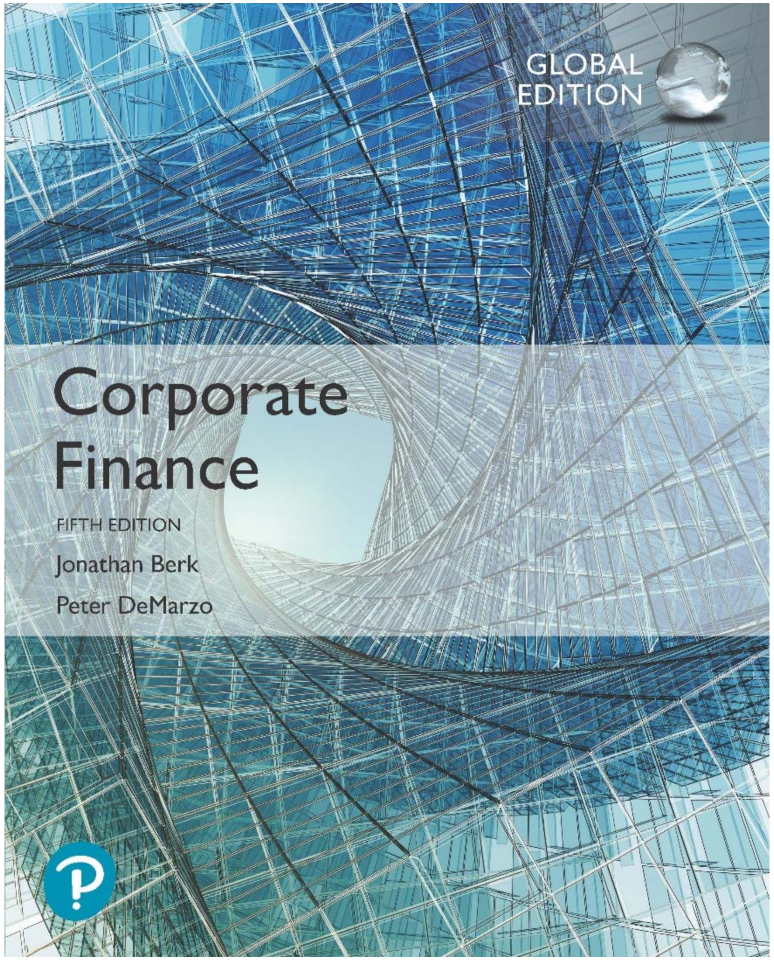
Corporate Finance

Fifth Edition, Global Edition



Chapter 6

Valuing Bonds

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Chapter Outline

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Learning Objectives (1 of 4)

- Identify the cash flows for both coupon bonds and zero-coupon bonds, and calculate the value for each type of bond.
- Calculate the yield to maturity for both coupon and zero-coupon bonds, and interpret its meaning for each.

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Learning Objectives (2 of 4)

- Given coupon rate and yield to maturity, determine whether a coupon bond will sell at a premium or a discount; describe the time path the bond's price will follow as it approaches maturity, assuming prevailing interest rates remain the same over the life of the bond.

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Learning Objectives (3 of 4)

- Illustrate the change in bond price that will occur as a result of changes in interest rates; differentiate between the effect of such a change on long-term versus short-term bonds.
- Discuss the effect of coupon rate to the sensitivity of a bond price to changes in interest rates.
- Define duration, and discuss its use by finance practitioners.

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Learning Objectives (4 of 4)

- Calculate the price of a coupon bond using the Law of One Price and a series of zero-coupon bonds.
- Discuss the relation between a corporate bond's expected return and the yield to maturity; define default risk and explain how these rates incorporate default risk.
- Assess the creditworthiness of a corporate bond using its bond rating; define default risk.

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6.1 Bond Cash Flows, Prices, and Yields (1 of 2)

- Bond Terminology
  - Bond Certificate
    - States the terms of the bond
  - Maturity Date
    - Final repayment date
  - Term
    - The time remaining until the repayment date
  - Coupon
    - Promised interest payments

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18. Mai | 6% Hypothekenpfandbrief Em. 4209 Serie A | 18. Mai 2006 | WKN 334 209 | DM 200,-

DIE WESTHYP

Mündelsicher | Emission 4209 Serie A | Nr.

6% Hypothekenpfandbrief über 200 DM

Die Westfälische Hypothekenbank Aktiengesellschaft schuldet dem Inhaber dieses Hypothekenpfandbriefes Zweihundert Deutsche Mark. Der Pfandbrief wird mit 6% jährlich verzinst. Die Zinsen werden zum 18. Mai eines jeden Jahres nachträglich gezahlt. Die Verzinsung endet am Tage vor der Fälligkeit. Wird jedoch eine Leistung nach § 193 BGB bewirkt, werden Karenztage nicht verzinst. Der Inhaber und die Bank können diesen Pfandbrief nicht kündigen. Die Rückzahlung erfolgt in einer Summe zum 18. Mai 2006; sie wird im Bundesanzeiger bekanntgegeben. Die Einlösung der fälligen Stücke erfolgt wie die Einlösung der Zinsscheine an der Kasse der Bank über sämtliche Kreditinstitute.

Dortmund, im Mai 1996

WESTFÄLISCHE HYPOTHEKENBANK AKTIENGESELLSCHAFT

Aufsichtsrat | Vorstand

Für diesen Pfandbrief ist die vorschriftsmäßige Deckung vorhanden und in das Deckungsregister eingetragen.

Kontrollunterschrift | Der staatlich bestellte Treuhänder

Zur 5. Deutschen Meisterschaft 1995/1996

Mantel

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Bogen

Coverded Bond - Pfandbrief

Langfristige Schuldverschreibung, die der Finanzierung von Baukrediten dient.

Pfandbriefe werden von Hypothekenbanken, Schiffspfandbriefbanken und öffentlich-rechtlichen Kreditinstituten ausgegeben. Sie sind ähnlich wie Anleihen ausgestattet. Durch die Beleihung von Grundvermögen sind sie jedoch besonders gut besichert. Ein Treuhänder kontrolliert, dass die emittierten Pfandbriefe zu jeder Zeit in gleicher Höhe durch Hypotheken mit mindestens gleichem Zinsertrag gedeckt sind.

König Friedrich II.
König von Preußen
Friedrich der Große
Der alte Fritz
24. Januar 1712 - 17. August 1786

Im Sommer 1769 erließ Friedrich II eine Kabinettsorder: Ein Pfandbriefinstitut, damals Landschaft genannt, sollte den schlesischen Rittergütern, die unter den Folgen des Siebenjährigen Krieges litten, günstige langfristige Darlehen verschaffen.

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6.1 Bond Cash Flows, Prices, and Yields (2 of 2)

- Bond Terminology
  - Face Value
    - Notional amount used to compute the interest payments
  - Coupon Rate
    - Determines the amount of each coupon payment, expressed as an APR
  - Coupon Payment

$$CPN = \frac{\text{Coupon Rate} \times \text{Face Value}}{\text{Number of Coupon Payments per Year}}$$

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Zero-Coupon Bonds (1 of 7)

- Zero-Coupon Bond
  - Does not make coupon payments
  - Always sells at a **discount** (a price lower than face value), so they are also called **pure discount bonds**
  - **Treasury Bills** are U.S. government zero-coupon bonds with a maturity of up to one year.

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Zero-Coupon Bonds (2 of 7)

- Suppose that a one-year, risk-free, zero-coupon bond with a $100,000 face value has an initial price of $96,618.36. The cash flows would be

  – Although the bond pays no "interest," your compensation is the difference between the initial price and the face value.

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Zero-Coupon Bonds (3 of 7)

- Yield to Maturity
  - The discount rate that sets the present value of the promised bond payments equal to the current market price of the bond
    - Price of a Zero-Coupon bond

$$P = \frac{FV}{(1 + YTM_n)^n}$$

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Zero-Coupon Bonds (4 of 7)

- Yield to Maturity
  - For the one-year zero coupon bond:

$$96{,}618.36 = \frac{100{,}000}{(1+YTM_1)}$$

$$1+YTM_1 = \frac{100{,}000}{96{,}618.36} = 1.035$$

- Thus, the YTM is 3.5%

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Zero-Coupon Bonds (5 of 7)

- Yield to Maturity
  - Yield to Maturity of an *n*-Year Zero-Coupon Bond

$$YTM_n = \left(\frac{FV}{P}\right)^{1/n} - 1$$

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Textbook Example 6.1 (1 of 2)

Yields for Different Maturities

Problem

Suppose the following zero-coupon bonds are trading at the prices shown below per $100 face value. Determine the corresponding spot interest rates that determine the zero coupon yield curve.

Maturity	1 Year	2 Years	3 Years	4 Years
Price	$96.62	$92.45	$87.63	$83.06

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Textbook Example 6.1 (2 of 2)

Solution

Using Eq. 6.3, we have

$$r_1 = YTM_1 = \frac{100}{96.62} - 1 = 3.50\%$$

$$r_2 = YTM_2 = \left(\frac{100}{92.45}\right)^{\frac{1}{2}} - 1 = 4.00\%$$

$$r_3 = YTM_3 = \left(\frac{100}{87.63}\right)^{\frac{1}{3}} - 1 = 4.50\%$$

$$r_4 = YTM_4 = \left(\frac{100}{83.06}\right)^{\frac{1}{4}} - 1 = 4.75\%$$

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Zero-Coupon Bonds (6 of 7)

- Risk-Free Interest Rates
  - A default-free zero-coupon bond that matures on date *n* provides a risk-free return over the same period.
  - Thus, the Law of One Price guarantees that the risk-free interest rate equals the yield to maturity on such a bond.
  - Risk-Free Interest Rate with Maturity *n.*

$$r_n = YTM_n$$

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Zero-Coupon Bonds (7 of 7)

- Risk-Free Interest Rates
  - Spot Interest Rate
    - Another term for a default-free, zero-coupon yield
  - Zero-Coupon Yield Curve
    - A plot of the yield of risk-free zero-coupon bonds as a function of the bond's maturity date

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Coupon Bonds (1 of 2)

- Coupon Bonds
  - Pay face value at maturity
  - Pay regular coupon interest payments
- Treasury Notes
  - U.S. Treasury coupon security with original maturities of 1–10 years
- Treasury Bonds
  - U.S. Treasury coupon security with original maturities over 10 years

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Textbook Example 6.2 (1 of 2)

The Cash Flows of a Coupon Bond

Problem

The U.S. Treasury has just issued a five-year, $1000 bond with a 5% coupon rate and semiannual coupons. What cash flows will you receive if you hold this bond until maturity?

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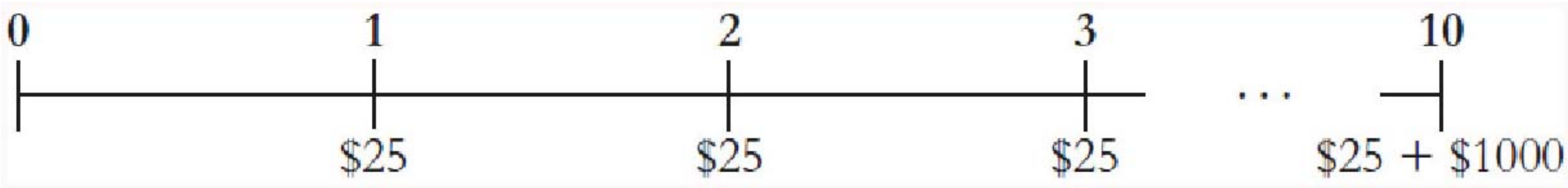
Textbook Example 6.2 (2 of 2)

Solution

The face value of this bond is $1000. Because this bond pays coupons semiannually, from Eq. 6.1, you will receive a coupon payment every six months of $\text{CPN} = \$1000 \times \frac{5\%}{2} = \$25.$
Here is the timeline, based on a six-month period:



Note that the last payment occurs five years (10 six-month periods) from now and is composed of both a coupon payment of $25 and the face value payment of $1000.

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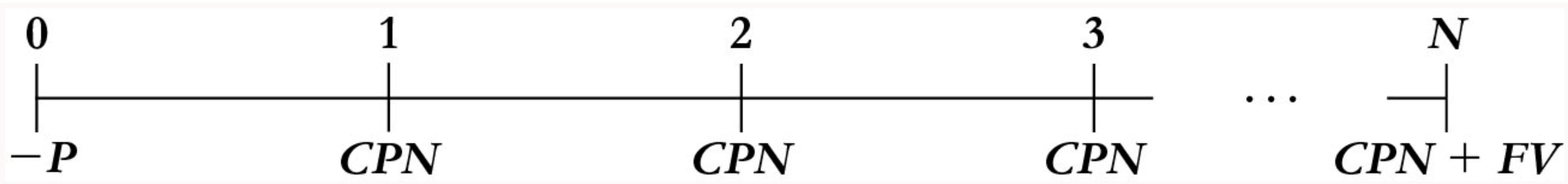
Coupon Bonds (2 of 2)

- Yield to Maturity
  - The YTM is the **single** discount rate that equates the present value of the bond's remaining cash flows to its current price



  - Yield to Maturity of a Coupon Bond

$$P = CPN \times \frac{1}{y}\left(1 - \frac{1}{(1+y)^N}\right) + \frac{FV}{(1+y)^N}$$

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Textbook Example 6.3 (1 of 3)

Computing the Yield to Maturity of a Coupon Bond

Problem

Consider the five-year, $1000 bond with a 5% coupon rate and semiannual coupons described in Example 6.2. If this bond is currently trading for a price of $957.35, what is the bond's yield to maturity?

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Textbook Example 6.3 (2 of 3)

Solution

Because the bond has 10 remaining coupon payments, we compute its yield *y* by solving:

$$957.35 = 25 \times \frac{1}{y}\left(1 - \frac{1}{(1+y)^{10}}\right) + \frac{1000}{(1+y)^{10}}$$

We can solve it by trial-and-error or by using the annuity spreadsheet:

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Textbook Example 6.3 (3 of 3)

	NPER	RATE	PV	PMT	FV	Excel Formula
Given	10		−957.35	25	1,000	
Solve for Rate		3.00%				= RATE (10, 25, −957.35, 1000)

Therefore, $y = 3\%$. Because the bond pays coupons semiannually, this yield is for a six-month period. We convert it to an APR by multiplying by the number of coupon payments per year. Thus the bond has a yield to maturity equal to a 6% APR with semiannual compounding.

