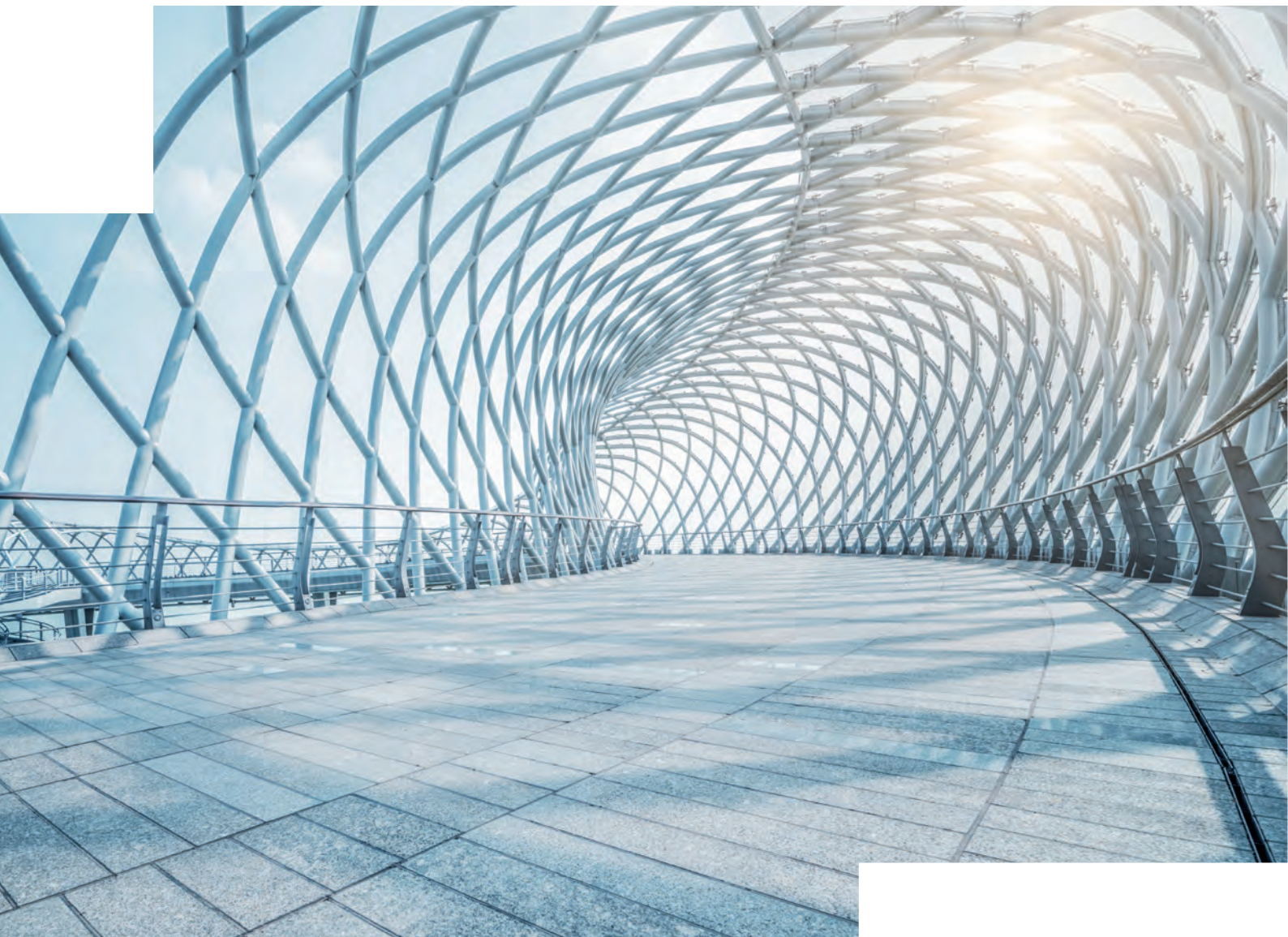


The case for convertible bonds



Foreword

Combining performance and protection

Convertible bonds have been used by corporations to raise external capital since the middle of the nineteenth century. Initially, they were issued mainly by US railroad companies to finance their growth. It has been a long time since small to medium-sized companies in growth markets were the only ones issuing convertible bonds. Today, convertibles have become a global asset class. Issuers range from medium-sized companies to large international corporations in both developed and emerging economies.

As a hybrid form of financing somewhere between equity and borrowing, convertible bonds are not only attractive for the issuing company, but investors also stand to benefit from certain characteristics of convertible bonds that are not tied to a specific market situation or investment strategy. As an additional source of risk diversification, convertible bonds are also suitable for inclusion in mixed (multi-asset-class) portfolios. It is important to note the wide variety of convertible bond strategies ranging from low-risk approaches to more dynamic ones with higher potential for both risk and return.

But why invest in convertible bonds? The current uncertainty on the financial markets presents opportunities and risks. Convertible bonds enable investors to benefit from a rising market without running the same risks as with an equity investment. Interest rates, which are currently very low, present another challenge. Right now, it is difficult to earn attractive returns from bond markets using traditional strategies. However, the situation looks different for convertible bonds. Since they are corporate bonds with an equity option component, they may contain an additional source of income compared to conventional corporate bonds. Besides the attractive potential returns that convertible bonds offer, it is important to understand the risks and opportunities they entail.

We are keen on helping our investors gain a deeper understanding of convertible bonds, which we believe are an attractive asset class.

Using our global convertibles product range, we aim to offer our clients the best possible solutions in the global convertibles segment. The various fund awards that we have won in recent years are a gratifying endorsement of our work.



Oliver Gasser
Chief Executive Officer at
Credit Suisse Investment
Partners

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Executive summary



This white paper is divided into three main sections. Each section can be read separately, but starting with the main characteristics of convertible bonds will make the other two sections easier to understand. A brief overview is provided at the beginning of each section.

1. Introduction

The hybrid nature of convertible bonds provides considerable benefits for investors: decreases in the equity price of the underlying asset are hedged against by the nominal value of the bond, whereas an increase in the equity price of the underlying asset also increases the value of the convertible bond. This section describes the basic characteristics of convertible bonds and explains what makes them attractive in the current market environment.

2. History and investment universe

Convertible bonds have been in existence for around 150 years now. The last ten years have seen an increase in convertibles issuance, particularly in the US. Today, the convertibles market is dominated by US issuers (65%), followed by European issuers (22%). In this section, we focus on the current convertible bond universe and the dynamic changes occurring on the market.

3. Convertible bonds and asset allocation

Thanks to their strong historical performance and low volatility, convertible bonds have an excellent performance track record compared to equities and bonds.¹ In mixed portfolios, convertible bonds are suitable for increasing portfolio diversification and reducing downside risk.

¹ For details, please see Figure 10 on page 27.

Historical performance indications and financial market scenarios are not reliable indicators of future performance.

Introduction



Convertible bonds in detail

- This section provides an overview of the key terms used for valuing convertible bonds such as bond floor, parity, and convexity.
- The Sika convertible bond: interpreting the features of a convertible bond using a concrete example.
- Factors influencing the price of convertible bonds and the risks involved. Features specific to equities, bonds, and options must be taken into account when valuing convertible bonds. Risks such as prospectus risk and currency risk must be given special consideration when investing in convertible bonds.
- The price of a convertible bond is linked to the bond floor and parity. Three examples (convertible bonds issued by Teva, Total, and SMIC) illustrate how the bond components provide protection and how investors may also benefit from rising equity markets.

Convertible bonds in detail

Convertible bonds are hybrid financial instruments that combine the features of corporate bonds (debt) and shares (equity). Like conventional bonds, convertible bonds have a fixed term, at the end of which the investor is entitled to repayment of the principal. The difference is that convertible bonds entail a conversion right. The investor is entitled to convert the bonds into a predefined number of shares, subject to the conditions set out in the prospectus.

Since a convertible bond has the additional option of conversion into shares, it costs more than a corporate bond (with the same term and coupon)

issued by the same company. This lower price barrier is known as the bond floor. It is equivalent to the present value of the future cash flows if the conversion option is not exercised. The percentage difference between the convertible bond price and the bond floor is the investment premium.

In addition to the bond floor, parity is the other natural lower price barrier for a convertible bond. Parity represents the value of the shares into which the bond can be converted. The relative price difference between the bond and parity is called the conversion premium. These relationships are illustrated in Figure 1.

Convertible bonds can be divided into three categories depending on how the price of the underlying share develops:

- Equity-like
- Balanced
- Bond-like

When the share price exceeds the strike price, the convertible bond is said to be “in the money.” This is illustrated in the right-hand section of Figure 1, where the value of the convertible bond is close to parity (low conversion premium) and behaves similarly to the underlying share.

In the balanced section of the illustration, the convertible bond is “at the money.” This section is particularly interesting for investors because it provides high participation when the share price is rising and low participation when the share price is falling. The ratio of upside potential to downside protection is at its highest, and this is where the asymmetric risk/return profile characteristic of convertible bonds comes into its own. This feature is known as the convertible bond’s convexity, which is measured in terms of gamma.

