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The Market Price of Risk: Quantifying a COVID-19 Equity Risk Premium Using High-Yield Bond Pricing

By Mark A. Orndorff, CFA, ASA, and
Matthew L. Jakes, CFA, ASA,
Southard Financial LLC (Memphis, Tennessee, USA)

Valuation professionals are faced with a complex problem of providing appraisals of private companies with valuation dates in 2020 while considering the market volatility and economic slowdown caused by the COVID-19 pandemic. As entire sections of the U.S. economy were shut down and millions of people were forced out of work, business owners in the United States have faced significant uncertainties about the future cash flows of their companies.

When providing appraisals of companies in the time period where the impact of the pandemic is known and knowable, valuation professionals are tasked with: (1) deriving a discount rate that reflects the level of risk inherent in the company's future cash flows; and (2) assessing whether the cash flows to be discounted/capitalized reflect the risk and uncertainty the pandemic caused. For example, if the valuation professional is provided with projected future financial statements from company management that reflect the expected impact of the pandemic on the cash flows, then recent guidance from the AICPA and appraisal organizations is to utilize the inputs to the cost of equity capital that would otherwise normally apply (no specific adjustment). However, if management is unable to provide projected financial statements that accurately reflect the impact of the pandemic, then recent guidance from the AICPA and appraisal organizations is that the valuation professional would need to use a discount rate that reflects the risk factors of the COVID-19 pandemic. In other words, the appraiser would need to increase the discount rate by some amount.

In this article, we will develop a methodology to help valuation professionals quantify the additional risk that could be used for appraisals of private companies where forecasted cash flows that reflect the impact of the COVID-19 pandemic are not available.

Theory and practice. In theory, the capital asset pricing model (CAPM) is an expectational concept. In other words, what expected rate of return does an investor expect (demand) at the present time for an investment in a particular asset. While we tend to think of pricing formulas in terms of equity securities, the broader theoretical concepts are based upon a pricing model for all financial assets.

In the application of the CAPM model (or any other model to derive a capitalization rate), analysts typically rely upon historical data to estimate the cost of equity. The use of historical inputs when using an expectational pricing model should always be scrutinized, particularly when the financial markets are in turmoil due to an external event that might cause a shift in the pricing of risk in either the long term or the short term. The model is based upon the following simple premise: Investors demand a rate of return commensurate with the risk level borne.

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Expressed mathematically, the modified CAPM method results in the following relationship:

$$CR = R_f + (R_{eq} * \beta_j) + R_{size} + R_{cs}$$

where:

CR = Capitalization rate for the subject entity;

R_f = Risk-free rate of interest;

R_{eq} = Equity risk premium;

β_j = Beta coefficient;

R_{size} = Size premium; and

R_{cs} = Company-specific risk premium.

In determining the appropriate inputs for the CAPM, the following issues must be evaluated:

- What is the appropriate risk-free rate to use?
  - Theory would indicate that a current risk-free rate should be used even if one believes it is not representative of a longer-term view. In the valuation profession, the 20-year Treasury bond yield is often used as a proxy for the risk-free rate. In the past 12 years, since the recession that started in 2008, Treasury yields have been low, and, at times, artificially low due to the actions of the Federal Reserve to bolster the U.S. economy. This has resulted in some valuation professionals using normalized risk-free rates in their cost of capital analysis. During the months of March 2020 and April 2020, the Federal Reserve enacted several measures to bolster the U.S. economy, including purchasing massive amounts of securities that would have the impact of temporarily suppressing interest rates to historic lows.
- What about the equity risk premium?

- Theory indicates that the expected difference between the return on the equity market and the risk-free rate is an appropriate measure of the equity risk premium (ERP). In practice, a long-term ERP is used as a proxy for future expected returns. However, expectations are subject to continuous change (reflected in changing asset prices) yet the assumptions valuation analysts use are based on fairly consistent historical equity risk premiums. In our opinion, abrupt changes in market pricing of financial assets should be viewed as a change in the expectations of market participants. Further, increased market volatility would also imply a changing of market dynamics.

- Do size premiums change when market risk pricing changes? While not addressed in this analysis, appraisers will need to determine whether there is a material shift in the premium normally applied to smaller companies versus larger companies.