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Textbook Example 6.4 (1 of 2)

Computing a Bond Price from Its Yield to Maturity

Problem

Consider again the five-year, $1000 bond with a 5% coupon rate and semiannual coupons presented in Example 6.3. Suppose you are told that its yield to maturity has increased to 6.30% (expressed as an APR with semiannual compounding). What price is the bond trading for now?

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Textbook Example 6.4 (2 of 2)

Solution

Given the yield, we can compute the price using Eq.65. First, note that a 6.30% APR is equivalent to a semiannual rate of 3.15%. Therefore, the bond price is

$$P = 25 \times \frac{1}{0.0315}\left(1 - \frac{1}{1.0315^{10}}\right) + \frac{1000}{1.0315^{10}} = \$944.98$$

We can also use the annuity spreadsheet:

	NPER	RATE	PV	PMT	FV	Excel Formula
Given	10	3.15%		25	1,000	
Solve for PV			**−944.98**			= PV (0.0315, 10, 25, 1000)

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6.2 Dynamic Behavior of Bond Prices

- Discount
  - A bond is selling at a **discount** if the price is less than the face value
- Par
  - A bond is selling at **par** if the price is equal to the face value
- Premium
  - A bond is selling at a **premium** if the price is greater than the face value

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Discounts and Premiums (1 of 3)

- If a coupon bond trades at a discount, an investor will earn a return both from receiving the coupons and from receiving a face value that exceeds the price paid for the bond.
  - If a bond trades at a discount, its yield to maturity will exceed its coupon rate.

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Discounts and Premiums (2 of 3)

- If a coupon bond trades at a premium, it will earn a return from receiving the coupons, but this return will be diminished by receiving a face value less than the price paid for the bond.
- Most coupon bonds have a coupon rate so that the bonds will **initially** trade at, or very close to, par.

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Discounts and Premiums (3 of 3)

Table 6.1 Bond Prices Immediately After a Coupon Payment

When the bond price is	We say the bond trades	This occurs when
greater than the face value	"above par" or "at a premium"	Coupon Rate > Yield to Maturity
equal to the face value	"at par"	Coupon Rate = Yield to Maturity
less than the face value	"below par" or "at a discount"	Coupon Rate < Yield to Maturity

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Textbook Example 6.5 (1 of 2)

Determining the Discount or Premium of a Coupon Bond

Problem

Consider three 30-year bonds with annual coupon payments. One bond has a 10% coupon rate, one has a 5% coupon rate, and one has a 3% coupon rate. If the yield to maturity of each bond is 5%, what is the price of each bond per $100 face value? Which bond trades at a premium, which trades at a discount, and which trades at par?

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Textbook Example 6.5 (2 of 2)

Solution

We can compute the price of each bond using Eq.6.5. Therefore, the bond prices are

$$P(10\%\text{ coupon}) = 10 \times \frac{1}{0.05}\left(1 - \frac{1}{1.05^{30}}\right) + \frac{100}{1.05^{30}} = \$176.86$$ (trades at a premium)

$$P(5\%\text{ coupon}) = 5 \times \frac{1}{0.05}\left(1 - \frac{1}{1.05^{30}}\right) + \frac{100}{1.05^{30}} = \$100.00$$ (trades at par)

$$P(3\%\text{ coupon}) = 3 \times \frac{1}{0.05}\left(1 - \frac{1}{1.05^{30}}\right) + \frac{100}{1.05^{30}} = \$69.26$$ (trades at a discount)

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Time and Bond Prices

- Holding all other things constant, a bond's yield to maturity will not change over time.
- Holding all other things constant, the price of discount or premium bond will move toward par value over time.
- If a bond's yield to maturity has not changed, then the IRR of an investment in the bond equals its yield to maturity even if you sell the bond early.

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Textbook Example 6.6 (1 of 4)

The Effect of Time on the Price of a Coupon Bond

Problem

Consider a 30-year bond with a 10% coupon rate (annual payments) and a $100 face value. What is the initial price of this bond if it has a 5% yield to maturity? If the yield to maturity is unchanged, what will the price be immediately before and after the first coupon is paid?

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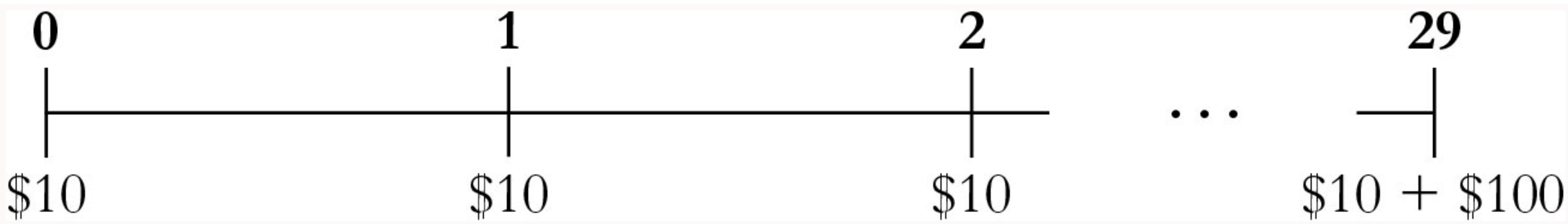
Textbook Example 6.6 (2 of 4)

Solution

We computed the price of this bond with 30 years to maturity in Example 6.5:

$$P = 10 \times \frac{1}{0.05}\left(1 - \frac{1}{1.05^{30}}\right) + \frac{100}{1.05^{30}} = \$176.86$$

Now consider the cash flows of this bond in one year, immediately before the first coupon is paid. The bond now has 29 years until it matures, and the timeline is as follows:



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Textbook Example 6.6 (3 of 4)

Again, we compute the price by discounting the cash flows by the yield to maturity. Note that there is a cash flow of $10 at date zero, the coupon that is about to be paid. In this case, we can treat the first coupon separately and value the remaining cash flows as in Eq. 6.5:

$$P(\text{just before first coupon}) = 10 + 10 \times \frac{1}{0.05}\left(1 - \frac{1}{1.05^{29}}\right) + \frac{100}{1.05^{29}} = \$185.71$$

Note that the bond price is higher than it was initially. It will make the same total number of coupon payments, but an investor does not need to wait as long to receive the first one. We could also compute the price by noting that because the yield to maturity remains at 5% for the bond, investors in the bond should earn a return of 5% over the year: $176.86 × 1.05 = $185.71.

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Textbook Example 6.6 (4 of 4)

What happens to the price of the bond just after the first coupon is paid? The timeline is the same as that given earlier, except the new owner of the bond will not receive the coupon at date zero. Thus, just after the coupon is paid, the price of the bond (given the same yield to maturity) will be

$$P\,(\text{just after first coupon}) = 10 \times \frac{1}{0.05}\left(1 - \frac{1}{1.05^{29}}\right) + \frac{100}{1.05^{29}} = \$175.71$$

The price of the bond will drop by the amount of the coupon ($10) immediately after the coupon is paid, reflecting the fact that the owner will no longer receive the coupon. In this case, the price is lower than the initial price of the bond. Because there are fewer coupon payments remaining, the premium investors will pay for the bond declines. Still, an investor who buys the bond initially, receives the first coupon, and then sells it earns a 5% return if the bond's yield does not change:

$$\frac{(10 + 175.71)}{176.86} = 1.05.$$

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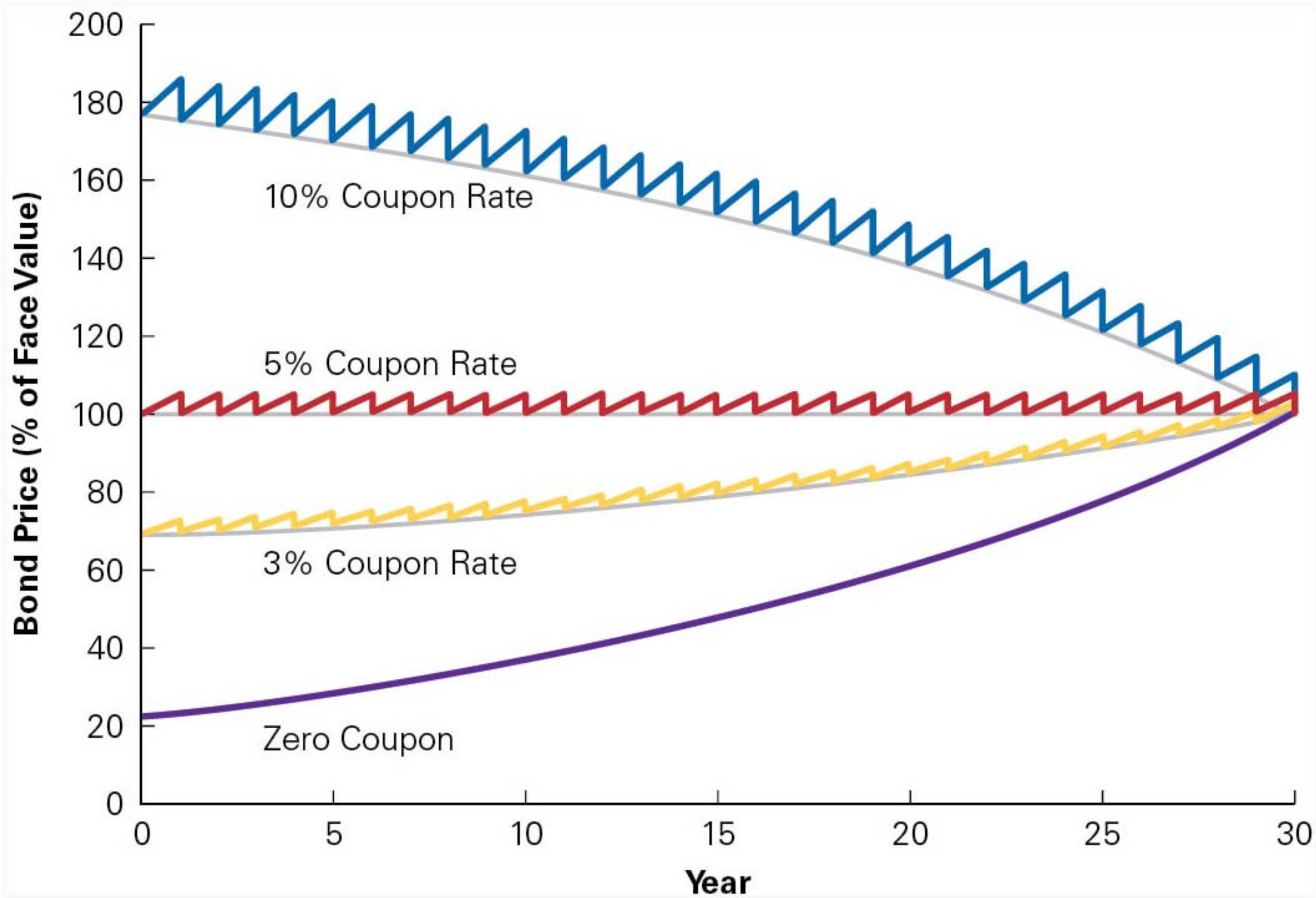
Figure 6.1 The Effect of Time on Bond Prices



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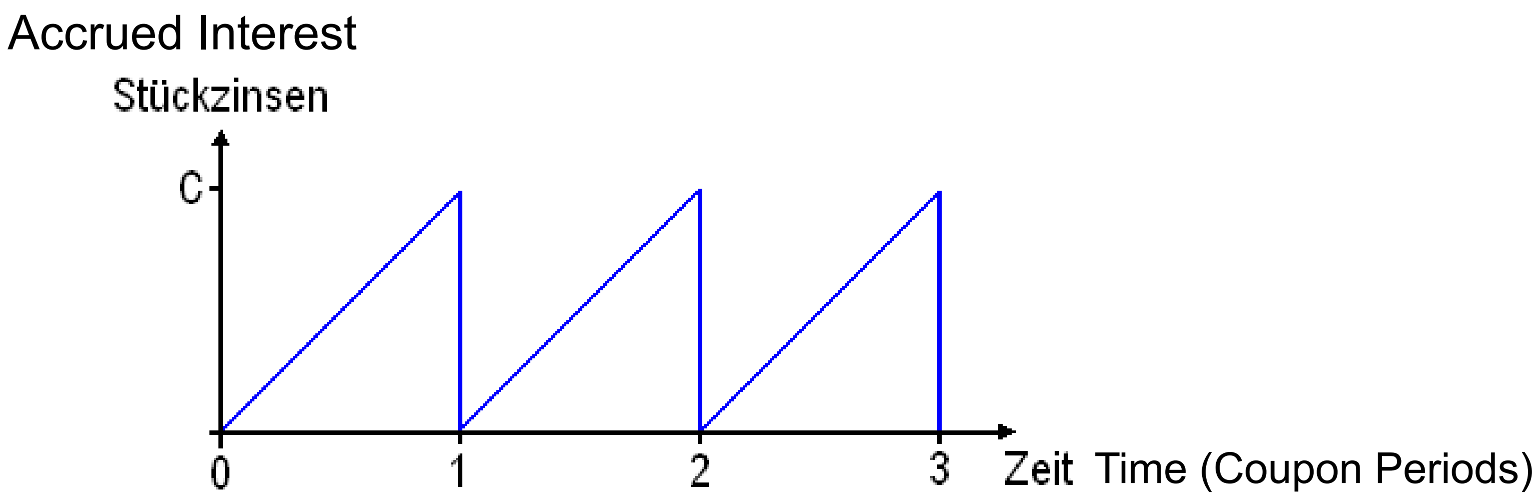
Accrued Interest (Stückzinsen)



$$\text{Clean Price} = \text{Dirty Price} - \text{Accrued Interest}$$

$$\text{Accrued Int.} = \text{Coupon Amount} \times \left(\frac{\text{days since last coupon payment}}{\text{days in current coupon period}} \right)$$

$$\text{Stückzinsen} = \text{Kuponbetrag} \times \left(\frac{\text{Tage seit letzer Kuponzahlung}}{\text{Tage in aktueller Kuponperiode}} \right)$$

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Interest Rate Changes and Bond Prices (1 of 2)

- There is an inverse relationship between interest rates and bond prices.
  - As interest rates and bond yields rise, bond prices fall.
  - As interest rates and bond yields fall, bond prices rise.

