Adjusting the Restricted Stock Transactions
to Estimate Marketability Discounts

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The courts have been critical of using restricted stock studies to estimate a discount for lack of marketability (DLOM). In particular, they question the use of averages culled from historical studies without specific reference to subject companies and studies that contain older, less relevant transactions. This article discusses methods to analyze the underlying restricted stock transactional data as a way to address the concerns.

The concepts presented here were considered with the use of the FMV Opinions Restricted Stock Study (the FMV database). The first update of the FMV database was done in mid-July 2012. Just under 100 new transactions were added—100% of the restricted stock issuances from the last two years that meet all 10 of the FMV criteria for arm's-length events. These methods may or may not be appropriate for other analyses of restricted stock transactional databases or methods of estimating DLOM.

Using restricted stock transactions, including those reported in the FMV database, provides specific challenges that business appraisers must address:

- Restricted stock transactions usually involve distressed companies that are not readily comparable to most operating companies;
- Holding periods may change over time;
- Market conditions may differ among transactions; and
- The relative value of fundamentals may fluctuate over time. It was observed that the FMV database includes several company types at different development stages.

Although critics and the courts have indicated that older transactions may be less relevant today, more recent transactions are subject to a shorter holding period. Looking at the chronology of changes in the holding periods for restricted stock, Rule 144 was enacted in 1972, and initially the holding period was two years. In addition, if the shares were sold while restricted, a new holding period would begin (piggyback provisions). In 1990, these piggyback

1 Restricted stocks are unregistered shares of common stock of a publicly traded corporation that are subject to transfer restrictions under Rule 144 of the Securities Act of 1933. These shares are generally considered identical in every respect to the publicly traded shares of the issuing corporation, except that they are not registered and, therefore, are not freely tradable. Under Rule 144, these shares can be sold in a private placement transaction; however, they are subject to a mandatory holding (restriction) period. These private placement transactions usually result in a discount that reflects a lack of liquidity, which is used as a benchmark to estimate the DLOM.

2 The FMV Opinions Restricted Stock Study (the FMV database) is an online database that at the time of this analysis includes almost 600 restricted stock transactions spanning approximately 30 years. It provides numerous variables that can be applied to estimate the DLOM. Business appraisers can analyze transaction data by company fundamentals to more closely match subject companies.
ADJUSTING THE RESTRICTED STOCK TRANSACTIONS

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This article discusses methods to adjust FMV database transactional data for comparability as follows: 1) adjusting transactions from the perspective of the buyers and sellers; 2) filtering selected transactions; 3) adjusting the holding period between two years, one year, and six months; and 4) adjusting for differences in market conditions among transactions.

Purpose of restricted stock sales. Public companies may issue restricted shares for numerous reasons, such as: 1) an initial public offering of stock; 2) in connection with a merger or acquisition; 3) in exchange for services including employee compensation; and 4) to raise capital, usually for working capital requirements. Further, restricted stock may be issued through hybrid securities, including debt, preferred stock, or convertible preferred stock, or the issue may contain stock warrants or options. In addition, restricted shares may include registration rights, while others do not. It is important to understand the nature of each transaction and that the market price is readily determinable.

The FMV database attempts to exclude restricted stock transactions when the share price is not completely determinable. These exclusions include shares issued 1) through hybrid securities; 2) in an initial public offering of stock; 3) in connection with a merger or acquisition; 4)
in exchange for services, including employee compensation; 5) containing stock warrants or options; 6) transactions for which the restricted stock price is not entirely determinable; and 7) private placements when they are known to involve related parties.\(^4\) It would appear the FMV database attempts to include only the transactions for which the restricted stock price is most evident.

**Adjusting transactions from the perspective of the buyers and sellers.** Many of the transactions included in the FMV database include somewhat distressed companies with negative working capital, accumulated deficits, operating losses, or the need for operating capital either to continue operations or to execute their business plans. While these companies are publicly traded, they may still need additional capital to be comparable to many subject companies. It is an important distinction that these shares are not sold between shareholders; rather, the shares are issued for capital.

The restricted stock transaction discounts presented in the FMV database are based on the market reference price, which is represented by the high-low average stock price for the month of the transaction.\(^5\) This is effectively looking at transactions on a historical basis, which is not from the perspective of willing buyers and sellers. Because these restricted stock transaction placements are private, average investors may only be aware of these transactions after they have occurred, and the market prices at the transaction date would not anticipate the sale.