If the share price is comparatively low, the convertible bond is “out of the money” and behaves similarly to a conventional corporate bond. In this territory, changes in the interest rate and the credit risk premium have an important influence on pricing. A distinction should be drawn between two different classes within the bond-like category:

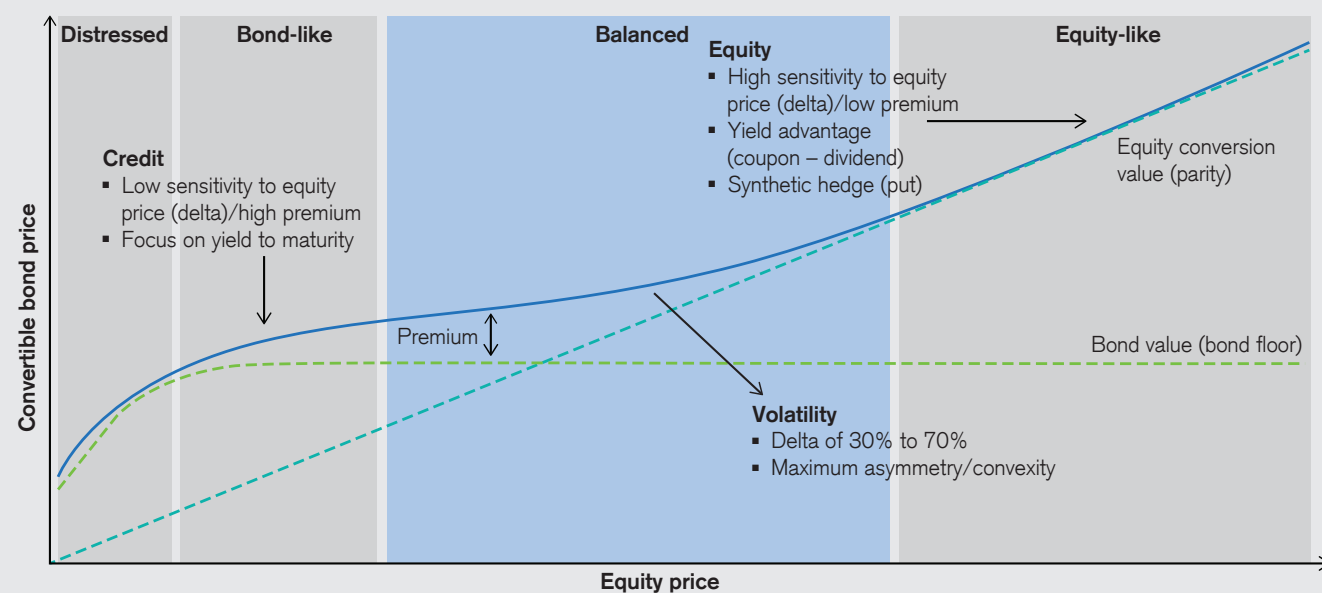
- Convertible bonds from companies with solid credit ratings are protected on the downside by the bond floor.
- In the distressed section, where a comparatively high probability of default exists, the bond floor may collapse.

To sum up, if the convertible bond is out of the money, it behaves like a conventional corporate bond. If it is in the money, its equity-like characteristics prevail. But how does the price of a convertible bond behave between these extremes?

This is in fact the most attractive situation, the so-called “sweet spot,” when convertible bonds that are at the money (i.e. close to the strike price) most clearly demonstrate their hybrid nature. The value of a convertible bond is more sensitive to a rise in the share price than it is to an equivalent drop in the share price. In this territory, the payoff is particularly asymmetric and can be attractive from the investor’s perspective. This effect stems from the fact that the bond’s sensitivity to the share price (known as the delta) is itself dependent on the share price. It increases when the share price rises and decreases when the share price falls; in other words, out-of-the-money convertible bonds have a low delta, while in-the-money convertible bonds have a high delta. The change in sensitivity to the share price is shown by the positive curvature, or convexity, of the curve in Figure 1. Convexity is measured in terms of gamma, which expresses the absolute change in the delta (%) when the share price changes by 1%.

From an investor’s perspective, it is attractive for a convertible bond to have a high gamma. However, this comes at a price, since the daily loss on the fair value of the embedded option is highest when the convertible bond is at the money. In a steady market, the daily loss on the option component is greatest when the gamma is high.

Figure 1: The risk/return profile of a convertible bond



Example 1

The Sika 0.15% 2025 convertible bond

Table 1 shows the main attributes of the Sika 0.15% 2025 convertible bond as they may appear on Bloomberg (“DES” function). Parity refers to the value of the underlying shares as a percentage of the nominal value. This percentage value can be calculated by multiplying the conversion ratio by Sika’s current share price and then dividing by the nominal value ($96.20 = 182.35 \times 105.5075 / 20,000 \times 100$). The result is the premium, defined as the percentage difference between the convertible bond price and the parity ($21.62 = [117 / 96.28 - 1] \times 100$). Another key figure is the conversion price. The conversion price is determined when the convertible bond is issued by dividing the nominal value by the conversion rate ($189.56 = 20,000 / 105.5075$). If the share price is over CHF 189.56 when the convertible bond matures, the conversion into shares will be worthwhile. If this price is not reached, it is preferable for the investor to choose a repayment of the nominal value of CHF 20,000.

In addition to the structure of the convertible bond described above, other aspects such as call and put procedures must be taken into account. A premature call or a missed put deadline may lead to considerable losses. It is therefore essential to know exactly when these deadlines are and to take action at the appropriate time. The Sika 0.15% 2025 convertible bond contains an embedded soft call option.

Sika has a CHF 100 call option on its issued convertible bonds from July 4, 2023, onward, provided that the parity value remains at or above 130% on 20 out of 30 consecutive business days. If the company calls the bonds, the investor usually has 30 days to either convert or sell. If the bonds are not converted or sold within that time, the investor yield will be only 100% instead of around 130%. For this reason, it is important for investors to be aware of the information provided in the prospectus.

Table 1: Key terms of the Sika 0.15% 2025 convertible bond as of June 30, 2020

| Name of convertible bond | Sika 0.15% 2025 | |
|---------------------------|---|---|
| Issuer | Sika AG | In the case of exchangeable bonds, the investor will receive shares in a different company, not in the issuer. |
| ISIN | CH0413990240 | |
| Price | 117%/118% | Bid and ask prices as a percentage of the nominal value; in some cases, unit prices are also possible (e.g. French convertible bonds). |
| Yield to maturity | -3.0%/-3.17% | Yield to maturity in percentages; the first value is calculated using the bid price, and the second value is calculated using the ask price; negative values may occur due to the option component. |
| Currency | CHF | Currency in which the bond is issued; it may differ from the currency of the share. |
| Country | Switzerland | Country in which the issuer is domiciled or the country in which the ISIN is registered. |
| Rank | Senior unsecured | In the event of bankruptcy, senior unsecured debt is given priority over subordinated debt. |
| Coupon | 0.15% | |
| Coupon frequency | Annual | |
| Type | Fixed | Fixed and zero coupons are the most common. |
| Dividend protection | Above CHF 1.85 | All dividend payments in excess of CHF 1.85 lead to an improvement in the conversion ratio. |
| Conversion ratio | 105.5075 | The number of shares into which the convertible bond can be converted; defined at the time of issuance. Has already improved since issuance due to dividend payments above the threshold of CHF 1.85. |
| Stock ticker | SIKA SW Equity | Bloomberg ticker for the underlying share. |
| Parity | 96.20 | Stock price \times conversion ratio / par amount \times 100 |
| Rating | A- (S&P) | |
| Conversion price | CHF 189.56 | Par amount / conversion ratio |
| Stock price | CHF 182.35 | |
| Conversion premium | 21.6% | Price / parity -1 (based on bid price) |
| Maturity date | June 5, 2025 | |
| Call | None | A hard call gives the issuer the right to redeem the bonds prior to maturity (usually at 100%). |
| Soft call | From July 4, 2023, onward (soft call trigger: 130%) | If parity is at least 130% on 20 out of 30 consecutive business days, the issuer may call the bonds at 100% from July 4, 2023, onward. In such cases, the investor still has the right to convert. |
| Put | None | A put gives the investor the right to redeem the bonds prior to maturity (usually at 100%). |
| Amount issued/outstanding | | This convertible bond was issued to the amount of EUR 500 mn. |
| Min. piece/increment | | Minimum amount tradable or minimum increment. |
| Par amount | | Nominal value of the convertible bond in euros. |

The security mentioned on this page is meant for illustration purposes only and is not intended as a solicitation or an offer to buy or sell these securities.

Factors influencing the price and risks of a convertible bond

The price of a convertible bond is influenced by a number of factors. For example, its sensitivity to interest rate changes or to changes to the issuing company's credit quality stems from the bond component. In addition to the equity market sensitivity attributable to the option component, there are also other factors connected with derivative valuation, including price volatility of the underlying stock and the fair value of the option.

A convertible bond's price sensitivity to all of these factors changes over time and in response to market movements. A convertible bond will behave like a bond or a stock in different situations, so the risks associated with each convertible bond must be assessed individually at any given time and in the context of the portfolio. The most important risk factors related to convertible bonds, the key data needed to quantify them (measures known as "Greeks"), and the general risks associated with this asset class are described below.

Equity sensitivity

The more a convertible bond is in the money, the greater the value of the embedded option. The equity sensitivity of convertible bonds of this kind can be attributed to the comparatively high probability of a conversion. If the option component is out of the money, equity sensitivity is low. Delta, which is expressed in either absolute or relative terms, is used to quantify equity sensitivity. In the Sika 0.15% 2025 convertible bond example above, the delta is 0.50 in absolute terms or 43% when expressed in relative terms (all key data based on Bloomberg as of June 30, 2020). This means that if the share price rises by 1% (e.g. from CHF 182.35 to CHF 184.17), the convertible bond will increase in value by CHF 0.50 (from CHF 117.00 to 117.50

on the bid side and from 118.00 to 118.50 on the offer side). In relative terms, a 1% rise in the share price results in the convertible bond gaining approximately 0.43%.

Bond-specific sensitivity

Convertible bonds that are far out of the money behave like corporate bonds. When valuing future cash flows, interest rate and default risks must be taken into account. Rho is used as a measure of the interest rate sensitivity of the bond component of a convertible bond. The rho of -3.687 for the Sika 0.15% 2025 convertible bond means that the price of the convertible bond will fall by 3.687 points if a 1% parallel upward shift in the yield curve occurs. The default risk of a convertible bond is commonly measured in terms of the credit risk premium, and the corresponding price sensitivity to the credit risk premium is expressed using omicron.

Option-specific characteristics

In addition to the factors described above, option-specific factors such as volatility sensitivity and fair value also play a role in valuing a convertible bond. The value of the call option embedded in a convertible bond rises as the share price becomes more volatile because this increases the probability that the bondholder will exercise the conversion option at maturity. Sensitivity to changes in volatility is greatest for convertible bonds that are at the money. The Sika convertible bond has a vega – the relevant risk measurement in this case – of 0.768. If the volatility rises by 1%, the price of the convertible bond will increase by this amount. The second option-specific characteristic, time sensitivity, is expressed using theta. In the example above, the theta of the Sika convertible bond is -0.006. This is the amount by which the price of the convertible bond falls each day, all other factors being equal, due to time value decay.