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Interest Rate Changes and Bond Prices (2 of 2)

- The sensitivity of a bond's price to changes in interest rates is measured by the bond's **duration.**
  - Bonds with high durations are highly sensitive to interest rate changes.
  - Bonds with low durations are less sensitive to interest rate changes.

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Textbook Example 6.7 (1 of 3)

The Interest Rate Sensitivity of Bonds

Problem

Consider a 15-year zero-coupon bond and a 30-year coupon bond with 10% annual coupons. By what percentage will the price of each bond change if its yield to maturity increases from 5% to 6%?

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Textbook Example 6.7 (2 of 3)

Solution

First, we compute the price of each bond for each yield to maturity:

Yield to Maturity	15-Year, Zero-Coupon Bond	30-Year, 10% Annual Coupon Bond
5%	$\frac{100}{1.05^{15}} = \$48.10$	$10 \times \frac{1}{0.05}\left(1 - \frac{1}{1.05^{30}}\right) + \frac{100}{1.05^{30}} = \$176.86$
6%	$\frac{100}{1.06^{15}} = \$41.73$	$10 \times \frac{1}{0.06}\left(1 - \frac{1}{1.06^{30}}\right) + \frac{100}{1.06^{30}} = \$155.06$

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Textbook Example 6.7 (3 of 3)

The price of the 15-year zero-coupon bond changes by

$$\frac{(41.73-48.10)}{48.10}=-13.2\%$$ if its yield to maturity increases from 5% to 6%. For the 30-year bond with 10% annual coupons, the price change is $$\frac{(155.06-176.86)}{176.86}=-12.3\%.$$

Even though the 30-year bond has a longer maturity, because of its high coupon rate, its sensitivity to a change in yield is actually less than that of the 15-year zero coupon bond.

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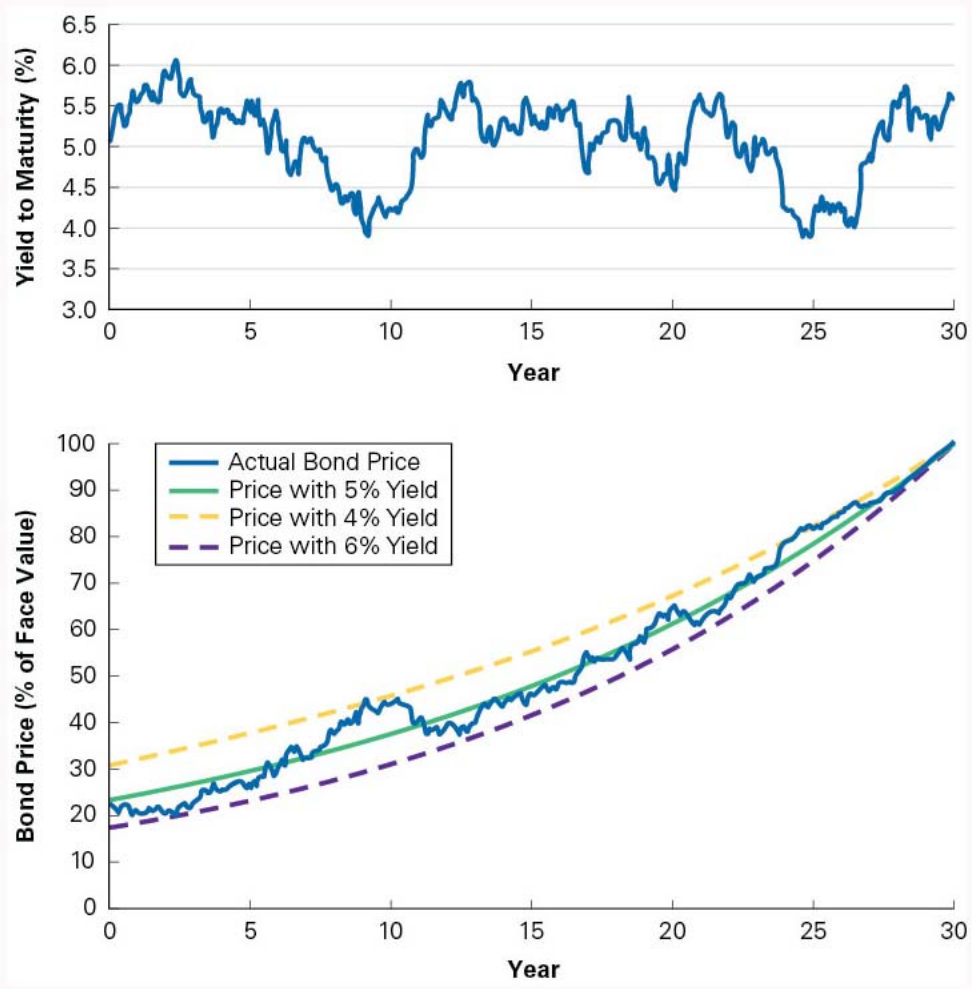
Figure 6.2 Yield to Maturity and Bond Price Fluctuations over Time



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6.3 The Yield Curve and Bond Arbitrage

- Using the Law of One Price and the yields of default-free zero-coupon bonds, one can determine the price and yield of any other default-free bond.
- The yield curve provides sufficient information to evaluate all such bonds.

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Replicating a Coupon Bond (1 of 3)

- Replicating a three-year $1000 bond that pays 10% annual coupon using three zero-coupon bonds:

	0	1	2	3
Coupon bond:		$100	$100	$1100
1-year zero:		$100		
2-year zero:			$100	
3-year zero:				$1100
Zero-coupon bond portfolio:		$100	$100	$1100

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Replicating a Coupon Bond (2 of 3)

Table 6.2 Yields and Prices (per $100 Face Value) for Zero-Coupon Bonds

Maturity	1 year	2years	3 years	4 years
YTM	3.50%	4.00%	4.50%	4.75%
Price	$96.62	$92.45	$87.63	$83.06%

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Replicating a Coupon Bond (3 of 3)

Zero-Coupon Bond	Face Value Required		Cost
1 year	100		96.62
2 years	100		92.45
3 years	1100		$11 \times 87.63 = 963.93$
		Total Cost:	$1153.00

- By the Law of One Price, the three-year coupon bond must trade for a price of $1153.

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Valuing a Coupon Bond Using Zero-Coupon Yields

- The price of a coupon bond must equal the present value of its coupon payments and face value.
  - Price of a Coupon Bond

$$V = PV\,(\text{Bond Cash Flows})$$

$$= \frac{CPN}{1+YTM_1} + \frac{CPN}{(1+YTM_2)^2} + \ldots + \frac{CPN+FV}{(1+YTM_n)^n}$$

$$P = \frac{100}{1.035} + \frac{100}{1.04^2} + \frac{100+1000}{1.045^3} = \$1153$$

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Coupon Bond Yields

- Given the yields for zero-coupon bonds, we can price a coupon bond

$$P = 1153 = \frac{100}{(1+y)} + \frac{100}{(1+y)^2} + \frac{100+1000}{(1+y)^3}$$

$$P = \frac{100}{1.0444} + \frac{100}{1.0444^2} + \frac{100+1000}{1.0444^3} = \$1153$$

	NPER	RATE	PV	PMT	FV	Excel Formula
Given	3		−1,153	100	1,000	
Solve for Rate		**4.44%**				= RATE(3, 100, −1153, 1000)

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Textbook Example 6.8 (1 of 3)

Yields on Bonds with the Same Maturity

Problem

Given the following zero-coupon yields, compare the yield to maturity for a three-year, zero-coupon bond; a three-year coupon bond with 4% annual coupons; and a three-year coupon bond with 10% annual coupons. All of these bonds are default free.

Maturity	1 year	2 years	3 years	4 years
Zero- coupon YTM	3.50%	4.00%	4.50%	4.75%

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Textbook Example 6.8 (2 of 3)

Solution

From the information provided, the yield to maturity of the three-year, zero-coupon bond is 4.50%. Also, because the yields match those in Table 6.2, we already calculated the yield to maturity for the 10% coupon bond as 4.44%. To compute the yield for the 4% coupon bond, we first need to calculate its price. Using Eq. 6.6, we have

$$P = \frac{40}{1.035} + \frac{40}{1.04^2} + \frac{40 + 1000}{1.045^3} = \$986.98$$

The price of the bond with a 4% coupon is \$986.98. From Eq. 6.5, its yield to maturity solves the following equation:

$$\$986.98 = \frac{40}{(1+y)} + \frac{40}{(1+y)^2} + \frac{40 + 1000}{(1+y)^3}$$

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Textbook Example 6.8 (3 of 3)

We can calculate the yield to maturity using the annuity spreadsheet:

	NPER	RATE	PV	PMT	FV	Excel Formula
Given	3		−986.98	100	1,000	
Solve for Rate		**4.47%**				= RATE(3, 40, −986.98, 1000)

To summarize, for the three-year bonds considered

Coupon rate	0%	4%	10%
YTM	4.50%	4.47%	4.44%

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Treasury Yield Curves

- Treasury Coupon-Paying Yield Curve
  – Often referred to as “the yield curve”
- On-the-Run Bonds
  – Most recently issued bonds
  – The yield curve is often a plot of the yields on these bonds.

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Yield Curve

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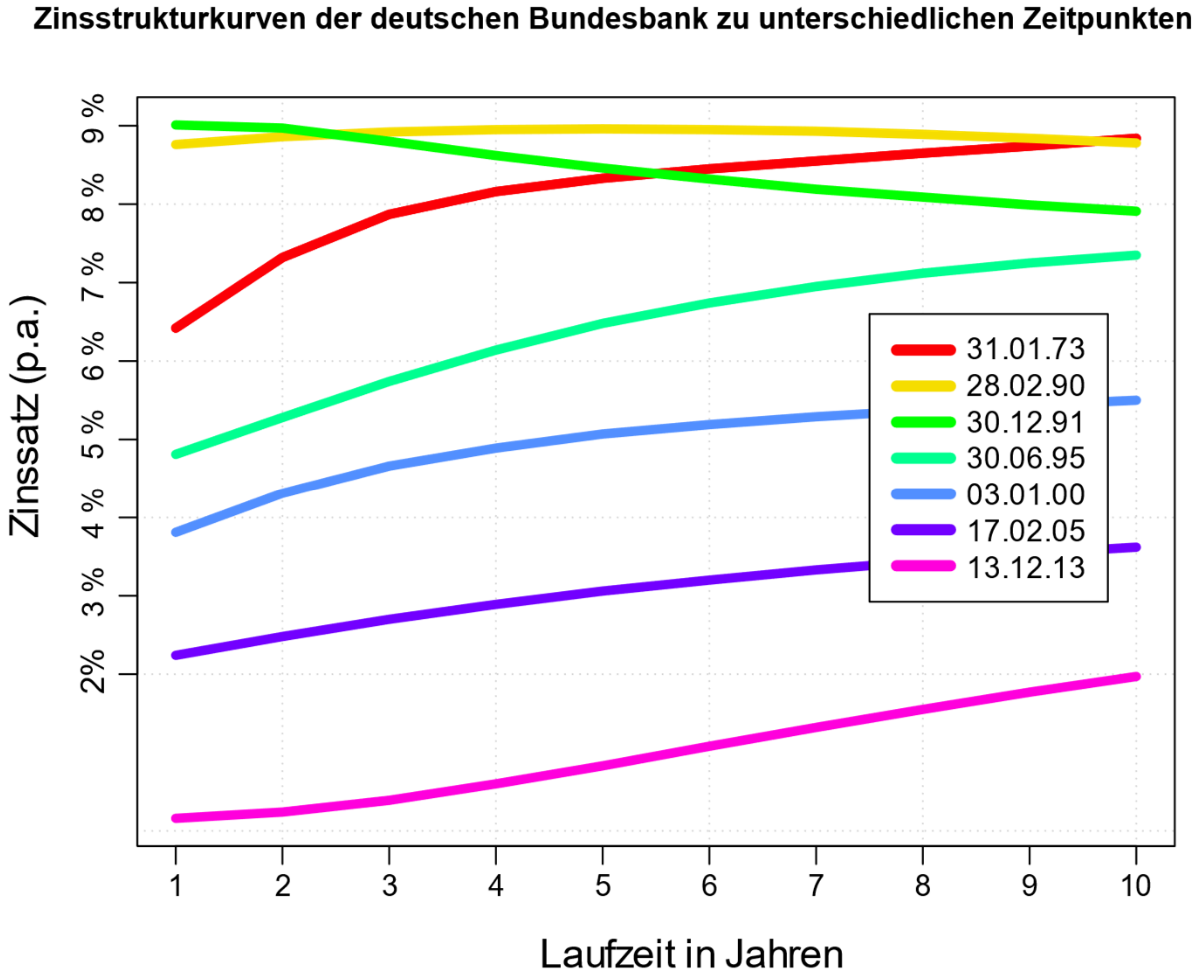
Historic Yield Curves Germany



Von Henning. H., Thomas Steiner, and Vlado Plaga - http://de.wikipedia.org/w/index.php?title=Datei:Zinsstrukturkurve.png&filetimestamp=20050219234920&, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=30175882

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6.4 Corporate Bonds

- Corporate Bonds
  - Issued by corporations
- Credit Risk
  - Risk of default

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Corporate Bond Yields (1 of 9)

- Investors pay less for bonds with credit risk than they would for an otherwise identical default-free bond.
- The yield of bonds with credit risk will be higher than that of otherwise identical default-free bonds.

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Corporate Bond Yields (2 of 9)

- No Default
  - Consider a one-year, zero-coupon Treasury Bill with a YTM of 4%.
    - What is the price?

$$P = \frac{1000}{1+YTM_1} = \frac{1000}{1.04} = \$961.54$$

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Corporate Bond Yields (3 of 9)

- Certain Default
  - Suppose now bond issuer will pay 90% of the obligation.
    - What is the price?

$$P = \frac{900}{1 + YTM_1} = \frac{900}{1.04} = \$865.38$$

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Corporate Bond Yields (4 of 9)

- Certain Default
  - When computing the yield to maturity for a bond with certain default, the *promised* rather than the *actual* cash flows are used.

$$YTM = \frac{FV}{P} - 1 = \frac{1000}{865.38} - 1 = 15.56\%$$

$$\frac{900}{865.38} = 1.04$$

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Corporate Bond Yields (5 of 9)

- Certain Default
  - The yield to maturity of a certain default bond is not equal to the expected return of investing in the bond.
  - The yield to maturity will always be higher than the expected return of investing in the bond.

