IFID Certificate Programme

Structured Securities

Convertible Bonds

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1. Overview

In this module, we examine the structure and characteristics of convertible securities, with a focus on equity convertibles. We discuss the types of issuers and their motivations, and the advantages and disadvantages of these securities for investors.

We also explain how investors assess the bond's **premium**, and you will be able to explore its pricing behaviour using an option-based valuation model.

Learning Objectives

By the end of this module, you will be able to:

1. - Distinguish between:
   - Convertible bonds
   - Exchangeable bonds
   - Mandatory convertibles
   - Bonds with warrants

2. - Define the conversion price and the conversion ratio

3. - Outline the benefits of convertibles to issuers and to investors

4. - Describe the typical soft call and hard call features that are embedded in many convertibles

5. - Define and interpret the following measures of a convertible's value:
   - Parity
   - Conversion premium
   - Investment value/bond floor
   - Investment premium

6. - ⏺ Calculate the payback period on a convertible

7. - ⏺ Outline the methodology of the dividend crossover pricing model

8. - ⏺ Describe the nature of the conversion option embedded in a convertible bond

9. - ⏺ Define the delta and the rho of a convertible bond

10. - ⏺ Describe how a convertible-equity switching strategy works and explain its rationale

11. - ⏺ Outline the structure of a convertible asset swap and explain how it may be used in convertible arbitrage

12. - ⏺ Distinguish between a convertible asset discount swap and a convertible asset par swap

2. Structure

A convertible security gives its holder the right to exchange the principal of the security and any remaining unpaid coupons for a specified amount of alternative securities **from the same issuer** - typically equity.

Equity convertibles combine features of pure debt and pure equity:

- Like straight bonds, they typically pay a fixed coupon and have a stated maturity date

- Like equity, they allow investors to participate in the prosperity of the issuing company by switching into its equity if the shares perform well.

Example

The main structural features of a typical Euroconvertible bond are summarised in the following term sheet.

Issuer:	HH Capital Inc.
Amount:	USD 150 million
Coupon:	3.75% (annual, 30/360 basis)
Issue date:	25 Sep 2002
Issue price:	100.00
Maturity:	25 Sep 2017
Denomination:	USD 5,000
Form:	Bearer
Liquidation status:	Subordinated
First interest date:	25 Sep 2002

Convertible from:	10 Oct 2002 - 11 Sep 2017
Conversion ratio:	76.9231
Call Features:	Callable at par from 25 Sep 2012, or from 25 Sep 2007 subject to 130% threshold.

Essentially, there is a quasi-American option embedded in the bond which gives the holder the right, at any time between 10 October 2002 and 11 September 2017, to surrender each USD 5,000 certificate, together with all the remaining coupons, in exchange for 76.9231 ordinary shares of HH Inc (rounded down to the nearest whole share).

Conversion Ratio & Conversion Price

Conversion ratio = Number of shares into which a single bond certificate may be converted

Conversion price = $\dfrac{\text{Par value of bond certificate}}{\text{Conversion ratio}}$

The conversion price is simply the par value of the bond divided by the conversion ratio. In this example the conversion price is USD 65.00 (= 5,000/76.9231).

Both the conversion ratio and the conversion price are typically established at the time of issue and remain fixed for the life of the bond.

Not all issues have fixed conversion prices:

- Some have a **step-up conversion price** feature: the conversion price is raised by predetermined amounts as the bond approaches maturity (the reason for this feature is explained in section *Pricing*)

- Others have a **resettable conversion price**, which protects investors if the underlying share price falls by more than a pre-specified amount by adjusting the conversion price down by a corresponding amount.

Impact of Corporate Actions

Most convertibles include provisions that will adjust the bond's conversion price in the event that the issuer makes a stock split, scrip issue, scrip dividend or takes some corporate action (other than the normal payment of dividends) that is likely to affect the underlying share price.

For example, if the issuer announces a 1:1 scrip issue the conversion price will be automatically halved to preserve the value equivalence. This protects bondholders who might otherwise suffer a capital loss on the bond as the market price of the underlying shares falls.

2.1. Call Features

Many Euroconvertibles, like the one shown here, are also **callable** by the issuer: the issuer has the right to redeem the bond at a specified price at one or more future dates (see Callable Bonds - Structure). Some convertibles are also putable by the investor, at a pre-determined price. This protects the investor in case the issuer does not perform and the bond's credit rating is downgraded.

In our example, which is typical of Euroconvertibles, the call option has two components:

- A **hard call feature**: the issuer may call the bond at par on any anniversary date commencing in 2008.

  Also known as: **Absolute call price**

- A **soft call feature**: the issuer may advance the call date to 2003 *provided* the underlying share price has already traded at a premium of at least 30% over the conversion price over a specified period of time (the **130% threshold** provision).

  Also known as: **Provisional call trigger**

Why the Call Feature?

The purpose of the call features is to force bondholders to convert into the shares by a certain date. If the shares have performed well by the first **call date**, the bond itself will be trading at a significant premium to par, so investors will exercise their conversion rights rather than have their bond redeemed at the (lower) call price.

For the issuer, forcing conversion has the benefit of:

- Limiting the potential dilution to existing shareholders

- Making the term of the debt instrument more predictable, and therefore easier to swap onto a different interest rate or currency basis

- Removing the gearing uncertainty from its balance sheet: while the bond remains unconverted there is additional equity in 'latent' form.