Liquidity risk

A convertible bond's liquidity is another important aspect to consider, particularly in the event of small issue volumes. Liquidity bottlenecks can lead to a considerable increase in trading costs owing to higher bid-ask spreads, or can even lead to a suspension of trading in a security. To reduce the risk of liquidity constraints, convertible bond index providers set minimum criteria in terms of market capitalization, historical trading volume, and pricing quality.

Prospectus risk

The individual structure of a convertible bond is described in its prospectus. A prospectus specifies, for example, when the issuer can call the bond and provides details on call protection and possible takeover protection. Since such clauses have a considerable impact on pricing, it is crucial to analyze them carefully before making investment decisions. Contacting an analyst or a broker may prove helpful in this regard.

A prospectus also includes information about the issuer, the bond's rank, the conversion ratio, any call and put procedures, and other details regarding takeover protection, dilution protection, sleeping investor clauses, etc. All of these features may be highly relevant in certain circumstances. Call and put conditions, for example, may have a significant influence on the pricing of convertible bonds. The glossary table at the end of this publication provides an overview of the most common terms used in a convertible bond prospectus.

Early call

A company may have the right to redeem a convertible bond on certain fixed conditions. This right usually comes into force after a certain amount of time known as the call protection period. After the expiration of the call protection period, the company can redeem the convertible bond after a notice period that typically lasts 30 days. If the call price is lower than the value of the underlying share, and if the deadline for a sale or conversion is missed, the investor in the convertible bond could incur significant losses.

Put rights on a convertible bond

While the company may have call rights, the investor in turn may have put rights related to the convertible bond. Put rights allow the investor to return the convertible bond at the put price under certain circumstances. If the convertible bond is returned early (or "put") by the investor, the maturity term is brought forward to the relevant put date. If the put date for the convertible bond is missed, the maturity term is extended to the next put date or to the maturity date of the bond. This means that the current value of the bond component may decrease and, as a result, so will the price of the convertible bond, as illustrated by the example below.

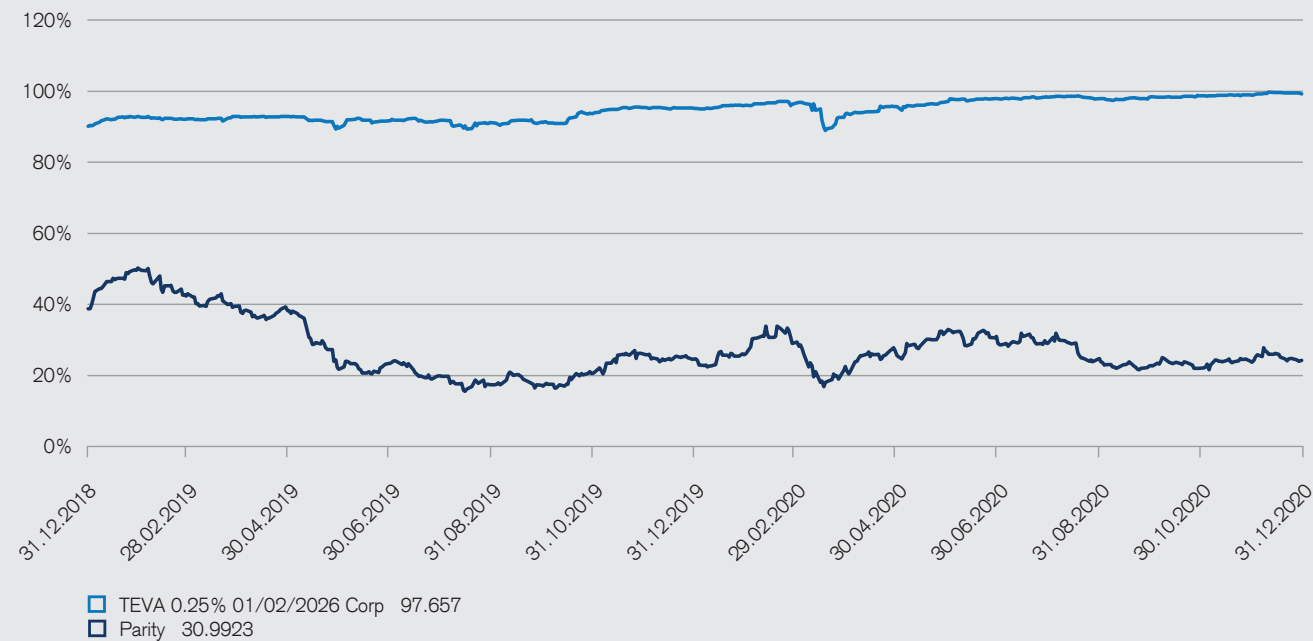
“
A convertible bond will behave like a bond or a stock in different situations, so the risks associated with each convertible bond must be assessed individually at any given time.

Example 2

The Teva 0.25% 2026 convertible bond

Figure 2 shows the 0.25% convertible bond issued by the pharmaceutical company Teva that is due to mature in 2026. A put date on February 1, 2021, shortens the duration risk to seven months, and the bond floor is at around 97.5% regardless of the elevated credit risk of the issuer (five-year credit default swaps: 450 basis points). Since the conversion value is nearly worthless with parity standing at 31 as of June 30, 2020, the convertible bond trades practically at the bond floor value. Missing the put in early 2021 may have fatal consequences. In such an unfortunate scenario, duration would jump to five years and, assuming that the credit spread remains unchanged, the bond floor and thus the price of the convertible bond would drop by approximately 20%.

Figure 2: Teva 0.25% 2026 convertible bond price and parity



Source Bloomberg

Currency risk

Financial securities issued in foreign currencies are exposed to currency risk. This also applies to convertible bonds. However, convertible bonds may also exhibit special features in this respect. In some cases, convertible bonds are issued in a different currency than the underlying shares are denominated. For example, the French energy company Total's 0.5% 2022 convertible bond is traded in US dollars and also pays coupons in US dollars. Upon conversion, however, the investor receives shares of Total traded in euros. The currency exposure of such bonds needs to be assessed separately.

Changes in prices of convertible bonds in relation to the bond floor and parity

The bond floor and parity are of interest not just from a theoretical standpoint. They can also be observed in relation to convertible bonds' price movements. An examination of convertible bond price movements clearly shows the cushioning effect of the bond floor and the possibility of participation in the share price increases.

The influence of the bond floor on the changing price of a convertible bond can be seen in the example of Total (Figures 3 and 4). The company's shares lost about 56% of their value between December 31, 2019, and March 18, 2020. Parity value fell to nearly 40. However, the bond floor prevented a corresponding drop in the price of the convertible bond, limiting it to about 12.7%. This effect can be attributed to the convexity of the convertible bond.

Figure 3: Total 0.5% 2022 convertible bond price and parity



Source Bloomberg

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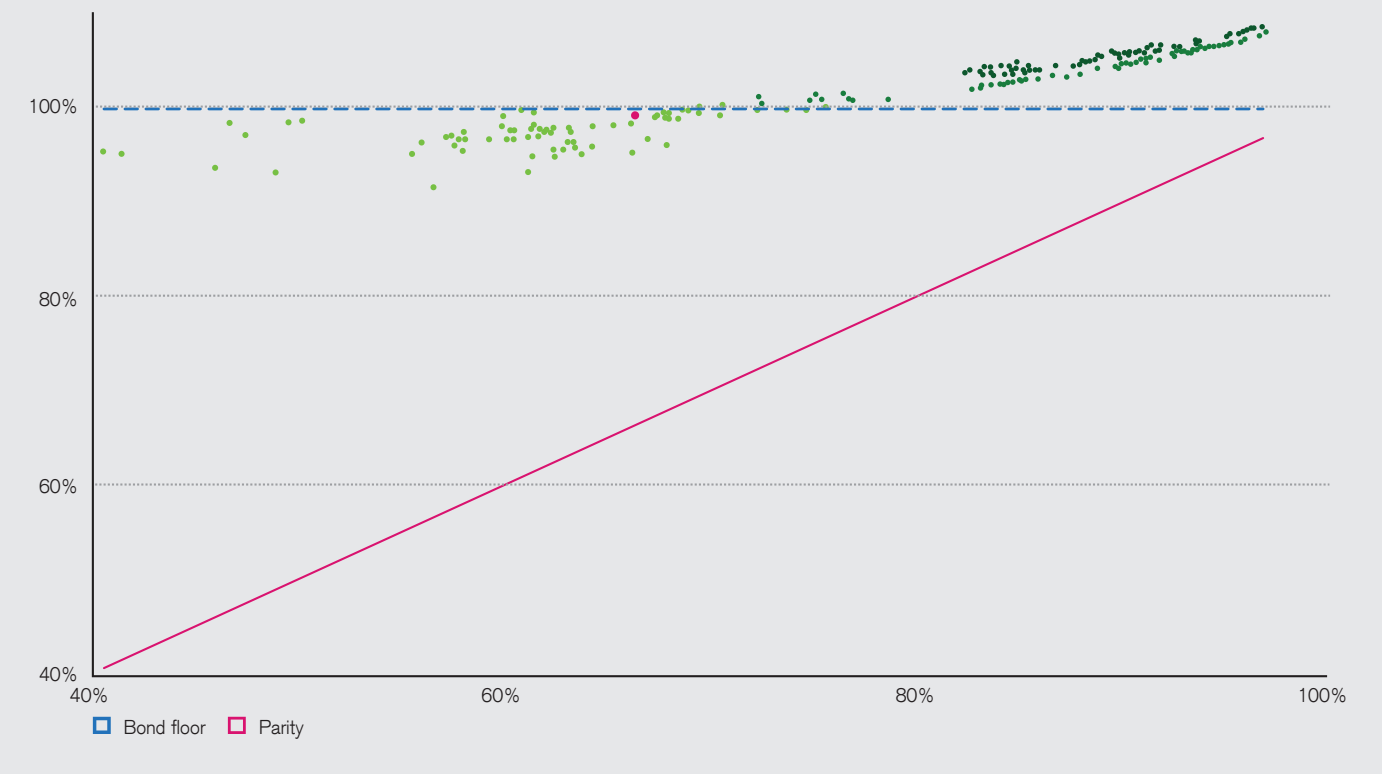
A reduction in the share price reduces the equity sensitivity of the convertible bond until it approaches the bond floor. If the credit spread does not increase further, the bond floor will remain stable. In this case, the convertible bond price should not have fallen below USD 100. However, the speed of the correction in Q1 2020 caused many convertible bonds to trade below their theoretical bond floors, as shown in Figure 4.

