Part I

The Convertibles Market

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Terminology

Gentlemen prefer bonds.
Andrew Mellon (US financier philanthropist, 1855–1937)

Convertible bonds have been around for more than a century. They are a spin-off from the traditional corporate bond market. The main difference is the fact that the buyer of convertible debt has the possibility to convert the convertible bond into shares of the issuing company. What makes these bonds challenging and at the same time interesting, is that their behaviour is on the crossroad of three asset classes: equity, fixed income and, to a lesser extent, currencies. The pricing and risk management of convertible bonds has benefited enormously from the advances in the equity derivatives scene and the advent of credit derivatives. In the equity derivatives discipline, for example, our understanding has moved a long way from the Black and Scholes breakthrough in 1973 to the introduction in the 1990s of the more advanced stochastic volatility models. The credit default swap market can be credited for bringing the concept of default intensity and recovery rates into the area of convertible bonds. This chapter provides a mandatory introduction into the standard terminology of this asset class. After reading this chapter, one will have mastered convertible slang.

1.1   THE PAYOFF

Hybrid securities are securities with both debt and equity characteristics. The most important family member of this asset class is the convertible bond. A convertible bond is a security in which the investor can convert the instrument into a predefined number of shares of the company that issued the bond. This conversion is, by default, not mandatory and is an option for the investor.

Convertible bonds are not new. We have to go back as far as 1881 to find the issue of the first convertible bond. The railroad magnate J.J. Hill needed an innovative way to finance one of his new projects because nobody was interested in buying any equity when he wanted to increase the capital in his railroad company. The convertible bond market has evolved a lot since this first issue more than a century ago, but the principle of mixing debt and equity in one single instrument remains the same. The final payoff of the convertible bond is written as:

$$\max(N, C_r \times S) \tag{1.1}$$

The holder of this convertible has the right, at maturity, to swap the face value N of the bond for C_r shares with price S, where C_r is the conversion ratio. Hence, a simplified definition of a convertible bond is a bond with an embedded call option. Rewriting (1.1) and abstracting from the fact that the convertible might pay coupons illustrates this:

$$N + \max(0, C_r \times S - N) \tag{1.2}$$

The above argument is only possible when the conversion is restricted to the maturity of the convertible bond. Actually, by put–call parity, holding a convertible bond is also economically the same as holding C_r shares combined with a European put option to sell these shares in return for the face value N of the convertible bond:

$$C_r \times S + \max(N - C_r \times S, 0) \tag{1.3}$$

Some simplified valuation methods support this breakup. These methods try to value a convertible as a package consisting of a European option on a stock and a corporate bond. Convertible bonds are issued by corporates (the issuer) but we cannot simply categorize them as debt. They rank before the common stockholders, and their behaviour can move from being a pure bond to an equity-like security. All of this depends on the behaviour of the underlying common stock, into which the convertible can be converted. In the case when the conversion value ($C_r \times S$) is high enough, the holder of the convertible (the investor) will exercise his or her conversion right. This could happen if the dividend yield earned on the shares is high enough compared to the coupon earned on the bond. On a non-dividend paying stock, conversion will not happen prior to maturity. A company issuing a convertible can be seen as selling shares on a forward basis. The above example is limited to the possibility of converting at maturity. Most convertibles are American-style in their conversion possibilities: converting the bond into shares is not limited to the maturity date only. Conversion can happen during a predefined conversion period ($\Omega_{\text{Conversion}}$).

The value $C_r \times S$ is called the conversion value C_V or parity P_a. Next to the conversion feature there is also a possibility for the bond to be called by the issuer. The issuer has, during a certain call period (Ω_{Call}), the right to buy back the outstanding convertible security at a price K. This is the call price. In legal documents regarding convertibles, this is often called the early redemption amount. The moment the bond gets called, the investor can still convert into shares even when $t \notin \Omega_{\text{Conversion}}$. This is called a forced conversion and is different from (1.2), which stands for an optional conversion. After receiving a call notice from the issuer, the rational investor will convert if:

$$C_r \times S > (K + \text{Accrued Interest}) \tag{1.4}$$

The conversion into common stock and the possibility of being called are the two basic building blocks present in most hybrid securities. In the next section, additional features will be discussed using a real-world example.

1.2 ADVANTAGES OF CONVERTIBLES

For both issuers and investors there are several advantages in issuing hybrid capital or investing in hybrid securities. According to the Modigliani–Miller theorem, the capital structure has no relevance. A company looking to raise capital should be indifferent to the way this capital is raised. Equity or debt, it doesn't really matter [78]. Their Nobel prize-winning paper is based on a perfect world with no taxes, and all information is available to everyone. A company cannot optimize its cost of capital by choosing a perfect mix of debt and equity. The reality is different however.

1.2.1 For the Issuer

Cost of capital consideration

Academic theory considers it a myth that the argument that the coupon on a convertible is less than the coupon on equivalent corporate debt, making the convertible the ideal instrument from a cost of capital point of view [28]. A treasurer or financial director of a company is not going to make the choice between issuing shares or corporate or convertible debt solely based on the annual coupon. If the share price rises in the future, the extra dilution after the conversion of the debt into shares would not maximize the value for the current shareholders. A company that is expecting a long-term rally on its shares would be better off issuing corporate debt. If the CFO is 100% certain that the share price is going to drop going forward, the shareholders would be better off having issued new share capital. But all of this is built on assumptions and wishful thinking. It is impossible to predict share prices. It would also imply that good companies issue debt and bad companies issue equity.

For growth companies, the lower coupon argument still stands, however. It might be a very good reason to opt for convertible debt as companies might run tight budgets in the first years after the issue date. A capital intensive growth company that is looking for a lighter interest rate charge will therefore prefer convertible debt over corporate debt. Table 1.1 provides for a handful of converts a comparison between the current yield[1] on the convertible bond and the current yield on a corporate bond issued by the same issuer of the convertible. For each of the convertibles in the list a corporate bond issued by the same company is used as comparison. The current yield on the convertibles is clearly lower than the yield on corporate debt of the same issuer. The difference in yield is compensated by the embedded right to convert the convertible bond into shares at the discretion of the investor.