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Corporate Bond Yields (6 of 9)

- Risk of Default
  - Consider a one-year, $1000, zero-coupon bond issued.
  - Assume that the bond payoffs are uncertain.
    - There is a 50% chance that the bond will repay its face value in full and a 50% chance that the bond will default and you will receive $900.
      - Thus, you would expect to receive $950.
    - Because of the uncertainty, the discount rate is 5.1%.

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Corporate Bond Yields (7 of 9)

- Risk of Default
  - The price of the bond will be

$$P = \frac{950}{1.051} = \$903.90$$

  - The yield to maturity will be

$$YTM = \frac{FV}{P} - 1 = \frac{1000}{903.90} - 1 = 10.63\%$$

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Corporate Bond Yields (8 of 9)

- Risk of Default
  - A bond's expected return will be less than the yield to maturity if there is a risk of default.
  - A higher yield to maturity does not necessarily imply that a bond's expected return is higher.

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Corporate Bond Yields (9 of 9)

Table 6.3 Price, Expected Return, and Yield to Maturity of a One-Year, Zero-Coupon Avant Bond with Different Likelihoods of Default

Avant Bond (1-year, zero-coupon)	Bond Price	Yield to Maturity	Expected Return
Default Free	$961.54	4.00%	4%
50% Chance of Default	$903.90	10.63%	5.1%
Certain Default	$865.38	15.56%	4%

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Bond Ratings

- Investment Grade Bonds
- Speculative Bonds
  - Also known as Junk Bonds or High-Yield Bonds

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Table 6.4 Bond Ratings (1 of 2)

Rating*	Description (Moody's)
Investment Grade Debt	
Aaa/AAA	Judged to be of the best quality. They carry the smallest degree of investment risk and are generally referred to as "gilt edged." Interest payments are protected by a large or an exceptionally stable margin and principal is secure. While the various protective elements are likely to change, such changes as can be visualized are most unlikely to impair the fundamentally strong position of such issues.
Aa/AA	Judged to be of high quality by all standards. Together with the Aaa group, they constitute what are generally known as high-grade bonds. They are rated lower than the best bonds because margins of protection may not be as large as in Aaa securities or fluctuation of protective elements may be of greater amplitude or there may be other elements present that make the long-term risk appear somewhat larger than the Aaa securities.
A/A	Possess many favorable investment attributes and are considered as upper-medium-grade obligations. Factors giving security to principal and interest are considered adequate, but elements may be present that suggest a susceptibility to impairment some time in the future.
Baa/BBB	Are considered as medium-grade obligations (i.e., they are neither highly protected nor poorly secured). Interest payments and principal security appear adequate for the present but certain protective elements may be lacking or may be characteristically unreliable over any great length of time. Such bonds lack outstanding investment characteristics and, in fact, have speculative characteristics as well.

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Table 6.4 Bond Ratings (2 of 2)

[Table 6.4 continued]

Speculative Bonds	
Ba/BB	Judged to have speculative elements; their future cannot be considered as well assured. Often the protection of interest and principal payments may be very moderate, and thereby not well safeguarded during both good and bad times over the future. Uncertainty of position characterizes bonds in this class.
B/B	Generally lack characteristics of the desirable investment. Assurance of interest and principal payments of maintenance of other terms of the contract over any long period of time may be small.
Caa/CCC	Are of poor standing. Such issues may be in default or there may be present elements of danger with respect to principal or interest.
Ca/CC	Are speculative in a high degree. Such issues are often in default or have other marked shortcomings.
C/C, D	Lowest-rated class of bonds, and issues so rated can be regarded as having extremely poor prospects of ever attaining any real investment standing.

*Ratings: Moody's/Standard & Poor's

Source: www.moodys.com

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Corporate Yield Curves

- Default Spread
  - Also known as Credit Spread
  - The difference between the yield on corporate bonds and Treasury yields

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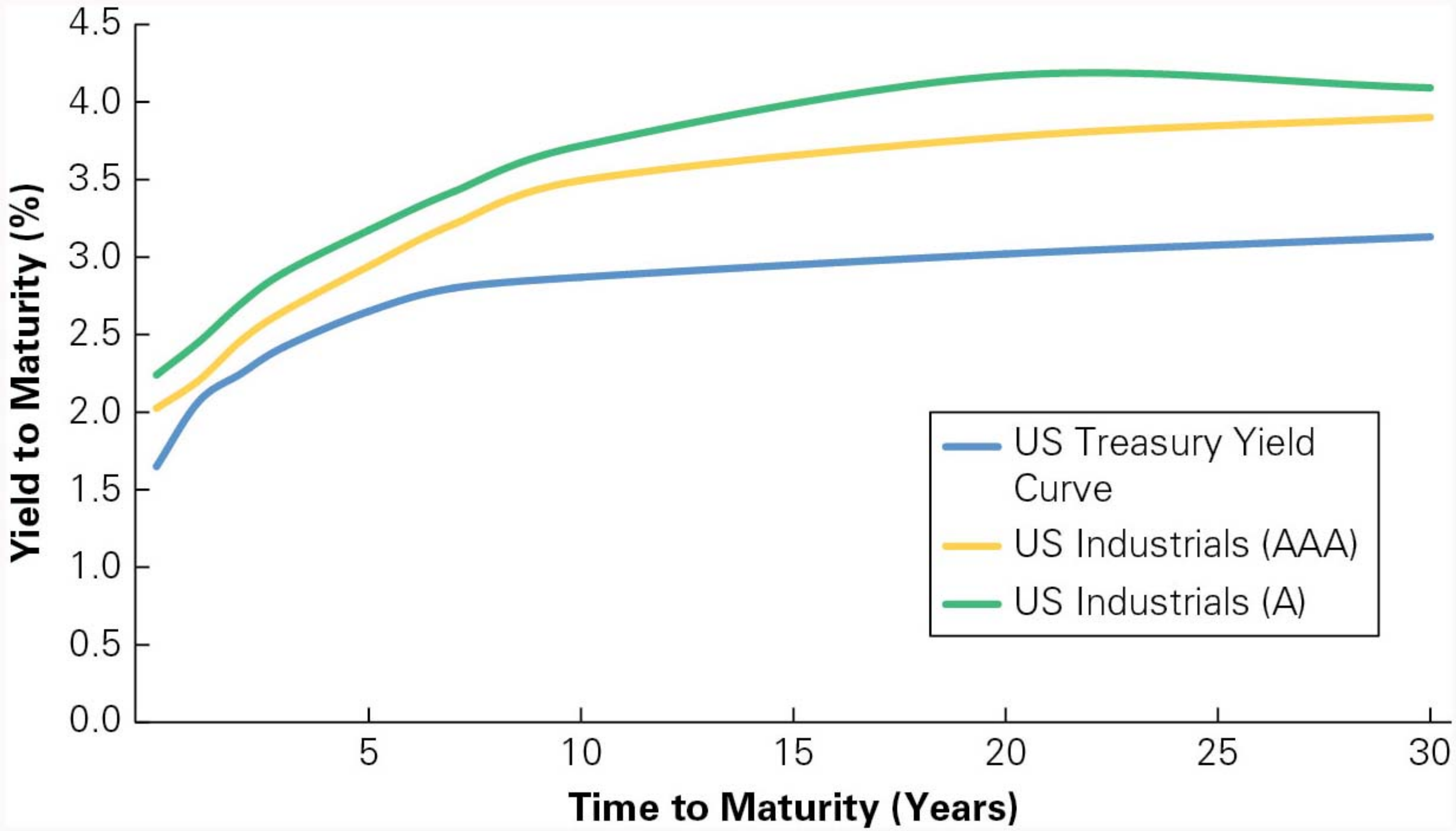
Figure 6.3 Corporate Yield Curves for Various Ratings, February 2018



Source: Bloomberg

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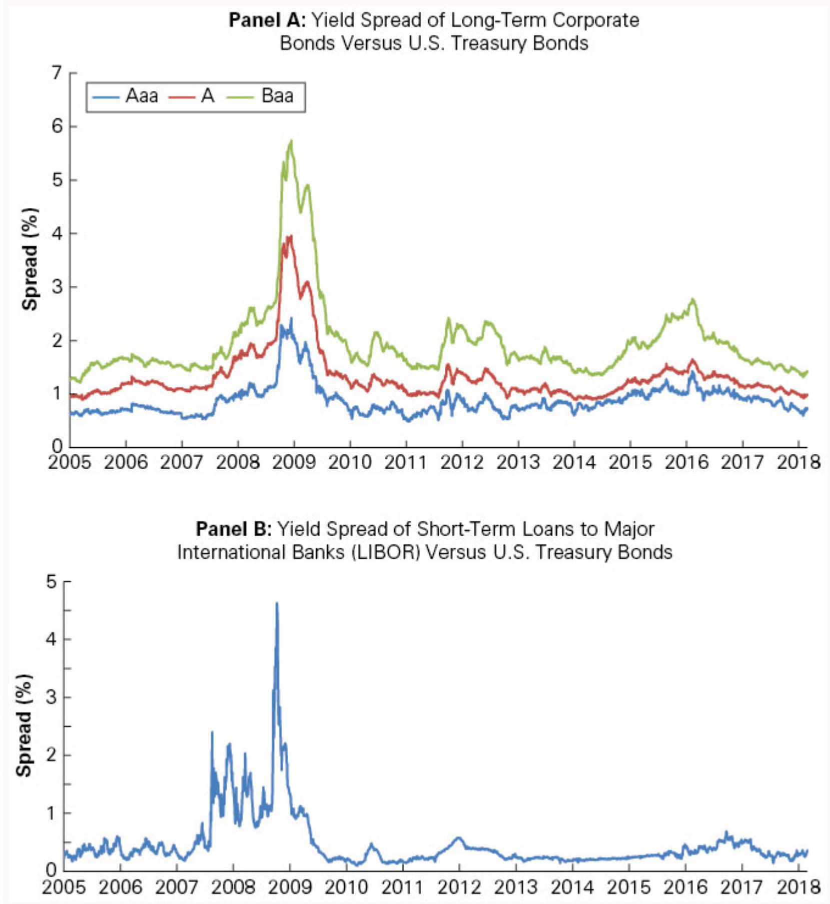
Figure 6.4 Yield Spreads and the Financial Crisis



Source: Bloomberg.com

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6.5 Sovereign Bonds

- Bonds issued by national governments
  - U.S. Treasury securities are generally considered to be default free
  - All sovereign bonds are not default-free,
    - e.g., Greece defaulted on its outstanding debt in 2012
  - Importance of inflation expectations
    - Potential to “inflate away” the debt
  - European sovereign debt, the EMU, and the ECB

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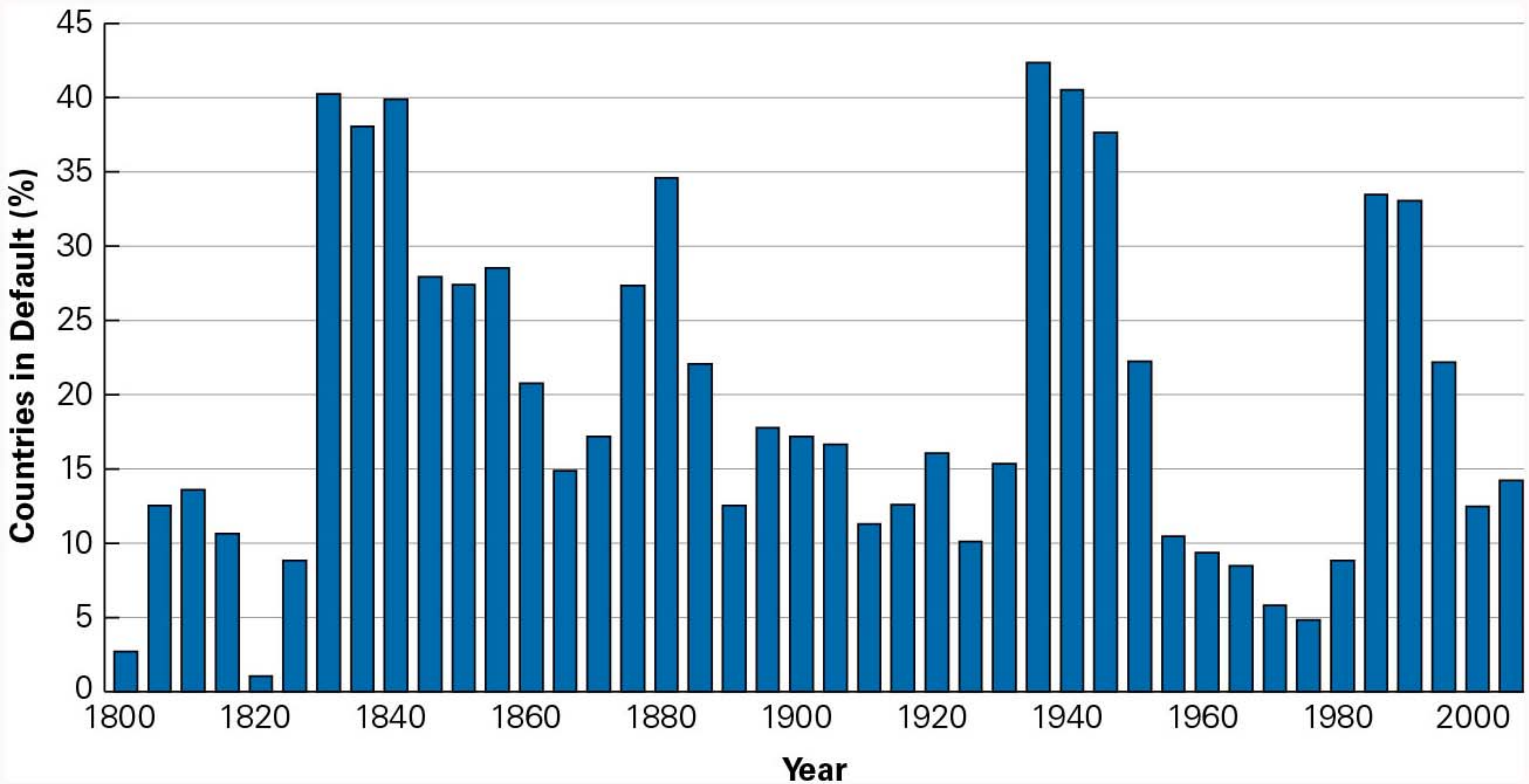
Figure 6.5 Percent of Debtor Countries in Default or Restructuring Debt, 1800–2006



Source: Data from **This Time Is Different,** Carmen Reinhart and Kenneth Rogoff, Princeton University Press, 2009.