Figure 5 shows the influence of parity on the price of the convertible bond issued by the Semiconductor Manufacturing International Company (SMIC) based in Hong Kong. By definition, the parity rises in line with the share price. Within just 1.5 years, the parity

rose from below 60 to nearly 300, resulting in a hefty gain of almost 200% for the convertible bond. It is noteworthy that the equity sensitivity (delta) of the convertible bond increases as the parity rises.

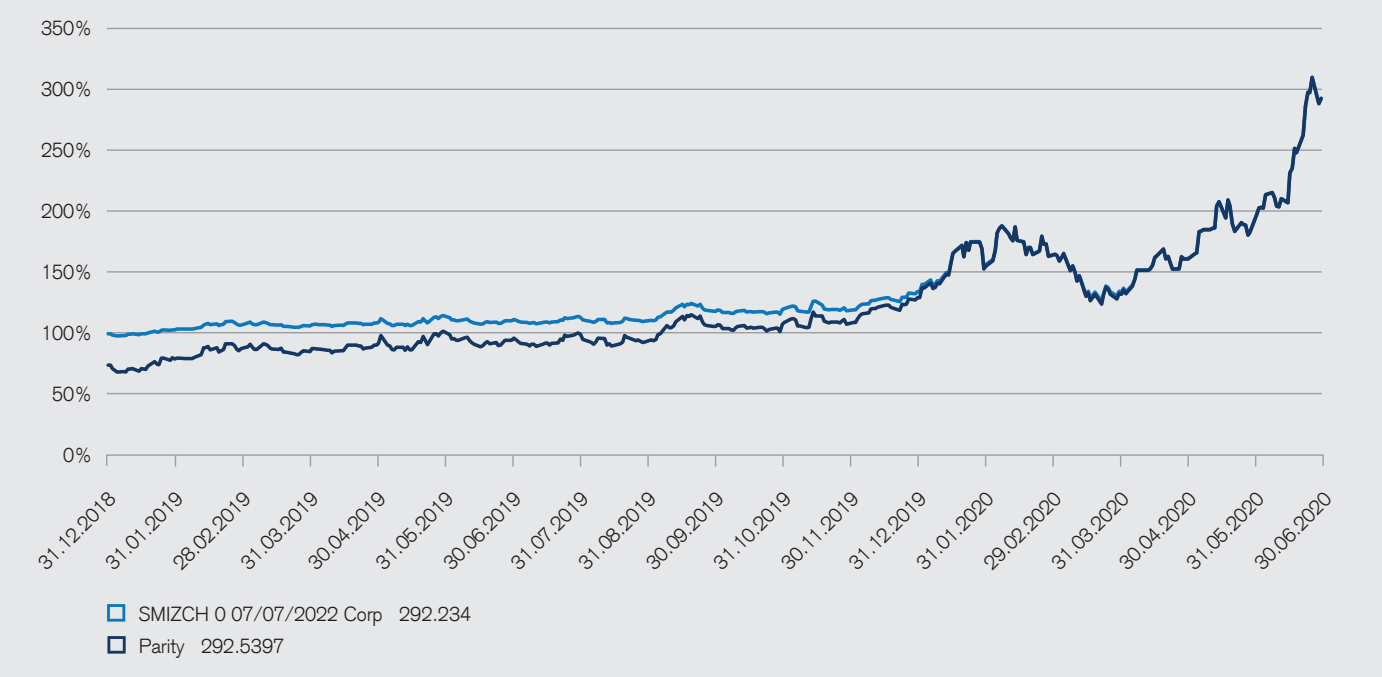
The Total and SMIC examples show the risk-reducing effect of the bond floor and the possibility of upside participation when the parity rises. Before purchasing a convertible bond, it is always advisable to examine the gap between the two lower price barriers in order to estimate the risks and opportunities.

Figure 4: Total 0.5% 2022 convertible bond price, bond floor, and parity (light green = closer to December 31, 2020)



Source Nomura

Figure 5: SMIC 0% 2022 convertible bond price and parity



Source Bloomberg

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History and investment universe



The convertible bond market: a historical overview

Railroad companies were the first issuers of convertible bonds in the nineteenth century. Today, the convertible bond market is globally diversified and the majority of issuers are medium-sized and large companies. The US market accounts for the lion's share of the global convertible bond universe at just under 65%, followed by Europe (approximately 22%).

Dynamically changing universe

While some issuers repeatedly tap the potential of the convertibles market, many companies decide to issue convertible bonds only once or twice. This makes the regional and sectoral composition of the convertible bond universe more dynamic than that of major fixed income and equity indices.

The convertible bond market: a historical overview

Issuing convertible bonds as a type of financing is by no means just a fad. Its history dates back to the nineteenth century, when American railroad companies needed capital to finance their business operations. At that time, the US was a rapidly growing economy, similar to the emerging markets of today. Capital was not easy to obtain through the issuance of shares or bonds. In the fierce competition for capital, another form of financing proved attractive to companies and investors alike: the convertible bond. The right to convert bonds into shares meant it was possible to benefit from rising equity prices in the US growth market. If the share price failed to rise, investors still had the coupons and the repayment of their investment.

For a long time, the convertible bond market was regarded as a market for small to medium-sized companies. This perception changed in the 1980s when IBM, which still had a triple-A credit rating at that time, financed a company takeover using a USD 1.25 billion convertible bond issue, thus benefiting from lower interest payments compared to those on conventional corporate bonds. Many large-cap companies issue convertible bonds today. The Refinitiv Global Convertible Bond Index, which covers more than half of the total market, includes 80% of large-cap companies.

Even though the convertible bond market has been in existence for over a century, global issuance volume has only really been soaring for the last 20 years. In terms of its regional breakdown, the US has the largest market share at 60% to 70%. Japan, which used to be the second-largest issuer, has been overtaken since the 1990s, first by Europe and then by other rapidly growing Asian countries.

In February, 2021, the global convertible bond market reached a record-high volume of over USD 490 billion. However, not all of those bonds are liquid enough or have a sufficient volume to attract a sizable investor community. Index providers use various criteria to filter the universe by liquidity.

Investment-grade issuers (companies with ratings from AAA to BBB), the majority of which are based in the US and Europe, account for over 20% of the universe. Convertible bonds from non-investment-grade and unrated issuers have been a driving factor in the recent growth of the asset class, underpinning favorable financing conditions for growth companies in the technology sector, for example.

The largest convertible issuers by industry are IT/technology, with about a 28% share, followed by industrials (14%) and pharmaceuticals (7%). This marks a clear differentiation and diversification compared to the major fixed income benchmarks. The financial industry, for instance, which is typically the largest sector in global bond markets, only accounts for 4% of the convertible benchmarks on average.

Figure 6: Convertible bond universe by sector (in %)

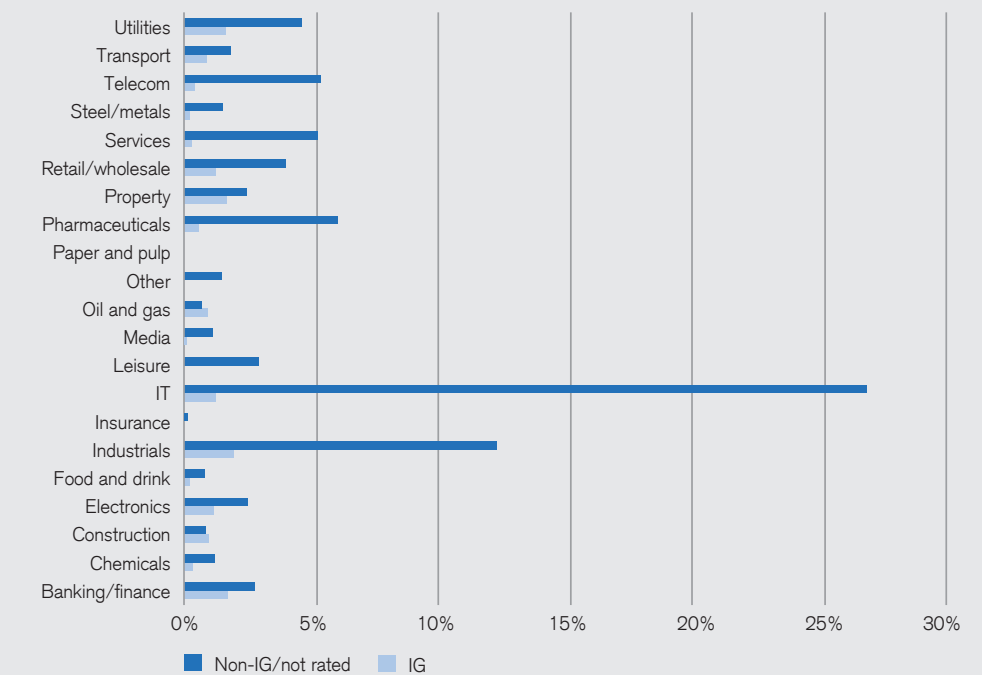
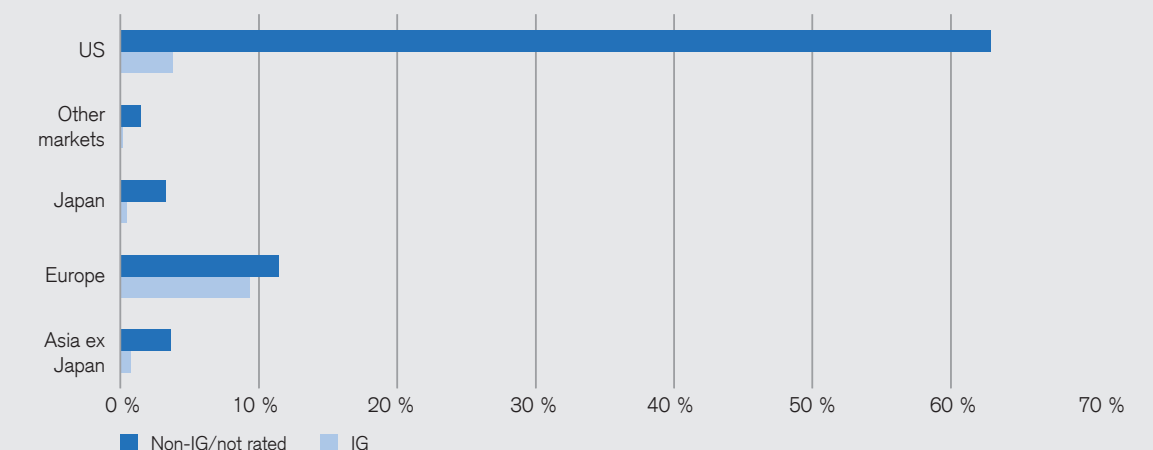