Monetization of risk

A company with a high degree of business risk will be charged a higher cost of capital by the bank from which it wants to get a loan or from the investors through which it wants to raise corporate debt. If this company has its shares listed on a stock exchange, the share price will be volatile and options will be adequately priced. Using a convertible, the company could monetize this high volatility. The conversion feature packaged into the convertible bond is worth a lot more on volatile underlying shares. The embedded equity option in the convertible is then more expensive. This enables the company to lower its interest rate charge.

Privatization

A convertible issue is a forward sale of shares. The investor can be forced into the purchase of shares when the company decides to call back the debt. This forward sale mechanism can be used by a government that wants to dispose of some of its stakes in industrial companies. An example is the convertible issued in September 2009 by the Hungarian State Holding Company. This 5 year 4.4% quasi-sovereign bond had the backing from the Hungarian state and could be redeemed into shares of Gedeon Richter, a pharmaceutical products company located in Hungary. As long as these bonds – which tend to be named exchangeables instead

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[1] The current yield (CY) is defined as the coupon rate divided by the market price of the instrument.

Table 1.1 Comparison of the current yield on some convertible and corporate bonds issued by the same legal entity. All the prices and yields were taken on 20 October 2009. (*Source:* Bloomberg)

Name		Current yield (%)		Maturity (Years)	
CB	Bond	CB	Bond	CB	Bond
Air France-KLM 2.75% 1-Apr-20	Air France-KLM 0.75% 22-Jan-14	2.73	4.82	2.09	4.24
Alcatel 5% 1-Jan-15	Alcatel 6.375% 7-Apr-14	4.78	6.52	1.74	4.44
Anglo American 4% 7-May-14	Anglo American 4.875% 17-Apr-15	2.96	5.51	2.55	5.47
ArcelorMittal 7.25% 1-Apr-14	Arcelor Mittal 8.28% 3-Jun-13	4.72	7.43	2.71	3.60
Clariant 3% 7-Jul-14	Clariant 4.375% 5-Apr-13	2.22	4.46	2.24	3.44
EFG Eurobank 1.7% 29-Oct-14	EFG Eurobank 4.375% 1-Feb-2013	1.70	4.35	2.65	3.29
Gedeon Richter/MNV 4.4% 25-Sep-14	Gedeon Richter 6.75% 28-Jul-14	4.35	6.29	1.94	4.75
Graubundner Kantonalbank 2% 8-May-14	Graubundner Kantonalbank 2.025% 12-Aug-15	1.96	2.08	0.12	5.79
Nexans 4% 1-Jan-16	Nexans 5.75% 2-May-17	4.32	6.09	1.77	7.51
TUI 2.75% 1-Sep-12	TUI 5.125%10-Dec-12	3.62	6.28	2.65	3.12
Vedanta 5.5% 13-Jul-16	Vedanta 9.5% 18-Jul-18	4.98	9.31	4.33	8.72
Alcoa 5.25% 15-Mar-14	Alcoa 6% 15-Jul-13	2.51	5.66	3.15	3.71
Allegheny Tech 4.25% 1-Jun-14	Allegheny 9.375% 1-Jun-19	4.25	8.21	3.96	9.59
Best Buy 2.250% 15-Jan-22	Best Buy 6.75% 15-Jul-15	2.10	6.29	4.19	3.71
BorgWarner 3.5% 15-Apr-12	BorgWarner 5.75% 1-Nov-16	2.80	5.62	2.82	7.01
PHH Corp 4% 1-Sep-14	PHH Corp 7.125% 1-Mar-13	4.00	7.50	3.50	3.34
Superior Energy Services 1.5% 15-Dec-26	Superior Energy Services 6.875% 1-Jun-14	1.66	7.12	5.46	4.59

Table 1.2   Description of Gedeon Richter 4.4% 25-Sep-2014

ISIN	XS0451905367	SEDOL	B4269L7
Issue Date	25-Sep-2009	Issue price	100%
Issue Size	833m		
Stock	Gedeon Richter	Issuer	Hungary
Stock Currency	UF	Bond currency	EUR
Conversion Ratio	561.7041	Face Value	100,000
Redemption	100.00%	Maturity	25-Sep-2014
Coupon	4.4% (30/360)	Frequency	Annual
Call Type	–		

of convertible bonds – are not converted, the original share holder is still entitled to all the normal share holder rights such as dividends. The details of the bond are given in Table 1.2.

Dilution

The dilution of earnings is postponed until the convertible is converted into shares. At this conversion date, the earnings per share are reported on the current outstanding number of shares.

In most annual reports, depending on the legal jurisdiction, the diluted earnings per share can also be found. This number takes all shares into account, including those resulting from a conversion of the convertible debt issued by the company. The convertible also has a limited announcement effect on the share price [72]. This is the effect on the share price a short period after the announcement of raising capital. Each method has a different announcement effect. A straight equity issue in the US domestic market has a negative impact on the share price between −2% and −4% [72]. When a corporate announces a new convertible issue on the other hand, the effect on the share price is much smaller and sometimes insignificant. All of this is a function of how equity-like the convertible issue is. Announcing a capital increase through a convertible bond with a very low conversion ratio will have a small impact on the price of the shares. The higher the conversion ratio, the higher the possible future dilution and the higher the announcement effect of the new issue. The dilution needs to be put in a probabilistic framework, because it depends on the path followed by the share after the bond is issued. Investors will only convert if the share price is above the conversion price. The announcement effect is therefore dependent on the expected probability that the convertible will be converted into shares.

Tax treatment

If an issuer were to issue shares this extra amount of capital would need to be serviced with dividends. Dividends come from after-tax profit, whereas interest payments on debt are tax deductible. This makes the convertible bonds preferable to issuing equity from a tax perspective.