Many convertibles also include a **clean-up call** provision, which gives the issuer the right to call the bonds if a certain proportion of investors (typically more than 80%) has already converted into the shares. Like the other call features, the purpose of the clean-up call provision is to force investors to convert.

3. Variations

3.1. Debt Seniority

Equity convertibles come in two main flavours:

- Convertible **bonds**: like conventional bonds, they typically pay a fixed coupon and oblige the issuer to repay the principal amount at maturity, unless the bond-holders have exercised their conversion rights

- Convertible **preference shares**: like conventional prefs, they typically pay a fixed dividend. Unlike conventional prefs, they are **redeemable** and oblige the issuer to repay the par value of the shares by a stated maturity date unless investors have exercised their conversion rights.

Convertible bonds are far more commonplace than convertible prefs, the latter being most prevalent in the US and the UK markets. In practice, convertible prefs are treated as debt instruments, rather than equity, for tax and capital adequacy purposes (although they may be treated as equity if the prefs are irredeemable). Both are typically subordinated to other types of debt but are senior to ordinary shares.
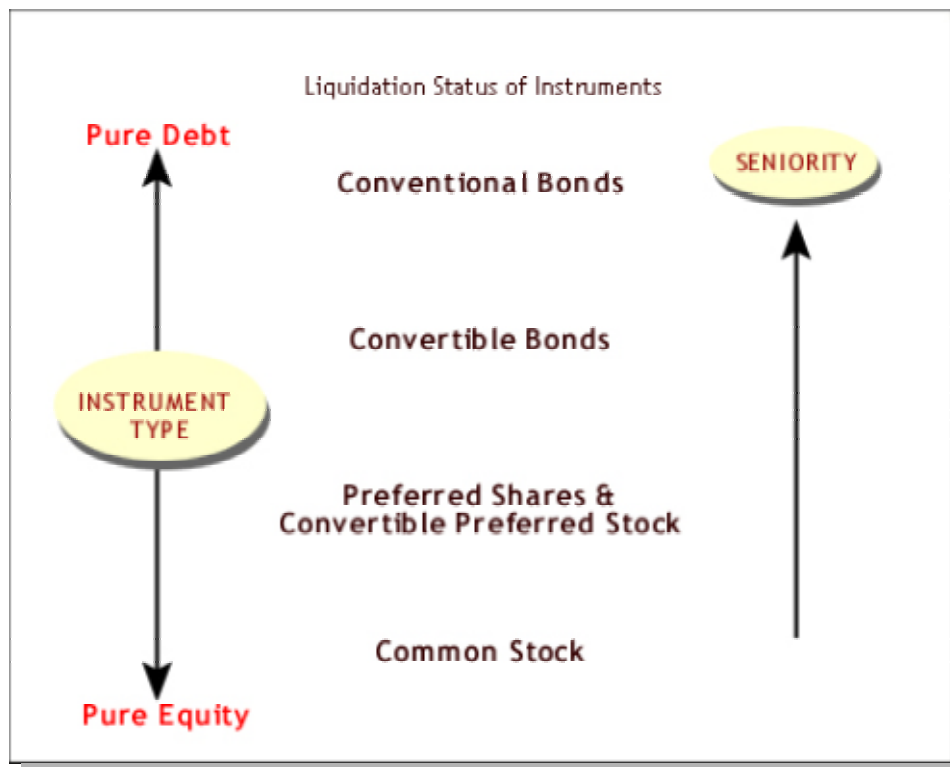
3.2. The Embedded Options

Exchangeable Bonds

An exchangeable bond gives its holder the right to exchange the principal of the security for a specified amount of alternative securities from a different issuer.

Structurally, exchangeable bonds are the same as convertibles; the only difference is that the underlying shares are not those of the bond issuer.

Exchangeable bonds are typically issued in situations where a company wishes to divest itself of a significant equity interest in another company. Instead of offering the shares directly into the secondary market (and risking pushing down the price), the issuer packages them in a convertible bond carrying a conversion price which is at a premium to their current market value.

Mandatory Convertibles

A mandatory convertible bond (or preference share) gives its holder the obligation to exchange the principal of the security for a specified amount of alternative securities.

With mandatory convertibles the investor's option is very limited: the investor typically has the right to choose when to convert but has an obligation to convert by a certain date.

Because the investor is really holding deferred equity, mandatory convertibles are normally classified as equity rather than debt instruments.

Reverse Convertibles

In a reverse convertible it is the issuer (not the investor) that has the right to exchange the bond certificate for a given number of shares.

The issuer of a reverse convertible has an incentive to exercise its conversion rights if the underlying shares do not perform well; therefore the investor takes on the equity risk. For this additional risk the investor receives a coupon that is normally higher than the rate for a straight bond issued by an equivalent credit.

In a reverse convertible, the investor sells a put option on the underlying equity to the issuer.

The structure of a reverse convertible is similar (but not identical) to that of a cash-or shares structured note (see Structured Option-based Notes - Exercise question 2).

4. Issuing Rationale

Benefits to the Issuer

- Convertibles allow the issuer to reduce its cost of finance: the investor pays for the conversion rights by receiving a lower coupon than they would on an equivalent straight bond. This is valuable to rapidly growing firms facing heavy capital expenditures.

- They allow the issuer to sell common stock on a deferred basis at a premium to its current market price - the conversion price is typically set at a premium of 15% - 30% of the current market price for the shares.

