Fixed Income

Yield and Yield Spread Measures for Fixed-Rate Bonds

Exam Focus

- Compounding periods
- Yield measures
- Yield spreads

Compounding Periods: Example

5%, $100 par bond trading at par

Calculate **effective annual rate** (EAR) for different *periodicities:*

- Annual: YTM = EAR = 5%
- Semiannual: Each coupon is . EAR = =
- Quarterly: Each coupon is . EAR = =
- Monthly: Each coupon is . EAR = =

Compounding Periods

- Most common periodicity is 2 (i.e., semiannual coupons)
- If a bond has a YTM of 4% on a **semiannual bond basis**, its **yield per semiannual period** is 2%
- YTM on a semiannual bond basis is not an effective rate

Periodicity: Example

A bond has a yield-to-maturity of –0.50% using annual compounding. If the yield is converted to monthly compounding, it will *most likely* be:

A. greater than –0.50%.

B. equal to –0.50%.

C. less than –0.50%.

-1

Source: CFA Institute. Used with permission.

Yield Measures: Example

5%, 3-year semiannual pay bond, par $100 trading at $98, coupons paid on February 1 and August 1.

Street convention YTM

FV = $100; PMT = $2.5; PV = –$98; N = 6; I/Y CPT =

YTM =

True yield

Takes into account that Feb 1 and Aug 1 may be weekends, bank holidays, so coupon will be delayed. If so, true yield < street convention.

Yield Measures: Example

5%, 3-year semiannual pay bond, par $100 trading at $98, coupons paid on February 1 and August 1.

Current yield: annual coupon / bond price

=

Simple yield: (annual coupon + prorated discount) / bond price

=

Yield Measures: Example

6.5%, 7-year semiannual pay bond, par $100 trading at $106.50, callable in three years at $103.25.

Yield-to-maturity:

FV = $100; PMT = $3.25; PV = –$106.50 N = 14; I/Y CPT =

YTM =

Yield-to-call:

FV = $103.25; PMT = $3.25; PV = –$106.50 N = 6; I/Y CPT =

YTC =

Yield-to-worst:

Yield Measures: Example

6.5%, 7-year semiannual pay bond, par $100 trading at $106.50, callable in three years at $103.25. YTM = 5.38%.

A similar 6.5%, 7-year semiannual pay bond, par $100 with **no call option** is trading at $109. YTM = 4.96%.

Callable bond value = straight bond value – call option value

$106.50 = $109.00 – **$2.50**.

Option-adjusted yield = 4.96%.

Yield Spreads

- Difference between yield of a bond and a benchmark security (same maturity):
  - **G-spread—**spread over a government bond YTM
  - **I-spread—**spread over interest rate swaps
  - **Z-spread—**spread over spot rates
  - **Option-adjusted spread —** Z-spread – option value

Yield Spreads: G-Spread Example

A 6.5%, USD annual coupon corporate bond has four years remaining, trading at $99.01.

The four-year government bond has a 5.5% coupon.

Find the G-spread.

Corporate YTM – government YTM

Maturity	Spot Rate
1 yr	4.127%
2 yr	4.768%
3 yr	5.287%
4 yr	5.912%

Yield Spreads: Example—Corporate YTM

6.75%, USD annual coupon corporate bond has four years remaining, par $100, trading at $99.01.

TVOM buttons to find YTM:

N = 4

PV = –99.01

PMT = 6.75

FV = 100

CPT I/Y =

-1

Yield Spreads: Government YTM

A four-year government bond has a 5.5% coupon.

To find YTM, first find price using spot rates:

T	CF	Discount Rate	PV
1	5.5	$1/(1.04127)$	
2	5.5	$1/(1.04768)^2$	
3	5.5	$1/(1.05287)^3$	
4	105.5	$1/(1.05912)^4$	

Price =

Maturity	Spot Rate
1 yr	4.127%
2 yr	4.768%
3 yr	5.287%
4 yr	5.912%

-1

Yield Spreads: Government YTM

Now, use TVOM to find YTM of government bond:

N = 4

PV = –98.85

PMT = 5.5

FV = 100

CPT I/Y =

-1

Yield Spreads: G-Spread Example

Find the G-spread.

Corporate YTM – government YTM

=

a.k.a.

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Yield Spreads: Example—Z-Spread

A 6.75%, USD annual coupon corporate bond has four years remaining—par $100, trading at $99.01, YTM 7.0426%.

Using the government spot rates below, which of the following is the Z-spread?

A. 78 bps.
B. 123 bps.
C. 148 bps.

Maturity	Spot Rate
1 yr	4.127%
2 yr	4.768%
3 yr	5.287%
4 yr	5.912%

-1

Yield Spreads: Example A

T	CF	Spot + Z-Spread	PV
1	6.75	4.127% + 0.78%	6.4343
2	6.75	4.768% + 0.78%	6.0590
3	6.75	5.287% + 0.78%	5.6566
4	106.75	5.912% + 0.78%	82.3836

Maturity	Gov. Spot Rate
1 yr	4.127%
2 yrs	4.768%
3 yrs	5.287%
4 yrs	5.912%

PV =

This is more than the current trading price of 99.01, so the spread must be more than 78 bps.