Tailor-made solution

There is no such thing as a convertible bond prototype. The different instrument features can quickly be combined to construct an instrument that fits the capital needs of the issuer but still offer an attractive payoff to the investor. Since the inception of the Black–Scholes model,

derivative pricing has made a revolutionary progress. The knowledge base on the investor and issuer side is definitively large enough to cope with this sophistication. One of the features is the call embedded in the convertible. It gives the issuer the right to call back the debt and pays the investor in the bond an early redemption amount. It gives the issuer the right to refinance the debt if the possibility arises to do so at lower rates. The issuer has, through the embedded call feature, a put on the interest rate and the credit spread. On receiving a call notice, the investor can convert into shares and will do so if the value of the shares received is greater than the early redemption amount. Forcing a call upon the investor changes the balance sheet: debt gets taken off and is replaced by equity, which strengthens the capital structure of the company.

Rating agency

An issuer piling up his balance sheet with debt will witness the cost of borrowing on new debt go up. Rating agencies could act on this new information by downgrading the credit rating of the company. All of this will be a function of the business outlook of the company and the allocation of this debt to new projects. But for convertible debt there are considerations that could soften the approach taken by the rating agencies [111]. Convertible preferreds, for example, often have no maturity date. There is therefore no binding commitment by the issuer to return the capital to the investor. The coupon payments on preferreds – market practitioners prefer to use the term dividends – can be deferred if certain conditions are met. Skipping a dividend payment on a preferred does not constitute a default event. Accordingly [70], preference shares are issued by financially weaker companies. However in hindsight, the avalanche of such preference shares issued in the first half of 2008 was clearly a warning that a lot of bad news was coming to the market. This eventually materialized in the second half of the year, when the financial crisis almost turned into an armageddon.

1.2.2   For the Investor

Restricted investor

A traditional convertible bond can be considered as a fixed income instrument. It has a face value, a limited maturity where the face value will be paid back and has a regular annual or semi-annual coupon. A fund manager might have a mandate to invest into fixed income instruments only. This restriction will prevent this investor, who is, for example, running a corporate bond fund, from making an allocation to the stock market. A convertible bond offers

Table 1.3   Description of Bulgari 5.375% 8-Jul-2014

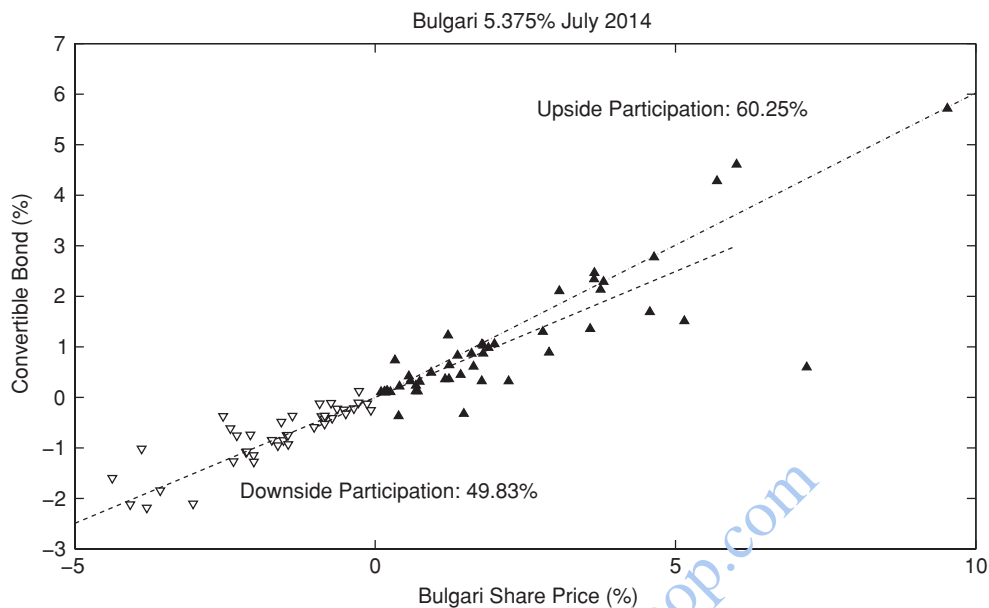| ISIN	XS0434384920	SEDOL	B59VQM2
Issue date	8-Jul-2009	Issue price	100%
Issue size	150		
Stock	Bulgari	Issuer	Bulgari
Stock currency	EUR	Bond currency	EUR
Conversion ratio	10,000	Face value	50,000
Redemption	100.00%	Maturity	8-Jul-2014
Coupon	5.38%	Frequency	Semi-annual

Figure 1.1   Daily returns of the share price of Bulgari versus the daily returns on the convertible bond. Observation period: 8 July, 2009 till 15 October, 2009. The days with a positive return (▲) are plotted next to the days where the share price had a negative return (▽). (*Source*: Bloomberg)

the best of both worlds and allows the manager to adhere to the investment guidelines of the fund but at the same time make an allocation to equity exposure.

Limited downside

Investing in convertible bonds is often said to be investing for the upside with a limited downside. To illustrate this point we look at the convertible bond issued by Bulgari, the luxury Italian watchmaker. The size of the issue was EUR 150m, and this convertible was launched in the summer of 2009. Further details can be found in Table 1.3. We studied the way a change in the underlying Bulgari share price is linked to the return on the convertible. Figure 1.1 plots the day returns of Bulgari versus the day return of the convertible bond. The linear regression between those returns is different depending on whether the share goes up or down. Using least squares we can construct the participation ratios.[2] On the upside the convertible participated with a factor of 60.25% in the increase of the share. But when the share had a negative day, the convertible participated less in the drop: the percentage drop in the convertible price was 49.83% of the negative return of the share price. This is convexity at work. The convertible holder is more and more exposed to the underlying shares as the price of these shares increases. When the share price drops, the holder suffers less. This limited 3-month data sample in the life of the Bulgari convertible can also be extrapolated to other names, and each time one will find the same dampening effect of the convertible structures. Convertibles decrease less

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[2] Market practitioners will use the word delta and not participation ratio.