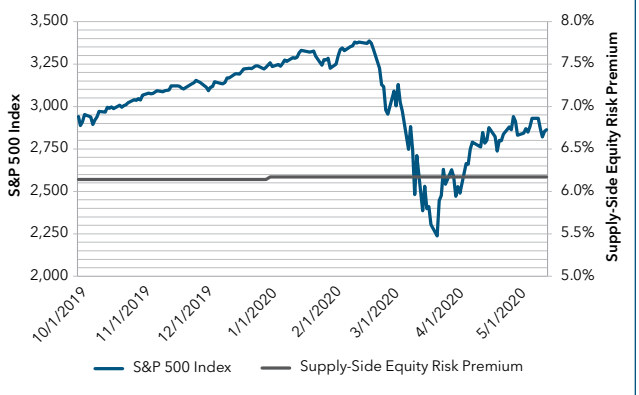
- Do industry risk premiums change during a period of high market volatility? The models that are used are based upon historical data (betas based on historical pricing relationships). Market volatility could result in changes to beta in the short term, while most valuation models utilize betas based on longterm historical data.

- How do analysts apply a company-specific risk premium? A new variable enters the decision-making process for the company-specific risk premium. Appraisers need to assess how the structural change or the event identified as causing the change in equity risk pricing impacts the subject company.

Quantifying the change in equity market pricing. This article addresses the questions: (1) Can external/exogeneous events (geopolitical events, pandemics, etc.) result in a change in the overall market price of risk, or a change in the required return on risky assets above the risk-free rate of return? (2) Can we quantify the change in the expected return on risky assets above the risk-free rate of return? We believe that the answer is yes to both questions and that the COVID-19 pandemic offers a case where the market price of risk underwent a structural shift, either in the short run (hopefully), but perhaps for the long term. In this article, we will attempt to help valuation professionals quantify that change.

COVID-19 and the change in equity risk. Since we are attempting to measure the change in pricing of equity risk in the market, we must look for data from the markets to evaluate. Due to the global economic slowdown and overall fear the COVID-19 pandemic caused, it is clear that risk pricing changed in late February 2020 and March 2020, with equity prices declining sharply and market volatility increasing. Exhibit 1 shows the magnitude and timing of the equity market decline and subsequent partial recovery from Oct. 1, 2019, to May 15, 2020, along with the historical supply-side equity risk premium. The starting point in October represents a period when the impact of the COVID-19 pandemic was indisputably not a known or knowable event and valuation professionals would have no reason to account for the repricing of equity risk in their valuation models.

Exhibit 1. S&P 500 Index Value vs. Supply-Side ERP



After reaching an all-time closing high of 3,386.15 on Feb. 19, 2020, the S&P 500 Index closed at 2,237.40 on March 23, 2020 (down 33.9% from its peak), but it rebounded to 2,863.70 as of May 15, 2020 (up 28.0% from the year-to-date low). Clearly, the risk of holding equities changed dramatically in a very short period. Does it make sense to continue using the same equity risk premium? In a stable economic environment, we believe that the historical equity risk premium is appropriate. However, we are certainly not in a stable economic environment right now. Some professionals will argue that the risk of the pandemic should be built into cash flows. Specific projections are almost certainly flawed in normal times, much less during a pandemic that presents the biggest modern challenge to businesses across the globe. In our opinion, most business owners cannot fully understand the impact of the pandemic and its potentially long-lasting influence on the economy. However, one variable of the valuation model is obviously changing: the risk of holding equities compared to owning a risk-free asset.

