry.
- d) The number of companies for which LEAPS options were available increased by 133 (from 903 to 1036), or 15%, between 2006 and 2008. There is no indication that this growth trend will change in the future.

Chart VII  
Costs of Price Protection/Discounts  
 All Companies

**2008**

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|                                    | <u>2010</u><br><u>Option</u> | <u>2011</u><br><u>Option</u> | <u>Increase</u><br><u>'11&gt;'10</u> |
|------------------------------------|------------------------------|------------------------------|--------------------------------------|
| Mean                               | 36.4%                        | 43.2%                        | 6.9%                                 |
| Median                             | 33.5%                        | 40.6%                        | 7.2%                                 |
| 25% Percentile                     | 27.4%                        | 34.0%                        | 6.5%                                 |
| 75th Percentile                    | 41.7%                        | 49.2%                        | 7.5%                                 |
| Company Count                      | 1036                         | 623                          |                                      |
| Months to expiration<br>of option: | 14                           | 26                           |                                      |
| Date of study:                     | November 2008                |                              |                                      |

**2006**

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|                                    | <u>2008</u><br><u>Option</u> | <u>2009</u><br><u>Option</u> | <u>Increase</u><br><u>'09&gt;'08</u> |
|------------------------------------|------------------------------|------------------------------|--------------------------------------|
| Mean                               | 16.3%                        | 20.5%                        | 4.2%                                 |
| Median                             | 13.9%                        | 17.4%                        | 3.5%                                 |
| 25% Percentile                     | 10.5%                        | 13.4%                        | 2.9%                                 |
| 75th Percentile                    | 19.2%                        | 23.9%                        | 4.7%                                 |
| Company Count                      | 906                          | 897                          |                                      |
| Months to expiration<br>of option: | 17                           | 29                           |                                      |
| Date of study:                     | July-August 2006             |                              |                                      |

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statement of  
qualifications

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qualifications

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U.S. Tax Court.

International President, American Society of Appraisers.

Former Member (6 years), Business Valuation Committee, American  
Society of Appraisers.

Seminar leader and author:

"What's Your (Medical) Practice Worth?"

"Valuation of Undivided Interests In Real Estate"

"LEAPS Provide A Minimum DLOM"

"Minimum Marketability Discounts – 3<sup>rd</sup> Edition"

business  
experience

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