Table 1.4   Annual performance and volatility data of the BofA Merrill Lynch Global Convertible Index versus the MSCI. (*Sources*: Bloomberg and BofA Merrill Lynch)

Year	Return		Volatility	
	Merrill	MSCI	Merrill	MSCI
2001	(4.74)	(15.25)	7.19	17.20
2002	(3.53)	(25.20)	5.71	21.12
2003	13.91	22.75	3.54	14.42
2004	5.23	9.49	3.88	8.83
2005	5.97	13.74	3.76	7.47
2006	12.82	13.52	5.42	9.23
2007	6.53	2.83	7.40	12.55
2008	(29.35)	(40.11)	14.15	31.39
2009	36.19	22.82	8.93	20.55

than the underlying and this is the very fundamental reason that a convertible is a less volatile holding than an investment in the underlying share.

Portfolio optimization

In Table 1.4 the return of the convertible bond universe is compared to the equity returns. For the convertible data we used the well-known BofA Merrill Lynch Global Convertible 300 Index (MLG 300) and for the equity markets we took the MSCI World Index expressed in local currencies. This table clearly illustrates the low volatility of convertible bond investing. Recently, in 2008, we recorded an annualized historical volatility with double digit numbers. The 2009 return numbers illustrate the impressive recovery made by the convertible index compared to the performance of the MSCI in 2009.

A convertible bond has a positive convexity. This property will be the focus of our attention later in the book. Table 1.4 shows the limited historical volatility of the MLG 300 Index compared to MSCI. Adding convertible bonds into a portfolio of bonds and equity delivers a positive effect. We can illustrate this using the capital asset pricing model (CAPM). In finance, CAPM is used to theoretically model the returns of shares. One of the cornerstones in portfolio theory resulting from this model is the efficient frontier. For a portfolio with different components each weighting scheme gives a particular expected risk and expected return. These numbers can be calculated starting from the expected risk and return of the individual assets in the portfolio. The efficient frontier is formed by those combinations of assets that offer, for a given return, the lowest expected risk. In Figure 1.2 the efficient frontier for a portfolio with corporate bonds and shares has been calculated. The equity markets were modelled through the MSCI Index while the iBoxx Investment Grade Index was used to represent the corporate bond universe. The horizon over which the different risk and returns were estimated covered the period from January 2005 to January 2008. We omitted the turbulent 2008 from this analysis. The efficient frontier is upward sloping and shows how the expected risk of the portfolio increases by changing the portfolio composition for the highest returns. In this equity–bond framework, the only way to make more profit seems to be to add more risk. But allowing less correlated asset classes in the universe can offer an investor higher expected returns while keeping the risk unchanged. This happens when convertible bonds are added to the portfolio.
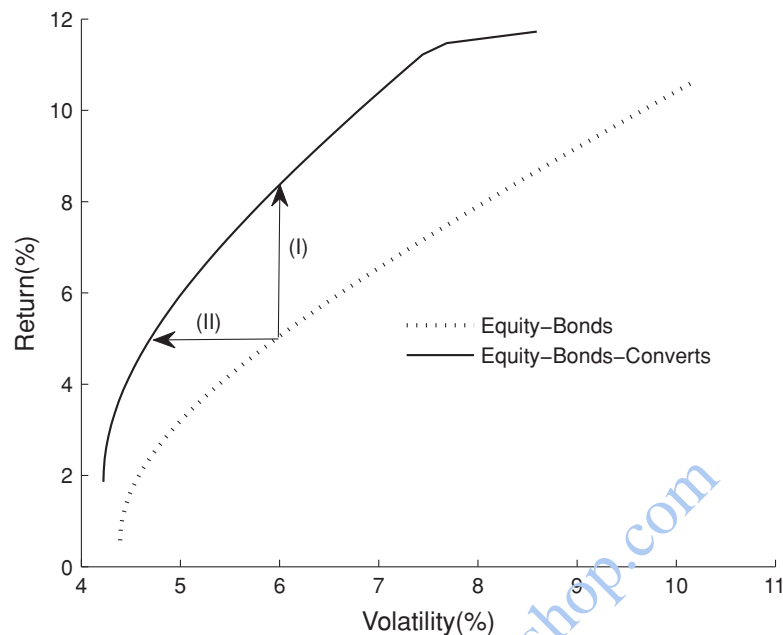
Figure 1.2 Changing the efficient frontier by allowing converts into a portfolio mix of bonds and shares

Figure 1.2 shows how the efficient frontier changes in two favourable directions when convertible bonds are allowed in the investment universe of a portfolio. The first effect is that the efficient frontier moves up (I). For the same risk one can now get a higher expected return. Moreover, there is a reduction of risk (II) while being able to keep the same expected return. The two efficient frontiers were built using indices to represent the different asset classes. The convertible performance was simulated using the Bloomberg Convertible Index (BBOCONV), which consists of open-ended convertible bond funds. The price performance of the different indices is shown in Figure 1.3.

Tailor-made investing

The convertible issued by a corporate is a tailor-made solution for the treasurer of the issuing company. The interest payments, the conversion ratio and all other instrument features resulted in a deal that fits the balance sheet and had, at the same time, enough capacity to attract investors. Even if an investor is not excited by the issue, he could still invest in the convertible and cut away the risks he does not like in the deal. This is the bread and butter of convertible arbitrage teams. This trading approach hedges, where needed, the different risk elements constituting the convertible: equity, credit and interest rate risk.

