



Frequently Asked Questions

RWC Convertible Bonds



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Contents

Introduction	3
The Technicalities	8
Portfolio Management and Asset Allocation	12
Terminology	15



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Convertible Bonds: Frequently Asked Questions

Introduction

Q: What is a convertible bond?

It is fair to say that convertible bonds are hybrids that behave like both debt and equity. They are debt obligations of company that usually pay a coupon and have a final maturity date. They also convert into shares of stock through an embedded option. The option gives the holder the right—that is, the choice—to exercise conversion, usually after the stock price rises by a pre-set amount to a specific price. The distance from the stock price at launch to the conversion price is referred to as the conversion premium.

For a long-only investor, convertibles can provide an equity-like return with better upside than bonds if the underlying stock price rises. If the underlying stock price were to fall, convertibles return capital if the bond is held to maturity, so, compared with holding stocks alone, they provide better downside protection with less volatility.

Q: Why do companies issue convertible debt?

In a word, flexibility.

A convertible bond might suit issuers that would like to raise equity-like financing. They do so by selling a bond that will potentially convert at a premium to the current share price, rather than having to offer new shares at a discount. And unlike straight corporate bonds, if the stock price rises beyond the conversion premium, convertible bond holders may choose to convert their

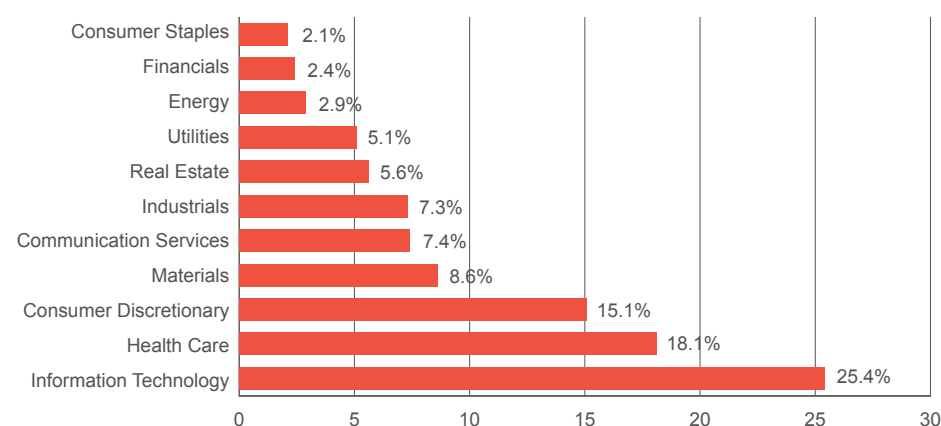
bonds into equity, and the issuer does not need to repay at maturity with cash.

Convertibles work well for issuers looking to raise money quickly—the sensitivity of the share price to the conversion option means that deals are usually announced and closed on the same day, compared with a much longer process of a roadshow and obtaining a bond rating for straight debt.

Also, convertibles will generally have a lower coupon than an equivalent straight bond would carry. That means that convertible financing may be attractive to issuers looking to minimise coupon payments. This is because convertible investors are happy to have a lower income stream in return for the value of the option to convert into equity. That means that convertible financing may be attractive to issuers looking to minimise coupon payments.

Finally, for issuers that do not yet have a corporate credit rating, being able to issue a bond without a rating brings flexibility to the issuer. Convertible holders tend to be more relaxed about holding non-rated bonds, although they usually rank the same as senior unsecured bondholders in the investment grade and high yield corporate bond markets. This flexibility can also help issuers looking to raise capital for development, where a rating agency might apply a lower rating to bonds until the development itself has been completed and has a longer operating history.

FIGURE 1: SECTOR BREAKDOWN



Source: Bloomberg, 28 February 2019

Q: When is a company likely to issue a convertible bond?

It depends! As we just noted, convertibles bring flexibility as a financing tool, which can be of value to the issuer. Assuming that an issuer has an immediate need and willingness to raise capital, they are also looking at the potential cost of the alternatives, including straight debt or issuing new shares at a discount, and whether those choices might restrict future flexibility.

In general, there are two factors that might make convertible financing more appealing to the issuer compared with straight debt or an equity raise.

First, if the issuer's stock price has been rising, they will be more inclined to sell an option to convert their shares at a premium. Potential dilution—meaning splitting up profits among more shareholders—might be more attractive than immediately accepting dilution and selling new shares, which might require a discount for investors to accept.

Second, convertible issuance effectively sells the option to convert into shares to the investor. We'll go through this in more detail later; it is enough for now to know that the higher the volatility of an underlying stock, the more valuable the option to convert should be. Following a period of higher volatility in the market or for the issuer's shares, investors could be prepared to pay for the potentially higher value of this option to convert. Compared with a straight bond, selling this option with a high perceived value might reduce the cost of financing, assuming the issuer's credit profile stays the same.

Q: What type of companies issue convertible bonds? Are certain sectors more prevalent than others?

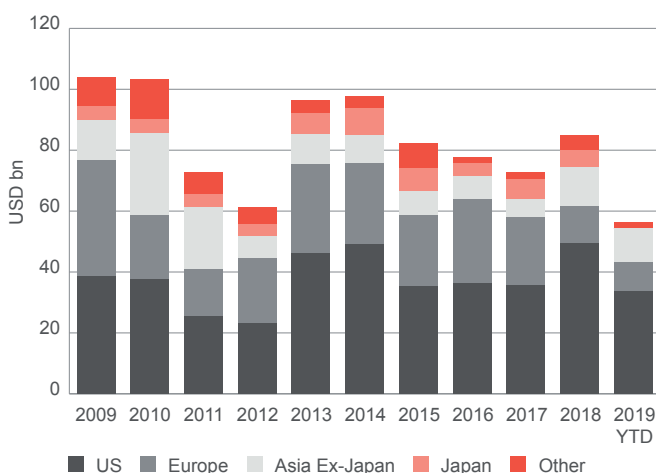
Convertible bonds have a long history, with the first issuance coming from a US railroad in the late 1800s. In today's global convertible bond market, the issuer base is broad, with most corporate sectors and regions having representation.