Example

Issuer: HH Capital Inc.
Amount: USD 150 million
Coupon: 3.75% (annual, 30/360 basis)
Issue date: 25 Sep 2002
Issue price: 100.00
Maturity: 25 Sep 2017
Denomination: USD 5,000
Conversion ratio: 76.9231
Conversion price: USD 65.00

At the time of issue the shares of HH Inc were trading at USD 50.00. The issue of 76.9231 ordinary shares would have only realised USD 3,846.16, whereas the same number of shares packaged into a bond raised USD 5,000.00.

Benefits to the Investor

- For bond investors, convertibles combine the certainty of a fixed income security (guaranteed coupons and a scheduled repayment date) with the potential for significant capital gains if the underlying stock performs well. Typically there is a strong 'equity story' to back a convertible issue.

- For equity investors, convertibles provide exposure to the underlying equity plus yield enhancement: the current yield on convertibles is typically higher than the dividend yield on the underlying shares.

5. Parity

Convertible bonds have been a feature of the domestic US markets since the early 1960s - well before the arrival of modern options pricing theory. In this and the next section we look at some of the traditional valuation measures that investors still use today, alongside the more sophisticated option-based pricing techniques. We shall use the convertible issue referred to in the earlier sections as our example.

Parity = Underlying share price x 100
Conversion price

Also known as: **Parity value**, **Parity ratio**, **Equity equivalent value**.

The convertible's parity value[1] indicates where the current share price is in relation to the conversion price. It is similar in concept to a warrant's parity value (see Warrants - Parity).

Example

Issuer:	HH Capital Inc.
Amount:	USD 150 million
Coupon:	3.75% (annual, 30/360 basis)
Issue price:	100.00
Maturity:	25 Sep 2017
Denomination:	USD 5,000
Conversion ratio:	76.9231
Settlement date:	25 March 2003
Current share price:	USD 59.50
Bond price:	105 3/8

In this case the bond's parity value is **91.54%** (= 59.50 / 65.00 x 100).

In a sense parity may be interpreted as the embedded option's intrinsic value - i.e. the embedded option is 8.46% out of the money. However, as we shall see, a convertible is more than just a bond plus a call option (or a bond with warrants) and its intrinsic value is therefore a little more difficult to interpret.

Another way of looking at parity is as a measure of the pure **equity value** in the structure. In other words, if the convertible were simply just a block of 76.9231 shares (each worth USD 59.50) packaged as a bond, then this bond should be trading at 91.54% of its face value.

$$\left(\frac{76.9231 \times 59.50}{76.9231 \times 65.00} \right) \times 100 = \left(\frac{76.9231 \times 59.50}{5,000} \right) \times 100$$

$$= \mathbf{91.54\%}$$

The actual bond price is 105 3/8, so clearly the market views this bond as more than just a block of shares dressed in bond clothing!

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[1] Don't confuse the parity value of a convertible with par (i.e. with a bond that trades at 100% of its face value).

6. Premium

Premium = (<u>Bond price - Parity</u>) x 100
             Parity

Also known as: **Conversion premium**, **Equity premium**.

Premium indicates how much more expensive it is to buy the underlying shares indirectly, by purchasing the convertible and exercising the conversion rights, rather than by going directly to the secondary market.

Example

Issuer:	HH Capital Inc.
Amount:	USD 150 million
Coupon:	3.75% (annual, 30/360 basis)
Issue price:	100.00
Maturity:	25 Sep 2017
Denomination:	USD 5,000
Conversion ratio:	76.9231

Settlement date:	25 March 2003
Current share price:	USD 59.50
Bond price:	105 3/8

The bond trades at a premium of:

<u>(105.375 - 91.54</u>) x 100
      91.54

= **15.11%** on a clean price basis, or

[<u>(105.375 + 180/360 x 3.75) - 91.54</u>] x 100
              91.54

= **17.16%** on a dirty price basis (i.e. including 180 days of accrued interest)

It may help to understand this point if we calculate the premium in a different way.
The cost of a USD 5,000 certificate at 105 3/8 (including accrued) is:

<u>107.25</u> x 5,000
  100

= USD 5,362.50

Converting this bond into 76.9231 shares results in an **effective conversion price**, per share, of:

<u>5,362.50</u> = **USD 69.71**
76.9231

This is 17.16% more expensive than buying the shares directly at USD 59.50! An investor buying this bond at 105 3/8 will therefore make a profit on the trade if the shares trade higher than USD 69.71 by the conversion date.

6.1. Why Pay a Premium?

Question 1

Convertibles typically trade at a premium to their parity value so, clearly, investors perceive these securities to be more than just a bunch of shares dressed up in bond clothing!

a) Which one or more of the factors listed below makes the shares embedded in the convertible bond so special that that the market normally pays a premium for them?

☐ There is a money-back guarantee at maturity of the bond

☐ While they are in convertible form, they typically yield more than the ordinary shares

☐ The market does not know how to value convertibles

☐ The underlying shares delivered on conversion will have no voting rights

In section *Pricing* we explore how to assess the convertible's premium in terms of these factors.

Discount Convertibles

Discount convertibles are bonds that trade at a **discount to parity** - i.e. for a negative premium.

In theory, if the premium is negative it should be possible to make an arbitrage profit:

1. Buy the convertible
2. Exercise into the shares
3. Sell the shares

In practice, some convertibles trade at a discount to parity for a variety of technical reasons:

- **Conversion delays** - in some markets conversion into the underlying shares is a protracted matter. In Taiwan, for example, investors must first convert into "entitlement certificates", which are then converted into the underlying shares only on set dates throughout the year. There is a risk, therefore, that the share price may fall between the time the arbitrageur exercises her conversion rights and the time she receives and on-sells the share certificates.