Attractive pricing on the new issuer

In December 2009, the market value of all convertible bonds was 560 billion USD. This was the value of the outstanding 2,523 different issues. These convertibles have a maturity of

Figure 1.3   BBOCONV: Bloomberg Convertible Index is an index composed of open-end convertible funds domiciled in an offshore market. IBOXX: iBoxx Investment Grade Corporate Bond fund is an exchange-traded fund listed in the USA and issued by Barclays Global Advisors. The fund seeks to replicate the return of the iBoxx Liquid Investment Grade Index. (*Source*: Bloomberg)

around 5 years, and on a continuous basis, this inventory of securities is renewed. Some issues are called or converted into shares, while others are redeemed to the investors. Fortunately there is an important supply of new issues, which in 2009 was equal to more than 10% of the outstanding convertible universe. To attract investors, the terms and conditions of these hybrids need to be as attractive as possible. On average, the newly issued convertibles are brought to the market with a discount to their fair value. The fair value is the theoretical price of the convertible based on the different valuation components: credit spread, share price, volatility and dividend yield.

Venture capitalist approach

The investor acts here as a sort of a venture capitalist. He is granting a loan to the issuer on favourable terms through a low interest rate. But, on the other hand, if things turn out to go well and if the shares of the company make a subsequent positive return, the investor participates in positive performance. Eventually the investor might become an equity investor after converting the debt into shares.

Table 1.5 Description of Q-Cells 1.375% 28-Feb-2012

ISIN	DE000A0LMY64	Sedol	B1R98J1
Issue date	7-Feb-2007	Issue price	100%
Issue size	492m		
Stock	Q-cells	Issuer	Q-cells
Stock currency	EUR	Bond currency	Eur
Conversion ratio	1497.2301	Face value	100,000
Redemption	100%	Maturity	28-Feb-2012
Coupon	1.375% (Act/Act)	Frequency	Annual
Call	Active	Put	–
Call type	Softcall	Seniority	Senior unsecured
Call trigger	130%		

1.3 BASIC TERMINOLOGY

The terminology used in convertibles is a mixture of the common language used in debt, equity and in derivative markets. Mastering the convertible terminology is an indispensable part of the equation. Convertible bonds are by no means standard financial instruments. Every issue is different and has a different story to tell. The term sheet of a sophisticated structured product traded between two banks on the other hand is an easier read. Such a term sheet is to the point, leaves no room for discussion, contains the mathematical description of the payoff formula and describes the rights of all the parties involved in this transaction. A convertible bond prospectus has often a more legal orientation than a mathematical one. But an experienced convertible bonds trader or portfolio manager will manage to dig out the necessary information in the prospectus to model the convertible. Most market participants active in convertible bonds have dedicated data teams to translate these lengthy documents into a shorter version based on convertible bond terminology. Some houses will rely on external vendors having dedicated teams to keep an accurate on-line database of convertible bond descriptions. The prospectus is a legally binding contract. It is the basis of a trust deed. A third party, the trustee, will ensure that the terms and conditions are respected. The best way to work through a list of instrument features specified in a prospectus is to start from a real example. These items can be found in the terms and conditions section of the prospectus.

As an example we take the convertible bond issued by Q-cells: **Q-Cells 1.375% 28-Feb-2012**. This solar cells company had a market cap of EUR 1bn in February 2009.

Using a real convertible bond is the best way to explain the different instrument features.[3] The prospectus of this bond is a 162-page document covering all aspects of the issue. The lists below provides a summary of the different constituents of the convertible. Where possible, for each instrument feature, a corresponding symbol has been introduced. We will return to these symbols throughout the book. The list is long and each of these elements intervenes in the pricing of the convertible. There is a danger that the focus might be more on the correct understanding of the instrument and less on the pricing model. Often traders, market makers and portfolio managers use numerical methods that are unable to cope with all the different features embedded in the hybrid instrument. The challenge is to build a model based on realistic stock, volatility, interest rate and default processes that can handle the complexity of

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[3] All prices are based on closing prices on 18 February 2009.

this instrument in an efficient way. This comes down to being able to generate rapidly, but accurately, prices and hedge ratios.

Bond data	Value	Remark
Date of issue	7-Feb-2007	
Issue price	100	
Face value (N)	EUR 100.000	The notional amount represented by one single bond.
Issue size	EUR 492.5m	
Issue outstanding	EUR 492.5m	Some corporates might sometimes buy back some of the convertibles they issued. This can happen at times when the company considers its outstanding convertibles bonds under-marked and has free cash available. On January 2009, for example, Lonking Holdings Ltd, a Hong Kong company, bought back USD 11m of its outstanding convertible bonds.
Bond currency	EUR	
Stock currency	EUR	Some issues are denominated in a different currency, than the currency of the common stock in which the bond can be converted. This adds extra pricing elements into the model. An example of this is Chi Mei Optoelectronics 0% 18-Dec-2011. The face value of each bond is USD 1000 and the bond can be converted into 1021 shares. The shares are listed and traded in Taiwan dollar on the Taiwan Stock Exchange. A decrease of the Taiwan–Dollar exchange rate (TWDUSD) decreases the value of the bond because the conversion value C_V in USD is lower even for an unchanged stock level. The volatility of the TWDUSD exchange rate and the correlation of this exchange rate with the return of the underlying stock are necessary input in the pricing of this bond. This bond has been called on 13 March 2009.
ISIN	DE000-A0LMY64	This, together with the SEDOL number, is the identifier of the bond. This is the reference used in all communications regarding the convertible.
SEDOL	B1R98J1	
Debt seniority	Senior unsecured	The debt seniority makes a reference to the order of repayment in case of a default. Senior debt ranks before subordinated and secured debt holders precede the unsecured ones. The importance of the debt seniority in the valuation is discussed in 6.4.2.
Bond price (P)	62.53%	This is the price on 18-Feb-2009 and corresponds to a total cash amount of EUR 62,530.