Figure 7: Convertible bond universe by region (in %)



Source Refinitiv, data as of December 31, 2020

The dynamically changing convertible bond universe

A somewhat overlooked aspect of the convertible bond market is its very dynamic nature, meaning that the universe of convertible bonds changes relatively quickly over time. Convertible bonds are usually issued by companies seeking growth. While some issuers tap the market multiple times, many of them do so just once or twice. This makes the universe of convertible bonds very dynamic with regard to its regional and sector composition, something that is not observable to the same extent in the equity and straight bond markets. Figure 8 breaks down the historical composition of the Refinitiv Global Convertible Bond Index by sector.

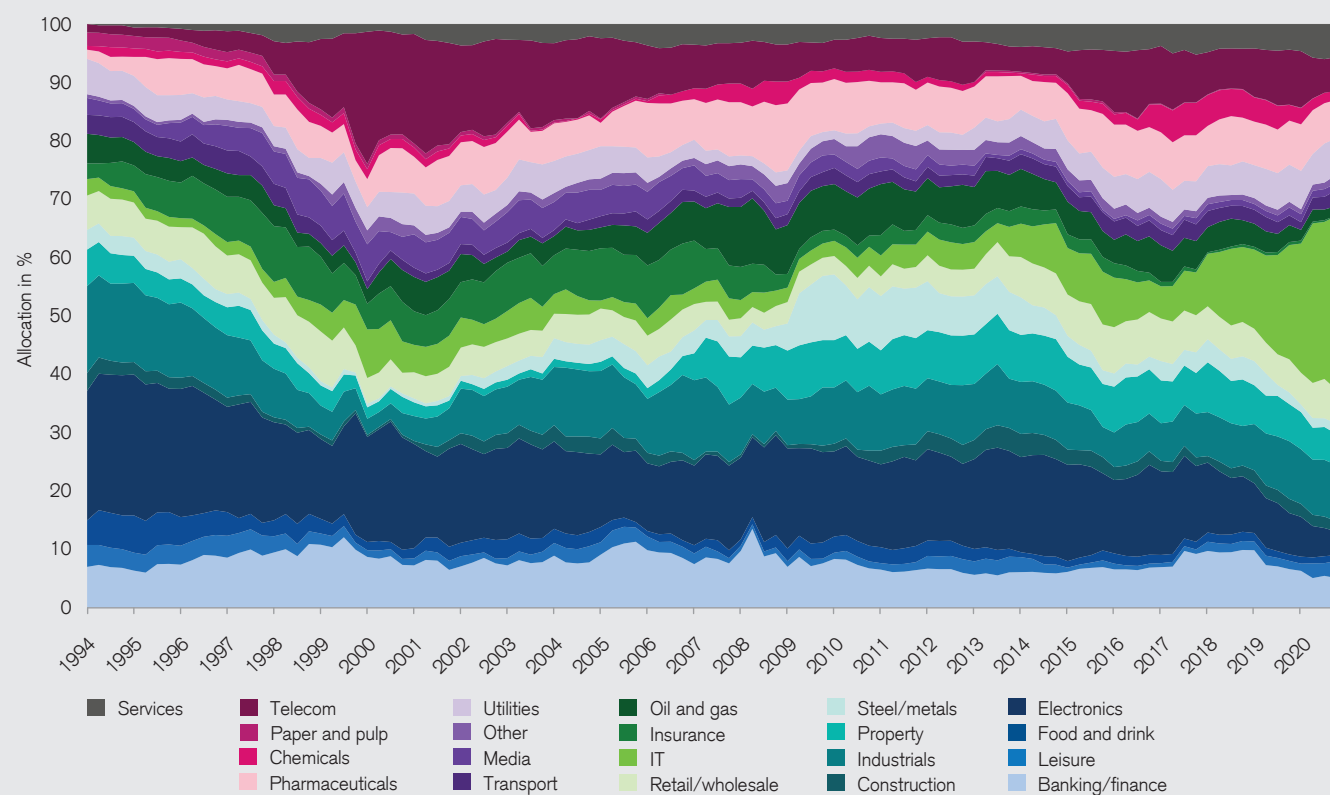
This dynamism is relevant because it beneficially influences convertible bonds' performance for three main reasons. First, convertible bonds are more likely to be issued when companies are in a growth phase. The best example of this is the wave of new issues that we saw in the technology sector in 2020. Second, the convertible bond market mainly attracts new issuers to the primary market in times of market dislocations like the one witnessed in the aftermath of the coronavirus-related market shock in 2020. The severely affected leisure and travel industry, which was underrepresented before, brought a number of new deals to market in Q2 2020 because the

industry outlook was dire and the straight bond market was the far more expensive alternative (e.g. Southwest Airlines, Carnival Cruise Line, Amadeus). Another example is the energy sector, which saw new issuers in 2015 and 2016 after the oil price fell substantially (e.g. Technip, BP, Total). This countercyclical element does not always materialize immediately, but it has a positive performance impact over the medium to long term. Third, and maybe most importantly, convertible bonds have a built-in profit-taking mechanism because of their fixed term, which differentiates them from equities. Even if a convertible bond doubles or triples in

price, at some point it reaches maturity, gets converted, drops out of the universe, and is eventually replaced by the next potential success story. These phenomena combined explain why convertible bonds beat global equities over time (see the next chapter) in spite of a long-term average delta of around 50.

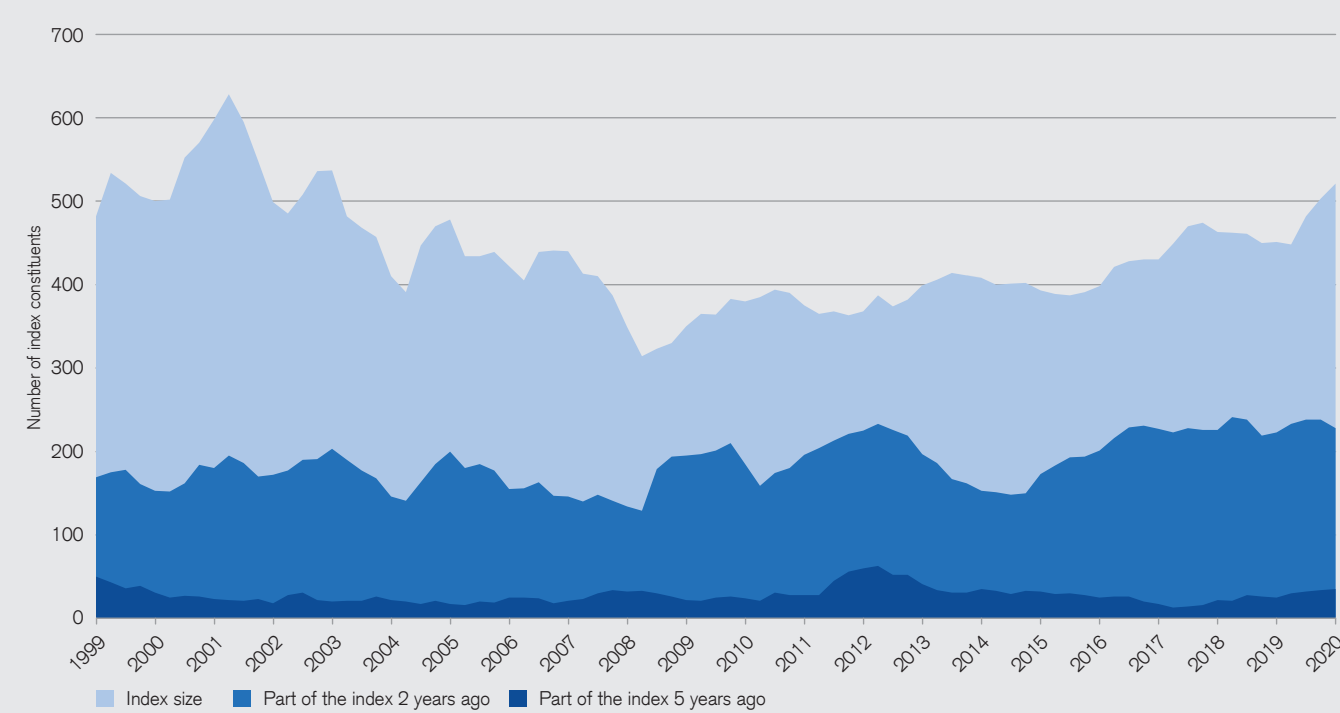
Figure 9 illustrates the fast turnover of convertible bonds. Of the 503 instruments that made up the Refinitiv global convertible bond universe at the end of September 2020, only 34 (dark blue area) had already been part of the index five years earlier.

Figure 8: Breakdown of the Refinitiv Global Convertible Bond Index by sector between 1994 and 2020



Source Refinitiv, data as of December 31, 2020

Figure 9: Number of Refinitiv Global Convertible Bond Index constituents between 1999 and 2020



Sources Credit Suisse Investment Partners, Refinitiv

Convertible bonds and asset allocation



Convertible bonds can be a useful instrument as part of an asset allocation. This section of the paper examines the effect that convertible bonds have on multi-asset-class portfolios.

