LATHAM & WATKINS LLP

Demystifying Modern Convertible Notes

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Table of Contents

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Introduction

Issuing convertible notes has long been an attractive capital-raising option for public companies. At its most basic essence, a convertible note is a debt instrument that pays interest and principal, but also carries the right to exchange the interest and principal cash streams into an equity interest, typically common stock, of the issuer. In that sense, a convertible note can be viewed as a debt instrument combined with a call option (a warrant) on the underlying common stock. However, this basic structure has evolved considerably, particularly within the past 20 years, to incorporate several new and sometimes relatively complex features to address changing regulatory and accounting frameworks and investment strategies. To a company contemplating a convertible note offering in the United States, many of these features may seem counterintuitive, and even puzzling. This primer aims to demystify the underlying financial and accounting principles and the mechanics that have developed to respond to those changing frameworks and strategies. With the right advisers to help navigate the potential pitfalls, many companies can effectively raise funds through convertible note offerings while reducing their overall cost of capital and, accordingly, increasing stockholder value.

Basic Valuation Theory

Having a basic familiarity with convertible note valuation models is necessary to understand the more complex concepts described below, such as delta hedging, that form the basis of many features of modern convertible notes. A valuation model is a mathematical function that takes input variables, or "inputs," and outputs a theoretical value of an asset. The inputs to most convertible note valuation models include the economic terms of the notes (such as the interest rate, tenor, and initial conversion price), issuer-specific metrics (such as an estimate of the company's credit spread, the current price of the underlying common stock, expected dividends during the term of the notes, and the volatility of the returns on the trading price of the underlying common stock), and market metrics (such as the risk-free interest rate and its term structure).

A convertible note can be viewed as a non-convertible, "straight" note coupled with a call option on the underlying shares of common stock. The more basic valuation models will directly assume this hypothetical bifurcation and calculate the value of the convertible note as the sum of the values of the hypothetical straight note and call option. Additional features of the security, such as redemption rights, are often factored into this basic model to achieve a more robust valuation framework. While this bifurcation assumption overlooks some important valuation nuances, which are described in more detail below, it nonetheless serves as a sound building block from which the more complicated aspects of convertible notes can be examined.

All About Settlement Methods

The settlement method of a convertible note refers to the manner in which the type and amount of consideration due upon conversion is determined. There are three primary settlement methods: physical, cash, and combination. Physical settlement is the simplest of the three. Upon conversion of a physically settled note, the noteholder receives shares of common stock at the applicable conversion rate, together, if applicable, with cash in lieu of any fractional share. Under cash settlement, the conversion value is paid exclusively in cash. For these purposes, "conversion value" roughly means the value of the common stock that would have been delivered had physical settlement applied. For reasons described in more detail below, the conversion value is usually determined by reference to the conversion rates and volume-weighted average prices (VWAPs) per share of common stock over an "observation period" spanning multiple trading days. Combination settlement is exactly what its name implies — some portion of the conversion value is paid in cash and the remaining portion is paid in shares. Combination settlement where the conversion value, up to the principal amount, is paid in cash and any excess over the principal amount is paid in shares is sometimes called "net share settlement."

A convertible note that permits the issuer to elect physical, cash, or combination settlement is often called "Instrument X." That term, which is an extension of references to instruments A, B, and C in early FASB literature on convertible notes (EITF 90-19), can be attributed to Robert Comerford in a speech he gave at the 2003 AICPA National Conference on Current SEC Developments, while he was a Professional Accounting Fellow at the SEC's Office of the Chief Accountant.

THE STRAIGHT NOTE

The value of a straight note is simply the present value of its expected interest and principal payments, discounted at the issuer's cost of straight debt. If a convertible note is issued at par (as is typically the case), then its coupon rate will always be less than the issuer's cost of straight debt. All other factors being equal, an investor of convertible notes will be

Option Styles

The exercise feature of an option generally falls within three broad categories, or "option styles": (1) an American option, which can be exercised at any time before its expiration; (2) a European option, which can be exercised only at its expiration; and (3) a Bermudan option, which can be exercised only on specified dates at or before its expiration.

willing to receive a coupon rate that is lower than the coupon rate it would demand if the notes were not convertible, because the embedded call option representing the conversion right has value.

THE CALL OPTION — INTRINSIC VALUE AND TIME VALUE

While the intricacies of call option pricing models are beyond the scope of this primer, an important fundamental concept is that a call option's value consists of two parts: intrinsic value and time value.

The intrinsic value of a call option is the value that would be earned if the option were immediately exercised and the underlying shares immediately sold. It is the difference between the trading price of the common stock and the exercise (conversion) price. Consider a call option on one share of common stock with an exercise price of $10 per share. If the stock's trading price is $13 per share, then the holder of the call option could exercise the option, thereby purchasing a share for $10, and then sell that share for $13 and earn a profit of $13 – $10 = $3. This option is said to be "in the money" with an intrinsic value of $3. Conversely, if the stock's trading price were $7 per share, then the holder of the call option would not exercise it, since the holder could purchase the underlying share at a cheaper price in the open market. For this reason, the option is said to be "out of the money" with an intrinsic value of zero. Similarly, if the exercise price and the stock's trading price are equal, the option is said to be "at the money" with an intrinsic value of zero.

For an "American" call option that can be exercised at any time before its expiration, time value is the value derived from the fact that the owner of the option may forgo exercising now to retain the possibility of exercising sometime in the future when the stock price may be higher than it is now. Time value is also derived from the downside protection that call options provide. Investing in a call option on an issuer's common stock can be viewed as an alternative to investing in the common stock directly. A direct investment in a number of shares of stock and a call option on that same number of shares struck at the current stock price will both potentially participate in stock price appreciation. However, the call option will generally always cost less than the direct investment and will also be limited on the downside. The worst an option can do is expire worthless. A direct investment in the underlying stock, on the other hand, may result in the loss of the entire value of the common stock. The value of this downside protection is manifested in time value. As such, the term "time value" itself is perhaps a little confusing, as time-to-expiration is not its only determining factor.

More on Option Pricing Models

Several option pricing models exist. Many of these models, such as the often-cited Black-Scholes model, adopt simplifying assumptions regarding how financial markets operate and derive an "equilibrium" option price that removes all possibilities of arbitrage (that is, the ability to earn a riskless profit from inefficiently priced assets). Another model, called the binomial pricing model, is conceptually easier to understand, although its implementation is usually computationally intensive and often involves computers running custom software. The binomial model, however, is incredibly flexible and is the basis for some of the most sophisticated option pricing models used today (with the Black-Scholes model, at least in its original form, now being largely relegated to use only in the academic and accounting fields or to roughly estimate the implied volatility assumption of traded options). Under a very basic binomial model for a European option that can be exercised only at expiration, the option's time to expiration is first split into equal, discrete units or "steps" (such as one trading day), and at each step, the price of the underlying stock is assumed to either go up by a fixed percentage or go down by a fixed percentage. For example, one could assume that at each trading day, there is a 60% chance that the stock price increases by three basis points from its close on the prior trading day, and a 40% chance that it decreases by two basis points. The actual probabilities for, and amounts of, these assumed increase and decrease factors can be derived as functions of the stock price return volatility and the duration of the step. With these assumptions, the universe of paths that the stock price can take from today through expiration can be mapped onto a "binomial tree," with each node of the tree at one time step breaking into two downstream nodes at the next time step. In more sophisticated models, the actual trading prices of options on the relevant stock are used to derive "implied" binomial trees. In all cases, for each final (or "terminal") node in the tree, which represents the stock price at expiration, the intrinsic value of the option at expiration can be calculated using the stock price at that node and the exercise price. The probability that the stock price reaches each of the terminal nodes can also be calculated. By summing the probability-weighted expected values of the option at expiration (in other words, by summing the option intrinsic values at each terminal node, weighted by the probability that the stock price reaches that node), one arrives at an expected option value at expiration. Discounting that value to the present will yield an estimated value of the option today.

In normal circumstances, an American call option that has not yet expired will always have positive time value. Further, an option on a stock with a highly volatile trading price will have higher time value than an otherwise identical call option on a stock with a relatively steady trading price. This property of call options can be explained as follows: at any given time in the future, both options will have a minimum value of zero, but the option on the volatile stock will carry a higher probability of

It's All Greek to Me

The sensitivity of the price of an option to the time to expiration, the price of the underlying stock, and the volatility of the stock price return are called, respectively, theta, delta, and vega, and the sensitivity of delta to the price of the underlying stock is called gamma. Delta and gamma are described in more detail below.

being significantly in the money than the option on the steady stock. Similarly, the downside protection that the call option affords to a highly volatile stock is worth much more than the downside protection that it would afford to a steady stock. Because of this property, the market will usually accept lower coupon rates for convertible notes of issuers whose stock price is expected to be more volatile than issuers with less volatile stock. As a general matter, this property explains why high-growth companies and issuers in volatile industries are frequent users of convertible notes as a financing tool.

Another important aspect of time value is how it is affected by the passage of time and the trading price of the underlying common stock. The longer the option is exercisable, the higher the time value, all else being equal. This is because a longer exercise period creates a higher likelihood that the option will be in the money at some point during its life. Accordingly, time value tends to decrease as time passes and reach zero when the option expires and is no longer exercisable. For a call option, this erosion of value as time passes is called "time decay." Finally, ignoring default risk, a call option's time value will generally be at its greatest when the option is at the money and will tend to decrease as the trading price of the underlying common stock moves away from the strike price, if all other factors remain constant.

Examining Time Value and Its Consequences

As noted above, a convertible note has an embedded call option as one component of its value proposition, and that call option has time value. This fact has several important consequences.

NOTEHOLDERS WILL NOT NECESSARILY CONVERT IF THE NOTES ARE IN THE MONEY

A conclusion from the discussion above is that, in a positive interest rate environment, if a convertible note has not yet matured or been called for redemption, then it will have positive time value. This means that its trading price in a relatively efficient market will always exceed the sum of the value of its straight debt component and the intrinsic value of its conversion right. Accordingly, while a convertible note still has time value, a noteholder should, in theory, always be able to sell the note for a higher price than the current value of the shares into which the note is then convertible. As a result, convertible noteholders will generally not convert their notes before the time the notes are just about to mature or be redeemed. Although "rogue" early conversions do happen for a variety of reasons, convertible note issuers usually need not be overly concerned about widespread conversions if the notes are not yet approaching maturity or redemption, even if the conversion right is in the money. Conversely, an issuer should prepare itself for conversions en masse if its convertible notes are nearing maturity or redemption while in the money. In practice, noteholders most often convert a maturing, in-the-money note after the record date immediately preceding the maturity date, once they have become entitled to receive the last interest payment.

Time Value at the Extremities

Considering what happens to time value when the stock price approaches extreme limits — either zero or infinity — can yield insights. At the lower limit when the stock price is zero, time value will also be zero. Modern financial theory predicts that a stock's price will converge to the market's perception of the discounted expected future returns on that stock. Accordingly, if a stock's price reaches zero, then the market considers the probability that the stock will earn any positive future return to be exactly zero. In that scenario, the probability that the stock's price will appreciate is zero, and, by definition, the time value will also be zero. At the other extreme, consider what happens if the stock price "reaches" infinity: The stock price cannot conceivably go any higher, and, accordingly, the total value of the call option is maximized at infinity. Since the total value cannot go any higher, the call option, by definition, will have zero time value (and infinite intrinsic value). Put another way, the total value of a call option approaches its intrinsic value as the stock price approaches infinity, all else being equal. Because time value tends to be maximized when the option is at-the-money, it follows that time value tends to decrease as the stock price moves away from the strike price.

Dividends on the underlying common stock muddy the theoretical waters to some extent, but the conclusion discussed above generally still holds true. If an option on dividend-paying common stock can be exercised before expiration, a set of economic circumstances will exist that would justify an early exercise, and at each point in time and stock price when early exercise is optimal, time value will be zero. For example, consider a call option that is currently in the money and nearing expiration, with an upcoming ex-dividend date for a large dividend scheduled to occur before expiration. The drop in the trading price of the common stock that is expected to occur on the ex-dividend date, coupled with the approaching expiration, may make the likelihood of the option expiring out of the money very high, particularly if the volatility of the non-dividend component of the common stock trading price is low. These circumstances could make an early exercise immediately before the ex-dividend date optimal, as it would permit the option holder to purchase shares at a discount now and be entitled receive the dividend (or, alternatively, immediately sell the shares, which, as described below, will tend to reflect the present value of the dividend in their trading price), as opposed to allowing the option to likely expire worthless. In fact, with relatively realistic assumptions, it can be shown that, for an American call option on stock that pays dividends, at each point in time during the term of the option that is immediately before an ex-dividend date, a stock price will exist above which early exercise is optimal (see the sidebar for a deeper explanation). The set consisting of these points in time and stock prices is called the "early exercise boundary," and its presence will cause an American option, which can be exercised at any time before expiration, to be worth more than an otherwise identical European option, which can be exercised only at expiration, if the underlying common stock pays dividends. Because a European option cannot be exercised before expiration, dividends on the underlying common stock can in fact cause the option to have negative time value during its term.

Convertible notes issued in US capital markets behave, for the most part, like American options (including Instrument X notes with conditions to conversion). However, convertible notes are more expensive to "exercise" than a traditional American option, because conversion forces the investor to forgo future interest payments on the notes. Furthermore, an increase in the issuer's dividend rate from the rate prevailing at the time the notes were issued will usually result in an upward adjustment to the conversion rate, which helps offset the downward impact the increase will have on the value of the conversion right. These factors, coupled with market forces that tend to eliminate perceived arbitrage opportunities, will generally ensure that even for convertible notes of dividend-paying issuers, investors will not have an economic incentive to convert early, except in relatively uncommon circumstances, such as where the market for the notes is highly illiquid or the cost of stock borrow is high.

When Is Early Exercise Optimal?

Financial professionals refer to early exercise of an American call option on dividend-paying stock as being optimal if a rational investor would exercise, rather than hold, that option immediately before the option "goes ex" on a dividend. For these purposes, the ex-time is the moment after which an exercise will not settle in time for the option holder to be entitled to the dividend on the shares deliverable upon settlement (because the option holder will not be a record holder of those shares at the time that determines which stockholders will receive the dividend). The expected payoffs for exercising versus holding will determine which action is optimal, and a rational investor will choose to exercise if (x) the intrinsic value immediately before the ex-time (the expected payoff for exercising) exceeds (y) the option's value immediately after the ex-time, assuming it is not exercised (the expected payoff for holding). The latter quantity, (y), can be expressed as the sum of the intrinsic value and the time value of the option immediately after the ex-time. In addition, we can expect the stock price to drop immediately after the ex-time by the present value of the dividend. Stated differently, if the option is and remains in the money, then the difference between the intrinsic value immediately before and after the ex-time is simply the present value of the dividend. Therefore, the quantity, (x), will exceed the quantity, (y), and, accordingly, early exercise will be optimal, if the present value of the dividend at the ex-time exceeds the time value of the option immediately after the ex-time. Now, insights regarding time value and its sensitivities can be applied to reach meaningful conclusions. For example, since, all else being equal, the time value of an in-the-money call option decreases and approaches zero as the stock price increases, there must exist a stock price — the "boundary stock price" — above which the time value of the option will be less than the present value of the dividend, and early exercise will be optimal. More generally, anything that increases time value (such as an increase in volatility or time left to expiration) will also tend to make early exercise non-optimal by increasing the boundary stock price, and vice versa.

MAKE-WHOLE FUNDAMENTAL CHANGE PROVISIONS

A large part of the bargain that convertible note investors pay for is time value. Accordingly, investors expect to be compensated if an event occurs that significantly erodes or eliminates the time value of their investment. This is exactly what happened in 2004 when rumors began to spread that MGM Mirage was interested in acquiring Mandalay Resort Group for cash, shortly after Mandalay issued a new series of convertible notes. If consummated, the acquisition would cause the notes to become convertible into a fixed amount of cash pursuant to a customary "conversion continuity" indenture provision, which is described in more detail below (see "Conversion Rate Adjustments — Conversion Continuity Provisions"). Generally, a conversion continuity provision provides that if the underlying common stock is exchanged for other consideration in a business combination, reclassification, or other similar transaction, then the notes will become convertible into that other consideration following the consummation of the transaction. In the case of a cash merger in which the convertible note issuer's common stock is acquired for cash, the convertible notes will become convertible solely into cash. While the cash value of common stock varies over time (and that variability results in

The Interplay Between the Debt and Call Option Features of Convertible Notes

A robust valuation model for convertible notes should account for both the debt and the call option features of the security. While some of the more simple models compute the value by treating those features as separate and independent components that can be summed together to arrive at a combined value, that approach overlooks several important nuances. For example, as discussed in this section, the opportunity cost of converting a convertible note is higher than that of exercising an otherwise identical call option, since converting entails forgoing future interest payments. Accordingly, the value of the call option feature is not always independent of the value of the debt component. The binomial model can easily address this interplay by simply evaluating, at each node in the binomial tree, whether the expected value of holding the note exceeds the conversion value. There is no easy corresponding kludge for the Black-Scholes model. This is just one example of the versatility of lattice models, such as the binomial model, and other comprehensive models, such as those that employ finite-difference methods, that are widely used in the market today.

positive time value, as described above), cash has a fixed nominal value. As a result, Mandalay's rumored acquisition would eliminate the remaining time value of its convertible notes. The note investors were not happy, and members of the underwriting banks' sales forces likely found themselves on the receiving end of what must have been some uncomfortable phone calls. Investor fears turned out to be warranted in June 2004, when Mandalay publicly disclosed MGM's formal offer to acquire it for cash. However, by then, the market had already crafted a new provision, called a "make-whole fundamental change" provision, designed to compensate noteholders for these types of events. The first issuance of convertible notes with a nascent version of this provision appears to be by Providian Financial Corporation in March 2004. The term "make-whole fundamental change" was coined in the indenture for a convertible note offering by Option Care, Inc., a few months later.