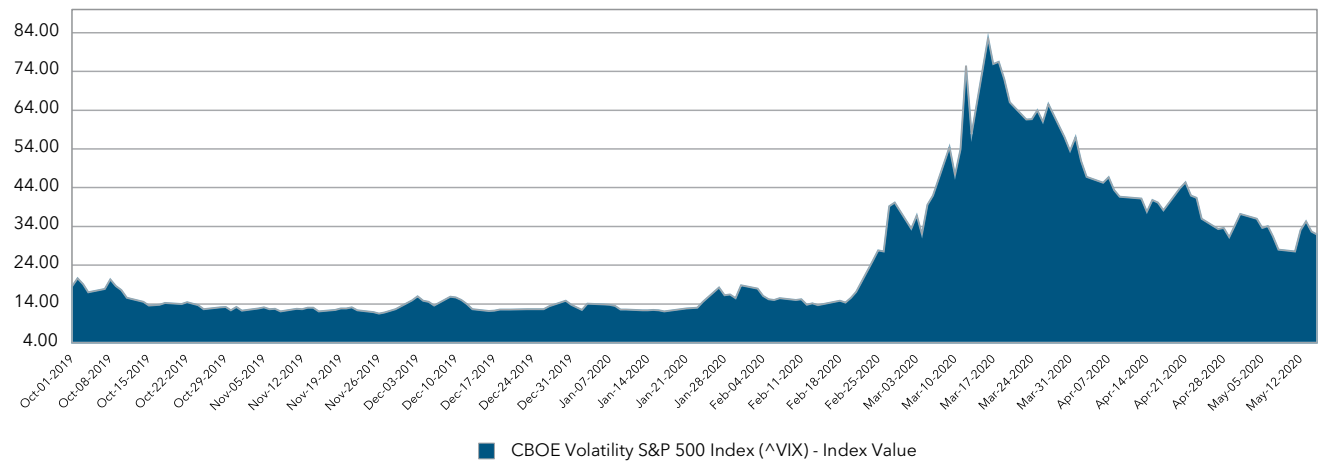
COVID-19 and Volatility. Confirming the degree of market turmoil was equity volatility during the same period. The Chicago Board Options Exchange created the CBOE Volatility Index (VIX) to measure the constant, 30-day expected volatility of the U.S. stock market, derived from real-time, midquote prices of S&P 500 Index call and put options. The VIX is sometimes known as the U.S. stock market's "fear index." Exhibit 2 depicts the VIX level from Oct. 1, 2019, to May 15, 2020, highlighting the increase in market volatility in mid-March 2020, concurrent with the wave of shutdown orders from U.S. state and local governments.

Looking at a longer-term view of the VIX levels from Oct. 1, 2005, to May 15, 2020, it is evident that market volatility increases in times of economic turmoil and uncertainty (Exhibit 3). The recession that followed the collapse of the housing market in 2008 shows a spike in volatility to near the same levels as observed in March 2020.

High-yield bonds as a proxy for market equity risk pricing. Where can an analyst look to evaluate changes in equity market risk premiums (expected returns versus risk-free rate)? We cannot look to historical equity pricing for changes in the expectations for future asset pricing when there is a significant event such as the COVID-19 pandemic. However, other fixed-income asset classes have contractual rates of returns, some of which have equity-like characteristics.

A class of investment that has risk characteristics similar to equity securities is high-yield (junk)

Exhibit 2. VIX Level From Oct. 1, 2019, to May 15, 2020



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bonds. Highyield bonds, which have both current yields as well as rates of return to maturity, are the "next-in-line" to equity in a market collapse. Due to its default risk, high-yield bond pricing is more closely related to the strength of the underlying business (particularly during periods of economic distress), while the price of typical investment grade debt is tied to interest rate fluctuations. Similar to the Great Recession, prices on investment grade debt increased (interest rates declined) starting in late February 2020 at the onset of the COVID-19 pandemic. Meanwhile, high-yield bond prices declined significantly along with equity prices.

Exhibit 4 shows the relationship between high-yield bonds (as measured by the SPDR Lehman High Yield Bond Index) and equity prices (as measured by the S&P 500 Index) over the Oct. 1, 2019-to-May 15, 2020, period.