Quote format	Clean and in percentage of nominal	A convertible can be quoted in four different ways. This sometimes creates confusion when trading a convertible bond. Most convertible prices are quoted as a percentage of the face value. Some convertibles (e.g. French Convertibles) are quoted in units. These are quoted in the amount of money one has to pay per bond. On top of these, there is an extra variation possible. This determines wether the quotes include the accrued coupon or not. Most CBs quote clean, this means that the accrued coupon is not part of the quoted price. The total price one has to pay is the clean price plus the accrued coupon. This total price is the dirty price. Some convertibles quote in dirty terms directly.

Coupon data	Value	Remark
Coupon type	Fixed	A minority of convertibles are issued with floating rate coupons
Coupon (c)	1.375%	
Coupon frequency	Annual	In Europe the frequency of the coupon payout is most of the time annual. In the United States and Japan, there is often a semi-annual interest payout.
First coupon date	28-Feb-2008	
Maturity date (T)	28-Feb-2012	
Redemption (R)	100%	This the amount paid out to the investor at maturity in case no forced nor voluntary conversion was observed on the bond. It is often expressed as a certain percentage of the face value of the bond.
Day count	Act/Act	
Accrued interest	EUR 1337.43	A purchase of one Q-cells convertible settling on 18-Feb-2009 corresponds to 356 days of accrued interest.

- Previous coupon date = 18-Feb-2008
- Settlement date = 18-Feb-2009
- Accrued days = 356
- Coupon (%) = 1.375%
- Coupon (EUR) = 1,375
- Day count = Act/Act
- Accrued coupon = 1,337.43 = 1375 × (356/366)

The total cash needed to buy one convertible is therefore EUR 63,867.43 (1,337.43 + 62,530)

Conversion data	Value	Remark
Conversion ratio (C_r)	1497.2301	The number of shares the bond holder gets when converting one bond into shares of Q-cells.
Conversion price (C_P)	66.79	Implied purchase price in the bond currency of the convertible upon conversion is Face Value/Conversion Ratio $= \frac{N}{C_r}$. This value is determined at the issue of the convertible. The convertible can be issued with flexible conversion prices. During the life of the convertible bond, the conversion price can be adjusted upwards or downwards. This is a refix convertible or a convertible with a reset. The downward adjustment of the conversion price increases the number of shares entitled after conversion and is supposed to compensate the investor for the disappointing share price performance.
Conversion type	Voluntary	Some bonds are mandatory convertible, meaning the holder of such a convertible is obliged to receive a predetermined number of shares at the expiration of the issue.
Investor receives accrued interest on conversion	Yes	When the holder of the bond decides to convert the bond in common stock, he will receive the accrued coupon he would be normally entitled to. The issuer has to pay out the accured interest.
Investor receives accrued on call	Yes	The holder of the convertible is entitled accrued interest if the convertible is called. This parameter would be set to NO, when the issue would carry the very unpopular 'Screw Clause'. An unattentive investor would miss out the earned accrued interest in the case of a call notice. The screw clause frees the issuer from having to pay accrued interest when calling the bond and paying the early redemption amount.
Callable	Yes	
Call price or early redemption amount (K)	100%	This is the amount (often expressed as a percentage of the face value of the bond) that the investor would receive if the bond is called and when the investor forgoes his right to convert into shares.
Puttable	No	The issuer can halt the life of the bond by calling the bond, but in some cases the bond is puttable. Here the investor can choose to put the bond back to the issuer. The put price P_v will be paid out to the convertible bond investor and puts an end to the existence of the bond. This puttable feature is normally active at a discrete set of dates. The right for the issuer to call back the issue on the other hand is typically continuous and is valid during a specific time interval.
Call type	Soft	A hard call would mean that the convertible can be called by the issuer unconditionally. In the case of the Q-cells bond,

		there is a soft call. The level of the stock price determines if the company can call back the debt. This level is called the trigger level (K_S).
Call trigger (K_S)	130% (= EUR 86.83)	Only when the stockprice is trading $1.3 \times$ higher than the conversion price, can the bond be called. This condition is often accompanied with a grace period. This is the number of days that the trigger condition needs to be fulfilled in order for the call to be callable by the issuer.
Call period	28-Feb-2009 to 28-Feb-2012	The call is currently active but the trigger level is not fulfilled. The stock closed at a level of EUR 16.06 on 18-Feb-2009. This is a price far below the trigger level.
Call notice period		The holder has been granted a specific period – typically a couple of months – to decide whether to opt for conversion after having received the call notice from the issuer.

1.4   ADVANCED TERMINOLOGY

The following definitions cover a broad range of convertibles. The necessity for the corporate issuer to create a convertible security attractive enough for the investor but at the same time having a low enough cost of capital drives hybrid securities into more complex structures. A summary of the more advanced instrument features can be found below:

Term	Value	Remark
Call protection	27-Feb-2007 to 28-Feb-2009	This specifies the period during which the bond cannot be called.
Accretion	–	Bonds may come with accreting features. These could be applied to the trigger level and on the early redemption amount. The trigger level would increase at a prespecified accreting yield. The longer the issuer waits the more the implied call price K also increases. This clause is advantageous to the investor since it will become more difficult for the issuer to call the bond as the convertible gets closer to expiration.
Makewhole	–	The makewhole clause makes the bond more attractive to the investor. The investor gets an extra payout when the bond gets called. This instrument feature is a 'sweetener'. It makes the terms and the conditions of the convertible security look good in the eyes of the investor. This payout can happen in two different ways:

- There will be an extra cash payment to the holder of the bond upon call. This cash payment could for example be equal to a number of years of coupons that the investor would miss because of the early call.
- Upon call, the conversion ratio is increased. Hence in the case of a forced conversion the investor will get an extra amount of shares.

This makewhole feature is active during a period called the makewhole period.