Further, the underlying companies have plans, technologies, or products, which at the transaction date lack the necessary capital. The raising of capital is generally a benefit to companies and their shareholders. Therefore, we should look more to the future than the past, just as the willing seller and willing buyer would. As business appraisers, we can recite in our sleep that *business appraisal is an expectation of future results*. Hence, comparing the restricted stock price to the market price for at least the *month subsequent to the transaction*--a variable provided in the FMV database--can be a better measure. In fact, the data indicate that the average stock price of a company increased subsequent to its issuance of the restricted stock. If the DLOM is based on the price in the month subsequent to the transaction, then the average DLOM increased to 21.4%, compared to 20.7%, based on the price for the month of the transaction. Moreover, using the market reference price (the high-low average stock price) for the month prior to the transaction, average DLOM was only 14.1%, which suggests an increase in the stock price and the DLOM of over 50% post-transaction.

In addition, since the companies issuing restricted shares received the proceeds of the offering, certain variables, such as market value, total assets, working capital, and book value prior to inflation adjustments (when appropriate), were increased by the amount of the offering to reflect this forward-thinking methodology. Further down, we will examine the DLOM by attribute. These adjustments have an influence on the significance and magnitude of each attribute.

**Filtering selected transactions.** For the purposes of this analysis, 89 restricted stock transactions from the FMV database were excluded for the following reasons: 1) they reflected a premium; 2) they were issued at the then market price; and/or 3) they contained no activity in the subsequent month.

In dissecting the data, the transactions could be filtered by certain business types in addition to specific attributes. This may provide a more appropriate measure for privately held companies. The discounts and comparable attributes are relatively similar among all SIC categories, with the exception of SIC code category 6, Finance, Insurance and Real Estate companies (financial services). This SIC code’s statistics have somewhat smaller DLOMs, substantially more total assets, lower market-to-book ratios, and lower volatility.

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\(^4\) Ibid.

\(^5\) Ibid.
than the other SIC ranges. Therefore, these companies were viewed separately from all other companies.

Companies in the FMV database without revenues were considered developmental and segregated from all other operating companies. Several companies with limited revenues up to $3 million were included in this category. Furthermore, dividend paying is an important attribute that can impact the scope of the DLOM. So both financial service and nonfinancial operating companies were further bifurcated by dividend- and non-dividend-paying.

Exhibit 1 is a summary of the categories described, including number of transactions along with the average and median discounts:

### Holding periods of two years, one year, or six months.

The average DLOM for operating companies summarized by holding periods of two years, one year, and six months were 27.6%, 26.9%, and 18.8%, respectively, based on the price in the month subsequent to the transaction. When the holding periods dropped from two years to one year, little difference appeared in the magnitude of the discount. At a casual glance, until 2008, the length of the holding period restriction could appear to be not a significant factor. However, there were only 19 restricted stock transactions with a six-month holding period. Therefore, this subset’s data may have limited significance upon changing the average of the entire subset. However, if the holding period remains at six months, the significance becomes greater in future years as more transactions are added.

### The impact of the holding period.

Holders of restricted stock face three primary risks during the required holding period, also known as the period of illiquidity: 1) the time value of money during the holding period; 2) the risk of a realized loss of value at the end of the holding period; and 3) the opportunity risk that the underlying asset increases in value during the holding period and then declines to a lower value before the end of the restriction period.

Business appraisers employ option-based models to measure the lack of liquidity. Option models address: 1) certain risks during the restriction period; and 2) the curvilinear nature of DLOM over time.

Put option models can be used to estimate the cost to hedge the loss and opportunity risks faced by a holder. A put is a simple contract that allows the holder to sell an underlying asset at a predetermined price at a certain date. In contrast, call options give the holder the right to purchase an asset at a predetermined price within a specified time. The price of the option, commonly called the premium, is the present value, at the risk-free rate, of the expected benefit from owning the option at maturity. The two option models commonly used in valuation practice are: 1) Finnerty Average Price Asian Put

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### Exhibit 1. Summary of the Categories

<table>
<thead>
<tr>
<th>Company type</th>
<th>Number of transactions</th>
<th>Marketability discount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating companies excluding financial services</td>
<td></td>
<td></td>
</tr>
<tr>
<td>non-dividend paying</td>
<td>314</td>
<td>Average 26.74%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Median 25.00%</td>
</tr>
<tr>
<td>Financial service - non-dividend paying</td>
<td>35</td>
<td>Average 21.84%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Median 16.02%</td>
</tr>
<tr>
<td>Operating companies excluding financial services</td>
<td>17</td>
<td>Average 18.30%</td>
</tr>
<tr>
<td>dividend paying</td>
<td></td>
<td>Median 13.90%</td>
</tr>
<tr>
<td>Financial service - dividend paying</td>
<td>22</td>
<td>Average 15.28%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Median 13.85%</td>
</tr>
<tr>
<td>Developmental stage companies</td>
<td>121</td>
<td>Average 33.88%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Median 29.09%</td>
</tr>
<tr>
<td>Total</td>
<td>509</td>
<td>Average 27.32%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Median 24.86%</td>
</tr>
</tbody>
</table>