  This delay might not have a significant effect on the bond's premium if it was possible to short-sell the underlying equity until the entitlement certificates are exchanged for real shares. Unfortunately, in these markets stock borrowing (to fund the short positions) is often either not permitted or expensive and risky.

- **The screw clause** - this is a feature that is present in some convertible bond prospectuses:

  The screw clause stipulates that on conversion, the investor forfeits any interest accrued on the bond up to the conversion date.

  Nowadays, the market warns investors of this technical distortion by quoting the premium on convertibles with screw clauses on a **net parity** basis - i.e. parity less accrued interest.

7. Exercise 1

7.1. Question 1

Question 2

Consider the following sterling convertible bond:

Issuer:	GG Finance Plc.
Issue amount:	GBP 200 million
Coupon:	5.25% (semi-annual, actual/365 basis)
Maturity:	10 June 2010
Denomination:	GBP 1,000
Convertible until:	10 May 2010
Conversion ratio:	176.9912
Call Features:	Callable at par from 10 June 2005

Settlement date:	10 December 2002
Bond price:	99½
Ordinary share price:	£5.46

a) Calculate the items below to 2 decimal places. Type your answer in each box and validate.

Conversion price (£) ☐

Parity (%) ☐

Premium (%) ☐

(clean price basis)

b) Which of the following would you expect to happen if, *other things being equal*, GG's share price were to trade down:

☐ The bond's price would rise

☐ The bond's parity would fall

☐ The bond's price would fall

☐ The bond's premium would rise

7.2. Question 2

Question 3

An issuer might favour bonds-cum-warrants as opposed to convertibles because:

a) Bonds cum warrants offer greater structural flexibility to the issuer.

    ☐   True

    ☐   False

b) In a bond with warrants, the cost of the debt portion is known with certainty and the fixed coupons may be swapped by the issuer into floating coupons.

    ☐   True

    ☐   False

c) A bond with warrants can potentially raise more funds for the issuer than a convertible.

    ☐   True

    ☐   False

8. Pricing

8.1. Income Advantage

One reason why the market pays a premium for convertibles is that their current yield is typically higher than the dividend yield on the underlying shares. Therefore, while the underlying shares remain in convertible form, the investor has an income advantage over ordinary shares - at least for a period of time. Many equity fund managers regard convertibles simply as a package of 'high-yielding' shares.

Below are two ways in which this income advantage may be assessed. We shall use the convertible issue referred to in the earlier sections as our example.

Issuer:	HH Capital Inc.
Amount:	USD 150 million
Coupon:	3.75% (annual, 30/360 basis)
Issue price:	100.00
Maturity:	25 Sep 2017
Denomination:	USD 5,000
Conversion ratio:	76.9231

Settlement date:	25 March 2003
Clean price:	105 3/8
Current share price:	USD 59.50
Historic dividend yield:	2.00%

Simple Payback Calculation

Question 4

Payback period: the number of years it will take to recover the premium paid, given the bond's income advantage.

$$\text{Payback Period} = \frac{\text{Conversion premium}}{(\text{Current yield - Dividend yield})}$$

$$= \frac{\text{Conversion premium}}{(\text{Coupon/Clean price} - \text{Dividend/Share price})}$$

a) Calculate the figures below, rounded to the nearest 2 decimal places. Type your answer in each box and validate.

Conversion premium (%, dirty price basis) ☐

Current yield (%) ☐

Payback period (years) ☐

b) The payback can be used to assess the premiums on comparable issues: other things being equal the bond with the shortest payback is preferable. However, as a measure of value it does have some serious conceptual problems.

Which do you think are the most critical problems with the payback method?

☐ The bond may not be held for that long

☐ It does not account for the timing of the income advantage

☐ It does not factor future dividend growth on the equity

☐ It does not factor the accrued interest on the bond, which is a cost

8.2. Dividend Crossover Model

The dividend crossover model overcomes the problems with the payback method by estimating present value (PV) of the bond's income advantage, taking into account future dividend growth and the timing of the cash flows.

Income advantage $= \Sigma$ PV [Excess cash flow$_t$]

> for t = 1 to t <= First call date and Excess cash flow$_t$ > 0

Where:

Excess cash flow$_t$	=	Coupon / Dirty price - DY_0 x $(1 + g)^t$
DY_0	=	Historic dividend yield
G	=	Assumed annual dividend growth rate
T	=	Number of years during which the excess cash flow is positive and the bond is not callable

Over time, the dividend on the underlying equity grows, whereas the coupons on the bond remain constant. At some stage, the dividend will 'overtake' the cash flows on the bond. On that date, known in the model as the **optimal conversion date**, the rational investor will convert into the equity. If the bond is callable before the optimal conversion date, then users of this model typically include only the excess cash flows up to the first call date.

Example

Calculation of the income advantage on a convertible using the dividend crossover method.

To illustrate how the model works, let's assume:

- The dividend yield on HH Inc's shares will grow by 15% per annum
- A uniform discount rate of 6%, annually compounded

Coupon / Dirty price = 3.75 / (105.375 + 180/360 x 3.75)
                                    = 3.75 / 107.25
                                    = 0.03497 or **3.50%** rounded

The table below calculates the income advantage on this bond.