Under the modern version of this provision, the conversion rate is temporarily increased if certain events, called "make-whole fundamental changes," occur that reduce or eliminate time value. Make-whole fundamental changes include the classic example of a cash merger, but they also include other events, such as the delisting of the underlying common stock, which reduces time value by decreasing liquidity and, accordingly, the ability to quickly sell the stock at fair value. As described below, calling the notes for redemption can also trigger make-whole fundamental change provisions. Importantly, a business combination event pursuant to which the notes become convertible into consideration 90% or more of which consists of listed stock of another issuer is usually excluded from the definition of make-whole fundamental change. The theory behind this exclusion is that the convertible notes will continue to have meaningful time value following the business combination because a substantial part of the consideration due upon conversion will be based on the value of a price-volatile asset — listed stock. This is rough justice, obviously, since the new underlying security could be significantly more or less volatile than the original underlying security. Nonetheless, this is the current market compromise on the issue.

The temporary increase to the conversion rate is usually designed to result in the consideration due upon conversion having a value that, except as described below, approximates the theoretical value of the notes immediately before the make-whole fundamental change. Accordingly, converting noteholders that are entitled to the increased conversion rate will, in theory, be "made whole" for the loss of time value resulting from the make-whole fundamental change. The amount of the increase is determined by reference to a table and is based on the effective date of the make-whole fundamental change and a measure of the value of the underlying common stock as of that effective date, called the "stock price." The stock price is usually the average of the last reported sales prices per share of the common stock over the five trading days immediately before the effective date or, in the case of a cash merger, the amount of cash paid per share in the merger. The "make-whole table," as it is often called, is usually left blank in the preliminary offering document and is populated in the pricing term sheet and the final offering document based on pricing and other terms prevailing at the time the note offering is priced. The table columns usually correspond to stock prices, increasing from the left to the right, with the first, leftmost column typically representing the last reported sale price per share available at the time the offering is priced (which is referred to as the "reference price") and one of the other columns reserved for the initial conversion price. The table rows, in turn, correspond to the effective dates, with the first row representing the settlement date of the offering and the last row representing the maturity date of the notes (or an earlier date, if any, as of which the notes become freely redeemable). See Appendix A for an example of a make-whole table.

"Increased Conversion Rate" vs. "Additional Shares"

Often, make-whole fundamental change provisions refer to "additional shares" being added to the conversion rate. While an increase in the conversion rate could require additional shares to be delivered upon conversion (such as in the case of a make-whole fundamental change caused solely by a delisting of the underlying common stock), this will not be the case in the classic cash merger that these provisions were primarily intended to address. In a cash merger in which the underlying common stock is exchanged for cash, the notes will become convertible into cash, and, upon conversion in circumstances in which the conversion rate is increased, the additional consideration resulting from the increase will be paid in the form of cash, if delivered after the cash merger's effective date. Nonetheless, make-whole fundamental change provisions often refer to "additional shares" merely because the conversion rate is initially denominated in shares.

Each entry in the make-whole table corresponding to a particular effective date and stock price is calculated by inputting, into a convertible note pricing model, the market, note-specific, and issuer-specific variables prevailing at the time the convertible note offering is priced, but substituting such effective date and stock price for the issue date and common stock trading price, respectively. With those inputs, the pricing model generates an estimated fair value for the convertible note as of that hypothetical effective date (albeit a very rough estimate, since the market and other inputs prevailing at the effective date may be significantly different from those prevailing at pricing). The conversion value (calculated as the product of the initial, unadjusted conversion rate and such stock price) is deducted from the result. This yields an estimate, as of the effective date, of the value noteholders would lose if they convert and sell the shares they receive upon conversion. However, because this estimate is denominated in dollars and not shares, it is divided by the stock price corresponding to the table entry being calculated to yield a share-denominated result that can be inserted into the table as an amount that is added to the conversion rate.

While the majority of the entries in the make-whole table are calculated as described above, certain entries are calculated as mathematical plugs, as follows:

- The first column, which corresponds to a make-whole fundamental change with a stock price equal to the reference price, consists of a number that, when added to the initial conversion rate, yields a conversion price that is equal to the reference price. In this case, noteholders are "made whole" for the conversion premium they accepted when the offering was priced. Since almost all convertible note offerings are priced at 100% of their principal amount, this is the number you would expect for the entry corresponding to the closing date and the reference price, since it yields a conversion value of $1,000 per $1,000 principal amount of notes. The convention described in this bullet point merely copies that number for each other date corresponding to the reference price.
- Each of the entries in the final row of each column with a stock price that is equal to or less than the initial conversion price consists of a number that, when added to the initial conversion rate, yields a conversion price that is equal to that stock price. The remaining entries in the final row are zeroed.

Appendix A contains computational examples illustrating these plug entries and the rationale behind them.

The span of stock prices in the make-whole table is usually sufficiently broad enough such that there is little or no lost value at the columns for the highest stock price, and the table entries for the lower end of the rightmost column will be zero or near zero. While the table for most issuers will tend to span up to roughly three times the reference price, the table can span a larger range for issuers with highly volatile stock prices. Conversely, the make-whole table for issuers with lower volatility or with a relatively high dividend rate (more on this later) will tend to have a tighter span of stock prices. In all cases, however, the indenture will provide that the conversion rate will not be increased for a make-whole fundamental change with a stock price that is less than the reference price or greater than the highest stock price in the make-whole table. Furthermore, to address make-whole fundamental changes with an effective date and stock price that do not fall exactly on a single table entry, the indenture will provide that the increase to the conversion rate will be computed by linear interpolation.

The entries in the make-whole table are typically adjusted in the same manner as the conversion rate is otherwise adjusted. Accordingly, a cash dividend that results in an upward adjustment to the conversion rate will also increase each entry in the make-whole table by the same factor. Similarly, the stock prices in the column headings of the table will also be adjusted inversely in the same manner. However, the indenture will require that no increase to the conversion rate as a result of these make-whole fundamental change provisions can result in a conversion price that is less than the reference price (with such reference price being similarly adjusted in the same manner as the stock prices in the table). This latter requirement was originally intended to address an accounting concern that has since been repealed, but it also proves useful in assuring there is a conversion premium when navigating the stock exchange stockholder approval rules.

THE EFFECT OF REDEMPTION RIGHTS ON TIME VALUE AND THE MAKE-WHOLE TABLE

Convertible noteholders are generally more sensitive to redemption rights than holders of straight notes, since redemption rights for convertible notes not only cut short the expected stream of interest payments but also reduce time value. As described above, with all else being equal, time value becomes higher the longer the option is exercisable. An issuer redemption right will have the effect of shortening the exercisability period, which, consequently, will reduce time value. If a convertible note is currently redeemable at the issuer's option, then, absent special circumstances, its time value will generally reflect an exercise period equal to the minimum number of days' notice that the issuer must provide to redeem the notes. More advanced convertible note valuation models, however, can incorporate additional pricing factors that, for example, bear on the likelihood that the notes will be called.

Redemption Table Make-Whole vs. Coupon Make-Whole

Many straight debt instruments provide for a "coupon make-whole" upon redemption. Under these provisions, the cash redemption price will include the present value of the remaining scheduled interest payments through maturity or some earlier date. This present value is usually calculated at a slight premium (*e.g.*, 50 basis points) to the US Treasury rate for a comparable tenor. While some convertible notes contain similar coupon make-wholes, they are relatively uncommon. As described in this section, convertible notes that are redeemable often have a price trigger that requires the notes to be significantly in the money before they can be called, coupled, in many cases, with a table make-whole. The table make-whole in fact incorporates the (present) value of the remaining interest payments, since the valuation model used to populate the table should account for both the straight-debt and the conversion features of the notes. However, there is an important difference between the "embedded" coupon make-whole reflected in the make-whole table and a cash coupon make-whole. The former, in effect, assesses the present value of the remaining interest payments at a cost of capital that reflects the issuer's credit risk, while the latter uses a small spread above a measure of the risk-free interest rate. Since a non-government issuer's cost of capital will be meaningfully higher than the risk-free interest rate, the value of the remaining interest payments reflected in the table make-whole will generally always be less than the present value that would be calculated in a cash coupon make-whole. However, unlike a table make-whole, a cash coupon make-whole will not compensate for lost time value.

Convertible notes that become freely redeemable by the issuer, subject to no price or other condition, after a specified "redemption trigger" date typically also provide that a make-whole fundamental change will not result in a temporary increase to the conversion rate if it occurs after the redemption trigger date. This makes intuitive sense, since make-whole table entries for dates on or after the redemption trigger date, if they were filled, would reflect near-zero time value.

However, freely callable convertible notes are relatively uncommon. More often, convertible notes with a redemption feature not only contain a "no-call" period during which they cannot be redeemed, but also require a price condition to be satisfied before they may be redeemed outside the no-call period. Typically, the price condition requires the underlying common stock to trade above a fixed premium (typically 30%) over the conversion price for a specified period of time. For these securities, the make-whole table customarily contains zero values for each entry that corresponds to both a date that is outside the no-call period and a stock price that satisfies the price condition.

There is an important exception, however. Issuers that want the flexibility of a redemption right usually pay for that redemption right through some combination of a higher coupon rate or initial conversion rate. Since investors must be compensated for the reduced time value resulting from the redemption right, and convertible notes are usually priced at 100% of their principal amount, the other pricing variables (primarily, the coupon rate and initial conversion rate) must be adjusted to recoup the lost value. One prevalent solution is to treat calling the notes for redemption as a make-whole fundamental change, potentially resulting in a temporary increase to the conversion rate. This feature can significantly reduce or eliminate the effect that adding a redemption right will have on the coupon rate and the initial conversion rate. For notes with this feature, the make-whole table is populated assuming that the notes are not redeemable. The lost time value caused by calling the notes for redemption is recouped by the resulting table make-whole (in theory, at least, as true recoupment will occur only if the inputs, other than the stock price and date, employed in the valuation model to populate the table in fact hold true at the time the notes are called for redemption).

Delta Hedging

Investors in convertible notes often fall under one of two categories: long investors and hedge investors. Long or "fundamental" investors are those that have an investment thesis with respect to the convertible notes that convinces them that, all things considered (*e.g.*, the issuer's industry and its place in that industry, the issuer's credit profile, and the interest coupon and conversion price of the convertible notes), the notes and, particularly, their time value component (principally, an evaluation of how likely the notes are to end their life in the money) are a good investment. Long investors may of course seek to reduce the unsystematic risk of their investment (*i.e.*, the risk that is specific to a particular issuer or its industry) by holding a well-diversified portfolio of investments in a multitude of industries and asset classes. But, generally, a long investor to some degree takes a "long view" of the value of the issuer's securities.

Hedge or "arbitrage" investors will also take a long position in the relevant convertible notes and seek to rationally reduce unsystematic risk, but they will also often employ a strategy, called a "delta hedge," to reduce the common stock price risk of their long position. Understanding the delta hedging strategy is important to understanding modern convertible notes, because several features of convertible notes are tailored specifically to accommodate delta hedging.

A primary goal of a delta hedging strategy is to reduce or minimize the sensitivity of the investor's investment to changes in the trading price of the common stock underlying the notes. Under this strategy, investors will short sell a number of shares of common stock (or take an equivalent short position by other means). The number of shares sold short depends on how much of the price sensitivity the investor seeks to hedge. For the most part, the investor's short position will be designed to minimize all of such sensitivity (resulting in what is called a "delta-neutral" hedge), but the investor could instead tailor the short position based on a bullish or bearish view on the common stock. (Delta hedges can also be achieved using short positions in equity derivatives, such as equity swaps or even options on the underlying stock. While the focus of this discussion is on short stock positions, the underlying principles apply to any form of delta hedge.)

To determine the magnitude of the short position, the investor uses a convertible note valuation model to generate an estimated fair value for the convertible note using the most currently available values for the model's inputs. The investor then varies the common stock price input to the model while keeping all other inputs constant and observes how the estimated fair value of the convertible note changes. By doing so, the investor can estimate the sensitivity of the trading price of the notes to the trading price of the common stock. This sensitivity is called "delta."

Suppose the investor observes that if the stock price increases (decreases) by $1 per share, then the theoretical value of a $1,000 investment in the convertible notes will increase (decrease) by $50. The investor could conclude that, to seek to fully hedge the stock price sensitivity of its investment in the convertible notes, it should short sell $50 ÷ $1 = 50 shares of common stock for each $1,000 investment in the convertible notes. For simplicity, assume that the investor purchases a convertible note for $1,000 and then implements this hedging strategy by short selling

50 shares of the underlying common stock for $10 per share, netting cash proceeds of $10 per share × 50 shares = $500. If the stock price falls by $1 per share to $9 per share, then the investor would expect the value of its convertible note to drop by $50. However, the investor would also expect the value of its short position to rise by exactly $50 (since the investor would need to spend $9 per share × 50 shares = $450 to purchase shares in the open market to close its short position, resulting in a profit of $500 – $450 = $50). The converse is expected if the stock price increases by $1 per share — the investor would expect the increase in the value of its convertible note to be exactly offset by the decrease in the value of its short position.

Bond Pricing Models and Delta

Many commercially available and proprietary pricing models will output the delta for any given set of inputs. For valuation models that assume continuous stock price movements and have a closed-form solution, such as the Black-Scholes model, delta can usually be calculated mathematically using calculus. Discretized models, such as the binomial model or the more formal finite-difference models described below, often estimate delta by using a similar approach to that described here: varying the stock price input by a small amount and observing the impact on valuation. Sometimes, earlier calculations in the valuation process, such as valuations at other nodes in the binomial tree, can be recycled to calculate delta. For discretized models, careful refining is often required, as the size of the variance in stock price compared to how finely discretized the model is may lead to wide variations in the estimate for delta.

In the above example, the investor determined how many shares to short based on its conclusion that a $1 change in the price per share should result in a $50 change in the theoretical value of a $1,000 investment in the convertible notes. This $50 figure, normalized to an amount per share, is what the financial industry refers to as the delta of the convertible note. Using the above example, if each $1,000 note is convertible into 80 shares of common stock, then the delta for the notes is $50 ÷ 80 = 0.625, which means that the value of each portion of a note that is convertible into one share of common stock will increase by $0.625 for a $1 increase in the price per share of the common stock. An instrument with a positive delta will have a value that increases as the value of the underlying increases, and vice versa, while an instrument with a negative delta will have a value that decreases when the value of the underlying increases, and vice versa.

To translate the above example into financial vernacular, if the notes have a delta of +0.625 per share, then the investor will want to acquire an instrument with a delta of -0.625 for each share underlying the notes it holds. This yields a combined delta of zero, which is the reason this hedging strategy is called delta neutral or "zero delta." A long position in one share of common stock will have a delta of +1.00 while a short position in one share of common stock will have a delta of -1.00. Accordingly, the investor can achieve a delta-neutral position by short selling 0.625 shares of common stock per share of common stock underlying the notes it holds. In this example, the holder owns a $1,000 note that is convertible into 80 shares and should short sell 80 × 0.625 = 50 shares of common stock to achieve a zero delta position. In practice, any instrument with a negative delta can be used to achieve a delta-neutral position. For example, instead of shorting shares, the investor could sell call options or buy put options (each of which has negative delta) on the common stock in order to implement a delta-neutral hedge. For various reasons, short sales of the underlying stock are currently the most common means of implementing a delta-neutral convertible note hedging strategy.

Short Selling and Short Equity Swap Positions

Generally, a short sale involves borrowing shares from a third party and selling them into the market. The proceeds (or, in some cases, other assets) are typically posted as collateral into a margin account, and a portion of the interest earned on those proceeds (called a "rebate") is sometimes credited to the short seller. At some point in time, the short seller will need to "close" the short position by purchasing or otherwise acquiring shares to return to the share lender. If the trading price of the shares declines after the short sale, then the short seller will earn a profit, since the price at which it sold shares short will exceed the price at which it purchases shares to close the short position. Conversely, the short seller will incur a loss if the trading price of the shares appreciates.

A short position in a stock can also be created by using equity swaps. In this context, an equity swap generally refers to a transaction in which one party agrees to pay to another party the total return (*i.e.*, the stock price appreciation/depreciation plus dividends) that would have been earned on a notional number of shares of common stock in return for a specified interest payment. The first party is called the "equity amount payer" and has a synthetic short position in the notional number of shares.

In reality, transaction costs and other factors complicate the strategy used in this example to some extent, but the fundamental concepts described above still underlie every delta hedge. In addition, as time passes while the investor holds the convertible note, the current values of the inputs to the convertible note model the investor used will change, which will cause the investor's optimal short position to vary over time. Put another way, delta is not constant, and it actually changes as the inputs to the valuation model (such as time-to-maturity and stock price) change over time. In response, the investor may dynamically adjust its short position throughout the term of its investment to maintain a delta-neutral position. The investor usually effects these dynamic adjustments by closing out a portion of its short position or increasing the short position by shorting more shares.