Yet convertible bonds have a different tilt to both broader equity and credit markets. On average, the typical convertible issuer's equity base is large cap in size but at the smaller end; i.e. there is more representation from mid-cap issuers, with fewer mega caps. Also, growth-focused sectors tend to have higher representation than they would in the corporate bond markets, but there is less issuance from ex-growth sectors such as banks.

Many convertible issuers are looking to reinvest at rates close to their required returns on equity but require additional capital to do so. Because of their hybrid equity/credit nature, convertible bonds can be an attractive financing alternative for such growth projects. This is a different profile to many straight bond issuers that might have fewer growth prospects and are adding leverage to increase their returns on equity.

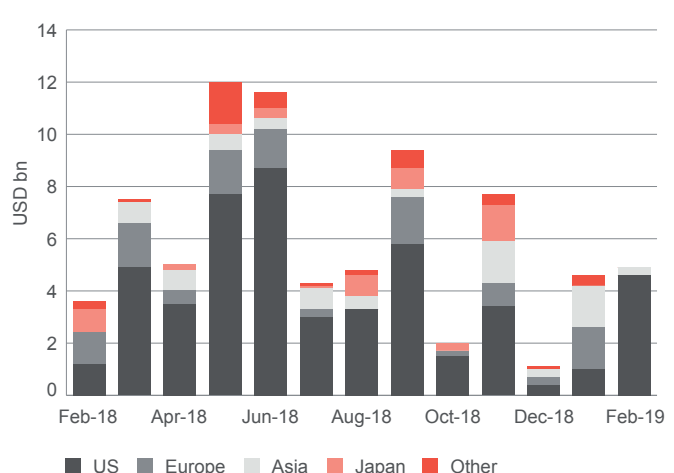
Also, many convertible issuers can have good cash flow or substantial cash holdings, but their asset bases may be newer or more focused on intellectual property, rather than physical assets with long operating histories with known useful lives and recovery values. Bank and bond lending standards are generally based on a pledge from asset values—these fixed income investors care mainly about getting their money back, rather than upside potential. As a result, convertible bonds can be useful for certain sectors such as information technology or health care that are not major corporate bond issuers, or for those issuers that are raising capital for development or potential acquisitions that are not yet completed.

FIGURE 2: ANNUAL CONVERTIBLE ISSUANCE



Source: UBS Convertibles Marketing / Thomson Reuters / Refinitiv, 28 February 2019

FIGURE 3: MONTHLY CONVERTIBLE ISSUANCE



Q: How big is the overall market?

We estimate the overall global market capitalisation of the asset class to be c. \$450 bn. This includes roughly \$50bn in equity-like instruments such as mandatory convertibles, and roughly \$50bn in onshore Chinese convertible bonds that are accessible only to domestic or qualified foreign buyers. That leaves approximately \$350bn in global convertible bonds accessible to any investor.

Q: Which benchmarks are most widely used?

The Thomson Reuters (TR) Global Focus Convertible Bond Index (previously overseen by UBS) is the most frequently referenced benchmark for global long-only convertible bond funds.

This index is available in hedged versions against major currencies and follows selection criteria for liquidity and size, as well as rules for equity sensitivity and conversion premium. That is, issues that become very bond-like or highly equity sensitive are excluded from the index. These rules generally keep the benchmark's equity sensitivity, or delta, which we discuss next, at a level where most long-only convertible managers aim to keep their own portfolios.

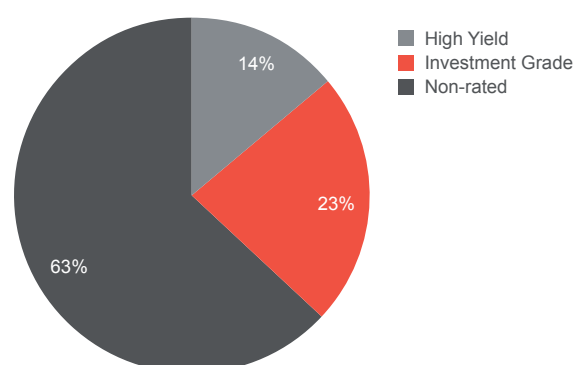
Broadly defined, delta is a measure of sensitivity of the convertible's price to moves in the underlying stock. A convertible with a delta of 0 has no sensitivity to the underlying stock, but one with a delta of 100 would have full participation to any stock moves. The bonds with deltas in the middle range, or mid-delta, can also be called "balanced"—that is, their equity sensitivity is neither too high, nor too low—and these convertibles offer an option-like payoff with participation to the upside if the underlying stock rallies, but with downside protection from the bond component. We see this option-like payoff profile as one of the main attractions of convertible bonds as an asset class.