Payment date	t	Bond (%)	Equity (%)	Excess cash flow	PV (%)
25 Sep 2003	0.5	3.50	2.00 x $1.15^{0.5}$ = 2.14	1.36	1.36 / $1.06^{0.5}$ = 1.32
25 Sep 2004	1.5	3.50	2.00 x $1.15^{1.5}$ = 2.47	1.03	1.03 / $1.06^{1.5}$ = 0.95
25 Sep 2005	2.5	3.50	2.00 x $1.15^{2.5}$ = 2.84	0.66	0.66 / $1.06^{2.5}$ = 0.57
25 Sep 2006	3.5	3.50	2.00 x $1.15^{2.5}$ = 3.26	0.24	0.24 / $1.06^{3.5}$ = 0.19
25 Sep 2007	4.5	3.50	2.00 x $1.15^{4.5}$ = 3.75	Negative	---
Net income advantage					**3.03**

On our assumptions, the bond's excess cash flow erodes completely by 25 September 2007 and the total income advantage amounts to only 3.03%. At the quoted clean price of 105 3/8, the actual premium on the convertible (on a dirty price basis) is calculated as follows:

Effective conversion price = 107.25 / 100 x 5,000 / 76.9231
                                           = $69.71

Premium = 69.71 / 59.50 - 1
                  = 0.1716 or **17.16%**

Therefore, an investor considering this bond purely for its income advantage would not buy it at the current price!

The calculated income advantage is sensitive to the assumption made about future dividend growth.

Question

Question 5

Consider the impact of expected dividend growth on the convertible's income advantage, hence its premium.

a)   If we assumed a lower dividend growth rate, then the bond's income advantage would be:

☐   Higher

☐   Lower

8.3. Pricing the Embedded Options

The dividend crossover model does not price the other main benefit of convertible bonds: unlike ordinary shares, they also offer investors a money-back guarantee at the maturity of the bond. If the shares do not perform, investors are not obliged to convert and may recover their principal in full. Valuing this additional benefit involves pricing the conversion option embedded in the bond.

In fact, there are typically three elements in a convertible:

- The investor is long a straight bond with a 3.75% coupon maturing in 2013 (the straight bond)

  A*t the same time*

- The investor is long an option to exchange a 3.75% bond maturing in 2013 for the equity (the conversion right)

- The investor is short a call option on the 3.75% of 2013 with an expiry in 2003 (the call features)

Pricing the straight bond is straightforward enough, but pricing the embedded options is technically much more complex. The hard call provision is a typically a Bermudan option, but the soft call provision is a type of **barrier option**: the option to advance the call date comes into existence only if the share price reaches the 130% barrier (see Barrier Options).

Moreover, the conversion right is an **exchange option** - the option to exchange one asset (the bond certificate) for another (the equity) - which is quite different from a conventional option.

Convertible bond = Straight bond + Exchange option - Call option(s)

Correlation Risk

The pricing of exchange options is discussed in Multi-asset Options - Pricing, but it is worth outlining briefly how these differ from conventional options:

- Exercising a conventional call option requires a payment of the exercise price in cash, which has a fixed monetary value

  Conventional call payoff = MAX(Share price - Strike, 0)

- Exercising the conversion right before the bond's maturity requires the investor to exchange the bond certificate for a given number of shares.

  Exchange payoff = MAX(Share price - Bond price, 0)

  The 'strike' effectively paid for the shares depends on the market value of the bond that has to be surrendered on conversion, which in turn depends on interest rates prevailing at the time. Other things being equal, the higher the market yields the lower is the strike paid.

The value of an exchange option depends not only on the volatilities of the underlying equity and bond markets, but also on the **correlation** between the two.

Correlation risk: the risk that the price of a hybrid financial instrument may change as a result of changes in the correlation between the returns on the relevant underlying markets.

Price correlations are notoriously unstable and difficult to hedge, so it is not surprising that only specialist convertible funds are able to value convertibles as options.

9. Exercise 2

Question 6

In this exercise we explore the price behaviour of convertible bonds using an Excel-based model. When you have launched the Convertible Bond Pricing model spreadsheet, please select the **Structure** worksheet and ensure the bond's characteristics have been set to the ones below.

Settlement date	25-Mar-03
Issue date	25-Sep-02
Maturity	25-Sep-17
Coupon (%)	3.75
Coupon period	Annual
Day count	E30/360
Denomination	5,000.00
Conversion Price	$65.00

Call features[2]

Call Protection until	25-Sep-07
Soft Call Period until	25-Sep-12
Threshold Level (%)	130

Now select the **Market Data** worksheet and ensure the following data is set correctly.

The underlying equity

Share price	$60.00
Price volatility (%)	30.0
Dividend growth (%)	15.00
Dividend yld (% pa)	1.50

The underlying bond

Benchmark yield (%)	6.00
Price volatility (%)	10.0

Correlation	0.45

a) Complete the table below. Type your answer in each box and validate.

Calculated values

Convertible bond [   ]

Parity [   ]

Premium [   ]

Please check the calculator settings, above, if your answers don't match!

b) Is there an income advantage in holding the convertible, rather than the equity?

☐ Yes

☐ No

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[2] The bond is callable at par from 25 Sep 2012, or from 25 Sep 2007 subject to the equity having reached a premium threshold of 30% over the conversion price.

c) Would you buy this bond purely on the basis of its income advantage?

☐ Yes

☐ No

d) What is the convertible's price for the following levels of volatility?