Risk and return of convertible bonds

- High historical returns compared to stocks and a high Sharpe ratio.
- A shorter duration than government or corporate bonds is an advantage when interest rates rise.
- If credit risk premiums tighten, convertible bonds will simultaneously profit from their bond and equity components.

Portfolio optimization with convertible bonds

- Having convertible bonds as a core portfolio component can provide diversification for different levels of risk tolerance.

- The risk diversification is greatest for profiles with medium risk.
- The extent of risk diversification also depends on the selected convertible bond strategy.

Reduction of the expected drawdown

- The addition of convertible bonds reduces a portfolio's expected downside risk.
- Convertible bonds reduce the magnitude of negative deviations (tail risk). This effect is particularly pronounced in the case of high-convexity and investment-grade bonds.

Risk and return of convertible bonds

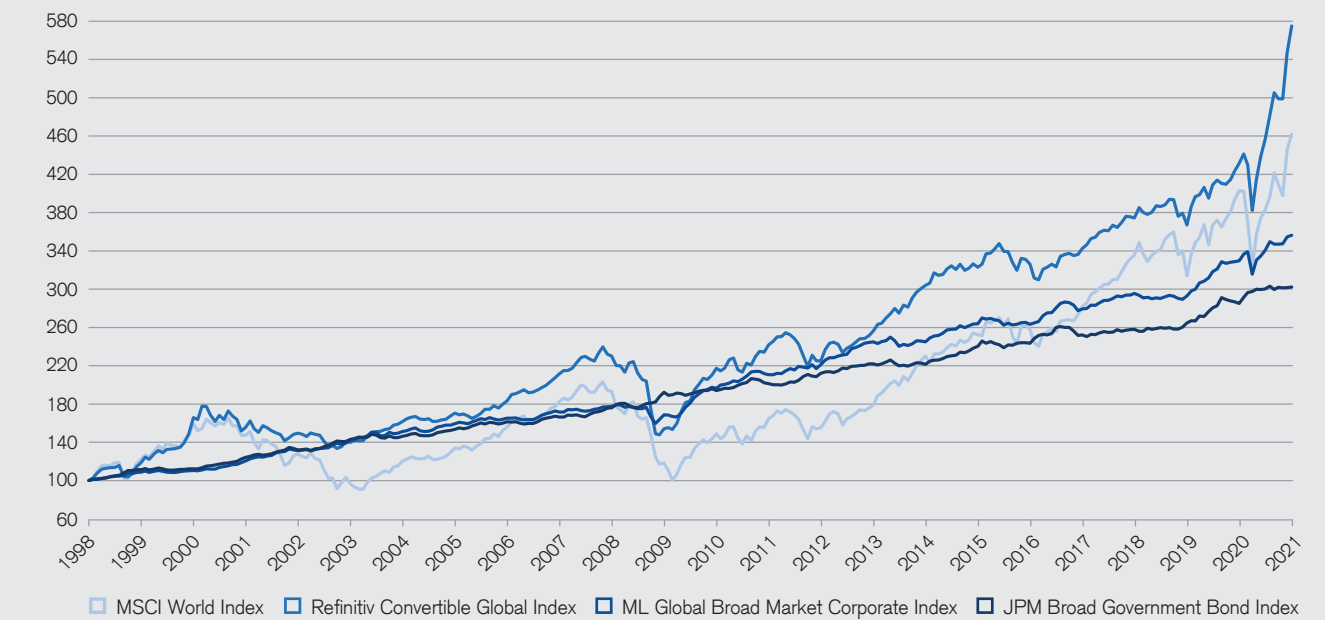
Convertible bonds, as measured by the Refinitiv Convertible Global Index, have significantly outperformed conventional corporate and government bond and equity markets since 1997.

At an annualized return of 7.9%, convertible bonds have clearly surpassed the returns generated by global equities and government and conventional corporate bonds (the benchmark indices are hedged in the reference currency US dollars). The two major stock market crashes that occurred during the analyzed period impacted convertible bonds far less than stocks. Convertible bonds exhibit lower volatility (10.8% versus 14.5%) and higher returns than equities, which results in a higher Sharpe ratio.

However, a comparison of Sharpe ratios also reveals that convertible bonds lagged behind government and corporate bonds from a risk/return perspective. One explanation for this is the falling interest rate environment over the last four decades as well as the higher average duration of government and conventional corporate bonds. Historical

returns on corporate bonds can be divided into an interest component and a credit component. Over the course of the last ten years, falling interest rates were clearly the main driver of returns on corporate bonds. With interest rates at historically low levels today – near 0% or even negative in many countries – this trend cannot continue on this scale. An upward adjustment in interest rates would lead to a negative performance. With their relatively low average duration of 4.1 versus 7.2 years in the ICE BofA Global Corporate Index, convertible bonds are well equipped for such situations. Moreover, the duration of the convertible bond market has been fairly stable in recent years compared to the extension in the conventional corporate bond market, where issuers have taken the opportunity to fund at lower interest rates for longer maturities.

Figure 10: Convertible bonds outperform straight bonds and equities (between 1997 and 2020)



| Asset class | Return p.a. | Volatility | Sharpe ratio |
|---------------------------------|--------------|--------------|--------------|
| Global equities | +6.9% | 14.5% | 0.29 |
| Global convertible bonds | +7.9% | 10.8% | 0.48 |
| Global government bonds | +4.9% | 3.0% | 0.74 |
| Global corporate bonds | +5.7% | 4.2% | 0.72 |

Sources Credit Suisse, Bloomberg

Returns hedged in US dollars, data range: December 31, 1997, to December 31, 2020

Indices: MSCI World, Refinitiv Convertible Global, ML Global Broad Market Corporate, JPM Broad Government Bond

Historical performance indications and financial market scenarios are not reliable indicators of future performance. It is not possible to invest in an index. The index returns shown do not represent the results of actual trading of investable assets/securities. Investors pursuing a strategy similar to an index may experience higher or lower returns and will bear the cost of fees and expenses that will reduce returns.

Portfolio optimization with convertible bonds

In addition to interest rate trends, the change in credit spreads is another decisive factor for government and corporate bonds. Investors holding conventional corporate bonds, for whom credit quality is a priority, can also consider convertible bonds as an alternative. If credit quality improves, convertible bonds profit from two factors simultaneously – the bond floor and the underlying share (an upward stock-market trend is often accompanied by an improvement in credit quality).

Adding convertible bonds to a mixed-asset portfolio can reduce portfolio risk without changing return expectations or can increase the expected return without increasing the risk. This risk diversification effect is significantly influenced by the low correlation of global convertible bonds with global government and conventional corporate bonds. In addition, portfolio risk is reduced as a consequence of global convertible bonds' lower volatility compared to equities.

Each dot in Figure 11 shows the risk and the return of various portfolio combinations. The upper frontier of this dotted area is called the efficient frontier, which is made up of all portfolios that offer the best possible expected return at the given level

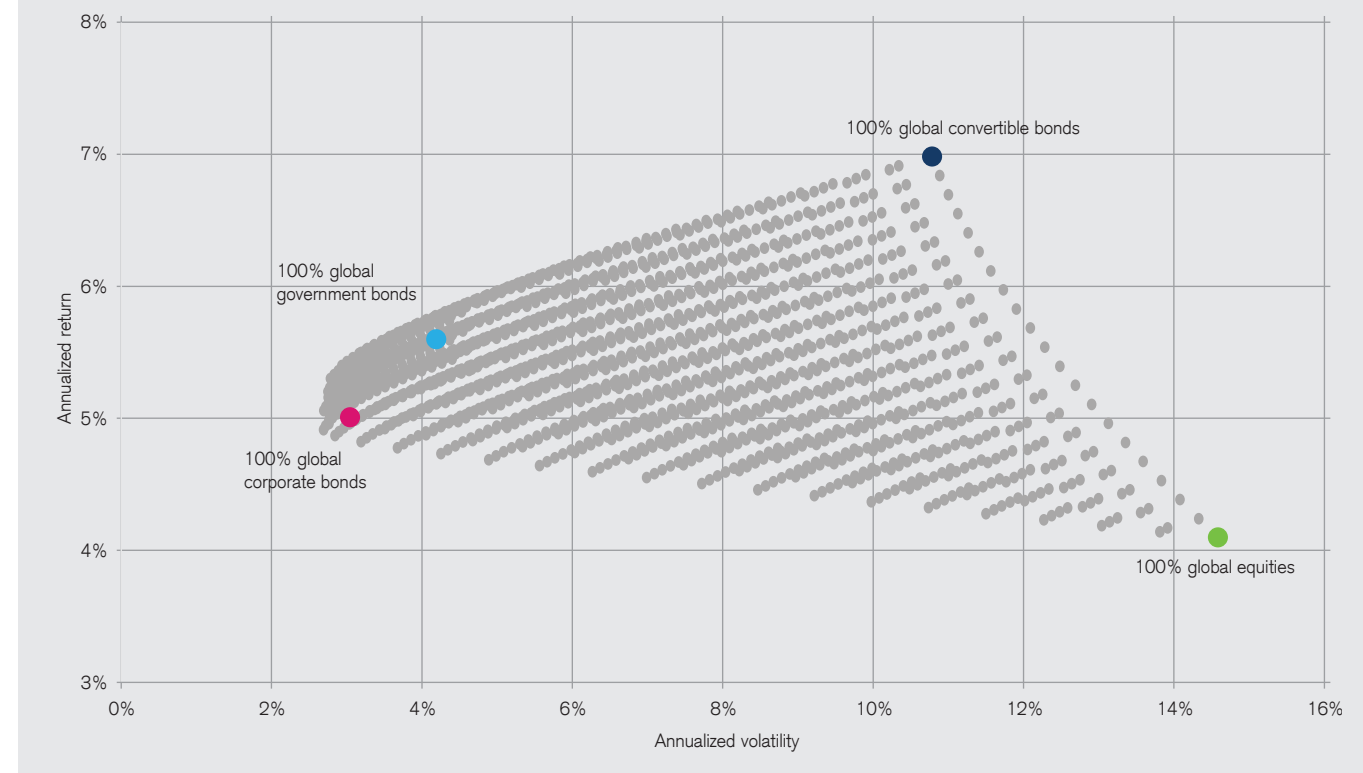
of risk. All portfolios on the efficient frontier include convertible bonds. The high return that convertible bonds have generated since 1997 make them particularly suitable for portfolios that are specifically aiming for higher returns.