Contingent conversion (CoCo)	–	The conversion of the convertible can happen during a pre-defined conversion period ($\Omega_{\text{Conversion}}$). But in some cases this conversion can only happen when the stock price S is above a trigger level. In 2010 some banks (e.g. Lloyds) issued contingent capital notes where the conversion into equity is triggered as soon as the tier-1 ratio of the bank drops below a certain level. These tools strengthen the balance sheet of the bank if its tier-1 ratio falls into a dangerous zone. Hence some debt is automatically transferred into equity on the balance sheet if this were to happen.
Contingent payment (CoPay)	–	The payment of coupons can also be made a function of the stock performance. In some cases the level of the coupon is a function of the stock price.
Resets	–	This feature made its first entry via the Asian markets. A reset is applied at certain preset dates – called reset dates. At such a reset date the conversion ratio can be changed. In case of weak stock performance, the conversion ratio is increased. This clause is a sweetener for the investor but could turn out to be a real pain for the issuer. An increase in the conversion ratio leads to an increase in the dilution of the existing equity holders. The new conversion ratio is bounded between two different values, 'floor' and 'cap'.
Dividend protection	Yes	A holder of a convertible is holding an embedded call option on the underlying shares. Any increase in dividends on the underlying shares is therefore detrimental to the convertible bond investor. It makes the bond less attractive compared to a direct investment in shares. Corporates have developed convertible issues where any sizable increase in dividends will be passed on to the investor. This happens in two different ways:

- A pass-through will be made available, where any unusual large dividend payment is passed on the bond holder as an extra cash coupon.
- A second possibility – a conversion ratio adjustment is one where the conversion ratio is changed upon a dividend in near above a pre-set dividend level.

The Q-cells convertible is using this second method.

Dividend entitlement	–	Attention needs to be paid to the dividend entitlement on the shares. It is very common that the shares received on conversion are entitled dividends for the fiscal year where the conversion was executed.
Look back		This is an investor trap because it will give the issuer the right to two different choices on conversion. The issuer can choose to deliver shares or he can deliver a cash amount. This cash amount is the conversion value on the conversion date. An opportunistic issuer will pick the cheapest solution. But for the convertible bond arbitrageur who is holding a short position in shares as a hedge for the convertible bond, it is a disaster if the issuer gives cash instead of shares. The investor then needs to buy back his short position (he won't be the only one doing this) and will receive cash from the issuer. This cash amount will not be enough to cover the cost of closing the short. A more extensive analysis of this feature can be found in 3.7.
Variable conversion ratio	–	In some bonds investors will find a variable conversion ratio. This is a ratio that depends on the level of the stock at the very moment of conversion.
Takeover protection		In some bonds a feature has been included to protect the bond holder in case the company gets taken over by another. In the case of a cash-only offer, where the target company gets bought out for a fixed cash price per share, the investor would be stuck with a convertible where all the optionality and potential future payoffs would be wiped out. All the future upward potential would be cancelled out. It is difficult to come up with a standard takeover protection clause. The convertible could include for example a 'Change of Control' put. The M & A activity is a lengthy process. A company might make a friendly or hostile bid for another company. This needs to be approved by the shareholders, other parties could get involved and start making a bid as well. The management or the board of the takeover candidate might disagree and arbitrageurs could step in. All of this could make the share price behave as a real roller-coaster. A well informed convertible bond investor can make money out of such a peculiar situation.
Change of control put		This would entitle the investor to put back the bond at par or more when a third party acquires a majority in the voting rights of the company. This is definitely a poison put when the convertible would be trading a lot lower than the par amount.

Step-up-conversion or 'ratchets'	Merger and arbitrage activity is a grey area in the convertible market. The remedy changes from case to case. In some cases the bond holder is left at the mercy of the goodwill of the acquiring company. The prospectus will elaborate at length on these events. A step-up conversion clause for example would allow the holder of a convertible to convert during a limited period into a number of shares at an increased conversion ratio.

1.5 LEGAL TERMINOLOGY

Term	Remark
Taxation	These provisions in the prospectus stipulate the rights and the obligation of the investor from a tax perspective. It will cover – if relevant – the stamp duty, registration or other taxes if the issuer converts the convertible into shares. The tax treatment of the payment of the principal resulting from either the exercise of the call or the redemption at the final maturity date of the convertible will be covered. A prospective buyer is in any case always better off checking with his legal or tax adviser on the exact tax treatment.
Negative pledge	This clause would stipulate that the issuer cannot pledge any of the assets of the company to a third party without the consent of all the bond holders. This is an element that protects the investors signing up for the convertible bond issue.
Ring fencing	In the case of an exchangeable bond where the issuer of the bond is different from the company into which the debt can be converted, the default risk is considered lower. In the unfortunate case that the bond issuer would go bankrupt, the investor still can convert the security into the shares of the underlying company. This company might still be in a perfect financial shape and this fact reduces the default risk of the exchangeable bond. Only if both issuer and underlying would collapse, an investor would get into trouble. All of this is based on the hypothesis that the issuer of the exchangeable has properly ring fenced the underlying shares. These shares must be separated from the corporate structure of the issuer and are definitively out of reach for any other creditor than those who bought the exchangeable bond.
Governing law and jurisdiction	This part sets out beforehand the jurisdiction applicable to any dispute between the bond holder and the company that issued the convertible.
Selling restrictions	The notes might for example not be offered in some jurisdictions or can only be sold to a particular category of investors. All the affected countries are mentioned on the offering memorandum.

Capital distributions		A company can return capital to its investors in different ways. If it would buy back shares, for example, the convertible bond holder is not disadvantaged. These transactions happen at market price. But if there is a cash distribution to the shareholders in the company, a special dividend for example, the convertible bond investors will see the value of their convertible decrease. The prospectus might in most cases provide a compensation through an adjustment of the conversion ratio to make up for this loss. The shareholder will receive more shares on conversion. The level from when a dividend is considered 'normal' or 'special' varies from case to case. The same variability in the compensation of the convertible bond holders will be found when the issuer issues rights to existing shareholders.