Equity Volatility	Convertible Price
20.0%	
30.0%	
40.0%	

e) Restore the volatility of the equity to 30.0% and recalculate the convertible's price. Other things being equal, which of the following is true?

☐ Higher bond price volatility always increases the convertible's price

☐ Higher bonds/equities price correlation reduces the convertible's price

☐ Higher bond price volatility always reduces the convertible's price

☐ Higher bonds/equities price correlation increases the convertible's price

f) Restore the volatility of the benchmark bond price to 10.0% and the correlation coefficient to 0.45. We shall now explore how changes in the price of the underlying equity affect the convertible's price and its premium. Entering the indicated values for the equity price, complete the table below.

Share Price	Convertible Bond Price	Parity	Premium
40.00			
50.00			
60.00			
70.00			

g) Restore the equity price back to $60.00. Other things being equal, which of the following statements are true?

☐ Higher dividend growth reduces the bond's income advantage

☐ Higher dividend growth reduces the bond's parity

☐ Higher dividend growth increases the bond's premium

☐ Higher dividend growth reduces the convertible's price

h) Restore the dividend growth back to 15.00%, and the share price back to $60. We shall now explore how changes in bond yields affect the convertible's price and its premium. Entering the indicated values for the yield on the benchmark bond, complete the table below.

Benchmark Yield	Convertible Bond Price	Parity	Premium
4.00%			
5.00%			
6.00%			

i) Which one or more of the statements below would correctly describe your exposure if you had a long position in this convertible?

☐ Long vega with respect to the equity

☐ Short rho

☐ Short psi

☐ Long delta with respect to the equity

10. Trading Strategies

In section *Issuing Rationale*, we outlined in general terms the key benefits of convertibles to equity and to fixed income investors. Here, we explain in some detail two rather more specialist convertible trading strategies:

- Convertible-equity switches
- Convertible asset swaps.

10.1. Equity Switching

Some equity funds trade convertibles as part of a switching strategy between the bonds and the underlying equity. Investors switching out of the equity and into convertibles at low premiums give themselves an asymmetric risk/return profile:

- If the bond's parity is greater than 100 (i.e. the equity option is already in the money) and the shares rally, the convertible will rise virtually in line with the shares.

- If the shares fall, the convertible will outperform the shares, as premium expands on the way down

  ...all the while the convertible is likely to yield more than the equity!

The figure below compares the price evolution of a Japanese convertible with its parity value; the gap between the two is a measure of the bond's premium.
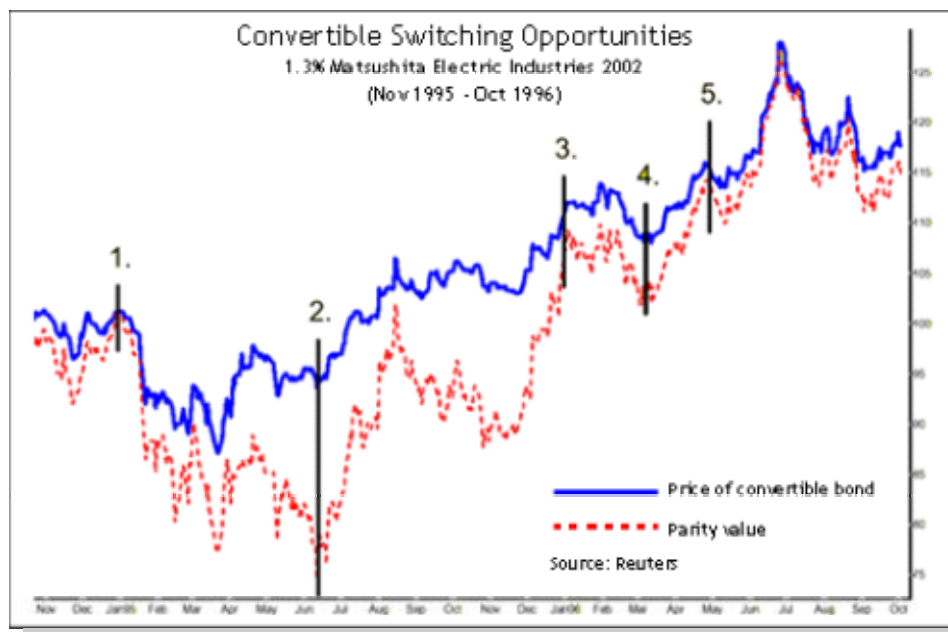
The chart flags a number of profitable switching opportunities:

1. Out of the equity / into the bond: premium unusually tight and subsequently expanded significantly, so the bond outperformed the shares

2. Out of the bond / into the equity: premium was unusually wide and share price at historically low levels, so recovery was likely

3. Out of the equity / into the bond: premium once again tight and shares meet resistance, so consolidation now likely

   ...and so on.

10.2. Asset Swaps

In a convertible asset swap a market participant (the **swap writer**):

1. Buys a convertible bond

2. Sells the bond's fixed income component, together with its credit risk, to a fixed income investor (typically on a swapped spread to LIBOR)

3. And either retains the bond's conversion rights (the **equity stub**) or sells these on to a derivatives specialist.

Convertible asset swapping has been one of the most significant recent developments in the convertibles market. It is a means of synthetically separating a convertible into its two primary components - a fixed income security and an equity option. Through the swap, each component can be sold to investors with different risk preferences. This unlocks the convertible's theoretical value and improves market efficiency.