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Adju Sting t he ReS tRicted Stock tRA nSA ctionS

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(Finnerty model)\(^7\) and 2) Longstaff Maximum Price Strike Lookback Put (Longstaff model).\(^8\)

The Finnerty model assumes a payout based on average price achieved for the underlying asset over the term of the option contract. The Finnerty model provides a partial coverage of the opportunity cost for inability to liquidate at the higher prices reached during the life of the option by averaging it with the potential losses. Therefore, the Finnerty model is generally assumed to be the viewpoint of the “willing seller” in a restricted stock transaction.

On the other hand, the Longstaff model is based on a lookback put option, which assumes a payout based on the highest value achieved for the underlying asset over the term of the option. The Longstaff model fully compensates the buyer for the inability to sell during the period of the contract, protecting against a realized loss in value as well as the opportunity cost of not being able to sell at the intermediate high price reached.\(^9\) As a result, the Longstaff model is generally assumed to be the viewpoint of the “willing buyer” in a restricted stock transaction.

To isolate the impact of the difference in holding periods among restricted stock transactions, we used an average of the Longstaff and Finnerty models, which is assumed to be the price that a willing buyer and willing seller would negotiate. For each restricted stock security transaction, the calculation assumed a negotiated price under the following conditions: 1) an assumed holding period; and 2) the actual holding period of each transaction. The difference between the two estimated negotiated prices is the impact of the holding period on that transaction.

Many assume the values determined by these option models are discounts. However, these options are akin to those used to hedge against declines in the market price and are considered premiums.\(^10\) In this case, an investor will purchase the stock and separately purchase an option. This option provides an investor added value protecting against a decline in the market, and an investor will pay a premium for this right. In the case of each Longstaff and Finnerty model, an additional sum is not being expended for the option. Conversely, the price of the shares is being reduced or discounted. Therefore, each option above was converted from a premium to a discount before averaging, where the discount is simply the ratio of the stock price over the stock price plus the option price. It can be expressed using the following formula:

\[
\text{Discount} = \frac{\text{Premium}}{1 + \text{Premium}}.
\]

Adjusting for differences in holding periods. Revenue Ruling 77-287\(^11\) suggests that the elements of time and expense bear upon the discounts of restricted stock; the longer an owner of the shares must wait to liquidate the shares, the greater the discount. Perhaps the Rule 144 holding period restriction could be an indication of the time required to sell a privately held block. When the holding periods were one year and two years, either could be a reasonable proxy, but evidence suggests a holding period to sell an illiquid, privately held interest could be longer than only six months. Therefore, if the restriction period will be used as a proxy for the holding period, some adjustment may be needed to apply those transactions with shorter restriction requirements. Ultimately, an estimated holding period must be based on the facts and circumstances surrounding the underlying asset.

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\(^7\) John D. Finnerty, “The Impact of Transfer Restrictions on Stock Prices,” *Analysis Group/Economics*, October 2002. The equation was corrected subsequent to the original paper and was presented by Finnerty at the ASA Advanced Business Valuation Conference, 2009.


\(^9\) Ibid.


For the purposes of demonstration, we assumed a holding period of one year, which allows testing the results of the holding period adjustments to the actual FMV database. For each transaction with either a two-year holding period or a six-month holding period, we calculated the impact of the holding period differential (the difference between a one-year holding period and the actual holding period, with all other factors remaining the same). Both the Longstaff and Finnerty models require a volatility assumption, which the FMV database provides for each transaction based on the average stock prices of the six months prior to the transaction. Using the volatility based on a prospective period was considered; however, the data for a sufficient number of companies did not exist or is not readily available for all transactions. Finally, based on the available volatility for several prospective companies that was available, there was little difference for many of the transactions. An average adjustment for each holding period was applied to those transactions without volatility. The average adjustment for a six-month holding period was an addition of 6.1%, and the average adjustment for transactions with two-year holding periods was a 7.0% reduction.

