FINANCIAL STRATEGY

Students tend to find discussing debt finance far easier than doing the calculations. **Andrew Howarth** explains how to deal with yield on debt.

An investor who purchases a corporate bond receives a return from that bond in the form of annual interest (or coupon) payments and, if the bond is redeemable, the final redemption payment. The total effective return is referred to as the yield. The yield of a redeemable bond is also known as the yield to maturity (YTM) or redemption yield.

In F3 exams you will often be asked to calculate the yield or YTM of a bond. In some cases – eg, if the bond is irredeemable – the calculations are simple. But they are more complex if the bond is redeemable or denominated in a foreign currency.

As well as being the effective return to the investor, the yield on a bond is important in many other calculations. For example, an entity's cost of debt, which is used in calculating the weighted-average cost of capital, can be derived by adjusting the yield for the tax relief on debt interest. This post-tax cost of debt, derived from the yield, is also used as the discount rate when evaluating a lease-versus-buy decision.

CORBIS

Irredeemable bonds

Let's start with the simplest of all yield calculations. An irredeemable corporate bond that has just been issued at par (the face, or nominal, value) will have a yield equal to its coupon rate.

Consider a company called Kite, which has just issued some irredeemable 5% coupon-rate bonds at their par value of £100. It is clear that if an investor were to purchase one of these Kite bonds, they would receive a return of 5% x £100 = £5 every year into perpetuity. So their average annual return, as a percentage of the current value of the bond (£100) is £5 ÷ £100 = 5%.

In short, for an irredeemable bond, the percentage yield = (annual interest received ÷ current bond price) x 100.

Owing to factors of supply and demand in the marketplace, bond prices fluctuate over time. So it could be that, say, one year later Kite's bonds are trading at £95. An investor purchasing a bond now has to pay £95 in

CIMA Executive CPD Academy

7–8 October 2010 | London

CIMA
Chartered Institute of Management Accountants

A two day academy providing high level professional CPD training to senior executives. It will cover seven strategic areas, all key to your career and help you fulfil your annual CPD requirements.

Book by 6 September to get the early booker rate of £1495 (+VAT).

For more information and to book:
E. conferences@cimaglobal.com
T. +44 (0)845 026 4722
www.cimaglobal.com/executive

CIMA
LEARNING QUALITY PARTNER

London
School of Business
& Finance

London • Birmingham • Manchester • Worldwide

Choose confidently

There's countless reasons to choose LSBF as your business and finance education provider. **Here's 3:**

1. Financial Times

The LSBF MBA is listed at number 19 in the 2010 Global Financial Times Online MBA programmes listing.

2. Number 1 for Online

LSBF won PQ Magazine's number one online learning platform and Pass Magazine's best website of 2009.

3. PQ Magazine

LSBF is the only college to win PQ Magazine's College of the year, two years in a row. LSBF CIMA tutor Jenny Hughes is PQ Magazine's 2010 tutor of the year.

Find out how to win a Mini Cooper* by visiting **LSBF.org.uk/winmini**

*See website for details. Terms and conditions apply. E&OE.

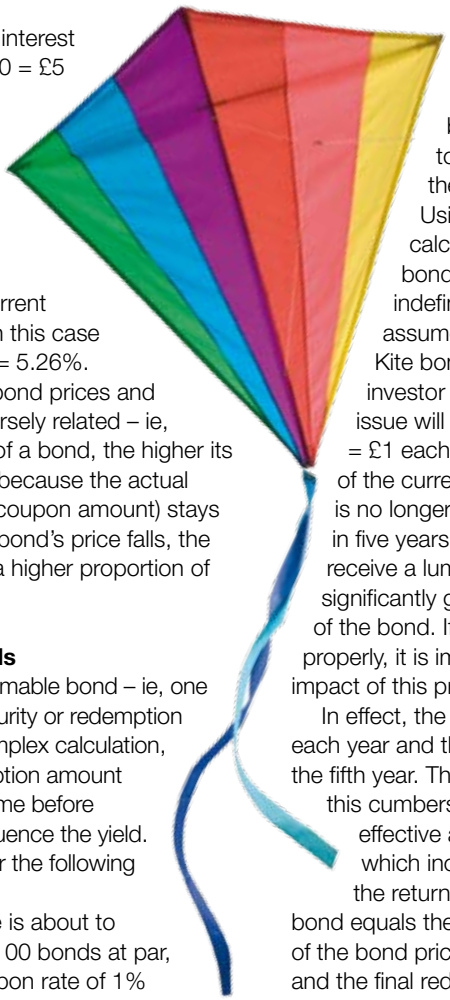
LONDON	BIRMINGHAM	MANCHESTER	INTERACTIVE
LSBF.org.uk	FBT-Global.com	LSBF.org.uk/Manchester	StudyInterActive.org
0207 823 2303	**0121 616 3370**	**0161 713 1777**	**0207 099 0077**

1 Calculating the internal rates of return for Kite's redeemable bond

Time	£	Discount factors at a discount rate of 8%	Present value at 8%	Discount factors at a discount rate of 10%	Present value at 10%
Year 0	(100)	1.000	(100.00)	1.000	(100.00)
Years 1-5	1	3.993	3.99	3.791	3.79
Year 5	150	0.681	102.15	0.621	93.15
			6.14		(3.06)

order to receive the interest stream of 5% x £100 = £5 every year into perpetuity. The interest is always calculated by applying the coupon rate to the bond's par value, irrespective of its current price. So the yield in this case is (£5 ÷ £95) x 100 = 5.26%.