1.6   ANALYTICS AND HEDGE RATIOS

A hybrid instrument shows the characteristics of both debt and equity. The risk of this instrument is often described from both angles. A fixed income investor will often compare the yield to maturity, duration or other typical fixed income measures of the different convertibles in which he is interested. An investor with an equity derivatives background will look for implied volatility, gamma, delta, etc. On top of this, converts come with a set of definitions of their own, and that is what we are going to cover in this section.

Term	Value	Definition
Parity (P_a)	24.06	Parity is the value of the shares one would hold if the bond was immediately converted. This equals the conversion ratio times the value of the share expressed as a percentage of face value if the bond is trading as a percentage of face value.

$$P_a = \frac{S.C_r}{N} \qquad (1.5)$$

When the bond is trading in units, the parity will be:

$$P_a = S.C_r \qquad (1.6)$$

Premium to parity(%)	159.89	Premium to parity indicates how much a convertible bond investor is willing to pay to own the convertible as opposed to the underlying shares.

$$\frac{P - P_a}{P_a} \qquad (1.7)$$

Premium to parity (pts)	38.47	Premium to parity expressed as a number of points. This is also called the dollar premium.

$$P - P_a \qquad (1.8)$$

Bond floor (B_F)(%)	57.07	This is the present value of all the cash flows embedded in the convertible bond while neglecting any possible conversion. This is often called investment value. It excludes any income coming from the convertible's equity option component. The bond floor is the value of the hybrid security when the option is stripped out of the instrument set-up. To obtain this, the conversion ratio is put to zero in the calculations and the issuer call is ignored as well. The put is taken into account since it represents an investment value to the investor.
Investment premium (%)	9.57%	This is an indication how much an investor is willing to pay for the option embedded in the convertible. This is also called the premium to bond floor.

$$\frac{P - B_F}{B_F} \qquad (1.9)$$

Investment premium (pts)	5.46	Premium to the bond floor expressed in points.

$$P - B_F \qquad (1.10)$$

Current yield (%)(CY)	2.19	This is the value of the annualized coupon (c) divided by the price of the bond.
Yield to maturity (%)(YTM)	18.70	This is the discount rate needed to make the present value of all the cash flows coming from the convertible (coupons (c) and final redemption) equal to the price of the bond.
Yield to put (%) (YTP)	–	The yield is calculated based on all the cash flows until the date of the next put.
Duration (years)	2.88	This is the standard textbook definition of duration. Similar to the yield to maturity calculation, only the cash flows embedded in the convertible are taken into account. Abstraction from any embedded derivative is made.
Duration to put (years)		Only cash flows until the next put date are taken into account. The bond is supposed to be put by the investor on this particular date.
Modified duration (years)	2.36	

Fugit (years)	2.35	This is the expected average life of the bond. This output is dependent on the model used. The expected life of a convertible bond is shorter than the maturity of the bond. Events like calls, puts and conversions can terminate the bond before the final redemption date. The fugit is an output of the pricing model and will be dependent on the assumptions taken in the model.
Yield advantage (%)	2.19	This is the current yield on the convertible bond minus the dividend yield on the stock (CY-q).
Delta (Δ)	0.5072	This is the first derivative of the price of the convertible with respect to the price of the underlying common stock.

$$\Delta = \frac{\partial P}{\partial S} \qquad (1.11)$$

If the Q-cells share would increase from EUR 16.06 to EUR 17.06 per share, the convertible bond would increase with 0.5072%.

Delta ($\Delta_\%$)	33.88	Traders and market makers prefer to use this sensitivity to illustrate the equity sensitivity of a convertible bond. This measure is equal to

$$\Delta_\% = \frac{\Delta.N}{100.C_r} \qquad (1.12)$$

A convertible bond with a 40% delta would appreciate in value with 4% for every 10% increase in the value of the underlying share.

Gamma (Γ)	0.0199	This measure is representative for the convexity or non-linearity of the instrument.

$$\Gamma = \frac{\partial^2 P}{\partial S^2} = \frac{\partial \Delta}{\partial S} \qquad (1.13)$$

It illustrates the change of the delta for a change in the price of the underlying common stock.

Vega	0.0910	Price change for a 1% absolute change in volatility.
Rho	−0.0009	Price change for 1% parallel shift in interest rates.
CreditDV01	−0.0009	Price change for a single basis point (0.01%) absolute increase in the credit spread. This hedge ratio is also called omicron.
Implied volatility (σ)(%)	85.45	This is the volatility that needs to be plugged into the pricing model for the convertible bond in order for the theoretical price (fair value) to match the market price of the bond.

Cross Greeks		The only second derivative studied so far was the gamma. Without going into too much detail, other partial derivatives should be considered. In the structured products world a typical measure is vanna ($\delta^2 P/\delta S \, \delta\sigma$). Vanna is also called 'd-Delta-d-Vol' ($\delta\Delta/\delta\sigma$). Vanna measures the change in equity sensitivity of a convertible due to a change in the implied volatility. These measures are not often used on a traditional convertible bond trading floor. Nevertheless the risks are there and need to be considered.

There are seven different ways for a convertible to reach maturity or a premature ending:

(**1**) Call probability (%)	0	This is the probability that the convertible gets called by the issuer.
(**2**) Put probability (%)	0	Probability that the convertible is going to be put by the investor.
(**3**) Optional conversion probability (%)	1.11	This is the probability – based on the stock generation process – that the investor converts the bond before or at the expiration date without being forced by the issuer of the bond.
(**4**) Forced conversion probability (%)	0	The probability that the investor converts the bond into shares as direct consequence of the fact that the bond got called by the issuer.
(**5**) Redemption probability (%)	56.94	The bond is not called by the investor and the stock price is so low that the holder of the bond will not convert into shares.
(**6**) Default probability (%)	35.6	The issuer of the convertible goes bankrupt.
(**7**) Conversion at maturity (%)	6.35	This is the probability that the issuer will only convert at expiration.