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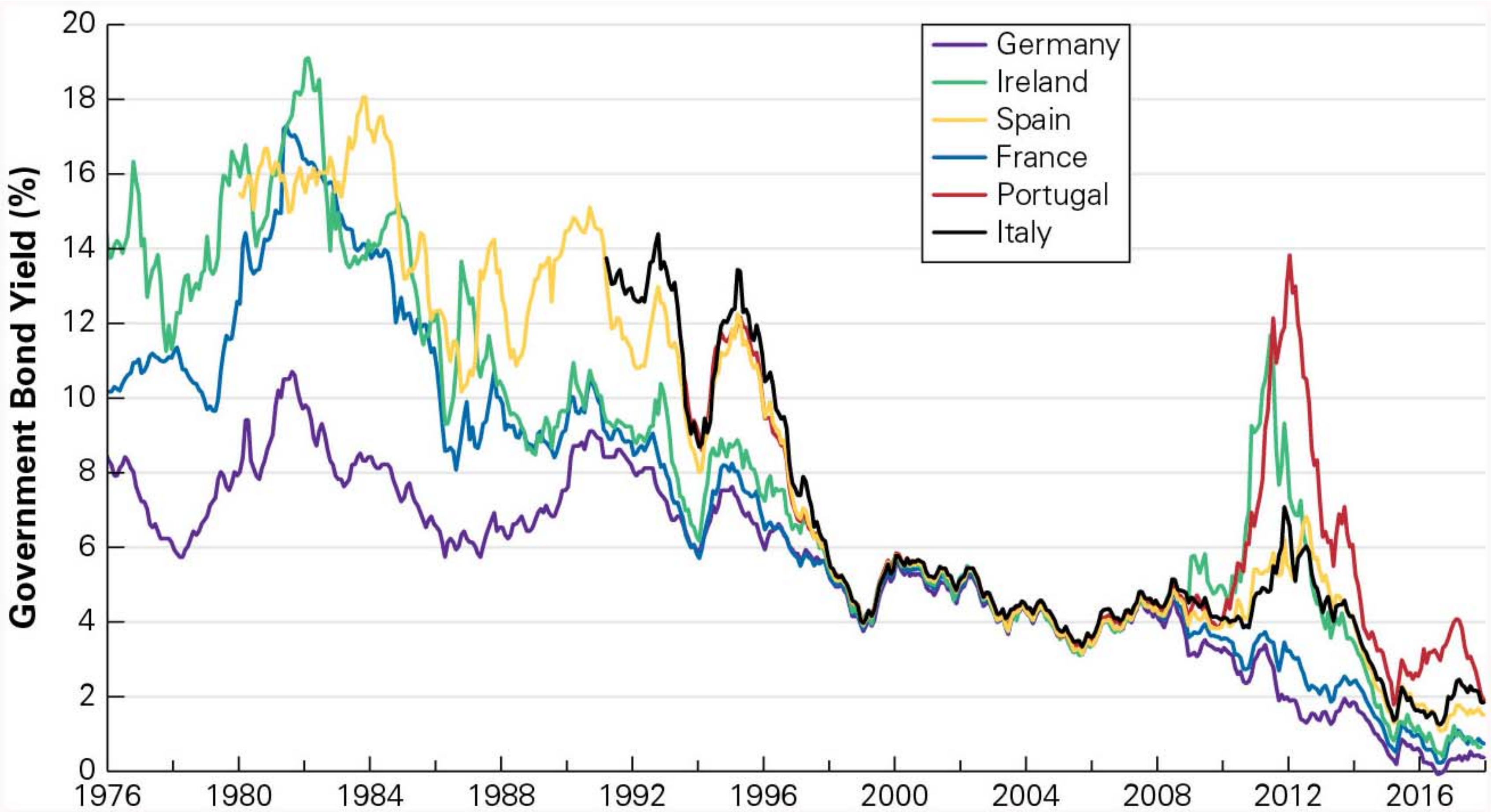
Figure 6.6 European Government Bond Yields, 1976–2018



Source: Federal Reserve Economic Data, research.stlouisfed.org/fred2.

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Chapter Quiz

1. What is the relationship between a bond's price and its yield to maturity?
2. If a bond's yield to maturity does not change, how does its cash price change between coupon payments?
3. How does a bond's coupon rate affect its duration—the bond price's sensitivity to interest rate changes?
4. Explain why two coupon bonds with the same maturity may each have a different yield to maturity.
5. There are two reasons the yield of a defaultable bond exceeds the yield of an otherwise identical default-free bond. What are they?

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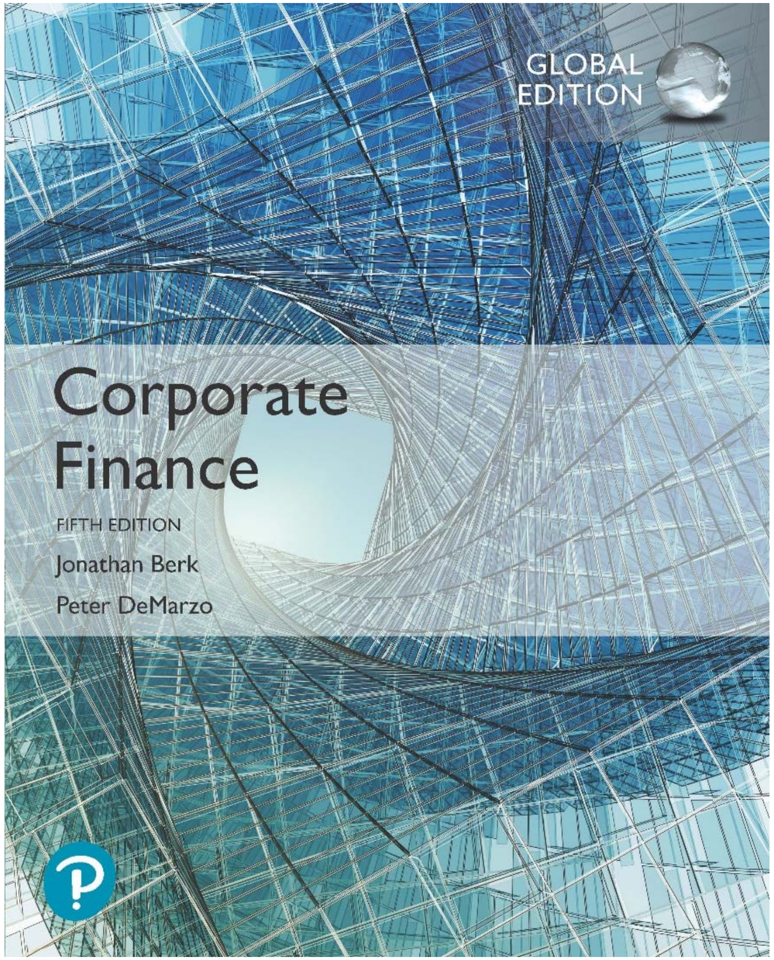
Corporate Finance (2 of 2)

Fifth Edition, Global Edition



Chapter 6

Appendix

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Forward Interest Rates

- 6A.1 Computing Forward Rates
  - A forward interest rate (or forward rate) is an interest rate that we can guarantee today for a loan or investment that will occur in the future.
  - In this chapter, we consider interest rate forward contracts for one-year investments, so the forward rate for year 5 means the rate available *today* on a one-year investment that begins four years from today.

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Computing Forward Rates (1 of 5)

- By the Law of One price, the forward rate for year 1 is equivalent to an investment in a one-year, zero-coupon bond.

$$f_1 = YTM_1$$

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Computing Forward Rates (2 of 5)

- Consider a two-year forward rate.
- Suppose the one-year, zero-coupon yield is 5.5% and the two-year, zero-coupon yield is 7.0%.
- We can invest in the two-year, zero-coupon bond at 7.0% and earn $\$(1.07)^2$ after two years.
- Or, we can invest in the one-year bond and earn $1.055 at the end of the year.
  - We can simultaneously enter into a one-year interest rate forward contract for year 2 at a rate of f_2.

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Computing Forward Rates (3 of 5)

- At then end of two years, we will have \$(1.055)(1 + f_2).
- Since both strategies are risk free, by the Law of One Price, they should have the same return:

$$(1.07)^2 = (1.055)(1 + f_2)$$

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Computing Forward Rates (4 of 5)

- Rearranging, we have

$$(1+f_2)=\frac{1.07^2}{1.055}=1.0852$$

- The forward rate for year 2 is $f_2 = 8.52\%$.

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Computing Forward Rates (5 of 5)

- In general,

$$(1+YTM_n)^n = (1+YTM_{n-1})^{n-1}(1+f_n)$$

- Rearranging, we get the general formula for the forward interest rate:

$$f_n = \frac{(1+YTM_n)^n}{(1+YTM_{n-1})^{n-1}} - 1$$

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Textbook Example 6A.1 (1 of 2)

Computing Forward Rates

Problem

Calculate the forward rates for years 1 through 5 from the following zero-coupon yields:

Maturity	1	2	3	4
YTM	5.00%	6.00%	6.00%	5.75%

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Textbook Example 6A.1 (2 of 2)

Solution

Using Eqs. 6A.1 and 6A.2:

$$f_1 = YTM_1 = 5.00\%$$

$$f_2 = \frac{(1+YTM_2)^2}{(1+YTM_1)} - 1 = \frac{1.06^2}{1.05} - 1 = 7.01\%$$

$$f_3 = \frac{(1+YTM_3)^3}{(1+YTM_2)^2} - 1 = \frac{1.06^3}{106^2} - 1 = 6.00\%$$

$$f_4 = \frac{(1+YTM_4)^4}{(1+YTM_3)^3} - 1 = \frac{1.0575^4}{1.06^3} - 1 = 5.00\%$$

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Alternative Example 6.A1 (1 of 2)

- **Problem**
  - At the end of 2015, yields on Canadian government bonds were

Maturity	1 Year	2 Years	3 Years	4 Years	5 Years	6 Years	7 Years	8 Years	9 Years	10 Years
Yield	0.51%	0.47%	0.54%	0.67%	0.82%	0.97%	1.13%	1.28%	1.42%	1.55%

  - Based on this yield curve, what is f_2? f_{10}?

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Alternative Example 6.A1 (2 of 2)

- **Solution**

$$f_2 = \frac{(1.0047)^2}{(1.0051)^1} - 1 = 0.0043 = 0.43\%$$

$$f_{10} = \frac{(1.0155)^{10}}{(1.0142)^9} - 1 = 0.02728 = 2.27\%$$

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6A.2 Computing Bond Yields from Forward Rates

- It is also possible to compute the zero-coupon yields from the forward interest rates:

$$(1+f_1)\times(1+f_2)\times\ldots\times(1+f_n)=(1+YTM_n)^n$$

- For example, using the forward rates from Example 8A.1, the four-year zero-coupon, yield is

$$\begin{aligned}1+YTM_4&=\left[(1+f_1)(1+f_2)(1+f_3)(1+f_4)\right]^{1/4}\\&=\left[(1.05)(1.0701)(1.06)(1.05)\right]^{1/4}\\&=1.0575\end{aligned}$$

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6A.3 Forward Rates and Future Interest Rates (1 of 2)

- How does the forward rate compare to the interest rate that will actually prevail in the future?
- It is a good predictor only when investors do not care about risk.

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Textbook Example 6A.2 (1 of 2)

Forward Rates and Future Spot Rates

Problem

JoAnne Wilford is corporate treasurer for Wafer Thin Semiconductor. She must invest some of the cash on hand for two years in risk-free bonds. The current one-year, zero-coupon yield is 5%. The one-year forward rate is 6%. She is trying to decide between three possible strategies: (1) buy a two-year bond, (2) buy a one-year bond and enter into an interest rate forward contract to guarantee the rate in the second year, or (3) buy a one-year bond and forgo the forward contract, reinvesting at whatever rate prevails next year. Under what scenarios would she be better off following the risky strategy?

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Textbook Example 6A.2 (2 of 2)

Solution

From Eq. 6A.3, both strategies (1) and (2) lead to the same risk-free return of $(1+YTM_2)^2 = (1+YTM_1)(1+f_2) = (1.05)(1.06)$.

The third strategy returns (1.05)(1 + *r*), where *r* is the one-year interest rate next year. If the future interest rate turns out to be 6%, then the two strategies will offer the same return. Otherwise Wafer Thin Semiconductor is better off with strategy (3) if the interest rate next year is greater than the forward rate—6%—and worse off if the interest rate is lower than 6%.