THE MAGNITUDE OF THE SHORT POSITION IN A DELTA-NEUTRAL HEDGE

In ordinary economic circumstances, the number of shares that the investor must short to implement a delta-neutral hedge before maturity will always be less than the number of shares underlying the notes that the investor holds. In other words, convertible notes of a solvent issuer that have not yet matured will always have a positive delta that is less than one (the rare exception is immediately before an ex-dividend date for a dividend on the common stock in circumstances where early conversion is optimal, which means delta is exactly one). This conclusion can be reached by examining how the convertible note pricing model described above predicts how the value of convertible notes is affected by changes in stock price. As described above, the value of a convertible note can be roughly estimated as the sum of the value of an equivalent straight debt instrument and the value of a call option on the underlying common stock. If the issuer is a going concern (*i.e.*, it is expected to remain in business, and not be forced into liquidation, for the foreseeable future), then the value of this hypothetical straight debt instrument will generally not be directly related to the price of its common stock, but the value of the call option will. Accordingly, a change in the price of the underlying common stock can be expected to affect the value of the embedded call option of the convertible note but — for the most part, assuming the issuer is a going concern — not the value of the embedded straight debt instrument. The change in the value of the embedded call option, in turn, will be equal to the change in its intrinsic value, plus the change in its time value.

The Effect of Borrow Costs

If the stock underlying the convertible note is relatively illiquid, stock lenders may charge a significant fee to lend the stock, and that fee may exceed any rebate to which the borrower may be entitled. The excess of the stock loan fee over the rebate is sometimes called the cost of stock borrow, and a high enough cost of stock borrow can incent early conversions by investors that employ a delta hedge, as it represents an ongoing cost to maintain that hedge. Typically, the stock loan fee accrues daily on the market value of the loaned shares, and the rebate, if any, accrues daily on the cash collateral for the stock loan. These aspects of the stock loan fee and rebate allow the cost of stock borrow to be roughly implemented in a valuation model by treating it akin to a continuous dividend yield on the underlying common stock. More advanced models treat the borrow cost as a “cost of carry” that is proportional to delta at any given point in time and stock price.

Consider a long call option on a single share of common stock. If the call option is in the money and the price of the common stock increases by $1, the intrinsic value will increase by exactly $1, but since the time value will decrease, the total change in the value of the in-the-money call option will always be less than $1, which means that delta must be less than one. Now, suppose the call option is deeply out of the money and the price of the common stock increases by $1. The intrinsic value will be unaffected if the option remains out of the money, but the time value will increase. However, the deeper an option is out of the money, the lower is the probability that it will expire in the money. Accordingly, intuitively, one would not expect the time value to increase by an amount that is greater than the change in the price of the common stock (there is an exception when the issuer is insolvent or is approaching insolvency; see “Modeling Credit Risk: Relaxing the Going Concern Assumption”). As a result, the total change in the value of the out-of-the-money call option will also be less than $1, which also means that delta is less than one.

Consider the other end of the spectrum. At the instant of maturity or redemption, delta will be exactly one, if the notes are at or in the money, or exactly zero, in all other cases. This fact is easier to deduce: at the moment a call option expires, all of its value is derived from its intrinsic value because its time value is zero. Accordingly, if the option is in the money, there is a one-for-one relationship between a small change in the price of the underlying common stock and the intrinsic value of the option. Similarly, if the option is out of the money, the intrinsic value will remain unchanged at zero if there is small change in the price of the common stock and the option remains out of the money. At the instant of maturity or redemption, the intrinsic value will be fixed, and delta will likewise be fixed at either zero or one.

The conclusion of these thought experiments is that in a relatively efficient market, a delta-neutral hedge for a solvent issuer will always involve a short position in a number of shares that is equal to or less than the number of shares underlying the long position in the convertible note. This conclusion has significant ramifications on how convertible notes must be structured to permit investors to efficiently unwind a delta hedge position.

UNWINDING THE DELTA-NEUTRAL HEDGE

Investors that short shares to effect a delta hedge will have to close their short position when the notes mature or are converted, redeemed, or sold. To close the short position, an investor usually must acquire shares to deliver to share lenders. This process, which is called “unwinding” the hedge, has particular significance when the holder converts its note.

Understanding VWAP Trading

Converting investors that purchase shares in the open market during the related observation period to unwind their short positions will seek to match the average price paid per trading day in the observation period to the VWAP for that trading day. There are several trading algorithms that are designed to accomplish this, and many major brokerage firms will facilitate “daily VWAP trades” on a guaranteed or best-efforts basis. Brokerage firms that are members of the relevant stock exchange often have access to the stock’s order book and can place buy/sell orders into the book in a manner that is designed to result in trades that approximate the day’s VWAP.

In the case of physical settlement, the unwind is simple. As described above, a delta-neutral hedge for convertible notes of a solvent issuer will involve a short position in a number of shares that will not exceed the number of shares underlying the long position in those notes. Accordingly, if a holder converts and physical settlement applies, then the holder can use some or all of the shares it receives upon conversion to close out its short position. If any excess shares remain, the holder can sell them into the open market or hold them. Where the investor expects to receive more shares upon conversion than it needs to close its short position, the investor may hedge against changes in the stock's trading price between the conversion date and the date that the shares due upon conversion are delivered. To do so, the investor can execute a sale transaction on the conversion date for the number of shares it will receive upon conversion in excess of the number it needs to close its short position. Since both the sale transaction and the conversion will settle on a t+2 basis, the investor can lock in the trading price prevailing on the conversion date and deliver the excess shares it receives upon conversion to settle the sale transaction. This unwinding process becomes slightly more complicated if cash settlement or combination settlement applies.

The Length of the Observation Period

The lead investment bank in the convertible notes offering will typically set the length of the observation period so that it is long enough that the investors' expected purchases to unwind their delta hedge positions, as described in this section, are not large enough to significantly affect the trading price of the common stock. Often, the length will be set so that the expected purchases, assuming cash settlement, will not exceed roughly 10% to 20% of the average daily trading volume. However, a shorter length may be justified in some circumstances, such as when the issue is not expected to draw many investors that employ a delta hedge.

The typical observation period for issuers with thinly traded stock will accordingly be larger than for issuers with actively traded stock. More specifically, the length of the observation period will be negatively related to the average daily trading volume of the issuer's common stock and positively related to the size of the convertible note offering and the expected initial conversion rate. In addition, if a call spread or capped call overlay is included in the transaction, then the observation period may be lengthened to accommodate potential market activity by the counterparties to those transactions during the observation period.

Note that, for purposes of determining the length of the observation period, delta is usually assumed to be one, since investors are expected to convert at maturity only if the conversion right is in the money. (As previously noted, at expiration, a call option that is in the money will always have a delta that is exactly equal to one.)

Under cash settlement, the converting holder can expect to receive cash based on the VWAP of the common stock over a multiple trading-day observation period. To close its short position, the investor must purchase shares in the open market. However, the investor will want to make those purchases in a manner that minimizes its exposure to fluctuations in the trading price of the shares. To do this, the investor will often structure its purchases to span the observation period in a manner that causes the average price that it pays to purchase shares on each trading day to approximate the VWAP on that trading day. By seeking to approximate the VWAP, the investor can ensure that the days that it pays a higher price to purchase shares in the open market will also be the days that result in higher cash being due under cash settlement (and, conversely, the days that the investor pays a lower price to purchase shares will be days that generate less cash under cash settlement).

When Does the Observation Period Begin?

The observation period that applies to a conversion is tied to the date the noteholder has surrendered its notes, and satisfied all other requirements, for conversion, which is usually called the "conversion date." Except for conversions close to a redemption date or the maturity date, the observation period will typically begin two or three trading days after the conversion date. If any notes are submitted for conversion after they have been called for redemption, or within a specified period of time before the maturity date, then a special observation period typically applies. That special observation period is designed so that its last trading day will fall exactly one settlement cycle before the redemption or maturity date, as applicable. This ensures that any market trades that the converting holder executes on that last trading day settles on the redemption or maturity date, as applicable. While this special observation period can, both in theory and in practice, begin before the relevant conversion date for a conversion, if the indenture is drafted correctly, then noteholders should have sufficient advance notice of when it will begin so that they can time any unwind or other market activity appropriately.

In other words, any "losses" the investor incurs during days it purchases shares at a high price will be offset by the additional cash consideration that becomes due upon conversion to the investor on account of that day, and vice versa. Under combination settlement, the investor will also make similar open market purchases during the observation period. However, the number of shares that it purchases on each trading day will generally be less than the number it would have purchased under cash settlement. This is because the investor may expect to receive some shares upon combination settlement, which it can use, together with the shares it acquires in the open market, to close its short position.

A key conclusion to the above discussion is that, in order to facilitate an effective hedge unwind, the converting holder must be informed of the settlement method and observation period in advance of the first day of the observation period. Otherwise, the investor cannot unwind its hedge in a manner that reduces its exposure to fluctuations in the stock price. This is why, for example, when an Instrument X or C note is called for redemption and a single observation period that precedes the redemption date applies to all called notes, a properly drafted indenture will require the redemption notice to be sent before that observation period begins. Although a long observation period may make the required advanced notice undesirably long for the issuer, it is necessary under cash or combination settlement to enable investors who choose to convert instead of being redeemed to execute an effective hedge unwind.

Unwinding Under Net-Share Settlement

A useful definition of unwinding a hedge in this context is the closing of any related securities positions and the reduction to cash of any resulting gains or losses. To unwind a physical short position, the noteholder usually must deliver shares to close that position. Converting the notes is itself part of the unwind process, as it will yield some or all of the shares, or some or all of the cash required to buy the shares, needed to close the short position. However, the noteholder must engage in additional unwind activity if the kind or amount of the consideration received upon conversion differs from the kind and amount of consideration needed to close the short position. Consider net-share settlement, where the conversion value is settled in cash up to the principal amount converted, with any excess settled in shares. As noted above, if the note matures in the money, it will have a delta of exactly one at maturity, and a delta-neutral-hedged noteholder will have a short position in the same number of shares that underlie its long position in the notes. To close the short position, the noteholder needs the entire conversion value in shares. However, upon conversion, the principal amount is settled in cash, resulting in a mismatch in the *kind* of consideration. Accordingly, during the observation period, the noteholder will purchase a number of shares having a value equal to the principal amount of its long position in the notes. Ideally, the dollar value of shares purchased will be spread proportionately over the length of the observation period and the shares will be purchased at an average daily price that approximates the daily VWAP. By structuring the purchases in this manner, the noteholder indirectly converts the cash received upon conversion into the additional shares needed to close the short position, producing an efficient unwind.

WHY INVESTORS EMPLOY A DELTA HEDGE

Delta hedging can be attractive to investors because it can form part of several broader investment strategies. At one end of the spectrum, if the convertible notes or hedging costs are underpriced, an investor could theoretically hedge many of the remaining investment risks (by, for example, using credit derivatives and short positions in US Treasuries to hedge against issuer-specific credit risk and systematic interest rate increases, respectively) and earn a relatively risk-free return that exceeds the otherwise prevailing market risk-free interest rate. At the other end of that spectrum, the investor could take a bullish view on the remaining investment risks and merely hold a delta-neutral investment with the expectation of receiving the remaining interest and principal payments under the notes. More often, however, an investor will take a bullish view on a subset of particular sensitivities and will seek to hedge the remaining risk. By holding a portfolio that remains exposed to a sensitivity on which the investor holds a bullish view, the investor will stand to profit if its view proves to be correct. Due to a fundamental

Modeling Credit Risk: Relaxing the Going Concern Assumption

Credit risk arises from the likelihood that the convertible note issuer will be unable to fully pay the principal and interest payments due on the notes. Most accepted valuation models will, at a minimum, address credit risk by discounting the debt-related payments at an issuer-specific spread above a proxy for the risk-free interest rate. Some more advanced models go one step further and introduce a negative correlation between that spread and the stock price, with that negative correlation increasing in magnitude as the stock price approaches zero. Because of this negative correlation, gamma tends to become negative at lower stock prices, as investors begin to seriously question the issuer's ability to satisfy its payment obligations under the notes. This is graphically illustrated in Appendix B, where the valuation function exhibits concavity at all points to the left of the inflection point axis. For these reasons, models that do not account for dynamic credit risk will tend to overstate gamma, and understate delta, at lower stock prices.

Introducing this correlation into a pricing model leads to other interesting predictions. For example, in ordinary circumstances, an increase in the volatility of stock price returns is expected to increase note valuation. However, issuers with highly volatile stock price returns are also usually at higher risk of failure. If the volatility is high enough, then the increased risk of default will overcome the increase in the value of the conversion right, leading to an overall *reduction* in note value. This is exactly what the dynamic credit spread model described above predicts. Modern convertible note offerings are usually priced using models that have this correlation-based insolvency modeling turned off, in large part due to the subjectivity required to quantify the correlation parameter. Instead, when marketing and pricing a convertible note offering, the lead banks will usually use a volatility that does not exceed a maximum of roughly 45%, even if historical prices or traded options imply a higher actual volatility.

property that convertible notes (and call options in general) often exhibit, called "convexity" (see "Gamma and Convexity," right), volatility is the sensitivity that note investors often choose to remain exposed to. The resulting investment strategy is sometimes referred to as "volatility trading" or "going long on volatility."

Because of convexity, the value of a delta-neutral-hedged investment in convertible notes should increase in value if the stock price increases or decreases, and the appreciation in the hedged position's value should be more pronounced the greater the change in the stock price. Accordingly, investors who employ this strategy are attracted to highly volatile stocks because they expect to profit from large changes in the stock price. As described above, when the stock price changes, so too will the notes' delta, which will prompt the investor to readjust its short position to maintain a zero delta position. This dynamic adjustment can itself yield additional profits, as more fully explained in Appendix B.

Gamma and Convexity

Delta varies as the stock price (or other factors) change. If the sensitivity of delta to the stock price, which is called gamma, is significant, then a delta-neutral hedge will not perfectly hedge against large movements in stock price. However, the gamma of a long position in a call option (including, for the most part, a long position in convertible notes of an issuer that is a going concern) will be positive, which means that its delta will increase as the stock price increases, and vice versa. Because of this, a long call position coupled with a short stock position that achieves a combined delta of zero will always earn a profit when the stock price changes significantly: if the stock price rises, then the gain in the long position will always exceed the loss in the short position, and conversely, if the stock price falls, then the gain in the short position will always exceed the loss in the long position. This feature of call options is called "convexity," and it is manifested by the valuation function taking the form of a convex line when plotted against the stock price. See Appendix B for a more detailed, graphical explanation.

A hedging investor can also choose to monetize the convexity of its convertible notes using a strategy that is sometimes called "scalping gamma." Because short positions in ordinary options (which can be created by writing a call or put option) will always have negative gamma, the investor can monetize the convexity by selling, and taking a short position in, options on the underlying common stock and collecting the option premium. However, because options also have a non-zero delta, the physical short stock position will need to be adjusted to maintain a zero delta and create what is called a "delta-gamma neutral hedge." For example, because the delta of a short call position on stock that trades at positive prices will always be negative, an investor that writes call options to implement this strategy must reduce its physical short stock position to maintain a delta-neutral position. Since physical long and short positions in stock always have zero gamma, the adjustment to the physical short stock position will not affect the investor's gamma position.

Many view the hedging strategies described above as attractive because they can be structured to allow the potential for significant returns while remaining effectively market neutral. A delta-neutral hedge also has a built-in hedge against rising interest rates: while rising interest rates tend to drive the value of the convertible note down, the hedged investor may expect to earn a higher rebate on the proceeds of its short sales that it has margined to secure the related share borrowings (see "Short Selling and Short Equity Swap Positions").

The Current State of the Art: Finite-Difference Methods

In financial mathematics, it is often not possible to define a valuation function directly. In those cases, you may instead begin by defining how the valuation changes when certain of its inputs, such as stock price or time to maturity, change by a very small amount. Approaching a valuation problem with this strategy typically yields what is called a differential equation. The next step is to consider what the valuation function must look like in order to exhibit the relationship expressed in the differential equation. A high school calculus student would have a good idea of what to do next: In theory, you can integrate the equation to obtain the valuation function itself. Although the math is much more involved in practice, this, in essence, is how Fischer Black and Myron Scholes first derived their famous equation in their seminal 1973 paper (it is worth noting, however, that the derivation would not have been possible without the development of a completely new field of stochastic calculus, which was pioneered in the mid-twentieth century by a brilliant Japanese mathematician named Kiyosi Itô). Luckily, the Black-Scholes differential equation has a closed-form solution (basically, a solution that can be expressed in a digestible formula). However, as more complexities are added to a differential equation, the equation may have no known closed-form solution, necessitating a different approach. Quantitative techniques have been developed to approximate what the valuation function would compute for a given set of inputs, even without the need to solve the differential equation and reduce it into a formal valuation function. Finite-difference methods are one class of these techniques, and they are employed by the most prevalent commercial models used today by investment banks to market and price convertible note offerings and by investors to manage their hedging activities.

Finite-difference methods used to valuate financial instruments often employ a two-dimensional grid of stock prices against points in time, where the separation between adjacent cells in the grid is fixed at some chosen finite, but small, difference. The terminal valuations at maturity (*i.e.*, the greater of conversion value and payment at maturity) can be populated, along with cells corresponding to other "boundary conditions" (basically, to reflect that the valuation approaches zero or an assumed recovery floor as the stock price approaches zero, and approaches the conversion value as the stock price approaches infinity). Valuations at the remaining cells can then be estimated recursively by using the differential equation itself, ultimately leading to a current valuation.

The description above is, of course, vastly simplified. Simply stated, these models are extremely complex, in both design and implementation.