Exhibit 3. VIX Levels From Oct. 1, 2005, to May 15, 2020

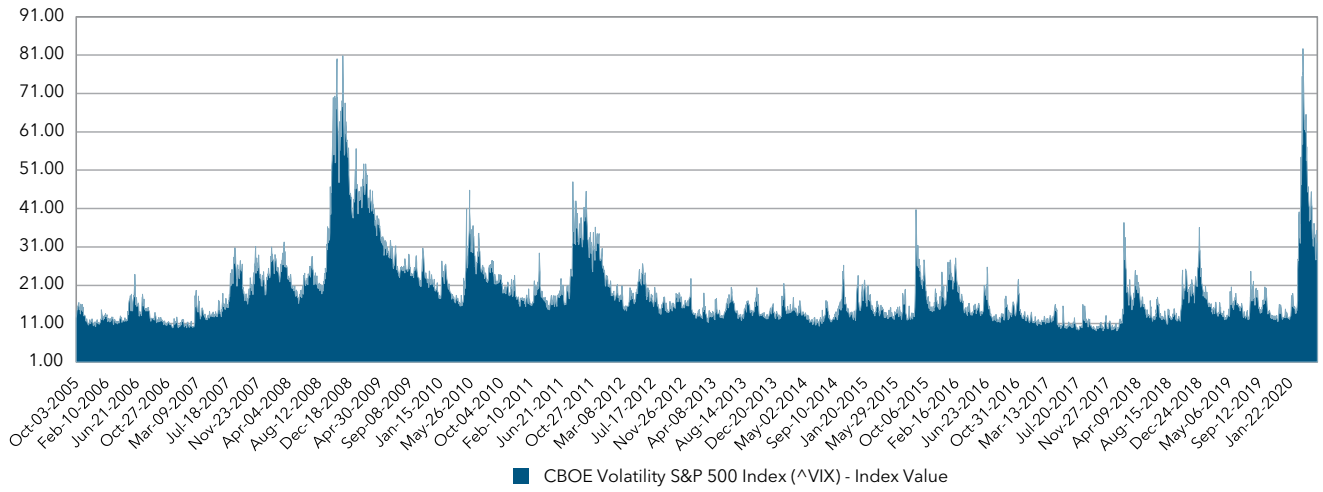
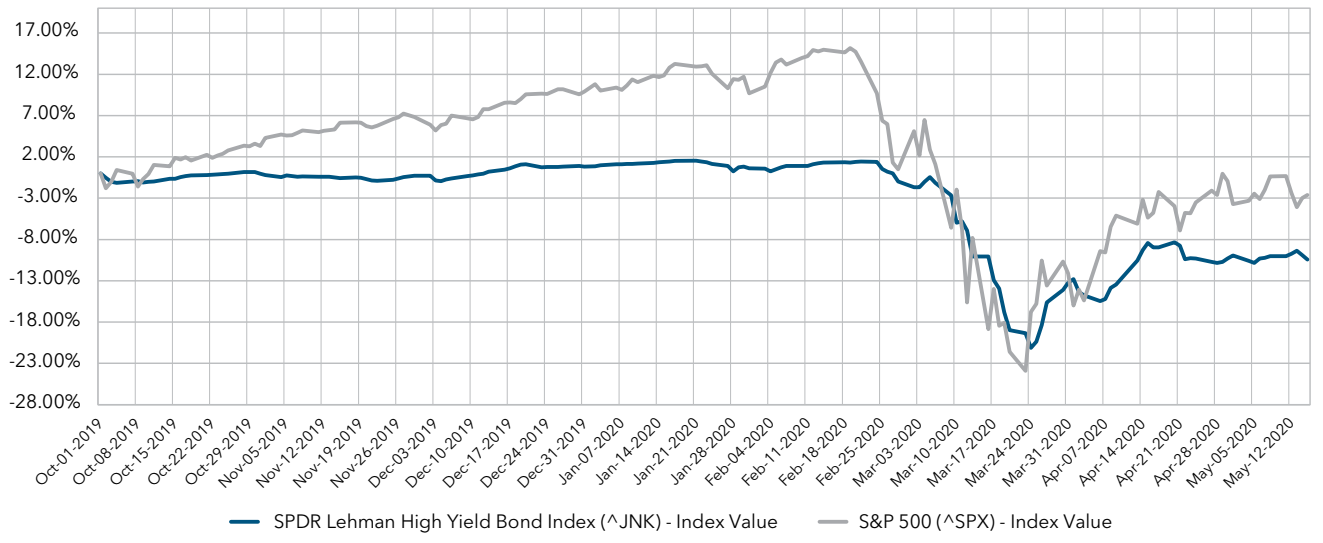


Exhibit 4. Relationship Between High-Yield Bonds and Equity Prices



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High-yield option-adjusted spread and changes in market risk pricing. To measure the increase in risk pricing, we can observe the spread of the junk bond yields over the risk-free rate and measure the change in the spread over the period of time that the structural event occurred. This can be done by observing the yield on a high-yield bond index compared to the risk-free rate and calculating the spread over a period of time. However, the high-yield bonds may have embedded options, such as call options, put options, or conversion options that increase the yield spread over the risk-free rate. Therefore, we have chosen to observe the option-adjusted spread (OAS) as a proxy for the yield spread on high-yield bonds over the risk-free rate. The OAS adjusts the spread on a fixed-income security yield over the risk-free rate for the impact of the embedded option. For the OAS in our analysis, we utilized the ICE BofA US High Yield Index Option-Adjusted Spread (ICE OAS) obtained from the Federal Reserve Economic Data (FRED) published by the Federal Reserve Bank of St. Louis.