The convertible asset swap is just an asset swap (see Interest Rate Swaps - Asset Swaps), except that:

- The underlying bond is a convertible, typically with a very low coupon

- The party holding the equity stub also has the right to terminate the swap by calling the underlying bond (e.g. if it wishes to exercise conversion)

This adds some technical complications that are not normally present in straight asset swaps, as the following example illustrates.

Example

A bank is considering asset swapping the following convertible:

Settlement date:	15 March 2001
Bond:	British Airports Authority (BAA) 5.75% sterling Euroconvertible maturing 1 March 2006
Call features:	Callable at par from 2003
Parity:	120.4%
Premium:	9.2%
Clean price:	131.50
Accrued interest:	0.22% (Annual, 30/360)
Current yield:	4.37%
Amount to be swapped:	GBP 1 million nominal
5 year swap rate:	6.10% (annual 30/360 against 12 month LIBOR)

The bank's credit analysts estimate that, in the current market, the unrated subordinated debt of BAA should yield 58 basis points over sterling LIBOR.

? What is the value of the fixed income component of the convertible?
What is the value of the embedded equity option?

Analysis
In Interest Rate Swaps - Asset Swaps, we used a simple rule of thumb to estimate approximately what spread over LIBOR could be paid on an asset swap, given the underlying bond's yield and the current market swap rate:

Return on asset swap = LIBOR + (Bond yield - Swap rate)

We can use the same rule (re-arranged) to estimate how much the BAA bond's fixed cash flows might be worth to an investor:

Bond yield = Return on asset swap - LIBOR + Swap rate

    = LIBOR + 0.58% - LIBOR + 6.10
    = **6.68%**[3]

Using this yield (and a standard bond pricing model), we find that the dirty price of a 5.75% straight bond maturing on 1 March 2006 is 96.30 (rounded). This is the **bond value** of the BAA convertible, as we defined it in *Exercise 2 - Question 1(e)*.

Bond value of a convertible: the estimated value of the convertible's fixed income cash flows - i.e. without the conversion option - calculated at the estimated yield for a comparable type of credit.

Also known as: **Investment value**, **Bond floor**.

If the bond value of this convertible is estimated at 96.30, it follows that its embedded equity option must be worth 35.42 (= 131.72 - 96.30).

There are two versions of the convertible asset swap and we explain these in the following dropdowns below, using the figures from this example.

Convertible asset discount swap (CADS)

In a CADS structure, the convertible bond is swapped at its bond value, rather than at par as is common with straight asset swaps. In essence, the party asset-swapping the BAA bond mentioned on the previous page:

- Buys GBP 1 million nominal of the convertible for a dirty price of 131.72

- Receives GBP 963,000 from a fixed income investor (the convertible's bond value)

- Pays the investor LIBOR + 0.58%, calculated on GBP 963,0000, in exchange for all of the bond's fixed coupons

- Repays GBP 963,000 to the fixed income investor at maturity (or earlier, if the bond is called by the issuer or converted by the asset swapper).

In reality there may be two other players behind the scenes, in addition to the asset swapper and the fixed income client:

- A swaps market maker, who manages the interest rate swap risk for the asset swapper

- An equity derivatives specialist (who could be another client, or the bank's own derivatives team) who buys the equity stub by funding the remaining GBP 354,200 necessary to buy the convertible (= 1,317,200 - 963,000).

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[3] As we explain in Interest Rate Swaps - Asset Swaps , this is only an approximation. When we enter the relevant data into an asset swap pricing model (see *Exercise 3* below) we find that the breakeven yield on the bond's fixed income cash flows in this case is 6.70%.

The figure below summarises all the cash flows involved in this transaction.
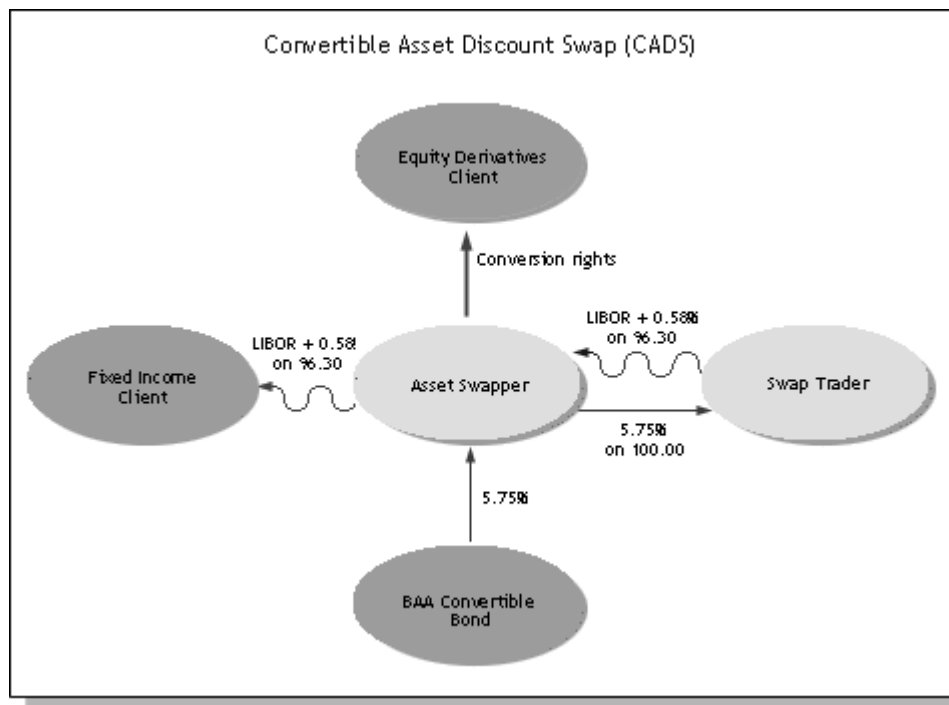
Market Risk & Credit Risk

As in all asset swaps, the legal owner of the underlying bond is typically the fixed income investor, except that here the investor has the obligation to surrender the bond if the owner of the equity stub decides to convert, or the bond is called by the issuer.