The TR Global Focus Index generally excludes convertibles with very high or low deltas, so that the benchmark has more of a mid-delta, balanced profile. TR also maintains broader global convertible bond indices, such as the TR Global Convertible Bond Index, that use fewer selection and exclusion criteria to a wider number of holdings. Despite the greater breadth of these indices, we see these broad benchmarks as less suitable for a long-only convertible bond manager aiming to maintain a mid-delta profile. This is because the presence of more bond-like and highly equity-sensitive issues influences the broader indices to a greater degree than would be true for the TR Global Focus. For example, following a steep increase in stock prices, the TR Global may have a much

higher equity sensitivity than the TR Global Focus Index, whose selection rules exclude increasingly equity-sensitive components.

As a result, we see the TR Global Focus as the best proxy for convertible investors looking to assess the opportunity set of mid-delta bonds. Other benchmarks do exist that have splits based on region or credit quality, and these are maintained by TR and other providers such as Exane and Merrill Lynch, but they are less widely followed than the TR Global Focus.

FIGURE 4: OFFICIAL RATING BREAKDOWN – Thomson Reuters Global Focus Index



Bloomberg, 28 February 2019

Q: What have the trends been for new issuance of convertible bonds?

Companies may have different reasons to launch convertible bonds, but issuance usually picks up by more than replacement when interest rates are rising, equity prices are rising, or when markets are more volatile. Also, convertible bonds tend to have maturities of about five years at issuance, so on average, 20-25% of the market matures each year.

For example, new issuance picked up markedly in calendar year 2018, which saw a few distinct periods of volatility. Issuance increased after stock prices rose, but paused after equity markets moved down. Also, and as expected, the Federal Reserve carried out interest rate hikes, which raised borrowing costs for issuers in the dollar-linked funding markets. The expected pace of these hikes led some issuers to raise bonds before rates might increase further. By contrast, the primary market was active but less robust between 2015 and 2017, which saw generally trending and non-volatile markets in a consistently low interest rate environment.

Q: What determines the terms of a convertible bond at new issuance? Are these fundamental factors, do they only relate to convertible pricing, or both?

Conversion premium and coupon are the subjects of most discussion for a new convertible bond, given that they have the most impact on a convertible's price. Investors would always like more in coupon payments and less conversion premium, but issuers want the reverse! A new deal must have enough investors willing to subscribe for the proposed size at the terms offered. To give flexibility for where the deal will eventually price, most new convertibles are launched with stated ranges for coupon and conversion premium, rather than fixed levels.

Broadly speaking, levels in the secondary market help to calibrate levels for the primary market, including coupon and conversion premiums. Of course, demand will vary for each individual issuer. Many of the factors that especially influence a new convertible bond's terms and conditions include whether the issuer has any existing bonds outstanding, the volatility of the underlying stock, the perceptions of the issuer's credit spread—especially if the bond is not rated—and whether there are any issues already outstanding from the same sector and region.

Q: What is a typical conversion premium for a new issue? Do investors need to understand all the mathematics of option pricing to understand conversion premium levels?

The conversion premium shows how both fundamental analysis and convertible & option-pricing models go together. You need both, ideally! Yet demand for the deal ultimately determines where the deal will price.

When assessing a new issue's proposed conversion premium, investors look to whether they think the underlying stock has a reasonable chance to reach the conversion price. In simple terms, one can work out the required compound annual growth rate for the stock price at issuance to reach the conversion price by maturity. That is a good first check on whether a premium is reasonable and in line with equity market returns. For example, a new convertible with a 25% premium over five years would require the underlying stock to go up by 4.6% each year. Investors must assess whether they think the underlying stock can do so—and think about why it might go up or down.

Also, the equity option component is priced using an input volatility level. That level is provided by the investment banks that are bringing the new deal. Investors can use the stock's historical volatility—as well as the volatility levels observed in the listed options market—to determine whether the conversion option has been priced too

aggressively; that is, at too high a level. We discuss this aspect of convertible pricing later in this FAQ.

Q: What are the typical coupons and what are maturities at issuance? Are covenants and other credit standards important for convertible bonds?

Coupon levels are a function of credit spread demanded over an applicable risk-free rate. For a convertible bond, splitting the entire package between the credit component and the equity option component allows both to be priced separately. In this way, investors that are solving for credit spread can then compare their view to the guidance provided by the investment banks bringing the deal in terms of the issuer's credit spread and to that of comparable issuers. Investors can ask for higher coupons if they think guidance is too aggressive, or they might balance the certainty of coupon payments against a lower conversion premium.

Convertible bond coupons will be lower than for straight bonds that have the same maturity and credit spread. This is because they include the value of the option to convert into equity; in effect, the convertible buyer pays for that option by asking for less in coupon. Since 2008-2009, government bond rates have generally been low, corporate credit spreads have compressed, and coupons on straight bonds are also lower. This also means less opportunity cost to the investor in holding a convertible bond versus owning a straight bond with a higher coupon.

Convertible bond maturities are not totally uniform, but as noted, this tends to be the most standardized aspect of new issues, with a typical maturity of five years. Bonds can come that are shorter or longer in maturity; what is of most importance to long-only investors is whether the underlying stock has the potential to earn back its conversion premium in the timeframe of the bond's life, and whether the issuer's cash flow is enough to repay the bond, if needed.

Credit protection matters to convertible investors, but not in the same way as for the leveraged loan or high-yield bond markets, where levels of security can vary widely. Convertible bonds are most often ranked *pari passu*—that is, ranked equally—with other senior unsecured corporate bonds of the issuer, with few convertibles subordinated below this level. Convertibles can sometimes have additional credit protection, such as put options that allow holders to ask for the par amount of their bonds at a future point in time before maturity. These differences in protection are less significant for a deal as the presence—or absence—of covenants might be for lower-grade credit investors.