Adjusting for differences in market conditions among transactions. Market conditions change over time. Volatility is a measure of broader market risk. The Chicago Board Options Exchange Volatility Index (VIX) is a measure of market expectations of near-term (30-day) volatility. The VIX is calculated using the implied volatilities of a wide range of S&P 500 index option prices. This volatility is meant to be forward-looking and is calculated from both call and put options. The VIX is a widely used measure of market risk and is often referred to as the “investor fear gauge.” The VIX can be an important attribute in assessing restricted stock discounts based on identified market and economic factors that impacted the DLOM from 1997 to 2008. The VIX values greater than 30 are generally associated with a large amount of volatility as a result of investor fear or uncertainty, while values below 20 generally correspond to less stressful, even complacent times in the markets.

Revenue Ruling 77-287 advises that buyer and seller negotiating strengths and weaknesses should be considered in restricted stock transactions. However, there is a paucity of information to access in this regard. However, it could be argued the VIX can be used as a surrogate for assessing this criterion. Therefore, under Revenue Ruling 77-287, considering the VIX appears to be almost a requirement for tax-related valuations.

To illustrate the impact of VIX on the DLOM, we analyzed the nonfinancial operating company subset of the FMV database. This subset was further subdivided to correspond to the movement of the VIX when the VIX either moved above or below 20 based on month-end closing prices for VIX as shown in Exhibit 2.

12 The FMV Companion Guide.
13 Ibid.

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**Exhibit 2. Historical VIX**

**FMV Data Subdivided by Movement in the VIX**

<table>
<thead>
<tr>
<th>Time period</th>
<th>VIX Median</th>
<th>Volatility Median</th>
<th>Number of transactions</th>
<th>Transaction month</th>
<th>Holding period</th>
<th>Marketability discount subsequent month</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N/A</td>
<td>64.2%</td>
<td>35</td>
<td>7/1/1980</td>
<td>6/1/1990</td>
<td>2 yr</td>
</tr>
<tr>
<td>2</td>
<td>21.28</td>
<td>78.0%</td>
<td>5</td>
<td>7/1/1990</td>
<td>5/1/1991</td>
<td>2 yr</td>
</tr>
<tr>
<td>3</td>
<td>13.85</td>
<td>74.1%</td>
<td>99</td>
<td>7/1/1991</td>
<td>6/26/1997</td>
<td>2 yr</td>
</tr>
<tr>
<td>4</td>
<td>23.91</td>
<td>87.6%</td>
<td>94</td>
<td>9/9/1997</td>
<td>10/7/2005</td>
<td>1 yr</td>
</tr>
<tr>
<td>5</td>
<td>15.74</td>
<td>78.3%</td>
<td>62</td>
<td>10/21/2003</td>
<td>11/6/2007</td>
<td>1 yr</td>
</tr>
<tr>
<td>6</td>
<td>23.41</td>
<td>71.6%</td>
<td>19</td>
<td>11/29/2007</td>
<td>8/26/2008</td>
<td>6 mo</td>
</tr>
</tbody>
</table>
For the most part, the timing of the holding period changes by the SEC under Rule 144 seems to match changes in the VIX. The VIX was not available in the 1980s. However, the first period has lower median volatility and DLOM. It is clear that the VIX has an influence on the DLOM, as does the holding period, although the effects of changes in the holding period are somewhat muted by offsetting increases in the VIX. However, the VIX prior to 1997 (Period 3) is similar to the period from 2003 to 2007 (Period 5), and the discount is five percentage points higher, which would appear to be due to the longer holding period. Secondly, during the one-year holding period, the change in VIX alone (between Periods 4 and 5) reflects a decrease of approximately nine percentage points in the DLOM.

Period 2 corresponds with the occurrence of the Gulf War. Furthermore, during periods of a higher VIX, when the holding period changed from one year to six months, DLOM decreased by 9%.

**Adjustments for VIX.** The DLOM for the restricted stock transactions in the FMV database was adjusted for the holding period as discussed above. The FMV database is based on average volatility for the six months prior to the transaction date, minimizing the effects of short-term sudden changes.\(^\text{14}\) For transactions since 1990, we grouped the transactions into quintiles by the VIX index presented in the FMV database. The average DLOM was 18.2% for the lowest quintile and 28.3% for the highest quintile, representing a range of approximately 10 percentage points. One method to adjust the DLOM for differentials in the VIX over time is to adjust DLOM on a sliding scale from high to low VIX. Under this method, the range of adjustment spans from subtracting four percentage points from the DLOM of those transactions at times of higher VIX to adding six percentage points at times of the lowest VIX. The time prior to the VIX was considered a prior period of low VIX because the average volatility in that period was low. In general, transactions during times of higher VIX also had higher stock volatility. Comparing Periods 4 and 5, while the VIX was higher, so was the volatility. However, calculating the effect of volatility without considering the effects of the VIX on the DLOM was only a few percentage points using the Longstaff and Finnerty models, which was not adjusted for separately.