However, the beneficial effect of convertible bonds is independent of a portfolio's risk profile. It is worth noting that risk/return-optimized portfolios have a core allocation to convertible bonds of approximately 15%, depending on the risk profile. This demonstrates that the addition of convertible bonds can be worthwhile even in portfolios with low risk tolerance.

The contribution of convertible bonds to mitigating portfolio risk can be improved further by including so-called balanced convertible bonds, which offer maximum convexity, or by including investment-grade instruments or a combination of both. However, such restrictions also tend to come with lower return potential.

To understand this analysis, it is important to recognize that various parameters can influence portfolio optimization.

Figure 11: Risk and return profiles of various types of portfolios between 1997 and 2020



Sources Credit Suisse Investment Partners, Bloomberg
Indices: MSCI World, Refinitiv Convertible Global, ML Global Broad Market Corporate, JPM Broad Government Bond

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Reduction of the expected drawdown

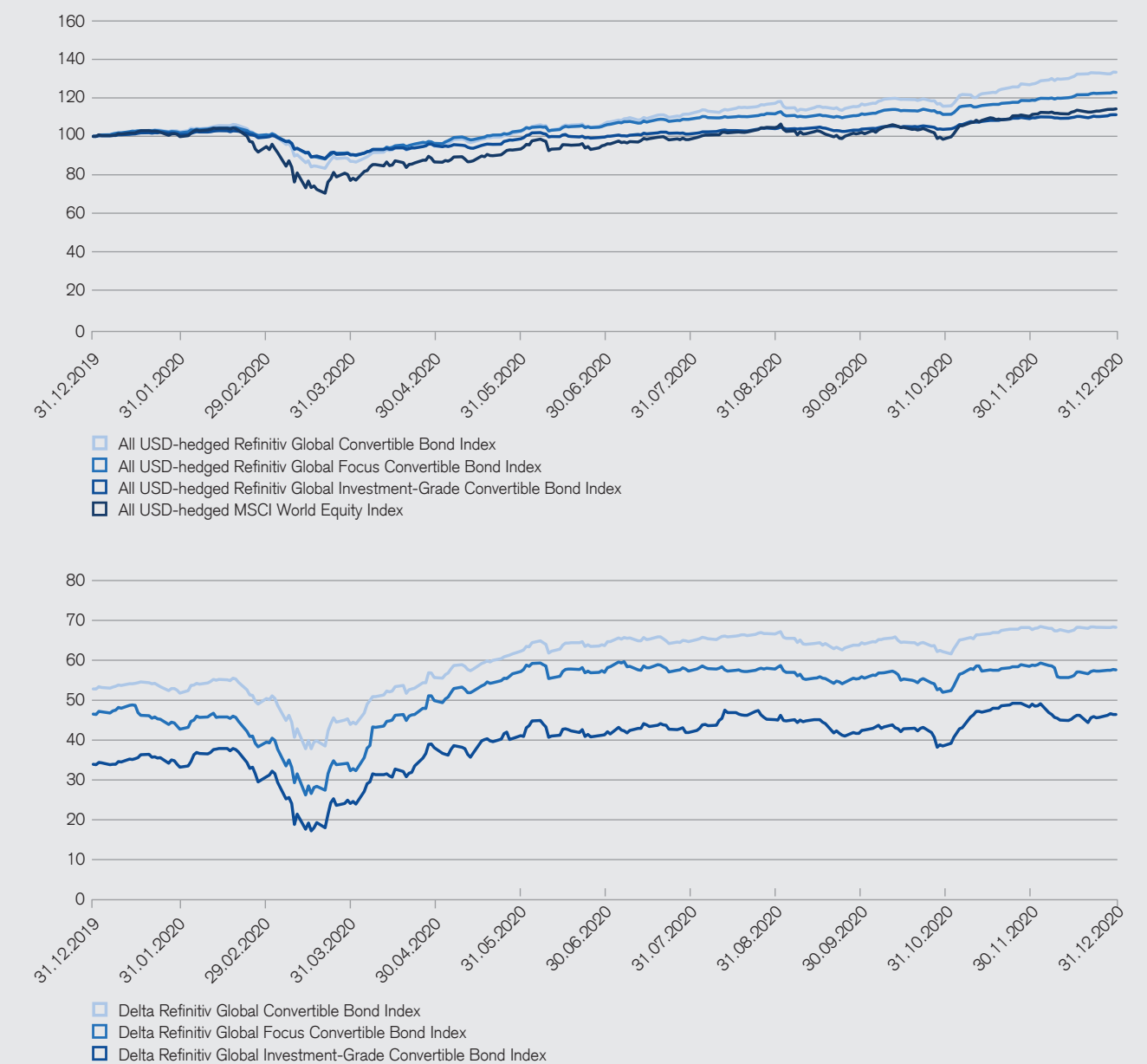
In addition to the traditional risk measure of volatility, attention is also increasingly being paid to the expected drawdown of a portfolio because it is better suited for quantifying the probability of extreme (negative) portfolio returns. Since financial market data tend to occur more commonly as positive extreme events (also more frequently than for a normal distribution of returns), the probability of negative extreme events gets underestimated and that of positive events gets overestimated owing to the symmetry of the volatility measure.

The expected drawdown is particularly relevant in the context of convertible bonds because they do not exhibit a symmetrical return profile and are able to absorb negative equity market shocks due to

convertible bonds' sensitivity (delta) and the change in equity sensitivity (gamma). Adding convertible bonds to a mixed-asset portfolio reduces the likelihood of extremely negative portfolio returns.

The recent coronavirus-related crisis is a perfect testimony to that. Figure 12 shows that convertible bonds not only lost far less than equities during the February–March 2020 pullback, but also recovered much faster afterward.

Figure 12: Convertible bond performance between January and December 2020



Source Bloomberg

Historical performance indications and financial market scenarios are not reliable indicators of future performance. It is not possible to invest in an index. The index returns shown do not represent the results of actual trading of investable assets/securities. Investors pursuing a strategy similar to an index may experience higher or lower returns and will bear the cost of fees and expenses that will reduce returns.

Reduction of the expected drawdown

When comparing the convertible bond indices (i.e. Global, Global Focus, and Global Investment-Grade), one can see that both composition restrictions – the Focus Index considering only balanced instruments and the Investment-Grade Index considering only high-quality credits – helped to further limit the losses during the crisis. In fact, those two subindices never dropped significantly below the 90% level (assuming a 100% level at the start of the year), whereas the MSCI World Index actually touched the 70% level at its low point in March 2020. Convexity worked almost perfectly as the equity sensitivity (see the lower section of the graph) fell by between 15 and 20 percentage points, depending on the index. Hence, as markets started to fall, the equity sensitivity (delta) of convertible bonds fell in parallel and convertibles became less equity-like and more bond-like.

Choosing the right convertible bond strategy

Convertible bonds have various risk and return characteristics. These should be taken into consideration when making an investment decision. It is therefore worthwhile to classify convertible bonds into various groups based on their main characteristics. One important characteristic is the credit quality of the underlying company since repayment of the bond depends directly on the company's financial condition. A distinction can be drawn here between investment-grade and non-investment-grade companies. Another important characteristic of convertible bonds is convexity. Convertible bonds with high convexity have the advantage of reacting quickly to positive equity markets and suffer less when markets fall. Focusing on convex bonds has a risk-reducing effect. A convex profile is what investors are looking for when they invest in convertible bonds.

If no complete currency hedging is undertaken, attention should be paid to the currency composition of convertible bond indices. Currency risk can significantly increase both volatility and the expected drawdown.



Glossary

| | |
|---|--|
| At the money | The share price is close to the strike price of the option. The convertible bond is highly convex. |
| Bond floor | The value of the conventional corporate bond. Also the cash value of future income streams if the conversion option is not exercised. Synonymous to investment value. |
| Bond price | The present discounted value of the future cash stream generated by a bond. |
| Bond's rank | The order in which creditors are repaid if the obligor becomes insolvent; creditors holding bonds with the lowest priority are the last to be paid. |
| Call | The right of the issuer to redeem a convertible bond at a fixed price before the maturity date. |
| Call conditions | Information about the conditions under which the obligor can redeem the convertible bond; examples: soft call, hard call, notice period, call price. |
| Call option | An option conferring the right to purchase the underlying shares at a fixed price. Convertible bonds are corporate bonds with an embedded call option. |
| Conversion period/ exercise period | The period during which convertible bonds may be converted into the underlying shares. |
| Conversion premium | The percentage difference between the price of a convertible bond and the value of the underlying shares. |
| Conversion price | The price at which convertible bonds can be converted into shares in a company. It is set when a convertible bond is issued. If parity is above this value at maturity, the bond will typically be converted. |
| Conversion ratio | The ratio expressing the number of shares into which the convertible bond can be converted. |
| Convexity | Describes the resilience of an instrument to different outcomes. The convexity of a convertible bond describes the potential to capture most of the upside in equity markets, while providing a measure of protection from the downside due to the bond characteristics. |
| Coupon | The interest payment on a convertible bond. |
| Currency | The currency in which the interest payments and principal repayment are made. |
| Delta | The sensitivity of the price of a convertible bond to changes in the price of the underlying stock. |
| Denomination/ minimum investment | Rules on trading conditions; particularly relevant to retail investors with low to medium investment volumes. |
| Dilution protection | An adjustment to the conversion ratio may be stipulated in the event of capital increases. |
| Dividend protection | The conversion value of the shares into which a bond may be converted is unaffected by dividend payments. |
| Dividend yield | A financial ratio that shows how much a company pays out in dividends each year relative to its stock price. |
| Drawdown | A measure of historical risk that refers to the proportional decline of an instrument from its highest point to its lowest point during a specific period, typically expressed as a percentage of movement between the peak valuation of the instrument (its highest point) and the trough valuation (its lowest point). |
| Exchangeable bond | A hybrid security consisting of a conventional bond and an embedded option to exchange the bond for the stock of a company other than the issuer at some future date and under prescribed conditions. |
| Exercise period | The period during which the investor can convert the bond into shares. |
| Gamma | A measure of the rate of change of delta. A higher-gamma convertible bond can earn more from potential equity upside than a lower-gamma instrument might. |
| Hard call protection | A period during which the investor is protected against a call on the part of the issuer. |
| Hedge | An investment that is made with the intention of reducing the risk of adverse price movements in an asset. |