**Q: What is the credit quality of the asset class?
Why is a large portion of the convertible bond
universe not rated?**

Using a broad measure of the convertible bond market—here, we use the TR Global Convertible Bond Index as of 28 February 2019—63% of bonds were unrated, 23% were rated investment grade (IG), and 14% rated below IG. The flexibility of a convertible bond for issuers is that they do not necessarily need to apply for and then pay the rating agencies to rate a new bond issue, as they would likely have to do in the straight bond markets. As a result, there are many issuers with IG straight bonds or that have ratings at the corporate level who choose not to have a rating for a convertible bond.

Without an official rating, there are two main ways for investors to determine the credit strength of a non-rated convertible bond. First, investors can estimate their

own view of a potential credit rating after analysing and forecasting an issuer's credit metrics, using either rating agency standards or their own standards. Second, and in a more direct manner, it is possible to isolate the credit component of a convertible bond. The implied credit spread can then be checked to see where it might fit within ranges for different credit rating bands in corporate bond markets. In this way, investors can see where the market is pricing the bond component. Investors can then choose what they see as the more appropriate—or the more conservative—estimate of an issuer's credit strength.

For our strategies, we exclude names that are rated CCC or trade at that implied credit spread. In this way, we see the universe of convertible bonds as broad enough to build portfolios and to keep an average rating at the investment grade (actual or implied) level.

The Technicalities

Q: What drives the valuation of a convertible bond?

We know that convertible bonds can appear complex. And yes, there is some maths involved. But most convertible bonds are simply a package of a corporate bond, plus an option to convert the bond into shares at a preset price.

Let's look at how to value the parts that make up the package itself.

Valuing a corporate bond is generally straightforward. The price of a bond is just the present value of the cash flows from the bond (coupon payments and principal repayment). The calculations for present value are not difficult and require only the timing of payments and discount rates at those payment points. The discount rate is a risk-free rate (usually defined as a government bond yield) applicable at that maturity, plus a credit spread that accounts for credit risk specific to the issuer.

It won't be a surprise that changes to the applicable discount rate and credit spread will create most of the change to the price of the bond component. The higher the discount rate or the higher the credit spread, the less the future payment from the bond will be worth after discounting; that is, in present value terms. So far, so good.

It is also important to know that by solving for the value of either the bond or the option component, subtracting that value from the market price of the convertible gives an implied value to the other component. This is going to be especially helpful in valuing the conversion option itself.

Now on to the option maths, which is what you need to understand the equity option component. But don't worry, there won't be a quiz at the end! It is enough to know that the creators of the Black-Scholes option pricing formula received a Nobel Prize for adapting a model from physics that required only five inputs to price an option. For a convertible bond, these inputs are:

1. the time until maturity,
2. the current price of the stock,
3. the strike (or conversion) price,
4. a risk-free rate,
5. a forecast annualised volatility for the underlying stock, plus
6. a dividend yield if applicable.

The sensitivity of the conversion option to these inputs varies, but probably the most important to understand is volatility. This is a standardised measure that shows the potential range of outcomes around a central (mean) value, which is used to determine the probability that the

underlying stock might reach the strike price within the life of the option. And the higher the volatility, the greater the probability that the stock can reach the strike price, which increases the value of the option.

Also, investors can take the value of the option on its own—which one can do for a convertible bond by first valuing the bond component—and solve for its volatility using the current market price. A cheap option would be where the “implied” volatility backed out of the market price is lower than the estimate for future or the actual realised volatility on the stock, or for listed options.

So are cheap options the main attraction of convertible bonds? In part, but they won't drive most of the price change to the convertible bond.

It is always better to pay less, rather than more, so cheap should be appealing. And in fact, convertibles often have a longer-dated option than what an investor could buy in listed form. But while volatility is observable, it is not always predictable. And knowing that a higher volatility input will drive more value to the option component does not mean that the stock is going to go up, only that it could possibly move within a wider range.

This means that convertible investors do still care about where the stock is priced in the equity market and the reasons why it might trade higher or lower. In fact, the change in the value of the underlying stock drives most of the price change of the convertible itself. As a result, most long-only convertible investors will forecast a future price for each underlying stock, much in the same as an equity investor will do in trying to determine fundamental value.

Q: What are the Greeks?

These measures—which are borrowed from option pricing formulas—capture the sensitivity of a convertible bond to changes in different inputs. Put another way, the Greeks, of which we will show six below, help to show what the future price of the convertible might be if a key input changes, such as the underlying stock price. (NB—there are two additional Greeks that show sensitivity to changes in the underlying stock dividend (ϕ) and recovery rate on the bond component (ϵ). They matter, but are less crucial to know than the six we review here.)

Of course, these measures can also be calculated for a portfolio of convertible bonds, as well as for a single holding. There is some more maths involved to get to the precise definition of each measure, but we will try to present a more intuitive view of what each of the Greeks means for investors.

The Greeks Explained

Delta: Expressed as a percentage from 0% to 100%, delta captures the change in the price of the convertible bond for a percentage move in the underlying stock price. A higher delta means a higher sensitivity, and a lower delta convertible bond will not move much in price as the underlying stock price changes.

With that said, delta is not static, and it will change as the underlying stock price changes: It is accurate for small changes in the underlying stock price, but you need the next Greek (gamma) to work out the price change for a large move.

Gamma: This measures the rate of change of delta itself. Basically, for a long-only convertible investor, as a stock price moves higher, a higher gamma convertible bond should see its own delta increase quickly. This means that the bond can earn more from potential equity upside than a lower gamma instrument might.