Reducing Equity Dilution: Share Repurchases, Call Spreads, and Capped Calls

A common concern of convertible note issuers is the potential dilution that will result if the notes are ultimately converted and the issuer is required to issue common stock. However, there are several tools that can be employed to reduce or practically eliminate the potential for equity dilution.

Perhaps the most straightforward means of reducing equity dilution is conducting a share repurchase contemporaneously with the convertible note offering. Typically, one of the investment banks in the offering, or one of its affiliates, will act as the broker for the repurchase, and the shares will be acquired from investors in the note offering that are selling short in order to establish their initial delta hedge position. The price at which these shares are repurchased is usually the same reference stock price used to price the convertible note offering (*i.e.*, the last reported sale price available at pricing), and the repurchase usually settles on the same day the note offering settles. The reduction in the number of outstanding shares is attractive to issuers as it reduces the potential net dilution from future note conversions. As an added benefit, repurchasing directly from note investors can also reduce downward pressure on the stock price that might otherwise have occurred if those investors instead sold (short) into the open market. Investors often find these repurchases attractive as well, since they enable short selling at a fixed price, which in effect eliminates execution risk. The number of shares that are repurchased will largely be a function of the initial delta of the notes and the amount of notes that will be purchased in the offering by investors who will employ a delta hedge. The serendipity of the issuer's desire to buy stock at the same time investors want to sell stock has caused this transaction to be referred to colloquially as a "happy meal."

Another common financial tool used to reduce dilution is implementing a "bond hedge overlay," which, economically, is a call spread in the form of either a "bifurcated" call spread or a "unitary" capped call. Generally, these are derivative transactions entered into between the issuer and one or more financial institution counterparties, which may include the investment banks participating in the convertible note offering or their affiliates. In a call spread overlay, the issuer will purchase a "bond hedge" from the counterparties that generally entitles the issuer to receive from those counterparties some or all of the shares or cash due upon conversion of the notes if and when they are converted. To offset part of the counterparties' initial short position in the bond hedge, the issuer will issue warrants to the counterparties at an initial strike price that is higher than the initial conversion price of the convertible notes. On a net basis, from the issuer's point of view, the conversion price of the convertible notes is effectively raised to the strike price of the warrants. Largely for tax reasons, these warrants typically expire after the convertible notes mature. An alternative to a call spread overlay is a capped call, which can be viewed as a bond hedge with a cap on the value of the shares or other consideration that the counterparties must deliver upon settlement. Economically, both structures are identical, albeit for other reasons, the call spread is usually comprised of two separate transactions, while in the capped call, the "warrant" is embedded in the same instrument. The above summary is a greatly simplified description of these derivative transactions, which are potentially complicated instruments that involve challenging tax, accounting, legal, and business issues.

Accounting for Convertible Notes

Many structural features of convertible notes are designed to achieve a specific accounting objective. The following discussion summarizes some of the more common accounting principles that drive these structural features. However, the authors are not accounting professionals, and accounting experts should be consulted for definitive advice.

Debt Issuance Costs

Beginning in 2016 for public companies, debt issuance costs must be reported on the balance sheet as a deduction from the liability representing the debt and are amortized into interest expense over the term of the debt. For ease of presentation, the discussion in this section ignores all issuance costs.

INITIAL BALANCE SHEET RECORDING AND INTEREST EXPENSE

The basic accounting for the common forms of physically settled, Instrument X, and Instrument C notes is relatively straightforward. If the notes are issued at par (which is typically the case), their principal amount is recorded as a liability, and interest expense is recorded at the coupon rate. If the notes are issued at a discount, then the discount is recorded in a contra-liability account, effectively reducing the carrying amount of the liability representing the notes, and the discount is amortized into interest expense over the term of the notes.

This relatively simple accounting treatment is a recent reversion from a far more labored and, arguably, obtuse framework that the Financial Accounting Standards Board introduced in 2008 when it published Staff Position APB 14-1. Under that previous framework, often referred to as the "cash conversion subsections," a convertible debt instrument that, by its stated terms, may be settled in cash or other assets upon conversion was bifurcated into debt and equity components, which were accounted for separately. This treatment generally applied to Instrument X and C notes, but not physically settled notes. The initial carrying amount of the debt component was recorded as a liability on the balance sheet in an amount equal to the fair value of a similar debt instrument with no conversion feature. This was calculated simply as the present value of the principal and interest payments on the notes, discounted at a rate equal to the issuer's cost of straight debt. The excess of the initial proceeds of the notes issuance over this initial liability carrying amount was considered to be the equity component of the notes, which was credited to additional paid-in capital in stockholders' equity and treated as original issue discount for accounting purposes. The original issue discount was then amortized into interest expense over the expected term of the notes.

The Capitalization Table

The offering document for convertible notes often contains a capitalization table, or "cap table." In traditional finance, the purpose of a cap table is to show the mix of debt and equity that finance the issuer's operations and have claims to the issuer's assets. In its pure form in financial theory, an issuer's capitalization should equate to its enterprise value, and, accordingly, the debt and equity components should be presented at their fair values and offset by cash and cash equivalents. The cap table variant used in offering documents, however, is a completely different animal with much more limited usefulness, as it often presents GAAP values instead of fair values, among other differences. Before the accounting treatment was recently simplified, Instrument X and C notes were typically presented at their principal amount in the cap table. This presentation was largely designed to avoid the torture of valuating the bifurcated equity and debt components of the notes, as was then required by GAAP, which would require calculations based on variables, such as the coupon rate, that would not be known until the pricing of the offering. This simplified presentation has, for the most part, survived the elimination of bifurcated accounting for modern Instrument X and C notes.

Issuers and the financial market in general welcomed the return to basics. However, even the current accounting regime can become less intuitive in more unusual cases, such as where the notes are considered to have been issued with a "substantial premium" (in which case, the premium may have to be recorded as paid-in capital) or if the issuer could be forced to make certain cash payments upon conversion (which, as described below, can require mark-to-market accounting).

The Effect of Conversion Triggers

In order to avoid potentially having to classify them as a current liability at issuance, Instrument X or C notes will often be convertible at the noteholders' option only during specified time periods or if certain triggering events have occurred. If these conversion triggers include a market-price trigger, as will almost invariably be the case, then the market-price trigger will be deemed to be satisfied for purposes of calculating diluted EPS. Accordingly, the fact that an Instrument X or C note may not in fact be convertible during a reporting period will generally not impact how the note is reflected in diluted EPS.

DILUTED EARNINGS PER SHARE ACCOUNTING: IF-CONVERTED METHOD

Issuers generally must report basic and diluted earnings per share, or EPS, in their statement of operations for each reporting period. Basic EPS is equal to income available to common stockholders divided by the weighted average number of shares of common stock outstanding during the reporting period. Diluted EPS is intended to account for the effect of securities or contracts that may require the issuer to issue stock during or after the reporting period, which is called "potential common stock." Shares issuable pursuant to convertible notes, convertible preferred stock, options, or warrants are examples of potential common stock. However, potential common stock that is not dilutive to EPS (such as when net income available to common stockholders is negative) is ignored when calculating diluted EPS.

Generally, diluted EPS reflects the impact of convertible notes, if dilutive, using the "if-converted" method. Under this method, diluted EPS is calculated as EPS assuming that the convertible notes were converted at the beginning of the reporting period (or, if later, when the notes were issued). For these purposes:

- the after-tax effect of the interest expense for the notes during the reporting period is added back to the numerator of EPS, unless the principal amount must be settled in cash (*e.g.*, Instrument C), in which case there is no add-back for interest expense; and
- the number of shares issuable upon conversion is added to the denominator of EPS as follows:
  - for physically settled and Instrument X notes, conversions are assumed to be settled entirely in shares at the applicable conversion rate; and
  - for Instrument C notes, the excess, if any, of the conversion value over the principal amount is assumed to be settled in shares (even if the issuer has the right to elect to settle the same in cash).

As described earlier, the kind and amount of consideration due upon settlement of Instrument C notes depend on the VWAPs of the common stock during an observation period. Current accounting standards require diluted EPS to be calculated assuming that such VWAPs were equal to the average market price during the applicable reporting period. As a result, Instrument C notes generally cannot be dilutive to EPS if this average market price is less than the conversion price of the notes (that is, if the conversion right is out of the money, as measured by such average market price). Conversely, physically settled and Instrument X notes can be dilutive even if they are out of the money. For this reason, many issuers prefer Instrument C to Instrument X and physical settlement.

Until recently, certain Instrument X notes were afforded a diluted EPS treatment that was similar to the if-converted method applicable Instrument C notes as described above, provided the issuer could establish that it had a policy of settling the principal amount in cash upon conversion. That treatment, which was called the "treasury stock method," no longer applies to Instrument X notes, and gone with its elimination is the statement of the issuer's intended conversion settlement policy that was typically included in offering documents for Instrument X notes in order to qualify for treasury stock method accounting. Not unsurprisingly, the elimination of treasury stock method accounting for Instrument X notes also prompted many issuers with outstanding Instrument X notes to take advantage of a common feature of such notes that permits the issuer to irrevocably switch to Instrument C.

More on Conversion Triggers

Contingently convertible, or CoCo, notes usually are convertible only in the following circumstances:

- if the common stock trades at above a specified premium (usually 30%) over the conversion price for a specified period of time (called a "market trigger");
- if the notes trade at below a specified discount (usually 2%) to their conversion value (called a "downside parity trigger");
- if the notes are called for redemption;
- if certain significant distributions are made on the common stock;
- upon a fundamental change, make-whole fundamental change, or an event that causes the common stock to be exchanged for other property; and
- during a specified period (usually between three to six months) preceding the maturity date.

As long as these conditions to conversion ensure that the notes will be convertible when noteholders have an economic incentive to convert (usually, when the notes approach maturity, or are called for redemption, while in the money, and when the conversion rate is temporarily increased following a make-whole fundamental change), the existence of the conditions should not have a meaningful impact on the trading price of the notes in a relatively efficient market.

CURRENT VS. LONG-TERM LIABILITY CLASSIFICATION

Issuers often segregate current and long-term liabilities on their balance sheets. Current liabilities usually include obligations that, by their terms, are due on demand or will be due on demand within one year (or, if longer, the issuer's operating cycle) from the balance sheet date, even if liquidation is not expected within that period. Ordinarily, physically settled notes will not be classified as a current liability unless they will mature within one year of the balance sheet date (including by reason of being called for redemption as of that date) or are subject to acceleration due to the existence of a continuing default that exists as of the balance sheet date. However, if an Instrument C (or, in some limited cases, Instrument X) convertible note is currently convertible at the noteholders' option, then the possibility of a cash payment becoming due upon conversion may require the notes to be presented as a current liability, since they could be deemed to be "due on demand." Current liability classification can apply in this instance even if conversion is not likely to occur within one year.

In order to avoid having to classify such notes as a current liability as of the issuance date, they are almost always structured to include conditions to conversion. These notes are known as "contingent convertibles" or "CoCos." If no condition to conversion has been satisfied as of the balance sheet date, then the notes generally need not be classified as a current liability unless they are otherwise due within one year.

EQUITY ACCOUNTING VS. MARK-TO-MARKET DERIVATIVE ACCOUNTING

ASC topic 815 generally provides that, unless an exception applies, a derivative instrument held by a reporting entity must be accounted for as an asset or liability and "marked to market" at the end of each reporting period. If the derivative instrument is embedded in another instrument, then the derivative instrument must first be bifurcated from its host instrument and accounted for separately. Under mark-to-market accounting, the fair market value of the instrument is measured at the end of each reporting period, and the change in fair value since the end of the last reporting period is recorded as a gain or loss in the statement of operations. Because this marking to market is cumbersome and potentially injects significant variability in reported net income from period to period, issuers go to great lengths to avoid it. An important exception to this mark-to-market accounting applies to instruments that, among other requirements, are indexed to the reporting entity's own stock. The conversion feature of convertible notes can be considered a derivative instrument that is potentially subject to mark-to-market accounting. However, if the notes qualify for this exception, then they generally will be accounted for entirely as a liability, as described above, with no marking to market.

The following accounting principles are often implicated when determining whether convertible notes qualify for the exception for instruments that are indexed to the reporting entity's own stock.

The "Double-Oh-Nineteen" Requirements

Under a set of subtopics of ASC topic 815-40 that are often referred to by their predecessor's citation, EITF 00-19, the exception for instruments that are indexed to the issuer's stock will generally apply to a "convertible debt instrument in which the holder may only realize the value of the conversion option by exercising the option and receiving the entire proceeds in a fixed number of shares or the equivalent amount of cash (at the discretion of the issuer)." For these purposes, adjustment provisions that fall within the accounting literature's definition of "standard anti-dilution provisions" will not preclude an instrument from satisfying the requirement that the number of shares be "fixed." Instruments that satisfy the requirements described above were formerly referred to as "conventional convertible debt instruments," but a series of accounting amendments published in 2020 dropped the "conventional" adjective, while largely leaving the definition otherwise unchanged. For ease of reference, this primer refers to these instruments as "qualified convertible debt instruments."

Many modern convertible notes will not be qualified convertible debt instruments. For example, convertible notes with any of the following features are generally disqualified:

- Instrument X or C settlement mechanics;
- a customary make-whole fundamental change provision; or
- the customary adjustment provision for any cash dividend paid on the underlying common stock.

Instruments that do not constitute a qualified convertible debt instrument must satisfy certain additional requirements to be eligible to avoid mark-to-market accounting. These requirements principally include the following, among others:

- **The contract cannot require "net-cash settlement."** In this context, net-cash settlement means settling the in-the-money portion of the conversion option in cash. Accordingly, requiring the issuer to settle only the principal amount in cash should not trigger mark-to-market accounting. Furthermore, net-cash settlement at the issuer's option is permitted, but net-cash settlement at the option of a third party is not. Finally, mandatory net-cash settlement is also permitted when holders of the underlying security are paid cash for their securities pursuant to a change-of-control event. Accordingly, a provision that causes the notes to be convertible into cash following cash merger should not trigger mark-to-market accounting.
- **Sufficient authorized and available stock must be available to settle the contract.** The issuer must have sufficient authorized, unissued, and available shares to settle the contract, and there must be an express limit on the number of shares to be delivered. Modern convertible notes often contain a cap on the conversion rate, which can potentially address this requirement.

While the additional requirements are usually not problematic, they are often implicated in the relatively rare circumstance when an issuer is unable to deliver the theoretical maximum number of shares due upon conversion, such as due to insufficient authorized stock. In these cases, the instrument may be drafted to require the issuer to satisfy any shortfall in cash, which typically triggers mark-to-market accounting.

The "Fixed-for-Fixed" and Related Requirements

ASC topic 815-40-15 (which, like the provisions described above, is often referred to by its predecessor's citation, EITF 07-5) sets forth certain additional requirements that may apply to convertible notes for them to be considered to be indexed to the issuer's stock. These requirements often implicate the conditions to conversion usually found in Instrument X and C notes and require that the triggers not be based on any of the following:

- an observable market, other than the market for the issuer's stock; or
- an observable index, other than an index calculated or measured solely by reference to the issuer's own operations.

The typical conversion triggers (see "More on Conversion Triggers," above), which are based on the stock price, the trading price of the notes, and corporate events such as redemptions, distributions, and business combination transactions, will ordinarily satisfy these requirements.

ASC topic 815-40-15 also has implications on how the conversion rate may be adjusted. To be indexed to the

Call and Put Rights as Embedded Derivatives

An issuer's right to call the notes, or a right of noteholders to put the notes to the issuer, can, in certain circumstances, be considered an embedded derivative that must be bifurcated from its host instrument and marked to market. An example that could require this bifurcated accounting is a change-of-control put right that entitles noteholders to require the issuer to repurchase notes at a cash price equal to their conversion value. However, call and put rights generally need not be bifurcated in this manner if, among other requirements, they are deemed to be "clearly and closely related" to the economic characteristics and risks of the host instrument (the hypothetical non-convertible component of the notes). Put or call rights in modern convertible notes are usually for cash at par plus accrued and unpaid interest and ordinarily do not require bifurcated, mark-to-market accounting if the notes are not issued at a substantial premium.

issuer's stock, the conversion rate adjustment provisions must be "commercially reasonable" and based on variables that are "inputs to [a standard pricing model for] the fair value of a fixed-for-fixed forward or option on equity shares." For these purposes, acceptable inputs include the stock price, the conversion price, the term of the notes, expected dividends or other dilutive activities, stock borrow costs, interest rates, stock price volatility, and the issuer's credit spread. The standard conversion rate adjustment and make-whole fundamental change provisions included in modern convertible notes generally satisfy these requirements. In addition, adjustments to account for events that prevent maintaining a standard hedge position in the underlying shares are permissible, as are "degressive issuance" price-protection adjustments, which are described below, and provisions that permit the issuer to increase the conversion rate to induce conversions.

Conversion Rate Adjustments

Convertible notes invariably have mechanisms that adjust the rate at which they are convertible into the underlying common stock. These mechanisms compensate noteholders for various events that otherwise reduce the value of their investment in the notes or that represent a change in the bargain that noteholders negotiated for when making their investment decision to purchase the notes.

Before examining the types of conversion rate adjustments in detail, a few preliminary concepts should be well understood.

CONVERSION RATES AND CONVERSION PRICES

The conversion rate is the number of shares of common stock into which each $1,000 principal amount of notes is convertible. Conversely, the conversion price is the dollar principal amount that must be surrendered to receive one share of common stock upon conversion. In the case of Instrument X or C notes, the number of shares, or price per share, is a notional concept, since those instruments permit or require payment in cash instead of shares. The relationship between the conversion rate and the conversion price is simple — each is derived by dividing $1,000 by the other. This relationship is an inverse one, which means that an increase to the conversion rate will decrease the conversion price, and vice versa.