It's notable that bond prices and bond yields are inversely related – ie, the lower the price of a bond, the higher its yield will be. This is because the actual amount of interest (coupon amount) stays constant. So, if the bond's price falls, the interest represents a higher proportion of the price.



Redeemable bonds

The yield on a redeemable bond – ie, one with a specified maturity or redemption date – is a more complex calculation, because the redemption amount and the remaining time before maturity will also influence the yield. To see why, consider the following simple example.

Assume that Kite is about to issue some more £100 bonds at par, this time with a coupon rate of 1% and a redemption amount of £150 after five years. An investor buying one of these bonds for £100 will be entitled to £1 in interest each year and then £150 in five years' time.

Using the logic from our previous calculations for irredeemable bonds – ie, bonds with an indefinite life – it would be easy to assume that the yield on these new Kite bonds is 1%. After all, an investor buying a bond for £100 on issue will receive interest of 1% x £100 = £1 each year, making a return of 1% of the current bond price. But the return is no longer received in perpetuity. In fact, in five years' time the investor will also receive a lump sum of £150, which is significantly greater than the original cost of the bond. If we are to calculate the yield properly, it is important to incorporate the impact of this premium on redemption.

In effect, the investor's yield is a 1% return each year and then an extra 50% return in the fifth year. The yield calculation replaces this cumbersome statement with a single effective annual percentage figure, which incorporates both elements of the return. The yield of a redeemable bond equals the internal rate of return (IRR) of the bond price, the annual interest received and the final redemption amount.

Using the figures from the Kite example, we need to calculate the IRR of:

- Year 0: current bond price paid: (£100).
- Years 1-5: annual interest received: £1.
- Year 5: redemption amount received: £150.

The yield can now be calculated by discounting these amounts at any two discount rates and using interpolation, as shown in table 1 above. By interpolation, the annual percentage yield works out as 8% + [2% x (6.14 ÷ {6.14 + 3.06})] = 9.33% a year.

So, instead of saying that the investor receives 1% every year in interest and then a 50% return in five years' time, we say that the effective annual return to the investor – ie, the YTM – in this case is 9.33%.

As with irredeemable bonds, the price of redeemable bonds can fluctuate over time. So, if one year later these Kite bonds were priced at £90 in the market, the yield of these *four-year* bonds could once again be calculated by interpolation. Using the figures derived from table 2 below, we can use interpolation to work out the percentage yield as 12% + [3% x (8.44 ÷ {8.44 + 1.34})] = 14.59% a year.

Again we can see the inverse relationship between yield and bond price: because the bond price has fallen, the yield has increased.

Irredeemable foreign currency bonds

Yield calculations become more complicated when foreign currency loans are involved.

2 Calculating the internal rates of return for Kite's redeemable bond taking account of change in market value after year one

Time	£	Discount factors at a discount rate of 12%	Present value at 12%	Discount factors at a discount rate of 15%	Present value at 15%
Year 0	(90)	1.000	(90.00)	1.000	(90.00)
Years 1-4	1	3.037	3.04	2.855	2.86
Year 4	150	0.636	95.40	0.572	85.80
			8.44		(1.34)

Dedicated CIMA Experts

Acorn home study options from £45!

We offer a diverse range of home study options ranging from study manuals to on-line and CD-ROM tuition, all designed to suit your own lifestyle and budget.

To print PDF chapters from our new range of Acorn study manuals, view free demonstrations of our on-line Live24tutors tuition courses, or for more details about our home study products please visit our website www.acornlive.com or contact gary@acornlive.com or call 01480 355 325.

CIMA Home Study Options	Acorn Study Manual	Acorn Teaching Guide	Exam Practice Kit	LIVE24TUTORS Tuition via Online	LIVE24TUTORS Tuition via CD-ROM	Acorn Tutor Support	Price
Study Material							
Silver Kit	✔	n/a	n/a	n/a	n/a	n/a	£45
Gold Kit	✔	✔	✔	n/a	n/a	✔	£115
Online (or CD-ROM) Tuition							
LIVE24TUTORS Online (6 months)	✔	n/a	n/a	✔	n/a	✔	£99
LIVE24TUTORS Online (12 months)	✔	n/a	n/a	✔	n/a	✔	£139
LIVE24TUTORS CD-ROM	✔	n/a	n/a	n/a	✔	✔	£169
Combined Study Material and Online (or CD-ROM) Tuition							
Platinum Kit	✔	✔	✔	✔	n/a	✔	£189
Kryptonite Kit	✔	✔	✔	n/a	✔	✔	£219

FREE Workshops (max 20 delegates)

Model answers to the CIMA May 2010 exam papers in the last sitting are demonstrated and discussed in detail by your tutor and copies of solutions made available on the day.