Also, gamma can serve as a proxy for convexity, which is the ratio of upside versus downside for a convertible bond if the underlying stock price were to move up and down by a similar percentage. For a long-only investor, more convex convertibles are generally preferable to those that are not. Gamma is shown as a whole number. It is enough to know that for potential convexity, a gamma of more than 0.75 would be considered good, and more than 1.0 would be quite good.

Vega: Remember that the option to convert into equity will rise in value as volatility increases, but it will fall if volatility were to decrease. Vega shows the forecast change in the convertible's price as volatility changes by a standard amount. Higher vega convertibles are more sensitive to changes in volatility than a lower vega convertibles.

NB: Vega is the change in convertible price for a 1% move in volatility.

Omega: As a credit spread changes, the value of the bond component will change. This measure shows the effect on a convertible's price if credit spread alone were to change by a standard amount. Omega can also be referred to as Omicron.

NB: Omega is shown from -1 to 1, which represents its sensitivity/participation rate to moves in credit spreads. Omega is the change in convertible price for a 1 basis point move in credit spread.

Rho: Interest rate changes affect the price of both the bond component and the option component. Rho shows the total sensitivity of a convertible if all interest rates were to shift equally—that is, by the same amount—across the yield curve.

Generally, higher interest rates have their greatest impact to a convertible in driving down the value of the bond component, but with lower interest rates pushing up that value. Higher duration bonds are affected to a greater degree by changes in interest rates versus short duration bonds: The longer you must wait until maturity, the higher the duration of your bond.

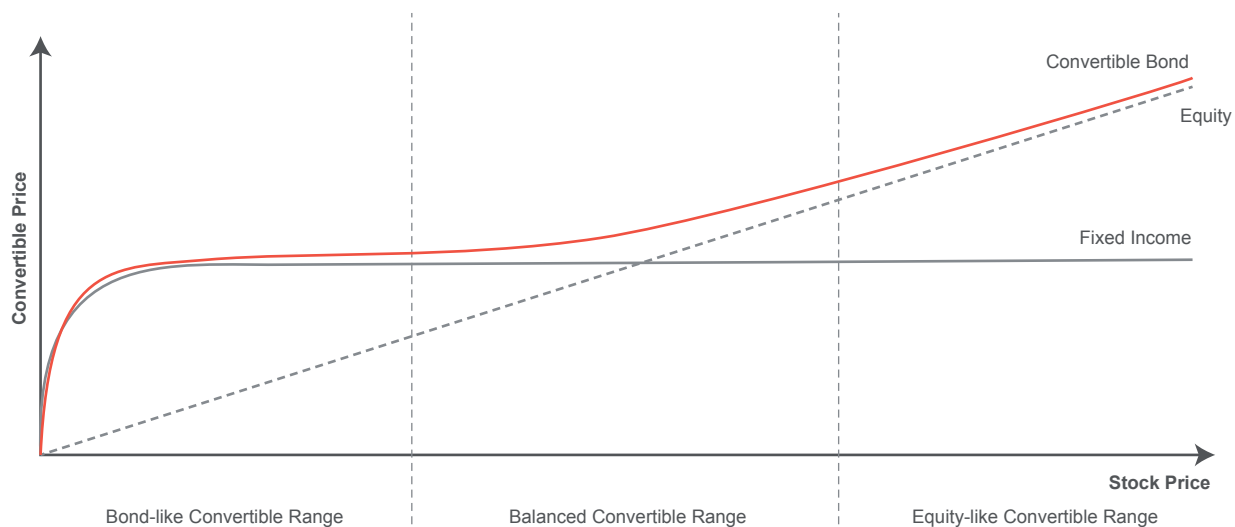
NB: Rho is shown from -1 to 1, which represents its sensitivity/participation rate to shifts in the yield curve. Rho itself shows the change in convertible price for a 1 basis point parallel shift on the yield curve.

Theta: Imagine if the value of the option to convert was divided among the number of days remaining in its life. If there was a trading day where the underlying stock closed below the strike price, you wouldn't choose to convert, and your option therefore lost that day's value.

Theta is a standardized measure that if negative shows the daily loss in value to the convertible bond and is also referred to as time decay. (Footnote—generally all convertibles with a call option have a negative theta) Theta changes as the other Greeks change, and as the time to maturity draws nearer.

NB: Theta is shown from -1 to 1, which represents sensitivity/participation rate to time decay. Theta is shown as the change in convertible price per day based on time decay.

FIGURE 5: CONVERTIBLE BOND PAYOFF PROFILE



Source: RWC. Shown for illustrative purposes only

Q: Do convertibles behave more like bonds or stocks?

The answer depends largely on the convertible's delta.

With a high delta, the convertible behaves like the underlying equity. Usually, the underlying stock price has come close to, or exceeded, the strike price at which it can convert.

At a low delta, the conversion option is far out of the money, so smaller moves in the underlying stock price will not affect the convertible very much. This makes a low delta convertible more bond-like, and its price stays pretty much the same unless the bond's credit spread moves or interest rates shift a lot. With that said, investors will want to know why the underlying stock has fallen in price, especially whether the credit spread might widen if the stock were to keep falling.

For long-only strategies, we focus mainly on convertibles with a mid-delta, or "balanced" profile. (Again, "balanced" means that the delta is neither too high nor too low.) This is usually within the range of 30-60% for delta. At these levels of equity sensitivity, the gamma of the convertible is usually higher than for a high- or low-delta convertible. In other words, the bond component will protect value, but the option component is poised to gain in value from moves in the underlying stock.