-1

Yield Spreads: Example B

T	CF	Spot + Z-Spread	PV
1	6.75	4.127% + 1.23%	6.4068
2	6.75	4.768% + 1.23%	6.0077
3	6.75	5.287% + 1.23%	5.5853
4	106.75	5.912% + 1.23%	81.0082

Maturity	Gov. Spot Rate
1 yr	4.127%
2 yrs	4.768%
3 yrs	5.287%
4 yrs	5.912%

PV =

This is equal to the current trading price, so Z-spread equals 123 bps.

Solutions

Compounding Periods: Example

5%, $100 par bond trading at par

Calculate **effective annual rate** (EAR) for different *periodicities:*

- Annual: YTM = EAR = 5%
- Semiannual: Each coupon is $2.50. EAR = $1.025^2 - 1 = 5.0625\%$
- Quarterly: Each coupon is $1.25. EAR = $1.0125^4 - 1 = 5.0945\%$
- Monthly: Each coupon is $0.42. EAR = $1.004167^{12} - 1 = 5.1166\%$

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Periodicity: Example

A bond has a yield-to-maturity of –0.50% using annual compounding. If the yield is converted to monthly compounding, it will *most likely* be:

A. greater than –0.50%.

B. equal to –0.50%.

C. less than –0.50%.

-1

Source: CFA Institute. Used with permission.

Yield Measures: Example

5%, 3-year semiannual pay bond, par $100 trading at $98, coupons paid on February 1 and August 1.

Street convention YTM

FV = $100; PMT = $2.5; PV = –$98; N = 6; I/Y CPT = 2.87

YTM = 2.87 × 2 = 5.74%

True yield

Takes into account that Feb 1 and Aug 1 may be weekends, bank holidays, so coupon will be delayed. If so, true yield < street convention.

Yield Measures: Example

5%, 3-year semiannual pay bond, par $100 trading at $98, coupons paid on February 1 and August 1.

Current yield: annual coupon / bond price

= $5 / $98 = 5.10%

Simple yield: (annual coupon + prorated discount) / bond price

= ($5 + $0.67) / $98 = 5.79%

Yield Measures: Example

6.5%, 7-year semiannual pay bond, par $100 trading at $106.50, callable in three years at $103.25.

Yield-to-maturity:

FV = $100; PMT = $3.25; PV = –$106.50 N = 14; I/Y CPT = 2.69

YTM = 2.69 × 2 = 5.38%

Yield-to-call:

FV = $103.25; PMT = $3.25; PV = –$106.50 N = 6; I/Y CPT = 2.57

YTC = 2.57 × 2 = 5.14%

Yield-to-worst: 5.14%

Yield Spreads: Example—Corporate YTM

6.75%, USD annual coupon corporate bond has four years remaining, par $100, trading at $99.01.

TVOM buttons to find YTM:

N = 4

PV = –99.01

PMT = 6.75

FV = 100

CPT I/Y = 7.0426%

Yield Spreads: Government YTM

A four-year government bond has a 5.5% coupon.

To find YTM, first find price using spot rates:

T	CF	Discount Rate	PV
1	5.5	1/(1.04127)	5.2820
2	5.5	$1/(1.04768)^2$	5.0108
3	5.5	$1/(1.05287)^3$	4.7124
4	105.5	$1/(1.05912)^4$	83.8440
			98.85

Price = $98.85

Maturity	Spot Rate
1 yr	4.127%
2 yr	4.768%
3 yr	5.287%
4 yr	5.912%

Yield Spreads: Government YTM

Now, use TVOM to find YTM of government bond:

N = 4

PV = –98.85

PMT = 5.5

FV = 100

CPT I/Y = 5.8306%

Yield Spreads: G-Spread Example

Find the G-spread.

Corporate YTM – government YTM

7.0426% – 5.8306% = 1.2120%

a.k.a. 121.2 bps

Yield Spreads: Example—Z-Spread

A 6.75%, USD annual coupon corporate bond has four years remaining—par $100, trading at $99.01, YTM 7.0426%.

Using the government spot rates below, which of the following is the Z-spread?

A. 78 bps.
B. 123 bps.
C. 148 bps.

Maturity	Spot Rate
1 yr	4.127%
2 yr	4.768%
3 yr	5.287%
4 yr	5.912%

Yield Spreads: Example A

T	CF	Spot + Z-Spread	PV
1	6.75	4.127% + 0.78%	6.4343
2	6.75	4.768% + 0.78%	6.0590
3	6.75	5.287% + 0.78%	5.6566
4	106.75	5.912% + 0.78%	82.3836
			100.53

Maturity	Gov. Spot Rate
1 yr	4.127%
2 yrs	4.768%
3 yrs	5.287%
4 yrs	5.912%

PV = 100.53

This is more than the current trading price of 99.01, so the spread must be more than 78 bps.

-1

Yield Spreads: Example B

T	CF	Spot + Z-Spread	PV
1	6.75	4.127% + 1.23%	6.4068
2	6.75	4.768% + 1.23%	6.0077
3	6.75	5.287% + 1.23%	5.5853
4	106.75	5.912% + 1.23%	81.0082
			99.01

Maturity	Gov. Spot Rate
1 yr	4.127%
2 yrs	4.768%
3 yrs	5.287%
4 yrs	5.912%

PV = 99.01

This is equal to the current trading price, so Z-spread equals 123 bps.

-1