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Forward Rates and Future Interest Rates (2 of 2)

- We can think of the forward rate as a break-even rate.
- Since investors do care about risk,

$$\text{Expected Future Spot Interest Rate} = \text{Forward Interest Rate} + \text{Risk Premium}$$

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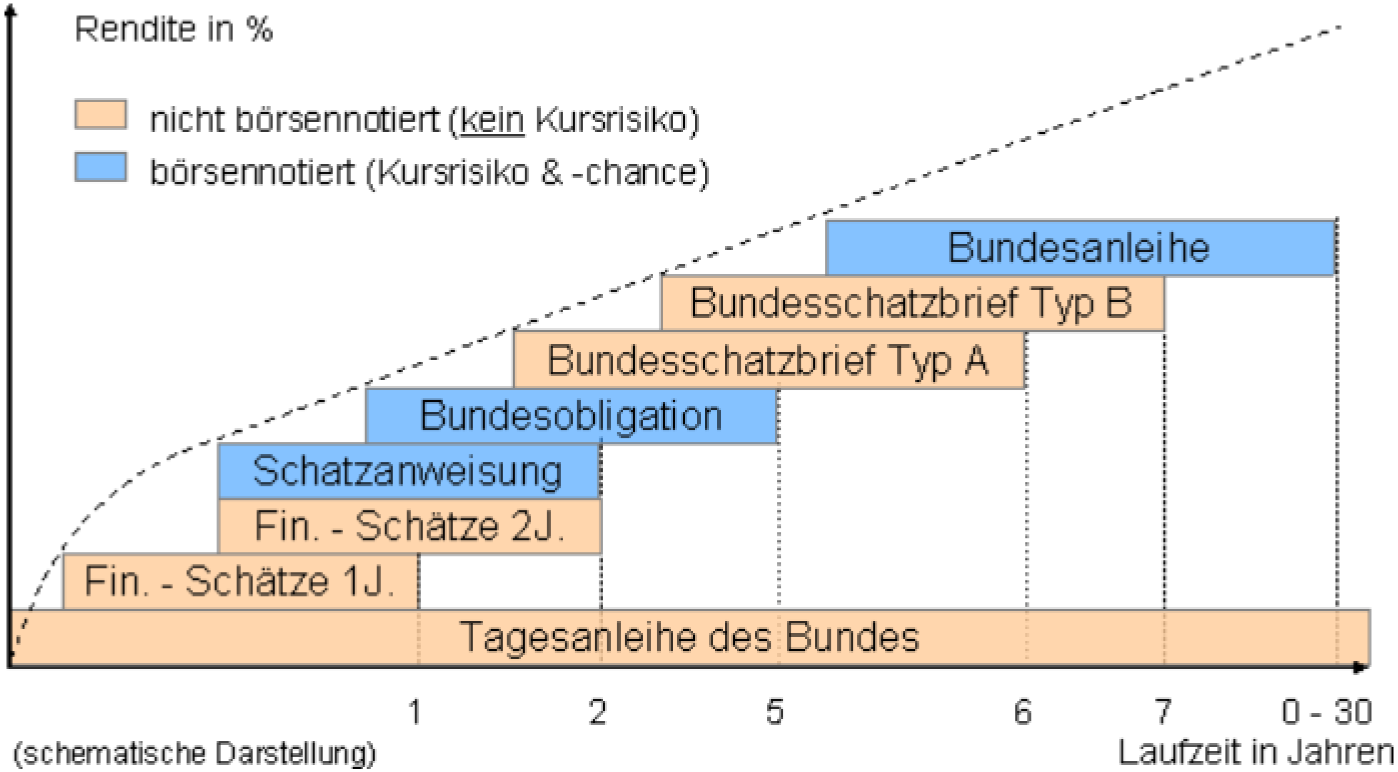

Grafik: Bundeswertpapiere können nach Laufzeit und Börsennotierung klassifiziert werden. Es gibt sie für nahezu jeden Anlagehorizont.

Einführung

10,7%

1981

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0,079%

17.04.2015

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-0,0481%

02.04.2019

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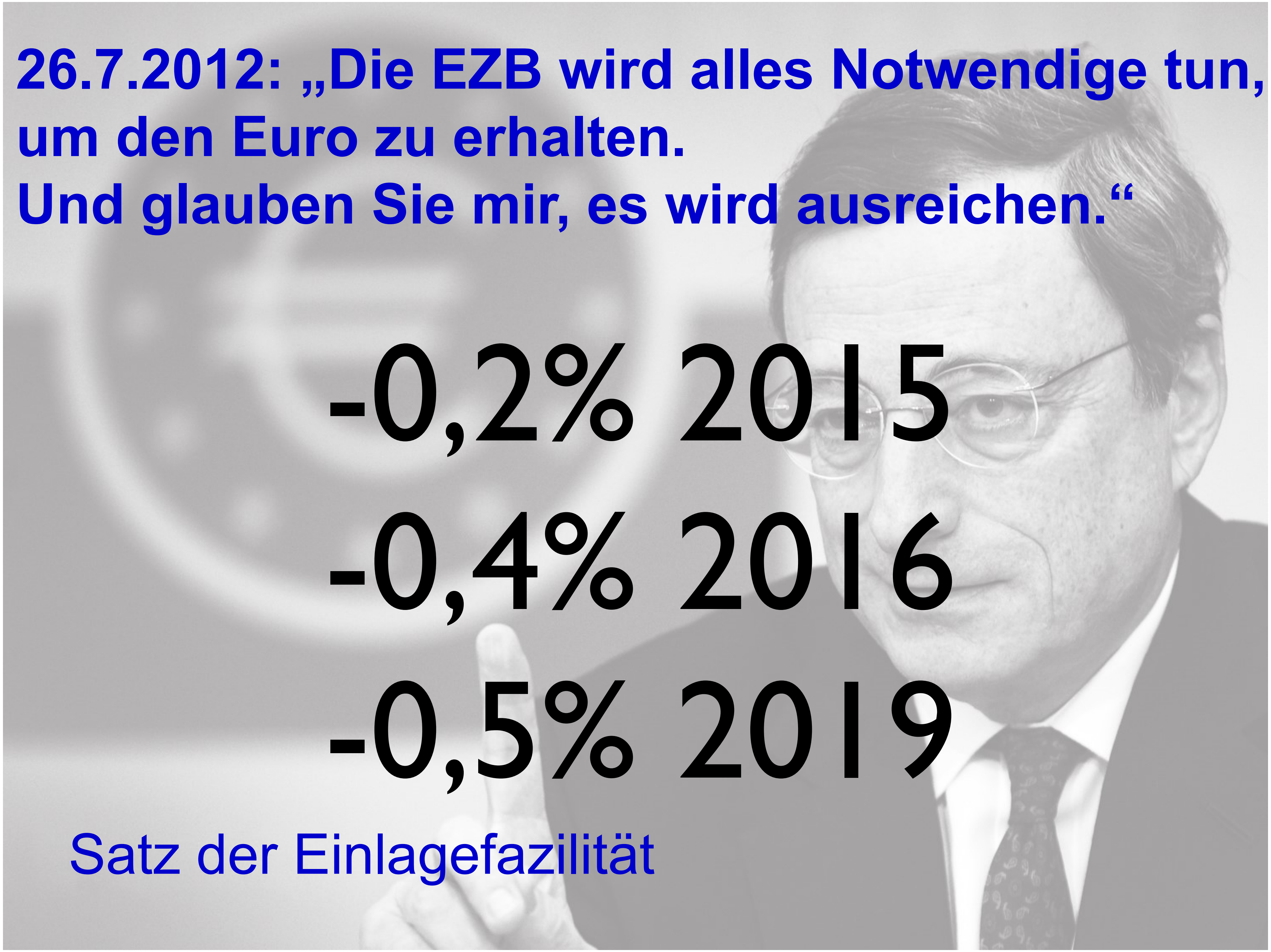
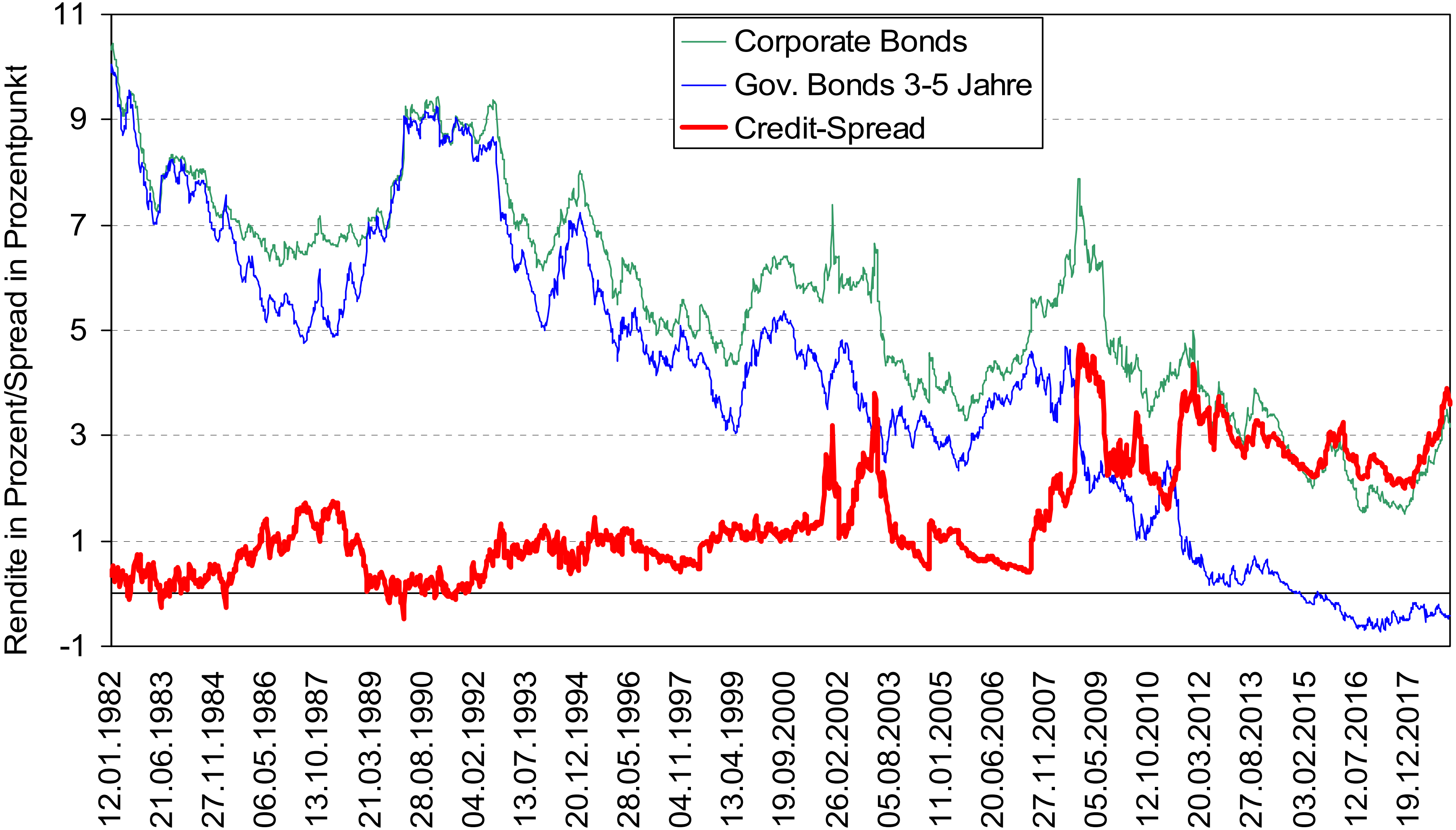

26.7.2012: „Die EZB wird alles Notwendige tun, um den Euro zu erhalten.
Und glauben Sie mir, es wird ausreichen.“
-0,2% 2015
-0,4% 2016
-0,5% 2019
Satz der Einlagefazilität

Credit-Spread im Zeitablauf



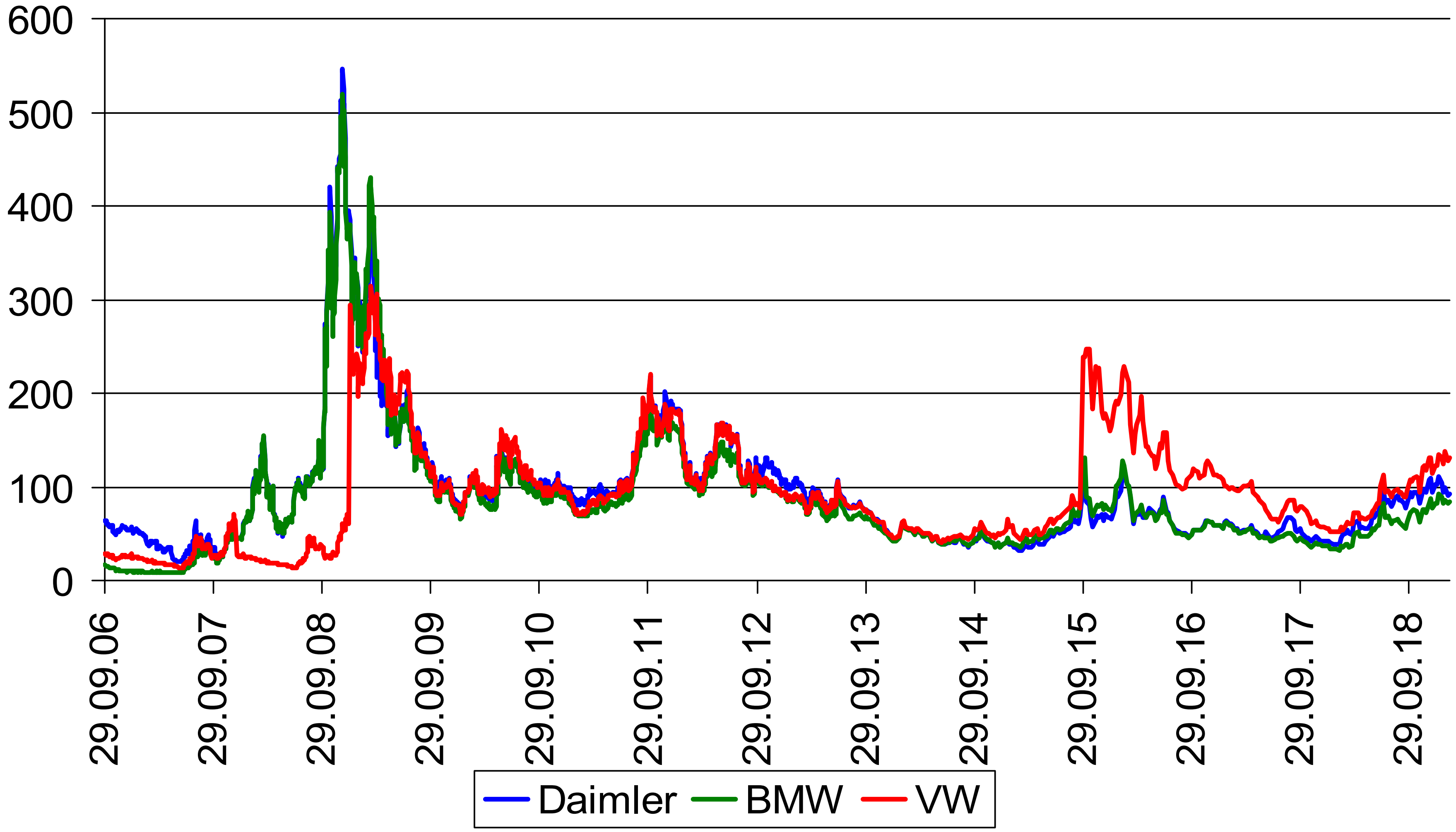
Credit Default Swap

Ein **Credit Default Swap** (CDS) ist ein Kreditderivat zum Handeln von Ausfallrisiken von Krediten, Anleihen oder Schuldnernamen.