There are two reasons why a higher gamma profile can be useful. Together, they show that gains from the upside are asymmetric (that is, potentially higher) than the losses on the downside. First, if the underlying stock were to rise, the high gamma means that the delta will increase at a fast rate, which increases equity sensitivity as the stock gains in value. Second, if the underlying stock were to fall, the high gamma will decrease the convertible's delta, which reduces equity sensitivity and insulates losses. This shows the benefit of convexity provided by convertibles.

Q: When are currency exposures typically hedged and why?

Generally, long-only investors keeping a mid-delta, balanced profile for a portfolio of global convertible bonds will fully hedge their currency exposures. Most convertible bond portfolio managers are not looking at foreign exchange positioning (i.e. unhedged positions) to be a main driver of returns, or a contributor to risk. And considering that the volatility of currencies can spike during periods of market stress to levels above convertible bonds themselves, hedging currency exposures helps to remove that aspect of risk to a portfolio.

Q: What is liquidity like for convertibles? How do they behave during periods of market stress?

We find that convertibles have similar liquidity to straight corporate bonds.

The US represents about half of the global convertible market, and it is the only region with standardised trade would reporting data (TRACE). Using TRACE data from 2006 to now, the amount traded in US convertibles divided by the amount of bonds outstanding is a roughly similar percentage as for the US high yield bond market, which is about 6 times greater in size. (Source Merrill Lynch research—01 March 2019 Global Convertibles Chartbook) We see from TRACE data that this percentage is roughly for the US investment grade bond market as well.

We can also compare turnover in bond markets—that is, the total value of bond trades in a year compared to the total amount of bond outstanding—to that of US stocks. From this data, we also see that the annual turnover in US investment grade, high yield, and convertible bonds is about 1.5x the size of each total bond market. For comparison, US stock annual turnover is about 7x market cap. (Source CBOE Markets, Bloomberg.)

Since the 2008-2009 period, the main holder base for convertible bonds has been long-only investors. Before then, more than 70% of all convertibles were held by hedged investors that were using leverage for convertible arbitrage strategies. When the financial markets went

through significant stress in 2008-2009, many of those investors were forced to unwind positions quickly and liquidity suffered. But since then, we would see about 2/3 of the global convertible market as now being held by long-only investors. As a result, we would imagine that in the next period of stress, convertible market behaviour would be more comparable to the straight bond markets.

Q: What factors influence liquidity for individual convertible bonds?

Issue size and liquidity of the underlying stock are key factors, as well as the delta of the convertible bond itself.

Smaller deals of less than roughly \$150 million in size are likely to trade less frequently than larger issues. Stock liquidity matters because market makers and hedge funds can provide liquidity by setting up positions that neutralize stock moves. This requires them to buy or sell stock to do so, and a less-liquid underlying stock means that they can only set up a smaller position in the convertible bond.

Mid-delta bonds are most popular with the long-only investors that are managing convertible portfolios. But if a convertible becomes lower or higher in delta, the potential holder base changes. As well as market makers and hedge funds, credit investors can look at low delta convertibles for diversification and relative value, while equity investors can consider a higher delta convertible as a replacement for equity. In this way, liquidity does not suffer as a convertible adds or sheds equity sensitivity.

Portfolio Management and Asset Allocation

Q: Can convertible bond portfolios be structured so that they have different risk profiles?

Very much so, based on the delta of each convertible, as well as the credit profile of each issuer and the nature of the underlying equity. In this way, a portfolio manager can use individual holdings to create a mid-delta, or “balanced” convertible portfolio, as well as a more bond-like or equity-like sensitivity. Also, a portfolio manager can control for the average credit risk to give a portfolio an investment grade or even a high yield bias.

Q: How is a convertible bond portfolio different to a portfolio split between stocks and bonds?

Imagine that you were playing a game and you were able to improve your chances of winning without increasing your possibility of losing. Seems like a worthwhile improvement! This is how convexity works and it shows why gamma is so important for convertible bonds. It also shows why a convertible bond portfolio will behave differently to a simple split of stocks and bonds.

Positive convexity means more participation to the upside compared with the downside, and it can be a feature of option-like payoffs, such as those found in a convertible bond. You get value if the underlying stock rises, but because the bond component must be repaid at maturity, you lose less compared with holding only the underlying stock, if it were to fall. Remember that gamma measures the rate of change of delta, and a positive gamma shows an asymmetric payoff to the upside if the underlying stock were to move up and down by the same percentage.

Let's return to the simple world of only stocks and bonds, both government and/or corporate. Do stocks or bonds have any gamma? The simple answer is no.

Stocks have a delta of 1.0—they go up or down—and there is no difference to that rate of participation, so no gamma. Corporate bonds have limited sensitivity to the issuer's underlying stock price, unless they become distressed or more high yield in nature, so, based on that sensitivity, they have close to zero delta and no gamma. Government bonds may have a sensitivity to stock prices, but usually only in periods of major equity sell-offs when investors pay for safety, and the effect is negative, meaning that bond prices will go up as stocks fall. Again, limited delta or gamma.

What about a portfolio split between stocks and bonds? If the portfolio has a delta of less than 1.0 because it also holds bonds, might it have any gamma? The answer is not really: there is no gamma in stocks or bonds alone, so the mixed portfolio won't have any, either. With a delta of less than 1.0, the mixed portfolio will go up or down pretty much in line with the expected delta, with no convexity. This isn't a reason to not hold stocks or bonds, of course! With a conversion option that provides gamma and convexity, investors can use convertible bonds in an asset allocation to slightly improve their chances and get more exposure to equity upside without taking on more risk.