The ICE OAS increases during periods of economic distress and uncertainty, and the change in the spread identifies the increase in required return of a quasi-equity security relative to the risk-free interest rate (additional equity risk over the risk-free asset). Exhibit 5 shows the inverse correlation between the change in the ICE OAS (along with the spread of the ICE BofA US High Yield Effective Yield over the 20-year Treasury rate) and S&P 500 returns over the period from Oct. 1, 2019, to May 15, 2020.

In our opinion, the change in the ICE OAS from a period of relatively low market volatility to the period of a global pandemic and widespread uncertainty in the future of the U.S. economy is indicative of the increase in the market price of risk in the short term.

Implications for the cost of equity. Clearly, COVID-19 had a significant impact on equity prices. Absent any observable adjustment to the CAPM and buildup model, the estimated cost of equity will grossly understate the risk of an investment in the equity of a private company. Further, simply "managing" the cost of equity with a subjective company-specific risk premium can lead to additional scrutiny.

Exhibit 6 estimates the cost of equity for a small privately held company as of Dec. 31, 2019, along with a comparison to the cost of equity as of March 31, 2020, without any quantifiable adjustments to the component inputs aside from updating the risk-free rate.

In periods of economic downturns such as the Great Recession and the onset of COVID-19, the risk-free rate declined. However, this does

Exhibit 5. Interest Rate Spreads vs. S&P 500 Return

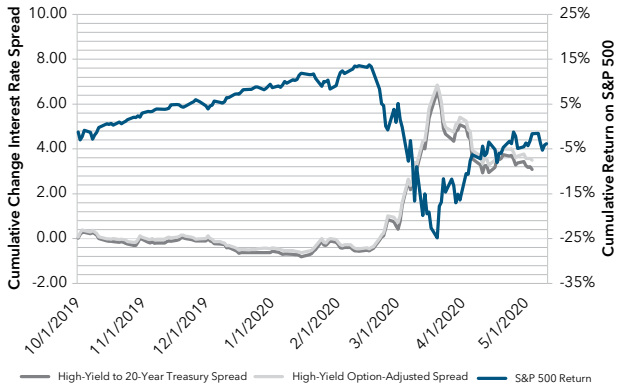

Exhibit 6. Unadjusted Cost of Equity Dec. 31, 2019, and March 31, 2020

Cost of Equity	12/31/2019	3/31/2020
Long-Term Government Bond Rate (20-year)	2.25%	1.15%
Equity Risk Premium		
Duff & Phelps Historical Equity Risk Premium	6.17%	6.17%
Beta	1.00	1.00
Beta Adjusted Equity Risk Premium	6.17%	6.17%
Duff & Phelps Size Premium	4.99%	4.99%
Specific Risk Premium	0.00%	0.00%
Cost of Equity	13.41%	12.31%

not mean that the rate of return equity investors demanded declined. The ICE OAS averaged about 3.84% from Oct. 1, 2019, through Feb. 21, 2020. However, the spread increased to 8.77% on March 31, 2020. This change in the option-adjusted spread shows an increase in the required return for a quasiequity security relative to the risk-free interest rate of 493 basis points (8.77% less 3.84%).

Revisiting the change in the cost of equity in Exhibit 6, we have added an additional risk premium in Exhibit 7 to reflect the impact of COVID-19 and the increased risk associated with equity investments.

Adding the change in the option-adjusted spread of 493 basis points to the equity risk premium increases the overall cost of equity by 383 basis points. If one assumes a growth rate of 2.5%, then the introduction of the COVID-19 risk premium above results in a reduction in the implied capitalization factor of 26.0%, consistent with the observed changes in market price-to-earnings ratios over the same period of time.