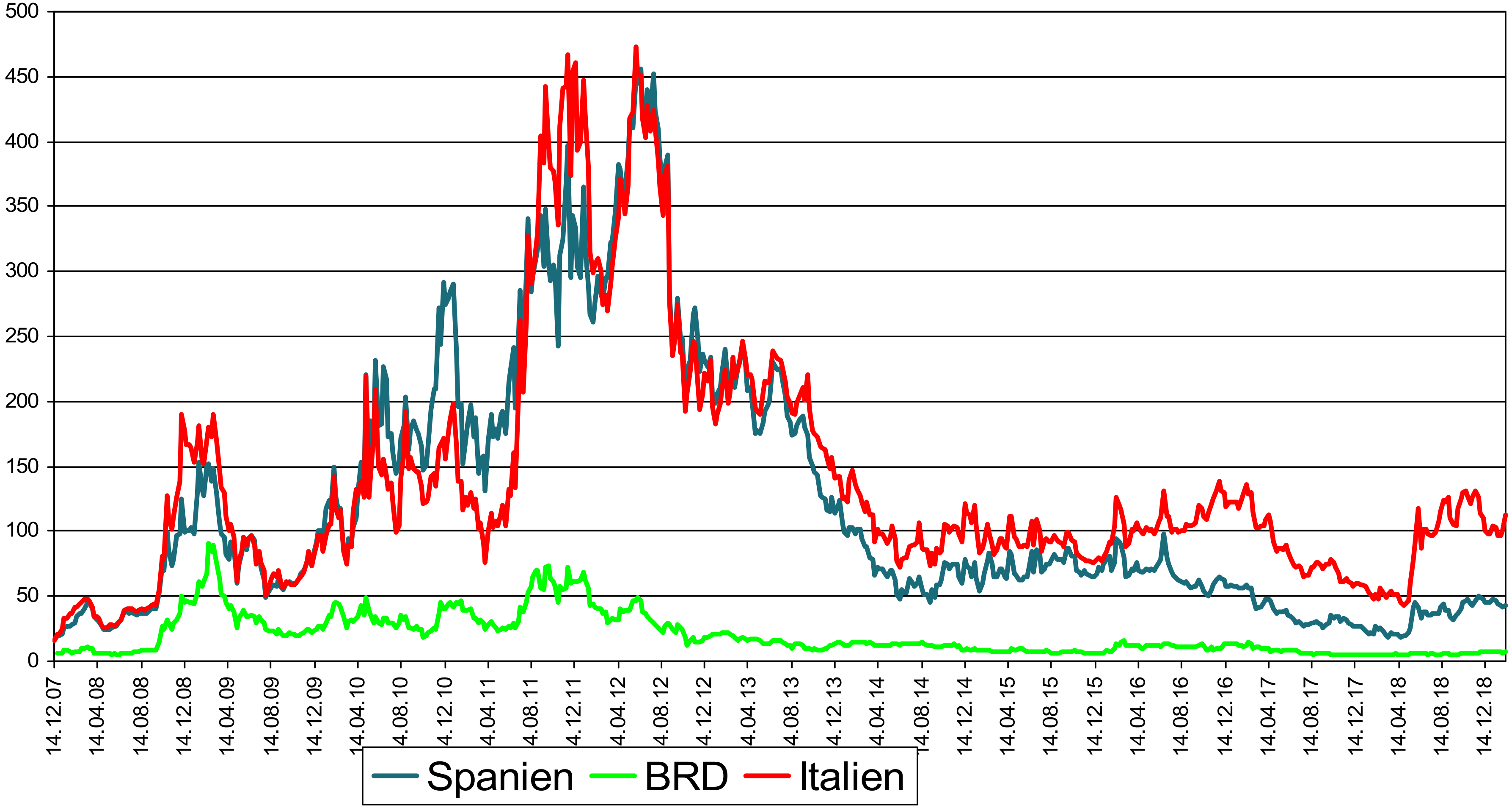
Der Sicherungsnehmer bezahlt normalerweise eine regelmäßige (häufig vierteljährliche oder halbjährliche) Gebühr und erhält bei Eintritt des bei Vertragsabschluss definierten Kreditereignisses, also beispielsweise dem Ausfall der Rückzahlung aufgrund Insolvenz des Schuldners, eine Ausgleichszahlung.

Der CDS ähnelt einer Kreditversicherung. Dadurch erhalten Banken und Investoren ein flexibles Instrument, um Kreditrisiken zu handeln.

Ausgewählte CDS Senior Debt 5 Jahre



Spanien, BRD; Italien Griechenland 5 Jahre CDS in EUR



Deutsche Bank ITL Zero Bond 15.10.2021

Datastream Anleihen 22.10.2019 09.06

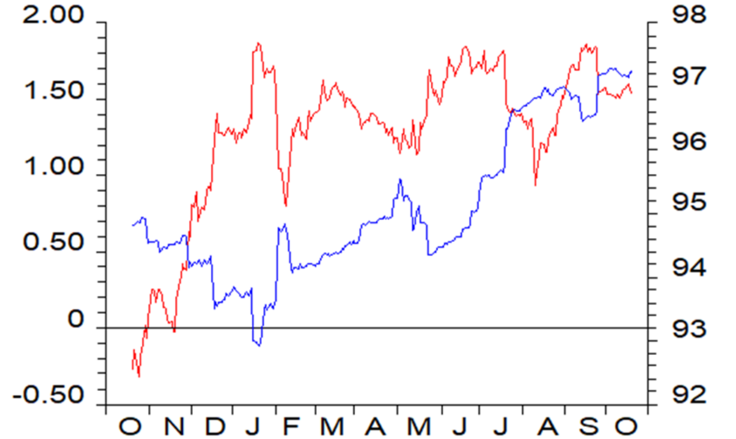
DEUTSCHE BANK AG 1996 ZERO 15.10.2021 REG.S

Land	BD	Datastream-Code	849616	ISIN	DE0001343101
Markt	IN	Emittenten-Code	BCDEB	Amtl. Code	NA

Kurs	L	97.2040
Nettokurs	L	97.2040
Bruttokurs	L	97.2040
		ZWANGSUMSTELLUNG
Letzte Kursveraenderung		21.10.2019
Abrechnungsdatum		25.10.2019
Beginn des Zinslaufs		NA
Aufgel.Zinstage		0
Stueckzinsen	A/A	0.0000

Anleiheart	ZR
Garantie-Art	PR
Tilgungsart	BL
Kupontermine	NA
Kupon	0.0000
Emissionstag	15.10.1996
Erste Tilgung	NA
Letzte Tilgung	15.10.2021
Emissionsvol.(T)	1B
Uml. Emissionsvol.(T)	869M

Rendite		1.4460
Laufende Verzinsung		0.0000
Japanische Einfach-Rendite		1.4562
Laufzeit		1.9753
Duration		1.9753
Modif. Duration		1.9472
Konvexitaet		5.7110
Dif.z.Zinsstruktur	GVIL	1.5385
Dif.z.Benchmark	NA	NA



	-1M	-3M	-12M
Kurs(% Ver.)	0.70	0.90	2.53
Rendite(% Ver.)	-16.63	-14.33	-19.92
Duration	2.06	2.23	2.98
Modif.Duration	2.02	2.19	2.93

S & P Rating	28.03.2017	BBB-
Moody Rating		Baa3

Source: Thomson Reuters Datastream

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Deutsche Bank AG LI-Zero Bonds 1996(21)

ISIN: DE0001343101

Letzte Kurse: Anzeigen

Stammdaten	
Wertpapier	Deutsche Bank AG LI-Zero Bonds 1996(21)
Unternehmen	Deutsche Bank AG
ISIN	DE0001343101
WKN	134310
Wertpapiertyp	Senior Guaranteed Bonds
Land	DE - Bundesrepublik Deutschland
Depotwährung	EUR
Fälligkeit	15.10.2021
Emissionsdatum	01.10.1996
Emissionskurs	11,7409000 Prozent
Nennwert	
Kleinste übertragbare Einheit	5.000.000,000000001
Mindestbetrag	Text Ganzzahliges Vielfache der kleinsten übertragbaren Einheit (kleinsten Stückelungen)
Branche	Kreditbanken einschließlich Zweigstellen ausländischer Banken
CFI-Code	Debt;Bonds;Zero rate/discounted;Senior;fix. mat.; Bearer

$$Initial\ Yield = \sqrt[25]{\frac{100}{11{,}7409}} - 1 = 8{,}95\%$$

Kapital	
Kapital börsennotiert	1.000.000.000.000,000 ITL
Kapital umlaufend	1.000.000.000.000,000 ITL
Kapital Emission	1.000.000.000.000,000 ITL

Zinsen	
Art	Zero Coupon

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Legal Facts

Stammdaten

WKN	134310
ISIN	DE0001343101
SYMBOL	-
BÖRSENSEGMENT	Freiverkehr
WERTPAPIERART	Unternehmensanleihe
SUB-TYP	Finanzen
EMITTENT	Deutsche Bank AG
S&P-RATING	BBB-
(HANDELS-)SEGEMENT / TICKS	-/ -
HANDELSZEIT	08:00:00 - 18:00:00 Uhr
ZINSSATZ	0,000 %
ZINSLAUF AB	01.10.1996
NÄCHSTE ZINSZAHLUNG	-
STÜCKZINSEN VOM NOMINALBETRAG	-

HANDELSWÄHRUNG / NOTIZ	Italienische Lire/ Prozent
NOMINALWÄHRUNG	Italienische Lire
ABWICKLUNGSWÄHRUNG	Euro
NOTIERUNG	Fortlaufend
EMISSIONSVOLUMEN	1.000,00 Mrd.
MINDESTBETRAG HANDELBARE EINHEIT	5.000.000,00
KLEINSTE HANDELBARE EINHEIT	5.000.000,00
FÄLLIGKEIT	15.10.2021
MARKET MAKER	-
STEP UP/DOWN BEI RATINGVERÄNDERUNG	Nein
STEP UP BEI EMISSION FESTGESETZT	Nein
STEP DOWN BEI EMISSION FESTGESETZT	Nein
ANLEIHE VOM EMITTENTEN KÜNDBAR	Nein
ANLEIHE IST NACHRANGIG	Nein

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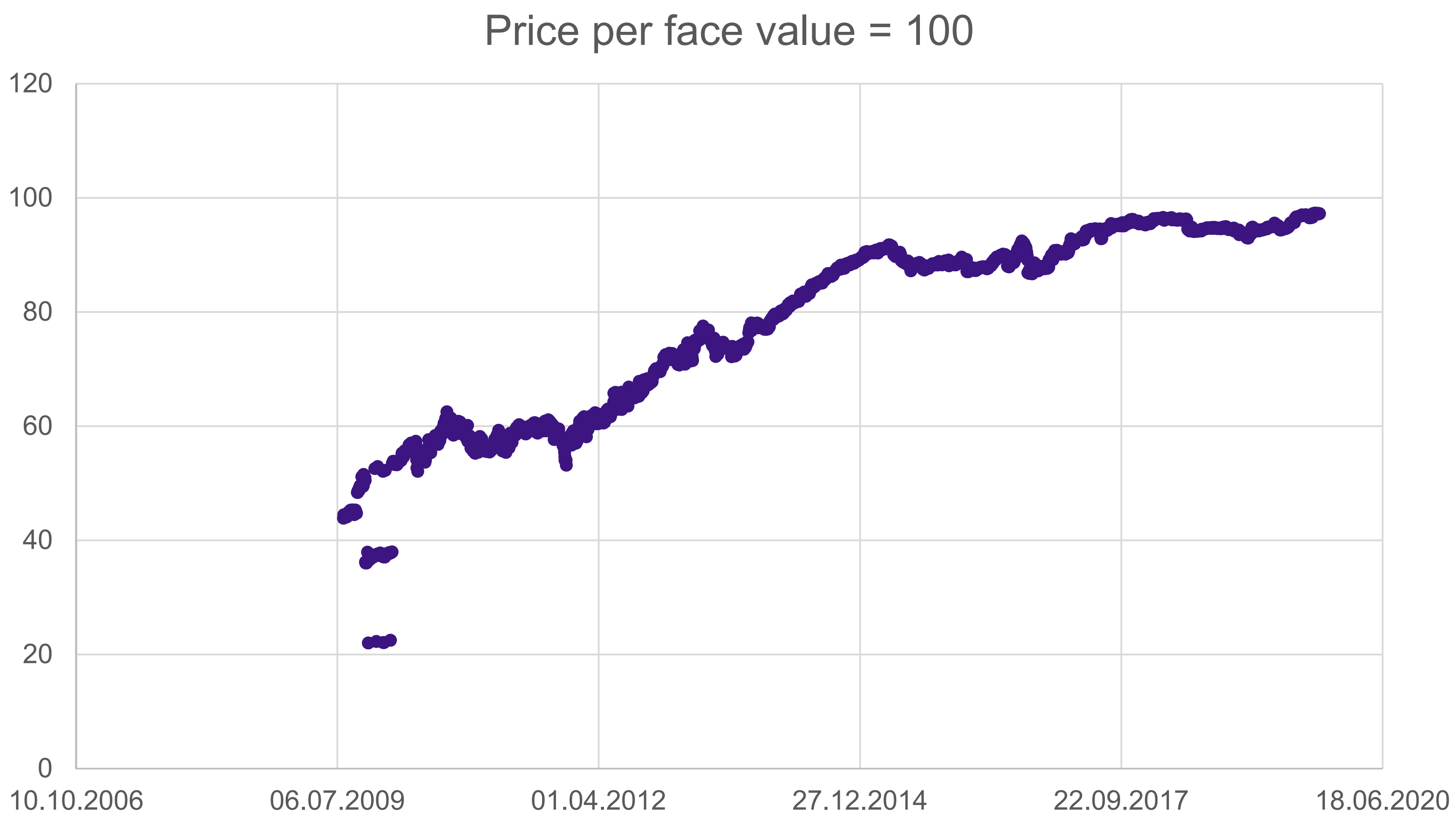
Price History