Also, even a simple portfolio split between stocks and bonds faces two critical choices: What should the splits be, and how frequently should the portfolio be rebalanced? What in fact are the correlations between and among equities, corporate bonds, and government bonds? These are not easy answers and there is no one solution that works for all investors.

Active convertible managers rebalance to maintain a consistently high gamma to maximise potential convexity. This means that they are usually selling positions where the stock price has run higher, which

increases delta but will lower gamma as the convertible price moves away from the bond floor. They will also look to sell positions where the underlying stock fell in price and the delta and gamma are both minimal. In this way, the asset allocation of the convertible portfolio will add delta after markets fall, but sell delta if markets are rising. This process means that the convertible portfolio should not become too equity-like or bond-like, and returns are not the result of asset allocation calls, which can introduce risk if they go wrong.

FIGURE 6: LONG TERM PERFORMANCE



Source: Thomson Reuters, 28 February 2018

Q: Where should an asset allocator position the convertible bond asset class within their own portfolios?

Let's cover the three main ways to position convertibles within a portfolio when using an active, long-only manager with specialist knowledge. We have a note from Arthur Grigoryants entitled "The Asset Allocator's Challenge" that addresses this topic in more detail.

First, convertibles can be a replacement for equities. They keep exposure to stocks, but with added capital preservation. In this way, the asset allocator does not need to sell down stocks to buy either bonds or hold cash, both of which will underperform if equities move higher. Also, as discussed, many convertible issuers have higher growth characteristics than for the broad equity markets, and convertible bonds can be a good way to hold option-like exposure on these higher growth issuers without taking on their higher expected volatility.

Second, convertibles can be a useful alternative for fixed income allocators. They are still bonds, but can deliver more equity-like returns with bond-like volatility. This can help returns under scenarios that might be positive for equities but bad for bonds; for example, if growth picks up and inflation expectations and central bank rate hike probabilities increase. Also, many convertible issuers do not have any other straight debt, so an allocation to convertibles brings credit diversification.

Third, within a multi-asset portfolio, convertibles bring convexity that cannot be replicated from combinations of only stocks or bonds alone, which helps the allocator to push out the portfolio's efficient frontier. That is, the convexity from convertibles helps to create a potential portfolio with better expected returns without having to accept higher risk, and therefore a higher Sharpe ratio.

Q: Why did convertible bond valuations collapse in 2008-2009? Could this happen again?

Before 2008, more than 70% of convertible bonds were held by hedge funds and other investors following convertible arbitrage strategies. These investors used leverage to magnify returns from small perceived mispricings. After Lehman Brothers declared bankruptcy in September 2008, short-selling restrictions hampered the ability to set up hedged positions, and investment banks and prime brokers had to de-lever and reduce credit lines that they had been providing to convertible arbitrage investors.

After this sell-off, convertible bond valuations moved away from their theoretical value; that is, below the value that a pricing model said a convertible bond should be worth. This was because hedged positions had to be sold in order to repay credit lines, and the reduction of leverage meant that until funds received inflows from investors, there were no natural buyers of convertibles.

This dislocation corrected by 2009. Pricing models were showing that some convertibles were trading more than 5% below fair value, and some convertibles were trading with higher yields than an equivalent straight bond, with a free option attached. Also, the issues affecting structured credit did not apply to most convertible issuers. The cheapness of the market and realization that most bonds could repay then attracted inflows. But these inflows went mainly to long-only managers: They required no leverage to benefit from cheapness, and convertible arbitrage was perceived as a risky strategy, given the recent losses suffered by those funds.

Since 2009, convertibles have remained largely held by long-only investors. Hedged investors still invest in convertibles and they can be useful for providing liquidity, as well as ensuring that bonds do not trade too far from theoretical value. Because most investors are not using leverage when owning convertibles, it would take a severe—and likely market-wide—withdrawal of funds by end investors to create a similar imbalance of sellers to buyers as was seen in 2008-2009. In addition, other institutional investors in equity and credit are by now familiar with convertibles and have stepped into offer buying support when the asset class appears to offer value.

Q: When are convertibles considered cheap? Is this when to buy or sell?

Cheapness in convertibles is nice to have, but it isn't the major driver of returns for long-only investors. Keeping a strategic long-only allocation is more sensible in our view than buying or selling convertibles based on whether they might be slightly rich or cheap to what a pricing model says.

FIGURE 7: CONVERTIBLE BONDS VERSUS EQUITIES THROUGH THE FINANCIAL CRISIS



Source: Bloomberg, 1 January 2010

The theoretical cheapness—or richness—of a convertible comes from a pricing model, but that does not depend on a forecast value for the underlying stock. Assuming input values for credit spread and volatility, a pricing model creates a theoretical value for a convertible bond that can be compared against where the convertible trades today in the market. In this way, convertible arbitrage investors will look for relative value opportunities from wide variations between theoretical price and market price. That said, their models need to be accurate, as do their input assumptions!

For long-only investors, the direction and absolute move in underlying stocks will be by far the largest driver of future returns. A cheap bond can fall in absolute terms where the hedged investor might make money on their position, but the long-only investor will suffer a loss. And a bond with an option that is priced 1% rich might have an underlying stock that goes up by more than 10%, which can more than offset the initial richness. Therefore, getting the direction of the stock right and managing risk based on equity sensitivity are much more important to long-only investors in finding opportunities and avoiding disasters.