The conversion price can also be viewed as the effective dollar price per share of the underlying common stock, if the notes trade at par. For example, notes with a conversion rate of 20 shares per $1,000 principal amount will have a conversion price of $1,000 ÷ 20 = $50 per share. If the notes trade at par and an investor purchases $1,000 principal amount of the notes for $1,000 and converts them into 20 shares, then that investor will have paid an effective price per share of $1,000 ÷ 20 = $50, which, as expected, is the conversion price.

Modern convertible notes define their conversion mechanics in terms of the conversion rate, while other convertible instruments, such as convertible preferred stock and warrants, often do so in terms of the conversion price (or "exercise price," for warrants). If drafted correctly, however, both methods are substantively identical, and the choice of one over the other typically only reflects market convention.

CONVERSION RATE ADJUSTMENT FACTORS

Many, but not all, conversion rate adjustments are effected by multiplying the old conversion rate by a number called an "adjustment factor." The adjustment factor is usually expressed as a fraction whose numerator and denominator are functions of some combination of the number of shares of common stock outstanding, the trading price of the common stock, and the numerical parameters of the event for which the adjustment is being made. For example, the typical adjustment factor for the payment of a cash dividend is based solely on the last reported trading price of the common stock on the trading day preceding the ex-dividend date and the amount of the cash dividend per share.

Stating the obvious, an adjustment factor that is greater than one will increase, and an adjustment factor that is less than one will decrease, the conversion rate and, accordingly, the number of shares or amount of other consideration deliverable upon conversion. Generally, adjustment factors of less than one are used only in adjustments for stock combinations and reverse stock splits. As noted below, however, safeguards must be implemented for other adjustment events to ensure that the related adjustment factor is not unintentionally less than one.

Convertible instruments that adjust the conversion price instead of the conversion rate can, and often do, still use adjustment factors. The adjustment factors for these instruments are simply the reciprocal of the equivalent conversion rate adjustment factor, which can be obtained by flipping the numerator and denominator. Alternatively, the equivalent conversion rate adjustment factor can be used for these instruments by dividing, rather than multiplying, the old conversion price by that conversion rate adjustment factor.

For purposes of the discussion below, adjustment provisions that use adjustment factors are referred to as "factor-based" adjustments, and the adjustment factors described below are those that are to be applied to (*i.e.*, multiplied by) the conversion rate as opposed to the conversion price.

DEFERRAL PROVISIONS

Many indentures for convertible notes provide that the issuer may defer giving effect to any conversion rate adjustments until the cumulative deferred adjustments exceed a minimum threshold, typically 1% of the pre-adjusted conversion rate. However, these provisions usually provide that all deferred adjustments must be given effect immediately if any note is converted, if a fundamental change or make-whole fundamental change occurs, or if the notes are called for redemption, and that no deferrals can be maintained during a specified period (typically between three to six months) before maturity. As a result, these deferral provisions in effect only serve to temporarily defer the requirement to provide noteholders or the trustee with notice of adjustments, and they primarily are intended to avoid defaults stemming from an unintentional omission to provide such notice.

TYPES OF CONVERSION RATE ADJUSTMENTS

Most conversion rate adjustment provisions can be classified into one of the following six categories:

- **Anti-dilution provisions** seek to maintain the proportion of the outstanding common stock into which the notes are convertible following an event (such as a stock split, dividend, or combination) that changes the number of outstanding shares of common stock but does not affect each outstanding common stockholder's individual ownership interest in the issuer.
- **Value-transfer protection provisions** seek to compensate noteholders for an event in which the issuer transfers items of value to its common stockholders, and the noteholders, as such, are not entitled to participate in the event.
- **Make-whole fundamental change provisions** seek to compensate noteholders following certain events that are likely to significantly reduce the time value of the conversion feature of the notes.
- **Price-protection provisions** increase the conversion rate when the issuer sells common stock, or rights to acquire common stock, at an effective price that is less than the conversion price of the notes, or when the common stock trades at a price that is below a specified threshold.
- **Voluntary adjustment provisions** permit the issuer to increase the conversion rate at its election to serve various corporate purposes.
- **Conversion continuity provisions** determine the consideration into which the notes are convertible following an event (most commonly, a business combination transaction) that forces existing common stockholders to exchange their common stock for other consideration.

But Aren't All These Just "Anti-Dilution" Provisions?

Often, the industry uses the term "anti-dilution" loosely to refer to all conversion rate adjustments. While this expansive use of the term may be convenient, it is arguably an oversimplification, and a more descriptive categorization, such as the one presented here, can be much more instructive. Accordingly, for purposes of this section, anti-dilution refers only to adjustments described in the first bullet point above.

While other types of adjustment provisions exist, the above categories cover virtually all of the adjustment mechanics that modern convertible notes employ.

ANTI-DILUTION PROVISIONS

Anti-dilution provisions are the most straightforward. These provisions generally cover stock dividends, stock splits, and stock combinations, and they operate by adjusting the conversion rate proportionately with the resulting change in the number of outstanding shares of common stock. For example, a two-for-one stock split (or its equivalent, a distribution of one share of common stock on each outstanding share of common stock) will double the number of outstanding shares and, accordingly, double the conversion rate. Conversely, a one-for-two stock combination will halve the number of outstanding shares and, accordingly, the conversion rate.

These provisions often use an adjustment factor whose denominator is the number of shares of common stock outstanding immediately before the applicable event and whose numerator is the number of shares of common stock outstanding immediately after, and solely as a resulting of giving effect to, that event. More specifically, the numerator is usually measured as the number of shares outstanding immediately before the open of business on the ex-dividend date (in the case of a stock dividend) or the applicable effective date (in the case of a stock split or combination).

VALUE-TRANSFER PROTECTION PROVISIONS

Value-transfer protection provisions are designed to compensate noteholders for the reduction in the value of their convertible notes that results from the issuer transferring anything of value to substantially all of its common stockholders.

In the absence of an adjustment to the conversion rate, an issuer's distribution or other transfer of assets to its common stockholders will tend to reduce the value of the convertible notes primarily due to the following two effects:

- **The parity effect.** For the reasons described more fully below, the trading price of the common stock will tend to drop by the per share (present) value of the distributed assets on the first date when the shares trade without the right to receive those assets. This drop will reduce the conversion value (sometimes called the parity value) of the notes, which will drive the value of the conversion right down.
- **The credit spread effect.** The distribution to common stockholders results in fewer assets being available to service payments due on the convertible notes. This could increase the credit risk of an investment in the notes, which could justify the use of a higher credit spread to value the notes, driving down their value.

Of these two effects, the parity effect is usually the most significant. Moreover, the credit spread effect is often minimal because issuers that are not in bankruptcy typically will not distribute assets to common stockholders if they are financially distressed. This observation has an important consequence for notes that are convertible into only one of two or more outstanding classes of stock of the same issuer. The conversion rate for these types of notes is typically adjusted for distributions or other value transfer transactions on only the class of stock into which the notes are convertible. Distributions or other transactions on the other classes of stock, including other classes of common stock, will generally not have a direct impact on the parity value of the notes, and the credit spread effect could reasonably be expected to be minor for the reason noted above. Accordingly, these adjustments are usually limited to transactions relating directly to the class of stock underlying the notes.

Value-transfer protection provisions typically protect noteholders for two types of transactions: distributions to common stockholders and issuer tender offers for the underlying common stock. Each is described below. While the adjustment formulas in the discussion below are presented in simplified format, the formulas in their formal, contractual form can be found in Appendix C.

Distributions to Common Stockholders

Typically, distribution protection provisions are triggered by the distribution of any of the following to all or substantially all of the issuer's common stockholders:

1) in-the-money rights to acquire common stock that are exercisable for a limited period of time (usually between 45 and 60 days);
2) cash (*i.e.*, cash dividends);
3) listed equity of any subsidiary, affiliate, or business unit of the issuer (*i.e.*, spin-offs); or
4) any other securities or assets.

The adjustment for these distributions is usually factor-based. Before looking at the adjustments in more detail, understanding the underlying principles of the adjustment factors will be helpful.

To compensate for the downward impact that a distribution will tend to have on the value of the convertible notes, the adjustment should *increase* the conversion rate. This requires that the conversion rate adjustment factor be greater than one, and, since adjustment factors are usually expressed as fractions, that the numerator be greater than the denominator.

There are two general types of adjustment factors for distributions:

- those that are based on the total number of shares outstanding and the effect the distribution will have on the number of shares outstanding, which are referred to as "share-count-based adjustment factors"; and
- those that are based on the trading price of the common stock and the value of the consideration distributed, which are referred to as "value-based adjustment factors."

The adjustment factor for the anti-dilution provisions described above (see "Anti-Dilution Provisions") is an example of a share-count-based adjustment factor. Similarly, the adjustment factor for distributions described in clause (1) above is typically a share-count-based adjustment factor. Conversely, the adjustment factors for distributions described in clauses (2), (3), and (4) above are usually value-based adjustment factors.

Generally, all value-based adjustment factors begin as a fraction whose numerator and denominator consist of some measure of the value of the underlying common stock — often, the last reported sale price per share on the trading day preceding the ex-dividend date for the distribution or an average of the last reported sale prices over a period of multiple trading days. Then, to arrive at an adjustment factor that is greater than one, value-based adjustment factors either add the per share value of the property distributed to the numerator or deduct that value from the denominator (there is a rationale underlying these formulas, which will be explained shortly). Value-based adjustment factors that add such value to the numerator can be referred to as "top-heavy," and value-based adjustment factors that deduct such value from the denominator can be considered to be "bottom-light."

Bottom-light adjustment factors begin to break down as the value of the distributed property approaches the trading price of the common stock. In that scenario, bottom-light value-based adjustment factors approach infinity. When the value of the distributed property equals or exceeds the trading price of the common stock, the adjustment factor breaks down entirely and becomes undefined or negative. Although a distribution of this type is largely theoretical, indentures for convertible notes often address this contingency by providing that, in lieu of an adjustment to the conversion rate, noteholders will participate in the distribution on an as-converted basis.

Convertible notes typically provide that no conversion rate adjustment is required pursuant to these distribution-based provisions if the noteholders participate in the relevant distribution on an as-converted basis. As described further below, participation on an as-converted basis tends to result in a windfall to noteholders, particularly at low deltas, such when the conversion right is deeply out of the money.

Distributions of In-the-Money Rights That Are Exercisable for a Limited Time

This adjustment provision is usually triggered by the distribution, to all or substantially all common stockholders, of rights, options, or warrants that:

- entitle stockholders to subscribe for or purchase shares of common stock at a price that is less than the average last reported sale price per share over the 10 consecutive trading days immediately preceding the date the distribution is announced (such average being referred to as the "reference stock price" for purposes of the discussion below); and
- are exercisable for a period not exceeding a specified number of days (typically, between 45 and 60) after the record date (or, sometimes, the announcement date) for the distribution.

A distribution of rights pursuant to a stockholders' rights plan (commonly referred to as a "poison pill") is usually excepted from this adjustment provision and instead covered by the catch-all provision described below (see "Other In-Kind Distributions"). Note that a distribution of rights, options, or warrants that satisfies only one of the two bullet points above will not escape the adjustment provisions, since the distribution will trigger an adjustment pursuant to that same catch-all provision.

Are Bottom-Light Adjustment Factors More "Aggressive" Than Top-Heavy Factors?

For any given positive stock price and positive per share value of distributed property, if the former is greater than the latter (*i.e.*, in all real-world scenarios), then a bottom-light value-based adjustment factor will always be greater than a top-heavy factor and, accordingly, result in a greater upwards adjustment to the conversion rate. While this may suggest that a bottom-light adjustment factor is more aggressive, or "noteholder-friendly," that conclusion fails to look at the whole picture. Bottom-light adjustment factors in modern convertible notes always use a stock price that reflects the right to receive the distribution: either a spot price that precedes, or an average of spot prices that precede, the relevant ex-dividend date. Conversely, top-heavy adjustment factors always use a stock price that does not reflect the right to receive the distribution and, accordingly, will tend to be less than the stock price used in a bottom-light factor, all else being equal. In fact, if you assume that the stock price will drop on the ex-dividend date by the per share value of the distributed property (an arguably reasonable assumption and, as described below, one that underlies the derivation of these adjustment factors), then both adjustment factors can be shown to be equal. Why, then, is there a need for these two types of adjustment factors? The answer lies in price discovery. Top-heavy adjustments are typically used for listed spin-offs in which the value of the spun-off securities can be measured by their last reported sale prices on the relevant stock exchange. This usually requires using post ex-dividend-date prices. Using a bottom-light adjustment factor in this scenario would require the issuer to guess the value of the spun-off securities before they start trading, which is not ideal for a number of reasons.

Last Reported Sale Price vs. VWAP

Indentures for Instrument X or C notes typically use a VWAP, and not a last reported sale price, to determine the type and amount of consideration due upon conversion. A specific reason justifies why a VWAP is appropriate for that purpose. Namely, because investors can execute open market purchases in a manner designed to match any given day's VWAP, the use of a VWAP can, in theory, allow an investor to "perfectly" unwind its delta hedge over the observation period. Similarly, investors that do not hold a delta hedge position in the notes can, again in theory, eliminate the price risk of selling any shares due upon conversion by short-selling in a similar manner throughout the observation period and using any shares received upon settlement of the conversion to close their short positions. For the most part,* there is no corresponding reason to use a VWAP to determine the amount of an adjustment to the conversion rate. Accordingly, conversion rate adjustment provisions that use a measure of the value of the underlying common stock usually use the last reported sale price and not the VWAP.

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* Since an adjustment to the conversion rate will, necessarily, change the short position required to maintain a delta-neutral hedge, some investors can achieve efficiencies by adjusting their short position throughout the same period during which the market prices of the common stock are used to determine the magnitude of the conversion rate adjustment.

As noted above, the adjustment factor for this adjustment trigger is a share-count-based adjustment factor. Specifically, the adjustment factor is often expressed in the following format:

$$\frac{O+X}{O+Y}$$

O in the fraction above represents the number of shares outstanding immediately before the open of business on the ex-dividend date for the distribution. *X* represents the number of shares of common stock underlying the rights, options, or warrants, and *Y* represents the number of shares that could be purchased, at the reference stock price, with the aggregate price payable to exercise the rights, options, or warrants. Because the trigger for this conversion rate adjustment requires that the rights, options, or warrants be exercisable at a price per share that is less than the reference stock price, *X* will always be greater than *Y*. Accordingly, the fraction above will always be greater than one, and the adjustment will always increase the conversion rate.

This adjustment provision was primarily designed to cover a conventional rights offering. In these offerings, which are not common nowadays, an issuer distributes, on each share of common stock outstanding as of a fixed record date, a specified number of rights, each entitling the holder to purchase one share of common stock at a fixed subscription price. The subscription price is usually at a discount to the last reported sale price of the common stock available at the time the offering launches, and the rights are usually exercisable for a period of between 16 and 30 days. In part to satisfy stock exchange listing rules that could limit the number of shares that can be issued in these offerings, the rights are usually distributed to all common stockholders. Offerings structured in this manner will almost invariably trigger an adjustment to the conversion rate under this provision.

Cash Dividends and Distributions

Except as described below, a dividend or other distribution of cash to all or substantially all common stockholders will trigger an adjustment pursuant to this provision. The adjustment typically uses a bottom-light value-based adjustment factor with the common stock valued at the last reported sale price per share on the trading day preceding the ex-dividend date for the dividend or distribution.

For an issuer that regularly pays cash dividends at the time it conducts a convertible notes offering, the economic terms of the notes determined when the offering is priced (generally, the coupon rate, the initial conversion rate, and the make-whole fundamental change grid) will incorporate an assumption that the issuer will continue to pay those regular dividends throughout the term of the notes. Accordingly, an upward conversion rate adjustment for future cash dividends that do not exceed the regular dividend rate would represent an unjust windfall to noteholders. Instead, the issuer's regular cash dividend rate at the time of the convertible notes offering (called the "dividend threshold") is usually grandfathered, and the cash dividend adjustment provision will contain an exception for regular cash dividends not exceeding the dividend threshold. The dividend threshold, in turn, will be subject to adjustment in a manner that is inversely proportional to the anti-dilution conversion rate adjustments described above. Often, the threshold will also be similarly adjusted for adjustments made pursuant to the other value-transfer protection provisions described in this section, although the rationale for these additional adjustments is arguably not as compelling.

For these dividend-paying issuers, a cash dividend exceeding the dividend threshold will nonetheless trigger a conversion rate adjustment. In this case, the adjustment

Spot vs. Average Last Reported Sales Prices

Occasionally, the adjustment factor for cash dividends uses the average of the last reported sales prices over a specified period (typically, 10 trading days) preceding the ex-dividend date, as opposed to the last reported sales price on the trading day preceding the ex-dividend date, to measure the value of the common stock. This formulation generally tends to result in a larger upward adjustment to the conversion rate. The value-based adjustment factors described in this section will increase as the value of the common stock decreases, and vice versa. When an issuer declares a dividend and the market has no reason to believe that the dividend will not be paid as declared, the trading price of the common stock should reflect the present value of the dividend payment. In a positive interest rate environment, this present value reflected in the trading price of the common stock will increase as time passes and the payment date approaches, and it will reach its maximum on the trading day before the ex-dividend date (the present value will cease to be reflected in the trading price of the common stock from and after the ex-dividend date). Accordingly, if all other factors remain constant, an average of the trading price over a period preceding the ex-dividend date should be less than the "spot" trading price on the trading day preceding the ex-dividend date. Accordingly, using that average instead of the spot price preceding the ex-dividend date would result in a greater adjustment to the conversion rate, all else being equal.