The Companion Guide suggests a separate step of adjusting DLOM for the VIX during uncertain times. The adjustments cited here are not an alternative to that modeling; rather, we are only presenting methodologies to better compare transactions over different economic and market periods.

\(^{14}\) Ibid.

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**Exhibit 3. Comparison of Total Asset Variable**

<table>
<thead>
<tr>
<th>Quintile</th>
<th>Total Assets</th>
<th>Companion Guide</th>
<th>FMV Database Transaction Month with Only Non-financial Operating Companies</th>
<th>Adjusted Using Option Models and VIX with Only Non-Financial Operating Companies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Range (Smm)</td>
<td>High Low Median Discount</td>
<td>Range (Smm) High Low Median Discount</td>
<td>Range (Smm) High Low Median Discount</td>
</tr>
<tr>
<td>1st</td>
<td>16,326.3</td>
<td>157.1 11.0%</td>
<td>9,080.6 78.5 13.2%</td>
<td>10,655.5 129.3 17.9%</td>
</tr>
<tr>
<td>2nd</td>
<td>154.5</td>
<td>57.0 11.4%</td>
<td>78.2 42.7 15.3%</td>
<td>128.5 65.0 20.7%</td>
</tr>
<tr>
<td>3rd</td>
<td>56.2</td>
<td>21.6 15.9%</td>
<td>42.1 18.8 17.5%</td>
<td>64.9 33.8 24.1%</td>
</tr>
<tr>
<td>4th</td>
<td>21.4</td>
<td>9.3 23.7%</td>
<td>18.8 8.5 25.6%</td>
<td>33.5 16.8 27.2%</td>
</tr>
<tr>
<td>5th</td>
<td>9.1</td>
<td>- 28.9%</td>
<td>8.5 0.6 32.1%</td>
<td>16.7 0.7 31.2%</td>
</tr>
</tbody>
</table>

Note: The Companion Guide adjusted total assets for inflation. The FMV database presents transactional data at historical values. The model used in the report adjusts data for inflation including the offering value.
Analysis of the variables. Revenue Ruling 77-287 considered attributes such as market value, total assets, total revenues, and book value to be significant. The Companion Guide also considers volatility and market-to-book ratios to be significant. For each attribute, the FMV database can be sorted and summarized by quintiles, compiling the median DLOM for each quintile using the adjusted DLOM (our analysis excluded financial service companies [SIC category 6] and developmental stage companies). The median DLOM for the quintile group provides an indication of the appropriate discount. Each attribute can be weighted based on its significance. Those having a greater divergence between the first and fifth quintiles would be weighted more heavily.

Exhibit 3 is a comparison of the total asset variable presented in the Companion Guide, accompanied by the results from the analysis discussed above.

The columns titled “Adjusted Using Option Models and VIX” include only nonfinancial operating companies (discussed above). The Companion Guide data include the entire FMV database. Since the number of six-month holding period transactions is limited and the effects of the changes in the VIX and two-year holding period tend to offset, the difference in DLOM results is due to developing discounts based on post-transaction data.

Testing the average of the Longstaff and Finnerty models. Much of the analysis rests on the assumptions for changing DLOM for the length of the holding period restriction. Option models are largely dependent on a stock’s price volatility. A summary of DLOM by quintile using volatility was prepared as discussed above, and the average volatility using a one-year holding period was compared to the average of the Longstaff and Finnerty models. There was little difference when the results were compared to the actual observed discounts in the FMV database except for transactions with high volatility as seen in Exhibit 4.

Business appraisers continually seek to better understand the comparable data used in valuations. This is also true for DLOM. However, few have endeavored to quantify the effects of the holding period and VIX on the DLOM. While the option models provide guidance and similar conclusions to the FMV database, this is only a single variable. Consideration of more variables will yield better use of restricted stock data. The model expressed herein provides a mechanism for using restricted stock transactions in times of shorter holding periods, along with specific company factors that may influence the DLOM. Perhaps, as an example, a right of first refusal that could delay the sale several months could be calculated in the model by lengthening the assumed holding period.

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