This doesn't mean that cheapness doesn't matter to long-only investors. Market levels for valuation help to set where new bonds will be priced in the primary markets, and an overvalued option will be a drag on returns even if the underlying stock rises in price. But the 2008-2009 imbalance in valuations would not be considered typical in historical terms, and a typical level of cheapness is more like 1 percentage point from theoretical value, as opposed to more than 5 percentage points. So cheapness helps, but it isn't critical for timing when to invest in long-only convertible strategies.

Terminology

Arbitrage: A profitable trade that can be locked in with less risk—in theory—by hedging. Convertible arbitrage looks at the prices of the different components of a convertible, and uses hedging to isolate the component thought to be cheap.

Bond floor: The present value of the bond component alone of a convertible bond. Put another way, it is what the convertible would be worth right now if the conversion option lost value from a fall in the underlying stock price, and the credit spread remained unchanged. Usually, the bond floor at maturity is par, meaning that the issuer repays the bond in full.

Call protection: Not all convertibles can be immediately converted when the underlying stock price exceeds the conversion price; sometimes bonds are issued with call protection and become convertible only after the call date. For most investors, it is enough to know that convertible portfolio managers are aware of these features and how they affect the price of an individual convertible bond.

Conversion ratio: The number of shares received at the time of conversion for a specified amount outstanding of a convertible bond.

Conversion premium: The difference between the convertible price and the parity value, meaning how far the parity value (or stock price) must rise to get to where the convertible trades now. The ratio is of the convertible price less the parity value, then divided by the convertible price.

Conversion price: The price at which a convertible bond becomes convertible into shares. This is the strike price for the conversion option.

Exchangeable bond: This is where the credit of the issuer is different to that of the underlying stock. An example could be a government investment vehicle holding an equity stake in a listed company that pledges its credit to the bond component and would deliver the shares that it holds if converted.

Hedge: For convertibles, to neutralize a risk factor or a price sensitivity through an offsetting transaction. An example would be delta-hedging, where a market maker or arbitrage investor might buy a convertible bonds and uses its delta—a price sensitivity to the underlying stock—to create a hedge by selling stock short. In this way, the price of the hedged convertible should remain the same if the underlying stock goes up or down.

Mandatory convertible: A type of convertible bond which must be converted into the underlying stock. That is, there is no bond component to repay, and the mandatory must convert into stock at maturity. A mandatory is an equity-like instrument that usually carries a higher coupon than the dividend yield of the stock when issued. In effect, the higher coupon helps to offset the conversion premium, which allows the issuer to raise equity-like funding at a premium.

Out-of-the-money / At-the-money / In-the-money: These are terms used for options. In the case of a convertible bond, they compare the underlying stock against its conversion price.

An out-of-the-money option is as it suggests, meaning that the underlying price is not yet close to the strike, or conversion price. Convertibles when issued are structured to be out-of-the-money, so the description doesn't mean that the option can't gain in value.

At-the-money options would be where the underlying stock price is close to the conversion price. The delta of the convertible would be moving closer to 100% as the underlying stock price gets closer to the conversion price.

With the underlying stock above the strike price, the option would be in-the-money.

Par value: For a bond, the face value of what the company promises to repay at maturity. Par is usually expressed as a percentage; so 100% means the full amount of what will be repaid.

Parity: The current market value of the underlying shares of the convertible bond when multiplied by the conversion ratio.

Premium to parity: Convertibles generally trade at a premium to parity value to account for the remaining time value of the conversion option, i.e. the underlying stock has moved higher than the conversion price, and the bond can be converted immediately into stock, there won't be a premium to that parity amount.

Yield: There are several measures of yield; all of these are looking at the income return from a bond. For a convertible bond the most relevant yield measure is current yield, which takes the cash received from coupon payments divided by the current market price of the convertible bond. This figure can be easily compared against other types of bonds.

Why would current yield be more helpful than the other traditional yield measures for bonds? The reason is that current yield does not assume that the investor receives back only the par amount at the maturity date, and looks at a cash return from coupon.

This measure of current yield does skip some aspects of the mathematics used to calculate yield measures for straight bonds. Also, the current yield measure will change as the market price of the bond moves. However, the assumption behind most traditional yield measures is that the investor waits until maturity and only gets back par, or perhaps a small increase if the issuer decides to redeem early.

Because the embedded option to convert can become quite valuable if the underlying equity gains in value, the market price of a convertible can move much higher than 100%. As a result, convertible holders may wait around for the maturity date, if only to receive back par. Therefore, the traditional assumptions behind most of the yield measures don't apply for many convertibles that are trading above par.

We give a brief overview of some of the well-known traditional yield measures here:

Yield-to-maturity: The measure basically solves for the yield (that is, the annualised discount factor) that would produce the bond's current market price, and assumes that all cash flows are reinvested at this rate, and also that the bond is held until maturity. Neither of these assumptions are unreasonable, but they are not always true for convertible investors.

Yield-to-call: Some bonds can be called (that is, refinanced at a lower rate) at a known price and at dates earlier than maturity, often at a premium over what must be repaid at maturity. Investors can work out the yield to that call date, assuming an early redemption if interest rates have moved lower and the issuer is likely to refinance. This measure is relevant for straight bonds; for convertibles, less so given that the decision to refinance at a lower coupon may be less important than whether the bond will be converted.

Yield-to-put: Similar to a yield-to-call, the yield-to-put measures the return to a date when investors have the option to demand repayment of a bond before maturity. This measure matters when investors would like to exercise that put feature, usually because the bond is trading below par and they would prefer to receive repayment at par early rather than wait until maturity.

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