Exhibit 7. Adjusted Cost of Equity Dec. 31, 2019, and March 31, 2020, to Reflect Impact of COVID-19

Cost of Equity	12/31/2019	3/31/2020	Change
Long-Term Government Bond Rate (20-year)	2.25%	1.15%	-1.10%
Equity Risk Premium			
Duff & Phelps Historical Equity Risk Premium	6.17%	6.17%	0.00%
Equity Risk Premium Related to COVID-19	0.00%	4.93%	4.93%
Combined Equity Risk Premium	6.17%	11.10%	4.93%
Beta	1.00	1.00	0.00
Beta Adjusted Equity Risk Premium	6.17%	11.10%	4.93%
Duff & Phelps Size Premium	4.99%	4.99%	0.00%
Specific Risk Premium	0.00%	0.00%	0.00%
Cost of Equity	13.41%	17.24%	3.83%
High Yield Option-Adjusted Spread	3.84%	8.77%	4.93%

Admittedly, other factors, such as liquidity, impact high-yield bond pricing. Thus, a valuation analyst may consider reducing the equity risk premium by a small degree to account for the increased liquidity risk of high-yield bonds in economic downturns.

Presentation and discussion of results. Valuation professionals have been presented with a difficult task to determine the market value of investments in privately held companies due to the COVID-19 global pandemic and its impact on the U.S. economy. For appraisals with valuation dates where the impact of the COVID-19 pandemic was known or knowable, valuation professionals must account for the increase in the risk associated with an investment in the company. There have been numerous discussions among valuation professionals in online forums and webinars about the best practices of dealing with the COVID-19 impact in appraisals. In a perfect situation, business owners would be able to look into the future and provide accurate forecasts of a company's future cash flows. In this case, the additional risk associated with an investment in the company would be reflected in the forecasted cash flow and would not need to be reflected in the discount rate. However, it is our experience that business owners are likely not able to provide such forecasts. Therefore, we need to somehow reflect the increased risk in the cost of equity capital.

Valuation professionals often use the company-specific risk premium (CSRP) to account for specific increases or decreases in overall risk based on the circumstances of the company. In the use of the CSRP, it is difficult to quantify the adjustment and the appraiser must use professional judgement to determine the level of increased risk. In our opinion,

an additional equity risk premium can be estimated by the increase of the high-yield OAS above the level observed in a baseline period. The estimated additional equity risk premium can be used in the CAPM or buildup models to capture the increased risk the COVID19 pandemic caused.

The data show that the additional risk premium increased from 1.20% on Feb. 28, 2020, to 7.03% on March 23, 2020, but it declined to 3.94% by May 15, 2020. In our opinion, appraisers should apply an additional equity risk premium in the range indicated based on the valuation date. As an example, for a valuation date of March 31, 2020, appraisers could use the 4.93% premium shown in the example above, or the premium could be rounded down to account for the estimated impact of liquidity on junk bond yields.

Not every company is impacted in the same way by the COVID-19 pandemic. In fact, some companies have seen higher revenues as a result. The equity risk premium related to COVID-19 could be supplemented by an increase or decrease in the company-specific risk premium to consider additional qualitative factors, including the impact of COVID-19, on the specific company. For example, in the valuation of a restaurant that has been forced to close or only provide take-out meals, an appraiser might apply the additional equity risk premium and increase the company-specific risk premium. On the other hand, the valuation of a company that sells personal protective equipment to the medical industry might require the mitigation of the higher equity risk premium by reducing the company-specific risk premium.

It could be argued that the additional risk should be handled completely within the company-specific risk premium while using the observed historical risk premiums in the model. Simply increasing the company-specific risk premium to capture the additional risk of the pandemic is very subjective and would require quite a bit of guesswork. In our opinion, the additional equity risk is quantifiable from the market data presented. Further, it is clear that the equity markets priced in additional risk with the dramatic decline in stock prices.

Mark A. Orndorff, *CFA, ASA, and* ***Matthew L. Jakes,*** *CFA, ASA, are both principals at Southard Financial LLC, a full-service business valuation, financial advisory, and transaction advisory firm based in Memphis, Tenn. The firm offers corporate valuations, transaction advisory services, fairness opinions, and services for financial institutions.*