Why Not Use a Higher Dividend Threshold?

It is possible for an issuer to negotiate a dividend threshold that exceeds its current regular dividend rate. However, this will be priced into the convertible notes, which will result in less issuer-friendly economic terms. Moreover, a dividend threshold that exceeds the issuer's current dividend rate may signal to the market that the issuer intends to increase its dividend rate. These types of signals are potentially dangerous, since the market may negatively overreact if a dividend increase does not occur when or as expected, and the issuer may be better off simply announcing a dividend increase in advance of conducting the convertible notes offering. For these reasons, very rarely is the dividend threshold set at any value other than the issuer's current dividend rate.

factor can reflect the dividend threshold in the adjustment factor in one of two ways: by subtracting it from the numerator or by adding it to the denominator. In all real-world scenarios, subtracting the dividend threshold from the numerator will result in a greater adjustment factor than adding it to the denominator. Accordingly, issuers will favor the latter approach, although it is currently the less common market convention.

Listed Spin-Offs

This adjustment provision is typically triggered if:

- the issuer distributes shares of capital stock or any similar equity interest of any of its affiliates, subsidiaries, or business units to all or substantially all of its common stockholders; and
- that capital stock or equity interest is listed or quoted (or will be listed or quoted when the transaction is consummated) on a US national securities exchange.

Similar to the adjustment provision described in "Distributions of In-the-Money Rights That Are Exercisable for a Limited Time," a distribution that satisfies the first bullet point above but not the second will instead trigger an adjustment pursuant to the catch-all provision described in "Other In-Kind Distributions."

The adjustment for listed spin-offs typically uses a top-heavy value-based adjustment factor with the common stock valued at the average of the last reported sale prices per share over the 10 consecutive trading-day period beginning on the ex-dividend date for the distribution. The value of the distributed capital stock or equity interest is measured based on the average of its last reported sale prices over the same period, and it is expressed as an amount per share of common stock. For example, if two shares of the spun-off entity are distributed per share of the issuer's common stock, then this value is calculated as two times the average of the last reported sale prices per share of the spun-off entity over the applicable 10 trading-day period.

The adjustment factor is conceptually identical to a fraction whose:

- numerator is the sum of the post-spin-off equity market capitalizations of the issuer and the spun-off entity; and
- denominator is the post-spin-off equity market capitalization of the issuer.

Other In-Kind Distributions

A distribution of any securities or other property to all or substantially all common stockholders will trigger an adjustment under this "catch-all" adjustment provision if it does not fall within the scope of any of the adjustment provisions described above. This adjustment provision customarily uses a bottom-light value-based adjustment factor with the common stock valued at the average of the last reported sale prices per share over the 10 consecutive trading days immediately preceding the ex-dividend date for the distribution. The value of the distributed property is measured at its fair market value, and the issuer's board of directors is typically tasked with determining that value to the extent it contains non-cash items.

Poison Pills

Stockholders' rights plans, which are sometimes referred to as "poison pills," are an anti-takeover measure that is commonly implemented by distributing to common stockholders rights to acquire common stock. These rights are not exercisable until a triggering event occurs involving an actual or potential business combination that the issuer's board of directors has not approved. When triggered, the rights become exercisable at a deep discount to the market price of the common stock. When not exercisable, poison pill rights trade with, and are not separable from, the common stock. Accordingly, shares of common stock issued upon conversion of the notes should include those pill rights. However, when the rights become exercisable, they are usually then separated from, and become transferrable independently of, the common stock.

Rights distributed pursuant to a poison pill could trigger an adjustment pursuant to this adjustment provision. However, the indenture will normally provide that the distribution of poison pill rights will trigger an adjustment under this catch-all provision only when the rights separate from the common stock.

Self-Tender Offers

This adjustment provision is triggered if:

- the issuer or any of its subsidiaries conducts a tender offer or exchange offer for the issuer's common stock; and
- the value of the consideration paid per share of common stock exceeds the last reported sale price per share of common stock (referred to as the "trigger stock price") on the trading day following the date that the tender/exchange offer expires.

The adjustment factor for this adjustment is a hybrid of a share-count-based adjustment factor and a value-based adjustment factor, and it is often expressed as follows:

$$\frac{(O-N)\times P+FMV}{O\times P}$$

In the above equation:

- *O* represents the number of shares of common stock outstanding immediately before the tender/exchange offer expires, including the shares purchased or exchanged in the tender/exchange offer;
- *N* represents the number of shares of common stock purchased or exchanged in the tender/exchange offer;
- *P* represents the average of the last reported sale price per share of the common stock over the 10 consecutive trading days immediately following the date the tender/exchange offer expires, which, for purposes of the discussion below, is referred to as the "reference stock price"; and
- *FMV* represents the aggregate fair market value of the consideration paid to purchase or exchange common stock in the tender/exchange offer.

While the equation may not seem intuitive at first glance, it is actually fairly simple conceptually: the denominator is the issuer's equity market capitalization based on the reference stock price, and the numerator is the same equity market capitalization except that the shares purchased or exchanged in the tender/exchange offer are valued at the fair market value of the consideration actually paid in the tender/exchange offer instead of the reference stock price. However, this adjustment provision contains an inherent pitfall — if the reference stock price is sufficiently greater than the trigger stock price that it also exceeds the value of the consideration paid per share in the tender/exchange offer, then the adjustment factor will be less than one, which will *decrease* the conversion rate. This results from using one stock price (the trigger stock price) to determine whether the adjustment provision is triggered and another stock price (the reference stock price) to determine the amount of the adjustment. Accordingly, unlike the other adjustment provisions described above, which mathematically cannot decrease the conversion rate in any real-world scenario, this adjustment provision always needs a savings clause that precludes its application when it would reduce the conversion rate.

At first glance, one might think that the need for a savings clause can be easily avoided by using the same measure for the trigger stock price and the reference stock price. In fact, some adjustment provisions do exactly that by using *P* in the formula above for both the trigger stock price and the reference stock price. While this will ensure that the conversion rate adjustment will always be upward without the need for a savings clause, this approach carries its own pitfall. As described below, the adjustment for self-tender offers customarily becomes effective immediately after the tender/exchange offer expires, and, since *P* cannot be determined until the end of the 10 trading day averaging period immediately following the expiration date of the tender/exchange offer, the adjustment is given retroactive effect. If *P* is used as the triggering stock price and a noteholder converts during the averaging period, then the issuer may be required to deliver the consideration due upon conversion before the time it can determine whether the conversion rate applicable to that conversion must be adjusted for the tender/exchange offer. While there are other potential solutions to this problem, the current market standard is to use the different trigger and reference stock prices described above, coupled with a savings clause.

What Is a Tender/Exchange Offer?

"Tender offer" and "exchange offer" are usually not defined in the indenture. Instead, market practice is to look at whether the offer is a tender offer under federal securities laws. Similarly, federal securities laws do not contain a clear definition of the term but instead rely on a framework established by case law, which considers various factors, such as whether a widespread solicitation is involved, the percentage of the outstanding securities being sought in the offer, whether the offer price is at a premium to market, and whether the terms of the offer are fixed and open for a limited period of time.

When the Conversion Rate Adjustments Become Effective

The conversion rate adjustments described above will typically become effective immediately after the open of business on the ex-dividend date for the relevant distribution, or, in the case of a self-tender offer, immediately after the expiration of the self-tender offer. However, for physically settled notes, it is acceptable for the adjustments for distributions on the common stock to instead become effective at the open of business on the record date for the distribution. This potential dichotomy between physically settled notes and Instrument X and C notes has a history that is worth examining.

Before net-share settled, and then Instrument X and C, notes became popular, physical settlement was virtually universal. At that time, as is also the case now when an issuer elects to physically settle an Instrument X note, a converting holder would be considered to be the record holder of the shares issuable upon conversion from and after the applicable conversion date. Accordingly, if the record date for a distribution occurred on or before the conversion date for a conversion, then the shares issuable upon such conversion would be entitled to participate in that distribution. For these early physically settled notes, conversion rate adjustments for distributions on the common stock ordinarily became effective immediately before the open of business on the day following the record date for the applicable distribution. This was primarily designed to avoid the "double dip" hazard described in more detail below. Specifically, by making the conversion rate adjustment for a distribution become effective after the record date for that distribution, it will be impossible for a converting holder to convert based on a conversion rate that is adjusted for the distribution *and* receive shares upon conversion that are entitled to receive the distribution.

When net-share settled and Instrument X and C notes came to the scene, having these conversion rate adjustments become effective after the record date no longer worked. Under net-share, combination, or cash settlement, the consideration due upon conversion depends on the conversion value of the notes, which is measured as the product of the VWAP of the common stock and the conversion rate. If a distribution is declared on the common stock, then the trading price of the common stock will generally drop by the per share (present) value of the distribution on the relevant ex-dividend date. This will skew the conversion value from and after the ex-dividend date, unless the conversion rate adjustment for the distribution becomes effective on the ex-dividend date. Consider, for example, a stock dividend of one share of common stock per outstanding share of common stock. The dividend will trigger an adjustment that will double the conversion rate. However, on the ex-dividend date, the stock price should drop by 50%, all else being equal. If the adjustment becomes effective on the record date, the ex-dividend date precedes the record date, and an observation period for a conversion spans the ex-dividend date, then the conversion values from the ex-dividend date to the record date will be skewed downward and the converting holder would improperly receive 50% less consideration in respect of this period. The solution was to move the effectiveness of the adjustments forward to the ex-dividend date. While this solution reintroduced the double dip hazard, new language was added to address that hazard, as described below.

The adjustment factors for listed spin-offs and self-tender offers are based on an average of the last reported sale prices over a period that extends past the ex-dividend date or expiration time of the spin-off or self-tender offer, respectively. Accordingly, the amount of the adjustment cannot be determined until the last day of the averaging period. Typically, the indenture will provide that the adjustment will be given retroactive effect as of the ex-dividend date or expiration time, as applicable, once it can be quantified. However, if the adjustment affects the amount of consideration due upon conversion of a note but the amount of the adjustment cannot be determined before the date that consideration must otherwise be delivered, then the indenture will usually either shorten the averaging period or permit the issuer to delay the delivery of the consideration.

Readjustment Provisions

Since value-transfer protection provisions are designed to compensate noteholders when the issuer transfers value to common stockholders without a corresponding transfer to noteholders, the justification for a conversion rate adjustment disappears when the value transfer ultimately does not occur. Accordingly, the indenture will customarily provide that the conversion rate adjustment will be reversed if the transaction that triggered the adjustment fails to consummate. This would occur, for example, when an issuer declares a cash dividend but does not pay it.

Parity Maintenance

While the conversion rate adjustment factors described above may seem to be somewhat arbitrary, they are actually designed to preserve the conversion value of the notes immediately before the relevant event that requires the adjustment. This property, which is sometimes called "maintaining parity," is perhaps easiest to observe in the anti-dilution adjustment provisions described above. For example, a two-for-one split will tend to cause the common stock to trade at half its pre-split trading price, and a correctly operating anti-dilution provision will double the conversion rate to maintain parity.

Mathematically, to maintain parity, the product of the unadjusted conversion rate and the pre-event stock price must equal the product of the adjusted conversion rate and the post-event stock price. In fact, each of the above conversion rate adjustment formulas can be derived by making a few simplifying assumptions, setting the pre- and post-event conversion values equal to each other, and then solving for the adjusted conversion rate as a function of the unadjusted conversion rate. Since these conversion rate adjustment factors use only one reference price for the value of the common stock (*i.e.*, either a pre- or a post-event reference price, but not both), the simplifying assumptions describe the relationship between the pre- and post-event reference prices (or describe another condition from which that relationship can be deduced). For example, in the two-for-one stock split illustration described above, the simplifying assumption is that the split will halve the trading price of the common stock. The simplifying assumptions for the other adjustment factors are as follows:

- **Cash dividends and distributions and other in-kind distributions.** These provisions often use a bottom-light value-based adjustment factor, which can be shown to maintain parity if the per share stock price drops on the ex-dividend date by exactly the value of the distribution per share of common stock. As described elsewhere in this primer, there is a sound theoretical basis to assume that the price drop on the ex-dividend date will approximate the present value of the distribution as of that date, all else being equal. Often, the record and payment dates for a distribution are close enough in time that the difference between the amount of the distribution and its present value as of the ex-dividend date can be assumed to be negligible. Note that the cash dividend adjustment factor that includes a dividend threshold will generally not maintain parity, as it is not designed to.

- **Listed spin-offs.** The spin-off adjustment factor described above will maintain parity if the spin-off does not change the combined equity value of the spun-off business and the remaining business. In other words, to maintain parity, this adjustment assumes that the pre-spin common equity capitalization of the convertible note issuer is equal to the sum of the post-spin common equity capitalization of the convertible note issuer and the post-spin common equity capitalization of the spun-off entity. Economically speaking, this is largely equivalent to assuming that the spin-off has no material synergy gains or losses or transaction costs and that the post-spin equity trades in a liquid market.
- **Distributions of in-the-money rights that are exercisable for a limited time.** This adjustment factor maintains parity assuming that the rights are fully exercised and the common equity market capitalization of the issuer increases by the aggregate exercise price paid to the issuer upon exercise of the distributed rights. This is similar to assuming that the issuer will place the exercise proceeds in risk-free investments or otherwise deploy them in its business and earn a return to its stockholders equal to the issuer's cost of equity. While this assumption will almost invariably prove to be inaccurate, it is arguably justifiable on the grounds that any other assumption is likely to be highly subjective.
- **Self-tender offers at above the market price.** This adjustment factor maintains parity if the common equity market capitalization of the issuer decreases by the aggregate price paid to purchase shares of common stock in the tender offer. A common rationale for conducting a self-tender offer is that management believes the market is undervaluing the issuer's common stock. In that scenario, management hopes that the self-tender offer will signal to the market that management justifiably believes the issuer will outperform expectations, causing market forces to drive up the issuer's equity market capitalization. The parity-maintenance assumption of this adjustment factor, in essence, is that such signaling will not be effective.

Parity maintenance adjustments, although arguably sound, in fact represent a practical compromise. The events that trigger these adjustments are usually unexpected and not priced into the convertible notes when they were issued, and, as noted above, they tend to devalue the notes in the absence of an adjustment. A theoretically ideal adjustment provision would increase the conversion rate by an amount that would exactly offset the drop in the value of the convertible note caused by the relevant event. Quantifying such an adjustment, however, is not trivial, nor is it reducible into a tidy formula that can be included in an indenture. A parity maintenance adjustment will almost certainly never exactly offset that drop in value either — there are just too many factors that affect valuation and are not addressed by parity maintenance adjustments. Accordingly, like many other provisions in modern convertible notes, parity maintenance adjustments only provide rough justice.

However, some studies have concluded that these adjustment provisions fare reasonably well for cash dividends. Nonetheless, noteholders will almost always be better off if the issuer decides to forego an adjustment by electing to pay the dividend to noteholders on an as-converted basis. This is particularly true at low deltas, when the drop in the trading price of the common stock caused by the dividend will have a relatively minimal impact on the value of the notes. In that case, paying the full dividend in cash to noteholders on an as-converted basis would be a windfall.

Avoiding "Double Dips" and "Unfair Deprivations"

The indenture will ordinarily provide that the date on which a converting noteholder is deemed to become the holder of record of the shares of common stock issuable upon conversion is the applicable conversion date (in the case of physical settlement) or the last trading day of the related observation period (in the case of combination settlement of an Instrument X or C note). For these purposes, the conversion date is the date that the noteholder has satisfied all of the requirements set forth in the indenture to convert notes. This is typically the date the noteholder has submitted a conversion notice and tendered the notes for conversion (or satisfied the corresponding requirements of the Depository Trust Company, or DTC, in the case of notes that are admitted to DTC's book-entry system) and paid any necessary cash amounts required under the indenture.

If a note is converted close in time to a distribution that requires an adjustment to the conversion rate, and the consideration due upon conversion includes any common stock, then two events can potentially occur that represent an unwarranted windfall to the converting noteholder or the issuer:

- a "double dip," which occurs when the consideration due upon conversion is calculated based on a conversion rate that is adjusted for the distribution, and the shares issued upon conversion are also entitled to participate in the distribution; and
- an "unfair deprivation," which occurs when the consideration due upon conversion is calculated based on a conversion rate that is not adjusted for the distribution, and the shares issued upon conversion are not entitled to participate in the distribution.

A double dip would occur, for example, if:

- the conversion rate adjustment becomes effective on the ex-dividend date for the distribution;
- the ex-dividend date precedes the record date for the distribution; and
- the conversion date (in the case of physical settlement) or the last trading day of the relevant observation period (in the case of combination settlement) occurs on or after the ex-dividend date and on or before the record date.

Conversely, an unfair deprivation (which, as one may guess, has a much more colorful moniker in the marketplace) would occur, for example, if:

- the distribution is large enough to trigger stock exchange rules that require moving the ex-dividend date for the distribution to after the record date through the use of due bills (which generally apply to distributions that exceed 25% of the value of the common stock);
- the conversion rate adjustment becomes effective on the ex-dividend date; and
- the conversion date (in the case of physical settlement) or the last trading day of the relevant observation period (in the case of combination settlement) occurs after the record date and before the ex-dividend date.