For further information or to book a free workshop please e-mail safina@acornlive.com

CIMA Classroom Tuition from £129

Our classroom courses are LTP quality approved by CIMA. We offer weekday or weekend tuition, standard revision and mock practice exam days. Please visit our website for further details or to book online.

ACORN PROFESSIONAL TUTORS

Acorn Professional Tutors

01480 355 325

website: www.acornlive.com **email:** gary@acornlive.com

CIMA LEARNING QUALITY PARTNER

3 Calculating cash flows on Kite's redeemable $100 bond taking account of the strengthening dollar against the pound

Time	Item	$	£ to $ exchange rate	£
Year 0	Current bond price	(100)	1.5000	(66.67)
Year 1	Interest	5	1.5000 ÷ 1.03 = 1.4563	3.43
Year 2	Interest	5	1.4563 ÷ 1.03 = 1.4139	3.54
Year 3	Interest	5	1.4139 ÷ 1.03 = 1.3727	3.64
Year 4	Interest	5	1.3727 ÷ 1.03 = 1.3327	3.75
Year 5	Interest and redemption amount	115	1.3327 ÷ 1.03 = 1.2939	88.88

4 Calculating the internal rates of return for Kite's redeemable bond taking account of exchange rate fluctuations

Time	£	Discount factors at a discount rate of 8%	Present value at 8%	Discount factors at a discount rate of 10%	Present value at 10%
Year 0	(66.67)	1.000	(66.67)	1.000	(66.67)
Year 1	3.43	0.926	3.18	0.909	3.12
Year 2	3.54	0.857	3.03	0.826	2.92
Year 3	3.64	0.794	2.89	0.751	2.73
Year 4	3.75	0.735	2.76	0.683	2.56
Year 5	88.88	0.681	60.53	0.621	55.19
			5.72		(0.15)

Let's now assume that Kite issues some $100 irredeemable bonds at par, with a coupon rate of 5%. If the exchange rate between the dollar and the pound is expected to stay constant, the yield calculation is the same as it was before, but a problem arises when the rate is expected to change. For example, if the dollar is expected to strengthen by 3% a year against the pound, paying the interest in dollars each year will in effect cost Kite 3% more annually, on top of the 5% coupon rate payable. So the yield on its irredeemable dollar bonds would be (1.05 x 1.03) – 1 = 8.15% a year.

Redeemable foreign currency bonds

Lastly, let's calculate the yield if Kite issues some $100 5% coupon bonds at par, redeemable in five years at $110. Assume that the dollar is expected to strengthen by 3% a year against the pound and that the current (spot) exchange rate is £1 = $1.50. We know that the yield is the IRR of the current market value, the interest payments and the redemption amount. The complication in this case is that the cash flows will first need to be converted into Kite's home currency, pounds, using exchange rates that are different each year. This is done using table 3. Then we plug those figures into our IRR interpolation calculation in table 4 in order to obtain a percentage yield of 8% + [2% x (5.72 ÷ {5.72 + 0.15})] = 9.95% a year (or, by inspection, about 10%).

Bond yields are commonly tested at strategic level and examiners' past comments have indicated that students often find the calculations hard. But I hope that you now understand that the yield is not the same as the coupon rate on the bond. In fact, several other factors also affect the yield. They are as follows:

- The current market value of the bond.
- The capital payment on maturity.
- The coupon rate.
- The time to maturity, or whether the bond is irredeemable.
- Whether the bond is denominated in the company's domestic currency or whether it's in a foreign currency.

The crucial move before calculating a yield is to identify first whether the bond is irredeemable or redeemable and then whether it is denominated in the home currency of the company concerned or a foreign currency.

For an irredeemable bond – ie, one with no maturity date – the percentage yield can be calculated quickly as (annual interest ÷ bond price) x 100. If the bond is denominated in a foreign currency, you need to adjust this formula by taking into account the expected annual strengthening or weakening of that currency against the company's domestic currency.

For a redeemable bond – ie, one with a given maturity date – the yield is found by calculating the IRR of the current bond price, the annual interest payments and the redemption payment. If the bond is denominated in a foreign currency, make sure that you convert the cash flows back into the firm's home currency, using the forecast exchange rates, before calculating IRR.

Andrew Howarth is Kaplan Publishing's content specialist for paper F3.

F3 further reading

J Ogilvie, *The Official CIMA Learning System – Financial Strategy*, CIMA Publishing, 2009.