The fixed income investor runs the risk of having the asset swap terminated before its scheduled maturity.

In practical terms, this risk is considered to be small because:

- Holders of the conversion option will tend to wait until the last possible moment before converting

- Even if they are forced to convert (because the issuer calls the bond), the fixed income investor is returned the principal invested in full, plus any interest accrued up to the swap termination date.

In other words, there is some prepayment risk but no price risk to the fixed income investor. This prepayment risk is not always factored into the swap's LIBOR spread - which of course flatters the valuation of the equity stub!

The CADS carries potentially large credit risks for the swap writer.

If the underlying bond is called or held to maturity, the fixed income client (who legally owns it) may receive the bond's redemption amount from the issuer, but has to hand over to the asset swapper the difference between that and the originally-calculated bond value (which was what the client had actually invested). Since convertibles typically have very low coupon rates, this amount payable can be quite significant!

One way around this problem is to place the bond in a special purpose vehicle, but this can be expensive to set up. Another is to structure the swap as a CAPS, which we explain next.

Convertible asset par swap (CAPS)

The CAPS is much more like a par in / par out structure (as described in Interest Rate Swaps - Asset Swaps). Using the BAA bond as our example, the party asset-swapping this convertible on a CAPS:

- Buys GBP 1 million nominal of the convertible for a dirty price of 131.72
- Receives GBP 1 million from a fixed income investor (the convertible's par value)
- Pays the investor LIBOR plus a spread calculated on GBP 1 million, in exchange for all of the bond's fixed coupons
- Repays GBP 1 million to the fixed income investor at maturity (or earlier, if the bond is called by the issuer or converted).

As with the CADS, in reality there may be two other players behind the scenes (in addition to the asset swapper and the fixed income client).
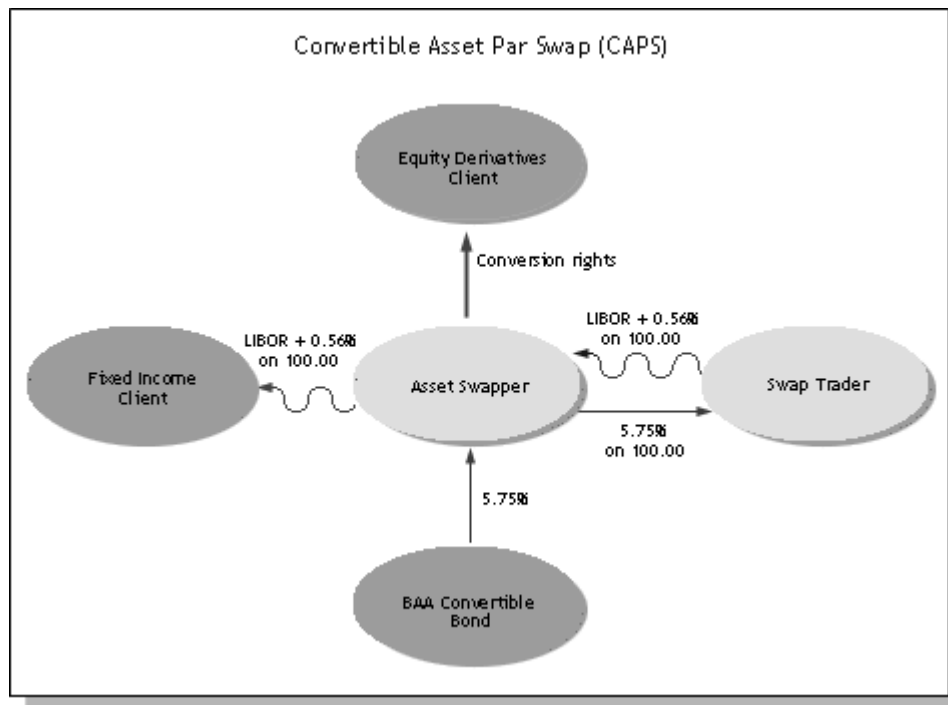
The credit risk on a CAPS is lower than on that on a CADS, because the fixed income client pays up front for the difference between the convertible's bond value and par.

Since the cash flows are now different, not surprisingly the spread over LIBOR payable is also different - in this case 0.56%. This is lower than the spread payable on the CADS because, in effect, the fixed income client receives:

- LIBOR + 0.58% on GBP 963,000 (the convertible's bond value)
- LIBOR flat (or less) on the GBP 37,000 (= 1,000,000 - 963,000) paid up-front to the swap market maker.

What Drives the Convertible Asset Swaps Market?

You can see in this picture the key drivers of the convertibles asset swap market:

- Fixed income investors who want credit exposure to issuers that may have only issued debt in convertible form - e.g. Asia Pacific issuers, technology companies. The swap's LIBOR-based return is especially attractive to floating rate borrowers, such as commercial banks.

- Equity derivatives specialists, who seeks to profit from selling OTC equity options on the back of the (cheaper) equity stub bought from the convertible.