The indenture should contain a provision that avoids double dips by providing that the conversion rate will not be adjusted solely for purposes of the conversion in question, or, alternatively, that the conversion rate will be adjusted but the shares issuable upon conversion will not be entitled to participate in the distribution. Similarly, the indenture should also contain a provision that avoids unfair deprivations by providing that the conversion rate will be adjusted solely for purposes of the conversion in question (and settlement will be delayed, if necessary to quantify the amount of the adjustment). As described above, physically settled notes sometimes provide for these conversion rate adjustments to become effective on the record date for the applicable distributions. If drafted correctly, those adjustment provisions can avoid unfair deprivations without the need for any savings language.

The application of the provisions described above can be confusing to both issuers and noteholders alike. All else being equal, an issuer should think carefully before undertaking a conversion rate adjustment event during an observation period for its convertible notes.

MAKE-WHOLE FUNDAMENTAL CHANGE PROVISIONS

These conversion rate adjustments, which seek to compensate noteholders following certain events that tend to significantly reduce the time value of conversion feature of the notes, are discussed in detail above (see “Examining Time Value and Its Consequences — Make-Whole Fundamental Change Provisions”).

PRICE-PROTECTION PROVISIONS

Price-protection provisions seek to compensate noteholders if the trading price of the common stock declines or the issuer subsequently issues common stock, or securities linked to common stock, at a price that is less than the then-current conversion price. These provisions are not common in conventional, capital-raising transactions and are most often seen in direct placements to strategic investors or in other circumstances in which the security is subject to heavy individual negotiation, such as for pre-IPO or financially distressed issuers.

In their pure form, price-protection provisions in privately placed convertible notes pose issues under the so-called “20% rule” of NYSE’s and NASDAQ’s respective listing standards. In its current form as of the time of this writing, that rule generally requires stockholder approval for private issuances of securities that are potentially convertible into 20% or more of the outstanding common stock at an effective price per share that is less than the lesser of the last available closing price and the average of the closing prices for the last five trading days. Unless they are subject to a cap, these price-protection provisions could theoretically always result in an adjustment to the conversion rate that runs afoul of the 20% rule without prior stockholder approval. Accordingly, listed issuers generally cannot include these adjustment provisions in privately placed notes without a cap that prohibits the issuance of common stock above the proscribed threshold unless and until stockholder approval is obtained.

There are two general types of price-protection provisions: reset provisions and degressive issuance provisions.

Reset Provisions

Reset provisions seek to compensate noteholders for declines in the trading price of the underlying common stock. Typically, these provisions measure the trading price of the common stock (usually on a VWAP or last reported sale price basis over multiple trading days) at one or more specified times after the notes are initially issued, and then reduce the conversion price to that measure if it is lower than the conversion price then prevailing. Often, the reduction in the conversion price is subject to a floor price below which the conversion price will not be adjusted. The floor price should be proportionately adjusted inversely to the anti-dilution adjustments described above.

Degressive Issuance Provisions

Degressive issuance provisions seek to compensate noteholders when the issuer subsequently issues and sells shares of common stock, or rights to acquire common stock, at an effective price per share that is less than the conversion price then prevailing. These adjustment provisions usually exclude issuances that are not primarily capital-raising in nature, such as issuances in connection with business combination or strategic transactions, equity compensation to directors, employees, and consultants, and issuances upon the conversion or exercise of pre-existing securities.

Generally, there are two types of degressive issuance provisions: a full ratchet adjustment and a weighted adjustment. Full-ratchet degressive issuance provisions simply reduce the conversion price to the effective price per share at which the common stock was issued or is issuable in the degressive issuance. Like reset provisions, these provisions can also contain a floor price below which the conversion price will not be reduced.

Weighted degressive issuance provisions, on the other hand, adjust the conversion rate or conversion price based on a formula that takes into account not only the price at which shares are issued or issuable in the degressive issuance but also the number of shares of common stock that are issued or issuable in the degressive issuance in relation to the total number of shares outstanding. These adjustment provisions can employ many types of formulas to quantify the adjustment.

Weighted degressive issuance adjustments can also be “broad-based” or “narrow-based.” These terms describe how the number of outstanding shares is measured for purposes of the adjustment formulas. Specifically, a broad-based adjustment uses a “fully diluted” number of outstanding shares that assumes that all outstanding securities or rights that are convertible into, or exercisable or exchangeable for, common stock are fully converted, exercised, or exchanged. Conversely, a narrow-based adjustment only counts shares of common stock that are actually outstanding. In most real-world scenarios, a broad-based adjustment tends to result in a smaller adjustment to the conversion rate or conversion price than a narrow-based adjustment using the same formula. However, this is a rough generalization, as the formulas and inputs used in weighted degressive issuance provisions can vary greatly in practice.

VOLUNTARY ADJUSTMENT PROVISIONS

Most convertible notes contain provisions that allow the issuer to increase the conversion rate voluntarily if it determines that doing so is in its best interests or is advisable to diminish certain taxes imposed in connection with dividends or distributions. These provisions can implicate stockholder approval rules under stock exchange listing standards and, accordingly, are often drafted to be subject to those standards. Furthermore, a conversion rate increase under these provisions could be viewed as incentivizing conversions in a manner that constitutes a tender offer, which could trigger significant procedural, filing, and other requirements under federal tender-offer laws. These voluntary adjustment provisions typically require that the increase to the conversion rate remain in effect for at least 20 business days.

CONVERSION CONTINUITY PROVISIONS

Conversion continuity provisions do not exactly adjust the conversion rate. Instead, they alter the consideration into which the notes are convertible. The principle underlying these provisions is that if a note is convertible into common stock, and that common stock is later exchanged for, or otherwise changed into, some other form of consideration, then the note should become convertible into that other consideration. Events that can trigger conversion continuity provisions primarily include recapitalizations and business combinations. For example, a restructuring of an issuer’s common stock into a dual-class structure may cause each share of common stock to be automatically exchanged for a specified number of shares of two separate classes of common stock. Similarly, a merger event may cause an issuer’s common stock to be automatically exchanged for a combination of cash and the acquiring entity’s equity securities. For these purposes, any event that causes the common stock underlying any convertible notes to be exchanged for any other consideration is referred to as a “common stock change event,” and that other consideration referred to as the “reference property.”

Ensuring that the notes become convertible into the same form of consideration into which the common stock is changed serves both noteholders and issuers. For noteholders, it ensures conversion continuity by causing the conversion right to travel with the common stock. These provisions also permit issuers to engage in restructurings and business combinations without unintended consequences. For example, consider an acquisition in which the acquired entity has outstanding convertible notes and its common stock is exchanged for equity securities of the acquiring entity. In the absence of a properly drafted conversion continuity provision, the notes would continue to be convertible into the common stock of the acquired entity following the business combination, and subsequent conversions could result in noteholders acquiring a minority interest in the acquired company, which would undermine the goal of the acquisition.

In the past, conversion continuity provisions typically operated by providing that conversions occurring after a common stock change event will be settled by delivering the consideration that the converting noteholder would have received if it converted its notes into common stock immediately before the common stock change event and participated in that event as a common stockholder. Although this early formulation is relatively straightforward, it does not adequately address how subsequent conversion rate adjustments should operate, among other things. Moreover, when Instrument X notes became more popular, this formulation broke down completely, necessitating a more robust approach. The modern formulation defines the quantum of property for which a single share of common stock is exchanged as a "reference property unit," and provides that the conversion mechanics following a common stock change event will operate as if each share of common stock were instead one reference property unit. This approach is more comprehensive than the early formulation, since it addresses not only the consideration that is due upon conversion (while preserving the issuer's right to elect cash or combination settlement for Instrument X and C notes), but also provides a framework for determining how future conversion rate adjustments will be made and how conditional conversion triggers (and, if applicable, price triggers for issuer redemption rights) will be evaluated.

When Stockholders Elect the Consideration They Receive

Sometimes, a business combination transaction may permit the note issuer's common stockholders to elect among different types of consideration to be received for their common stock in the transaction, subject to a default if no affirmative election is made. Recently, business combination transactions have been structured so that the default consideration is designed to be the more valuable consideration, while the optional consideration is designed to achieve tax efficiencies that may be unique to some, but not all, common stockholders. If not carefully drafted, a conversion continuity provision could lead to suboptimal results for noteholders if the transaction includes such an election. Ideally, the provision will account for these election rights by defining the reference property as the weighted average of the types and amounts of consideration actually received by all stockholders.

Treatment of Dividend Thresholds

As described above (see "Value-Transfer Protection Provisions — Cash Dividends and Distributions"), if an issuer regularly pays cash dividends at the time it issues convertible notes, then the conversion rate adjustment provision for cash dividends will usually provide that regular cash dividends at or below the regular dividend (called the "dividend threshold") will not trigger a conversion rate adjustment. The dividend threshold will become meaningless if a common stock change event occurs and none of the reference property consists of equity securities. However, if any of the reference property consists of equity securities, then the conversion continuity provisions will usually provide that the dividend threshold will continue to apply in some form. If the reference property consists only of a single class of stock, then the dividend threshold is usually adjusted only to reflect the exchange ratio in the common stock change event. For example, a merger in which each share of the convertible note issuer's common stock is exchanged for two shares of the acquiring entity's common stock will usually result in halving the applicable dividend threshold. So, if the pre-merger dividend threshold was $1 per share, a threshold of 50 cents per share of the acquiring entity's common stock would apply after the merger.

The situation gets more interesting when the reference property consists of a combination of different types of property that includes stock. Examples include a reclassification of the note issuer's common stock into two separate classes, or an acquisition of the note issuer by merger in which its common stock is exchanged for a combination of cash and stock of the acquiring entity. Practice varies to some extent in these situations, with some provisions giving the issuer reasonable discretion to implement the dividend threshold after the transaction and others requiring the dividend threshold to be allocated among the types of reference property based on their relative value.

The mechanisms in modern convertible notes that address how the dividend threshold applies following a common stock change event are designed more for simplicity and convenience than to reflect the underlying economic substance. Those underlying economics warrant further inspection.

When a note offering is priced, the threshold represents the issuer's then-current dividend rate. Typically, in evaluating their decision to participate in the offering, investors will assume that the issuer will continue to pay dividends at that rate throughout the term of the notes. As previously noted, the presence of a dividend stream on the underlying common stock will reduce the value of the conversion right. Since most convertible note offerings are priced at 100% of their principal amount, this means that other economic terms, such as the coupon rate or the initial conversion rate, must be made more investor-friendly to compensate for the reduction in value caused by the expected dividend stream. The dividend threshold protects noteholders against unexpected increases in the dividend rate that were not "priced" into the notes when they were initially issued. Accordingly, the issuer's subsequent declaration of a dividend in excess of the threshold will trigger an upward adjustment to the conversion rate to compensate noteholders for the unexpected increase.

For investors that employ a delta hedge, the assumed dividend stream and assumptions regarding delta over time will also affect the amount of cash they expect to pay to manufacture dividends on their short position throughout the term of the notes. As it turns out, however, since most widely accepted models price options based on a no-arbitrage equilibrium, and a (long or short) delta hedge position in some form is often essential to exploit arbitrage opportunities, this expected cost of manufacturing dividends during the term of the notes is very closely related to the effect of the dividends on the price of the option.

Manufacturing Dividends on a Short Position

A person that lends shares to a short seller will expect to receive all distributions on the shares that it lends during the period when the loan is outstanding. Accordingly, if the record date for a distribution on the shares, such as a cash dividend, occurs before the short position is closed, then the short seller will have to deliver an equivalent distribution to the share lender. This is called “manufacturing” the distribution.

The effect of cash dividends on the value of the conversion right depends on numerous factors, including, among others, the delta (and, consequently, whether the option is in or out of the money), the size of the dividend in relation to the stock’s price, the remaining term of the notes, and the payment frequency. With practical certainty, these factors will change, often significantly, if the notes become convertible into another issuer’s stock following a common stock change event, even if the new issuer happens to have the same regular dividend rate as the old issuer. Accordingly, simply carrying forward the pre-transaction dividend threshold (whether in its entirety or on a weighted basis), without taking into account these factors (including the new issuer’s current dividend rate), ignores almost all of the underlying economics. Nonetheless, modern convertible notes continue to employ some form of dividend threshold “grandfathering.” More complicated equity derivatives can, and often do, take a more comprehensive approach, particularly when the underlying documents task investment professionals with quantifying the effects of particular transactions on the hypothetical value of the derivative instrument. Quantifying those effects, however, can be subject to significant disagreements among reasonable investment professionals, both as to approach and as to inputs. The seemingly overwhelmingly attractive feature of the grandfathering approach, accordingly, is its simplicity.

Although the provisions that address the dividend threshold may not be economically comprehensive, the issue often becomes moot because many common stock change events will also constitute a make-whole fundamental change. In many of those cases, noteholders will convert their notes at a temporarily increased conversion rate and exit their investment entirely.

There is at least one exception, however, in which the provisions described above do tend to preserve the economics of the conversion right. A few convertible note issuers have engaged in tracking stock reclassifications in which the common stock is split into two classes, with the assets and operations of the issuer being divided so that each class of stock tracks a particular division or business of the issuer. Following the reclassification, the conversion continuity provisions will usually cause the notes to be convertible into a hypothetical “basket security,” each unit of which consists of the actual amount of each class of securities issued in exchange for each share of common stock in the reclassification. In this circumstance, applying the dividend threshold to the basket security, such that cash dividends adjust the conversion rate only to the extent the total dividends paid per unit of the basket security exceed the threshold, would be economically justifiable. In these

More on the Effect of Dividends

An increase in the expected dividend rate on the underlying stock will reduce the value of a call option, and vice versa, all else being equal. This relationship can be explained intuitively. Contemporary financial theory predicts that the risk profile and capital structure of an issuer, and the current market interest rate environment, will determine the expected return that investors will demand on that issuer’s common stock. A stock’s return, in turn, can be realized only through two means: stock price appreciation and dividends. If two issuers have an identical risk profile and capital structure, then the return on their stock will also be expected to be identical. However, if one issuer pays fixed periodic cash dividends and the other does not pay any dividends, then the trading price of the dividend-paying issuer’s stock will be expected to appreciate at a lower rate (or depreciate at a higher rate) than that of the non-dividend-paying issuer’s stock. Since call options can potentially participate in stock price appreciation but not in dividends, a call option on the dividend-paying issuer’s stock will be less valuable than an otherwise identical call option on the non-dividend-paying issuer’s stock.

To implement a discrete dividend stream, both the Black-Scholes approximation (sometimes called the “Hull approach,” which was introduced by John C. Hull in 1989) and the binomial pricing model assume that the stock price consists of a non-dividend component plus the present value of all expected future dividends. Empirical evidence supports this approach, since a stock’s price tends to shed the (present) value of a declared dividend on the ex-dividend date, and the declaration of an *expected* dividend tends not to impact stock price. It follows from these principles that the higher the sensitivity of a call option’s value to the stock price (*i.e.*, the higher the delta), the more sensitive that value will be to changes in the dividend rate. For this reason, call options that are in the money will tend to be more sensitive to changes in the dividend rate than out-of-the-money options. Furthermore, the longer the time remaining to expiration, the more sensitive a call option’s value will be to changes in the dividend rate. This follows from the fact that for a fixed periodic dividend, more dividends will potentially be paid during the term of the option as the time to expiration increases.

reclassifications, the notes continue to be convertible into securities of the same issuer, and, for the most part, the risk profile of the basket security as a whole should approximate the risk profile of the common stock before the reclassification. For these reasons, a carry-forward of the dividend threshold should, in theory, not have a meaningful effect on the value of the conversion right.

Cash Mergers

For Instrument X and C notes, a pitfall may arise for events, such as a cash merger, that converts the underlying common stock into cash. As described above, the consideration due upon conversion of Instrument X or C notes is determined over an observation period that, depending on the liquidity of the issuer's common stock and other factors, could span a significant number of trading days after the date the converting noteholder exercises its conversion right. However, an event that converts the underlying common stock into cash will cause the notes to become convertible into a fixed amount of cash under a properly drafted conversion continuity provision. In this circumstance, the observation period becomes unnecessary, and the issuer should not be permitted to delay delivery of the cash consideration due upon conversion until the observation period is completed. Accordingly, conversion continuity provisions often require conversions following such events to be settled within the normal settlement cycle of two business days. However, special circumstances, such as the existence of a capped call or call spread overlay, may justify a longer settlement cycle for such conversions.

Conclusion

While the modern convertible note has developed to include a fair number of complex provisions in response to regulatory, accounting, and market factors, hopefully, the discussion above goes a long way towards demystifying those provisions. If history is any indication of what lies in store for convertible notes, there will be further twists and turns in the road, but the authors are optimistic that they will remain an attractive capital-raising option for the right public company.

Appendix A: Sample Make-Whole Table

The following is an illustrative make-whole table for convertible notes with the following terms:

Pricing date:	November 15, 2023 (after market close)
Offering settlement date:	November 20, 2023
Last reported sale price per share on the pricing date:	$10.00 per share of common stock
Conversion premium:	25% over the last reported sale price per share on the pricing date
Initial conversion price:	$12.50 per share
Initial conversion rate:	80.0000 shares per $1,000 principal amount of notes
Maturity date:	December 1, 2028
Interest payment dates:	June 1 and December 1 of each year, beginning on June 1, 2024
Optional redemption:	Callable on or after December 1, 2026, if the last reported sale price per share of common stock exceeds 130% of the conversion price on each of at least 20 trading days during the 30 consecutive trading days preceding the date the redemption notice is sent. No table make-whole upon redemption.