| | |
|---|---|
| In the money | The share price is above the strike price for the option. High equity market sensitivity. |
| Interest rate, maturity, repayment | The amount and frequency of interest payments, last interest payment, principal repayment amount. |
| Investment premium | The percentage difference between the price of the convertible bond and the bond floor. |
| Investment value | Synonym for bond floor. The value of a conventional corporate bond. |
| Issue price | The value at which a convertible bond is issued. |
| Issue volume | The total nominal amount is usually stated in the general terms and conditions. |
| Issuer/guarantor | A distinction can be drawn between the issuer and the guarantor. The guarantor is the legal obligor of the convertible bond; the issuer, which issues the bond, may be a subsidiary or the finance division of the company. |
| Maturity | The length of time during which the owner receives interest payments on the investment. When the bond reaches maturity, the principal is repaid. |
| Negative pledge | In essence, this is a promise by the obligor not to pledge its assets as collateral in the future without offering existing creditors the same degree of security. |
| Omicron | The price sensitivity to a change in the credit risk premium measuring the default risk of a convertible bond. |
| Out of the money | The share price is below the strike price for the option. Low equity market sensitivity. |
| Parity | Refers to two securities having equal value, e.g. the value of the shares into which a convertible bond can be converted. |
| Put | The right of the investor to redeem convertible bonds before the maturity date at a certain price. |
| Put conditions | Information about the conditions under which the creditor can return the convertible bond; many different structures similar to those for call conditions are possible. |
| Rating | The guarantor's credit rating by Fitch, Moody's, or S&P. |
| Share split | Adjustment to the conversion ratio. |
| Sharpe ratio | The measure of the risk-adjusted return of a financial portfolio; used to help investors understand the return of an investment compared to its risk. |
| Soft call | A call linked to the fulfillment of certain criteria (e.g. a trigger price). |
| Subordinated debt | Subordinated bonds. Holders are paid after senior bond holders in the event of bankruptcy. |
| Takeover protection | Adjustment to the conversion rights (with regard to underlying shares and the conversion ratio) in the event of a merger. |
| Theta | Time decay of the embedded option. Daily loss in the option's value if other factors remain unchanged. |
| Trigger price | The level that has to be reached by the share price to trigger a specific event (e.g. a soft call). |
| Volatility | A rate at which the price of a security increases or decreases for a given set of returns. |
| Yield advantage | The advantage gained by purchasing convertible securities instead of common stock, which equals the difference between the rates of return on the convertible security and the common shares. |
| Yield to maturity | Annualized return (internal rate of return) on a convertible bond if it is held to maturity. |
| Yield to put | Annualized return (internal rate of return) on a convertible bond if it is redeemed on the next put date. |



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History and investment universe



The convertible bond market: a historical overview

Railroad companies were the first issuers of convertible bonds in the nineteenth century. Today, the convertible bond market is globally diversified and the majority of issuers are medium-sized and large companies. The US market accounts for the lion's share of the global convertible bond universe at just under 65%, followed by Europe (approximately 22%).

Dynamically changing universe

While some issuers repeatedly tap the potential of the convertibles market, many companies decide to issue convertible bonds only once or twice. This makes the regional and sectoral composition of the convertible bond universe more dynamic than that of major fixed income and equity indices.

The convertible bond market: a historical overview

Issuing convertible bonds as a type of financing is by no means just a fad. Its history dates back to the nineteenth century, when American railroad companies needed capital to finance their business operations. At that time, the US was a rapidly growing economy, similar to the emerging markets of today. Capital was not easy to obtain through the issuance of shares or bonds. In the fierce competition for capital, another form of financing proved attractive to companies and investors alike: the convertible bond. The right to convert bonds into shares meant it was possible to benefit from rising equity prices in the US growth market. If the share price failed to rise, investors still had the coupons and the repayment of their investment.

For a long time, the convertible bond market was regarded as a market for small to medium-sized companies. This perception changed in the 1980s when IBM, which still had a triple-A credit rating at that time, financed a company takeover using a USD 1.25 billion convertible bond issue, thus benefiting from lower interest payments compared to those on conventional corporate bonds. Many large-cap companies issue convertible bonds today. The Refinitiv Global Convertible Bond Index, which covers more than half of the total market, includes 80% of large-cap companies.

Even though the convertible bond market has been in existence for over a century, global issuance volume has only really been soaring for the last 20 years. In terms of its regional breakdown, the US has the largest market share at 60% to 70%. Japan, which used to be the second-largest issuer, has been overtaken since the 1990s, first by Europe and then by other rapidly growing Asian countries.

In February, 2021, the global convertible bond market reached a record-high volume of over USD 490 billion. However, not all of those bonds are liquid enough or have a sufficient volume to attract a sizable investor community. Index providers use various criteria to filter the universe by liquidity.

Investment-grade issuers (companies with ratings from AAA to BBB), the majority of which are based in the US and Europe, account for over 20% of the universe. Convertible bonds from non-investment-grade and unrated issuers have been a driving factor in the recent growth of the asset class, underpinning favorable financing conditions for growth companies in the technology sector, for example.

The largest convertible issuers by industry are IT/technology, with about a 28% share, followed by industrials (14%) and pharmaceuticals (7%). This marks a clear differentiation and diversification compared to the major fixed income benchmarks. The financial industry, for instance, which is typically the largest sector in global bond markets, only accounts for 4% of the convertible benchmarks on average.

Figure 6: Convertible bond universe by sector (in %)

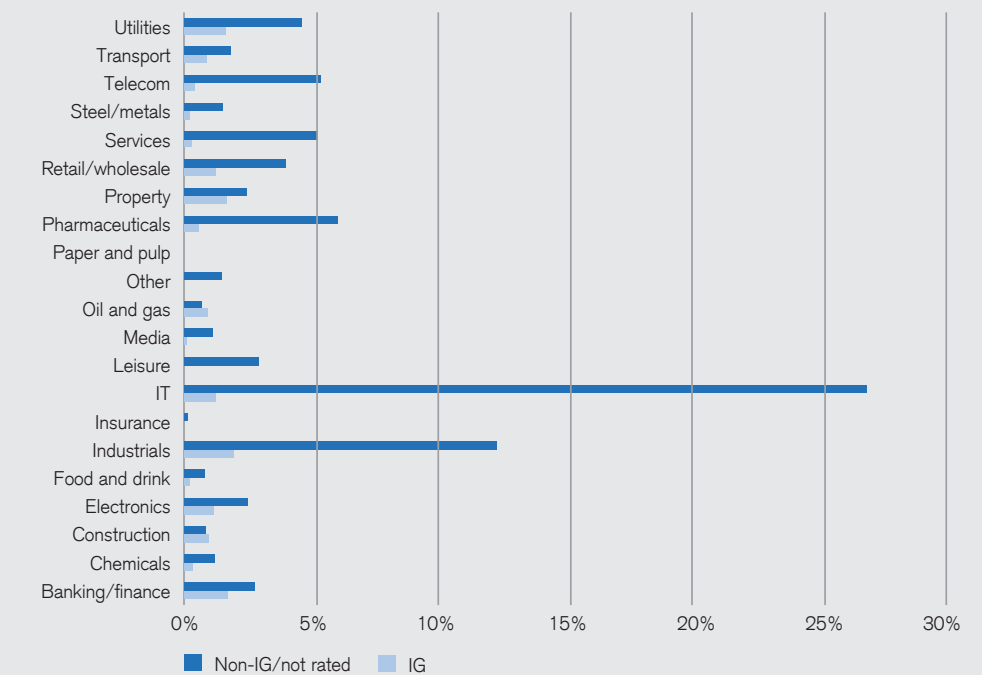
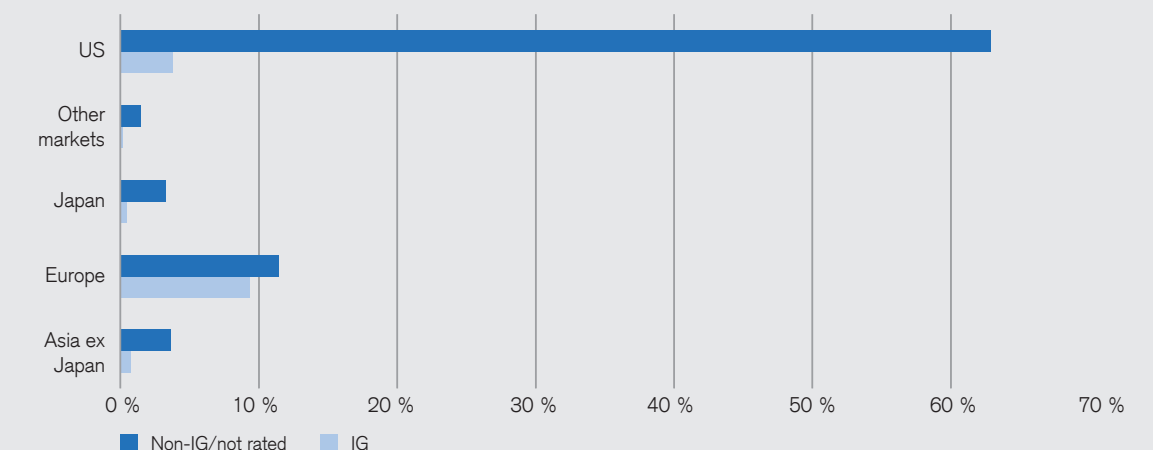


Figure 7: Convertible bond universe by region (in %)



Source Refinitiv, data as of December 31, 2020