	Stock Price											
Effective Date	**$10.00**	**$11.00**	**$12.00**	**$12.50**	**$13.00**	**$15.00**	**$16.25**	**$20.00**	**$25.00**	**$30.00**	**$35.00**	**$40.00**
November 20, 2023...	20.0000	14.0840	10.6351	6.2066	4.8427	3.4800	2.4285	1.6056	1.1906	0.5960	0.2368	0.1106
December 1, 2024.....	20.0000	13.4674	9.8842	5.7510	4.3894	3.0884	2.1197	1.3840	1.0170	0.5025	0.1996	—
December 1, 2025.....	20.0000	12.7083	8.9393	5.1774	3.8183	2.5998	1.7388	1.1140	0.8079	0.3943	—	—
December 1, 2026.....	20.0000	11.7098	7.6764	4.4101	3.0624	1.9670	—	—	—	—	—	—
December 1, 2027.....	20.0000	10.1166	5.6960	3.2135	1.9366	1.0859	—	—	—	—	—	—
December 1, 2028.....	20.0000	10.9091	3.3333	—	—	—	—	—	—	—	—	—

COMPUTATIONAL NOTES

$10.00 = Last reported sale price per share on the pricing date

$12.50 = Initial conversion price

$16.25 = Redemption trigger price (initial conversion price × 130%)

20.0000 = $\frac{1{,}000}{\$10.00} - 80.0000$ *

10.9091 = $\frac{1{,}000}{\$11.00} - 80.0000$ *,†

3.3333 = $\frac{1{,}000}{\$12.00} - 80.0000$ *,†

— = $\frac{1{,}000}{\$12.50} - 80.0000$ *

— = Plug (the notes are callable at these dates and stock prices with no table make-whole)††

— = Plug*

X = $\frac{V(S = \text{Stock Price}, T = \text{Maturity Date} - \text{Effective Date}) - (CR \times \text{Stock Price})}{\text{Stock Price}}$ †

where:

V(S, T) = convertible note valuation function for a note having a principal amount of $1,000, where:

- the current stock price per share is S
- the time to maturity is T
- the conversion rate is CR
- all other inputs (volatility of stock price returns, dividend rate, risk-free interest rate, credit spread, stock borrow assumptions, etc.) are at the levels existing at the time the offering is priced

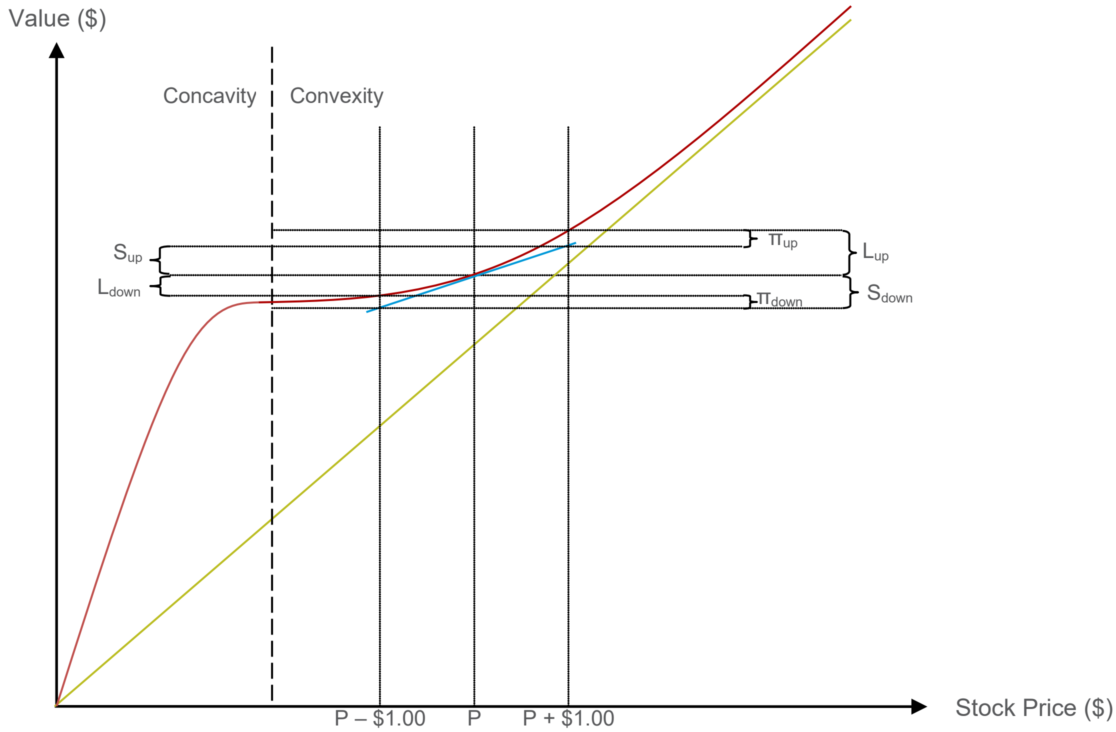
CR = the initial conversion rate per $1,000 principal amount of notes

* These plugs for the final row simply cause the conversion value, after giving effect to the table make-whole, to equal the terminal value of the note at maturity before the table make whole, which is the greater of $1,000 and the pre-adjusted conversion value. The formula set forth above for the orange-shaded cells should generate the same values as these plugs, disregarding any rounding.

† Rounded to four decimal places.

†† While this is by far the most common approach for populating these table entries for notes that are callable at a price trigger without a table make-whole, it is not universal. Since the price trigger usually must be satisfied for at least 20 of 30 consecutive trading days, the stock price may reach the trigger but not for a sufficiently long enough period to vest the issuer's call right, leaving some remaining option value. Some of the more robust pricing models can account for this value (a property called "path dependence" in lattice and finite-difference models, because the value of the instrument at each node in the lattice tree or cell in the finite-difference grid depends on the specific path the stock price takes to reach that node or cell). Accordingly, there are some examples of make-whole tables that include relatively small values in these entries.

Appendix B: Convexity and Volatility Trading



LEGEND

	Convertible note valuation function
	Conversion value function (also known as the parity line)
	Inflection point axis
	Line whose slope represents the price sensitivity of a long position in a number of shares equal to the product of delta at price P and the conversion rate (see explanation below)
P	The current stock price
π_{up}	The increase in the value of a delta-neutral investment if the stock price, P, appreciates by one dollar
π_{down}	The increase in the value of a delta-neutral investment if the stock price, P, depreciates by one dollar
L_{up}	The increase in the value of the convertible note if the stock price, P, appreciates by one dollar
L_{down}	The decrease in the value of the convertible note if the stock price, P, depreciates by one dollar
S_{up}	The decrease in the value of a delta-neutralizing short position if the stock price, P, appreciates by one dollar
S_{down}	The increase in the value of a delta-neutralizing short position if the stock price, P, depreciates by one dollar

EXPLANATORY NOTE

The red line in the graph presents an illustrative convertible note valuation function, where the “x” (horizontal) axis of the graph represents the price per share of the stock underlying the convertible note, and the “y” (vertical) axis represents the dollar value of the convertible note. More specifically, the values at the y axis along the red line denote the theoretical price of one convertible note (*i.e.*, a note having a principal amount of $1,000) at various stock prices, assuming all other inputs to the valuation function remain constant. The convertible note (more accurately, the valuation function) exhibits concavity at all points on the red line that are to the left of the vertical dashed line. As the valuation function approaches the vertical axis on the left, the issuer experiences greater financial distress, and the price of the convertible note drops as investors begin to expect the issuer to default on interest and principal payments. Conversely, the valuation function exhibits convexity at all points on the red line that are to the right of the dashed line. As described below, this is the sweet spot for volatility investors. (While the valuation function in this illustration drops to zero as the stock price does the same, the note’s value could instead cross the y axis at a positive number, which would represent the recovery an investor would expect per $1,000 principal amount of notes if the issuer goes bankrupt. The credit spread correlation factor described in this primer could be estimated using an expected recovery amount at a very low stock price.)

The slope of the red line represents the sensitivity of the value of one convertible note to changes in the stock price. Dividing that slope by the conversion rate will yield delta (recall that delta is always expressed as a percentage per share underlying the instrument). In the concave portion of the valuation function, the slope decreases as the stock price increases, and, accordingly, gamma is negative. Conversely, in the convex portion of the valuation function, the slope increases as the stock price increases, which indicates a positive gamma.

The solid green line in the graph represents the conversion value of the note (*i.e.*, the stock price multiplied by the conversion rate) across various stock prices. The slope of the green line is constant and is equal to the conversion rate. As the stock price increases far to the right on the graph, the red line (representing the value of the convertible note) approaches this green line as time value falls and approaches zero. The difference between the red and green lines is also closely related to the make-whole table. Suppose the graph is for a five-year note that was issued one year ago, and the note currently has exactly four years left to maturity. Suppose further that the inputs used in the convertible note valuation function (other than the stock price, which is the input that is varied to plot the red line) are the inputs that prevailed at the time the note offering was priced, except that four years is substituted as the time left to maturity. If you measure the vertical distance between the red and green lines at a given stock price and then divide the distance by that stock price, the result will be the number that would go into the make-whole table entry corresponding to that stock price and the date that represents a time to maturity of four years.

For volatility investors, convexity offers an attractive opportunity to profit. To illustrate this, suppose an investor buys one convertible note at a time when stock price is P. To implement a delta-neutral hedge, the investor will short sell a number of shares of common stock equal to the product of (1) delta at P and (2) the conversion rate. That product is equal to the slope of the red line at price P. Accordingly, the resulting short stock position in the graph is represented by drawing a blue line that is tangent to the valuation function at price P. As the stock price increases, the resulting rise in the blue line represents the decrease in the value of the short position. Conversely, as the stock price decreases, the resulting drop in the blue line represents the increase in the value of the short position. For simplicity, the combined long position in the note and short position in the shares is referred to as the “hedged investment.”

Now, consider what happens if the stock price, P, increases by one dollar to P + $1.00. The vertical distance that the red line rises between P and P + $1.00, which is denoted in the graph as L_{up}, is the amount by which the value of the convertible note increases. Similarly, the vertical distance that the blue line rises between P and P + $1.00, which is denoted in the graph as S_{up}, is the amount by which the value of the short position decreases. The increase in the value of the convertible note is greater than the decrease in the value of the short position, and, accordingly, the value of the hedged investment will increase. Graphically, the amount by which the hedged investment will increase is represented by the distance between the red and blue lines at stock price P + $1.00, which is denoted in the graph as π_{up}. Accordingly, the hedged investor stands to profit if the stock price increases.

Now, consider what happens if the stock price decreases by one dollar to P – $1.00. The decrease in the value of the convertible note is denoted by L_{down}, and the increase in the value of the short position is denoted by S_{down}. The gain on the short position exceeds the loss on the long position, and the value of the hedged investment will increase by an amount denoted by π_{down} in the graph. Accordingly, the hedged investor stands to profit both if the stock price increases and if the stock price decreases. As a result, an investor holding this hedged investment will favor volatility, because any change in the stock price will tend to increase the value of the hedged investment. This particular property of a delta-neutral investment is a direct result of positive gamma and the resulting convexity.

Another interesting aspect of delta hedging that the graph illustrates is how a rational investor will dynamically adjust its short position as the stock price varies. So long as the convertible note exhibits convexity, delta will increase as the stock price increases, and vice versa, assuming all other factors remain constant. This property is evident in the graph by noting that at price P + $1.00, the slope of the red line is greater than the slope of the blue line, and, conversely, at price P – $1.00, the slope of the red line is less than the slope of the blue line. Accordingly, assuming all other factors remain constant, if the stock price increases, then the hedged investor will need to increase its short position (*i.e.*, short sell additional shares) to maintain a delta-neutral investment, and, conversely, if the stock price decreases, then the hedged investor will need to decrease its short position (*i.e.*, buy shares to close a portion of its short position) to maintain a delta-neutral investment. If the stock price tends to oscillate, which may be expected of highly volatile stocks, then these dynamic adjustments can themselves drive profits, since they will consist of short sales at relatively high prices and the closing of short sales by buying shares at relatively low prices.

There are a few important caveats to the discussion above regarding how convexity can drive positive returns for a delta-hedged investment in a volatile environment. Importantly, volatility trading involves costs, and it is not riskless. For example, the investor may incur significant stock borrow costs (which will be proportional to its short position) and brokerage fees for buying and selling shares in the market. In addition, the changes in stock price described above were considered in isolation, assuming all other factors remained constant. This will never be the case. At a minimum, time decay (the sensitivity of an option’s price to the passage of time, which is measured by theta) will eat away at the option value of the convertible note with each passing day. For the strategy to be profitable, the gains must exceed these additional costs. However, one of the reasons that convertible notes are particularly attractive for this investment strategy is that the expected coupon payments on the notes can offset some or all of these additional costs.

Appendix C: Value-Transfer Protection Conversion Rate Adjustment Formulas

Distributions of In-the-Money Rights That Are Exercisable for a Limited Time

$$CR_1 = CR_0 \times \frac{OS + X}{OS + Y}$$

where:

CR_0	=	the conversion rate in effect immediately before the open of business on the ex-dividend date for the distribution
CR_1	=	the conversion rate in effect immediately after the open of business on such ex-dividend date
OS	=	the number of shares of common stock outstanding immediately before the open of business on such ex-dividend date
X	=	the total number of shares of common stock issuable pursuant to the rights, options, or warrants
Y	=	a number of shares of common stock obtained by dividing (1) the aggregate price payable to exercise the rights, options, or warrants by (2) the average of the last reported sale prices per share of common stock over the 10 consecutive trading days ending on, and including, the trading day immediately before the date the distribution is announced

Cash Dividends and Distributions (Non-Dividend-Paying Issuers)

$$CR_1 = CR_0 \times \frac{SP}{SP - D}$$

where:

CR_0	=	the conversion rate in effect immediately before the open of business on the ex-dividend date for the dividend or distribution
CR_1	=	the conversion rate in effect immediately after the open of business on such ex-dividend date
SP	=	the last reported sale price per share of common stock on the trading day immediately before such ex-dividend date
D	=	the cash amount distributed per share of common stock in the dividend or distribution

Cash Dividends and Distributions (Dividend-Paying Issuers)

Issuer-Friendly Version: $$CR_1 = CR_0 \times \frac{SP}{SP-(D-T)}$$

Noteholder-Friendly Version: $$CR_1 = CR_0 \times \frac{SP-T}{SP-D}$$

where:

CR_0	=	the conversion rate in effect immediately before the open of business on the ex-dividend date for the dividend or distribution
CR_1	=	the conversion rate in effect immediately after the open of business on such ex-dividend date
SP	=	the last reported sale price per share of common stock on the trading day immediately before such ex-dividend date
T	=	an amount initially equal to $[__] per share of common stock; *provided*, *however*, that (1) if the dividend or distribution is not a regular [quarterly] cash dividend on the common stock, then the dividend threshold will be deemed to be $0.00 per share of common stock with respect to the dividend or distribution; and (2) at each time the conversion rate is adjusted pursuant to the provisions described in this section, the dividend threshold will be adjusted in an inversely proportional manner
D	=	the cash amount distributed per share of common stock in the dividend or distribution

Listed Spin-Offs

$$CR_1 = CR_0 \times \frac{FMV+SP}{SP}$$

where:

CR_0	=	the conversion rate in effect immediately before the open of business on the ex-dividend date for the spin-off
CR_1	=	the conversion rate in effect immediately after the open of business on such ex-dividend date
FMV	=	the product of (1) the average of the last reported sale prices per share or unit of the capital stock or equity interests distributed in the spin-off over the 10 consecutive trading day period (the "spin-off valuation period") beginning on, and including, such ex-dividend date (such average to be determined as if references to common stock in the definitions of "last reported sale price" and "trading day" were instead references to such capital stock or equity interests); and (2) the number of shares or units of such capital stock or equity interests distributed per share of common stock in such spin-off
SP	=	the average of the last reported sale prices per share of common stock for each trading day in the spin-off valuation period

Other In-Kind Distributions

$$CR_1 = CR_0 \times \frac{SP}{SP - FMV}$$

where:

CR_0	=	the conversion rate in effect immediately before the open of business on the ex-dividend date for the distribution
CR_1	=	the conversion rate in effect immediately after the open of business on such ex-dividend date
SP	=	the average of the last reported sale prices per share of common stock over the 10 consecutive trading days ending on, and including, the trading day immediately before such ex-dividend date
FMV	=	the fair market value (as determined by the board of directors or a duly authorized committee thereof), as of such ex-dividend date, of the shares of capital stock, evidences of indebtedness, assets, property, rights, options, or warrants distributed per share of common stock pursuant to the distribution

Self-Tender Offers

$$CR_1 = CR_0 \times \frac{AC + (SP \times OS_1)}{SP \times OS_0}$$

where:

CR_0	=	the conversion rate in effect immediately before the time (the "expiration time") the tender or exchange offer expires
CR_1	=	the conversion rate in effect immediately after the expiration time
AC	=	the aggregate value (determined as of the expiration time by the board of directors or a duly authorized committee thereof) of all cash and other consideration paid for shares of common stock purchased or exchanged in the tender or exchange offer
OS_0	=	the number of shares of common stock outstanding immediately before the expiration time (including all shares of common stock accepted for purchase or exchange in the tender or exchange offer)
OS_1	=	the number of shares of common stock outstanding immediately after the expiration time (excluding all shares of common stock accepted for purchase or exchange in the tender or exchange offer)
SP	=	the average of the last reported sale prices per share of common stock over the 10 consecutive trading days beginning on, and including, the trading day immediately after the date the tender or exchange offer expires

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