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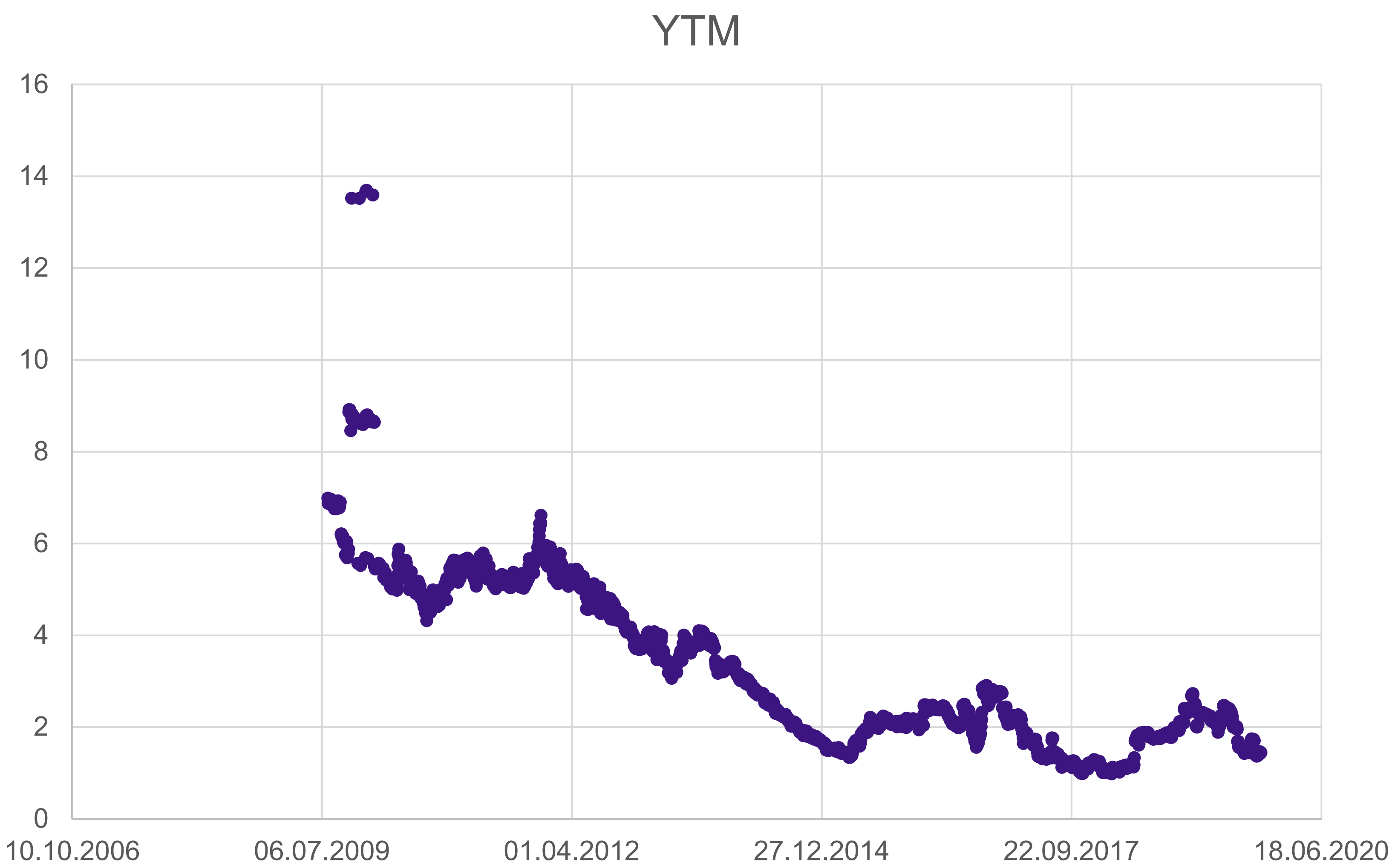
Yield to Maturity History



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Stock Exchanges

Handelsplätze

LiveTrading	Geld	Brief	Datum	Zeit	Gestellte Kurse
--	--	--	--	--	--

Börse	Aktuell	Datum	Zeit	Tages.-Vol.	Anzahl Kurse
Stuttgart	96,74	22.10.19	10:02	0,00	7
Berlin	96,75	22.10.19	08:59	0,00	1
Frankfurt	96,74	22.10.19	10:00	0,00	1

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comdirect

Deutsche Bank AG LI-Zero Bonds 1996(21) Euro-Anleihe

WKN: 134310 ISIN: DE0001343101

96,75 %
-0,01 % -0,01

Börse	Berlin
Stand	22.10.19 - 08:59:48 Uhr
Rendite p. a.	1,679 %
Realtime	

Kauf/Verkauf

Übernehmen in ...

Übersicht Chart News

5 Jahre

6 Monate

10 Tage

Kursdaten

Börse	Berlin
Aktuell	96,75 %
Zeit	22.10.19 08:59
Diff. Vortag	-0,01 %
Tages-Vol.	0,00
ØVol 30T	476.190,48
Liquidität	hoch
Geld	96,76
Brief	98,21

Stammdaten

Restlaufzeit	2,0 Jahre
Fälligkeit	15.10.2021
Ausgabedatum	15.10.1996
Nominalzinssatz	--
Anleihevolumen	516 Mio.
Kupon-Art	Zero
Zinszahlung	Sonstige
Zinstermin	--
Emittent	Deutsche Bank AG

Renditekennzahlen

Berechnung:	22.10.19 04:00
Rendite p.a.	1,679 %
Stückzinsen	--
Duration	1,98
Mod. Duration	1,945
Konvexität	5,513
Zinselastizität	0,000

News

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Realtime Quotes Berlin Exchange

Stammdaten Handelsplätze **Realtime**

96,75 %

-0,01 % -0,01

Börse Berlin

Stand: 22.10.19 - 08:59:48 Uhr

Weitere Kursdaten	
Geld (Stk.)	96,76 (10000000)
Brief (Stk.)	98,21 (10000000)
Zeit	22.10.19 09:58:05
Spread	1,48 %
Schluss Vortag	96,76
Eröffnung	96,75
Hoch	96,75
Tief	96,75
Geh. Stück	0

Letzte Kurse

Zeit	Kurs	Stück
08:59:48	G 96,75	0

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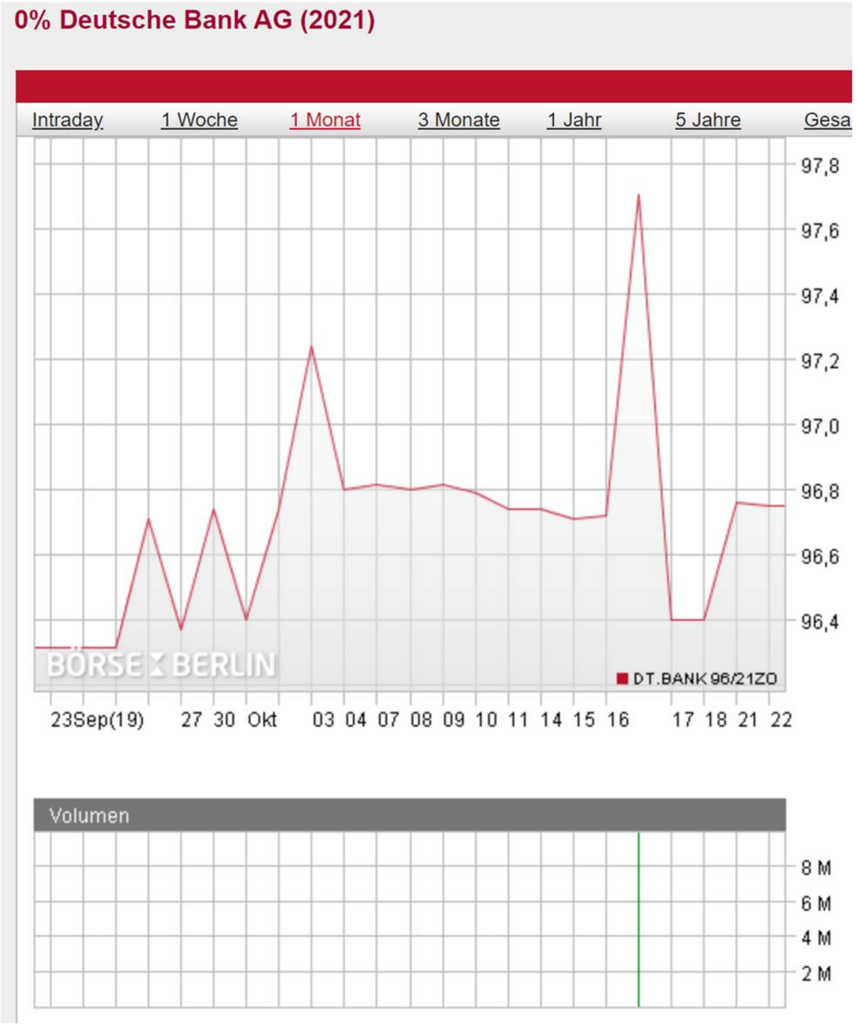
Trades Berlin Exchange



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Realtime Quotes Stuttgart Exchange

96,74 %

+0,02 % +0,02

Börse Stuttgart
Stand: 22.10.19 - 10:02:33 Uhr

Weitere Kursdaten

Geld (Stk.)	96,74 (5000000)
Brief (Stk.)	98,23 (5000000)
Zeit	22.10.19 10:02:33
Spread	1,52 %
Schluss Vortag	96,72
Eröffnung	96,73
Hoch	96,74
Tief	96,73
Geh. Stück	0

Letzte Kurse

Zeit	Kurs	Stück
10:02:33	G 96,74	0
09:38:04	G 96,73	0
09:19:00	G 96,73	0
09:11:05	G 96,73	0
08:49:20	G 96,73	0
08:34:55	G 96,73	0
08:19:49	G 96,73	0

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Quotes Stuttgart

DATUM	ZEIT	PREIS	VOLUMEN EINHEITEN	VOLUMEN	VOLUMEN (KUM.) NOMINAL	VOLUMEN (KUM.)
22.10.2019	12:15.10	96,73G	0,00	0,00	0,00	0,00
22.10.2019	11:20.59	96,73G	0,00	0,00	0,00	0,00
22.10.2019	10:02.33	96,74G	0,00	0,00	0,00	0,00
22.10.2019	09:38.04	96,73G	0,00	0,00	0,00	0,00
22.10.2019	09:19.00	96,73G	0,00	0,00	0,00	0,00
22.10.2019	09:11.05	96,73G	0,00	0,00	0,00	0,00
22.10.2019	08:49.20	96,73G	0,00	0,00	0,00	0,00
22.10.2019	08:34.55	96,73G	0,00	0,00	0,00	0,00
22.10.2019	08:19.49	96,73G	0,00	0,00	0,00	0,00
21.10.2019	17:45.54	96,72G	0,00	0,00	0,00	0,00
21.10.2019	15:16.53	96,72G	0,00	0,00	0,00	0,00
21.10.2019	12:09.24	96,72G	0,00	0,00	0,00	0,00
21.10.2019	11:02.27	96,72G	0,00	0,00	0,00	0,00
21.10.2019	10:03.52	96,72G	0,00	0,00	0,00	0,00
21.10.2019	09:37.05	96,72G	0,00	0,00	0,00	0,00
21.10.2019	09:21.26	96,72G	0,00	0,00	0,00	0,00
21.10.2019	09:14.26	96,72G	0,00	0,00	0,00	0,00
21.10.2019	08:45.58	96,72G	0,00	0,00	0,00	0,00
21.10.2019	08:31.15	96,73G	0,00	0,00	0,00	0,00
21.10.2019	08:16.01	96,74G	0,00	0,00	0,00	0,00
18.10.2019	17:46.41	96,73G	0,00	0,00	0,00	0,00
18.10.2019	15:16.49	96,73G	0,00	0,00	0,00	0,00
18.10.2019	12:13.29	96,73G	0,00	0,00	0,00	0,00
18.10.2019	11:18.55	96,74G	0,00	0,00	0,00	0,00

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Realtime Quotes Frankfurt Exchange

●96,74 %
+0,02 % +0,02

Börse Frankfurt
Stand: 22.10.19 - 10:00:30 Uhr

Weitere Kursdaten	
Geld (Stk.)	● 96,74 (5000000)
Brief (Stk.)	● 98,23 (5000000)
Zeit	22.10.19 10:00:38
Spread	1,52 %
Schluss Vortag	96,72
Eröffnung	96,74
Hoch	96,74
Tief	96,74
Geh. Stück	0

Letzte Kurse

Zeit	Kurs	Stück
10:00:30	96,74	0

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Trade 16.10.2019

Nr.126706142/1	Kauf		DT.BANK 96/21ZO	(DE0001343101/134310)	
Ausgeführt	:	10000000,000000 ITL	Kurswert	:	5.046,30 EUR
Kurs	:	97,710000 %	Provision	:	5,90 EUR
Devisenkurs	:	1.936,270000	Eigene Spesen	:	0,00 EUR
Faktor	:	1,0000000	*Fremde Spesen	:	8,07 EUR
Verwahrart	:	Wertpapierrechnung			
Lagerstelle	:	Clearstream Lux.			
Lagerland	:		Bemessungs-grundlage	:	0,00 EUR
Gewinn/Verlust:		0,00 EUR	**Einbeh. Steuer:		0,00 EUR
			Endbetrag	:	-5.060,27 EUR
*	Enthalten sind folgende Gebühren		Courtage	:	3,78 EUR
			Tradinggebühr	:	0,00 EUR
			Regulierung	:	2,67 EUR
			Schlussnoten	:	1,62 EUR
			LS-Umlegung	:	0,00 EUR
			Sonstige	:	0,00 EUR

Hinweis: Maklercourtage 0,075% vom Nennwert.
10.000.000 ITL / 1.936,26 ITL/EUR = 5.164,57 EUR
5164,57 EUR * 0,075/100 = 3,87 EUR

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Trade 16.10.2019

Suchergebnis: Kurse nach Datum

ISIN: DE0001343101
WKN: 134310
Wertpapier: Deutsche Bank AG LI-Zero Bonds 1996(21)
Datum: 16.10.2019

Für ausgewähltes Wertpapier **Stammdaten** anzeigen.

	Börse	Erster	Hoch	Tief	Letzter	Vortag	Umsatz/St. o. Nom.	Währung	Rendite
var.	**Berlin**	96,72 G	97,71	96,72 G	97,71	96,71 G	10.000.000	ITL	1,16757 %
var.	**Frankfurt**	96,71 BID	96,80 BID	96,71 BID	96,80 BID	96,70 BID		ITL	1,68468 %
var.	**Stuttgart**	96,70 G	96,75 G	96,70 G	96,75 G	96,71 G		ITL	1,6952 %

ISIN: DE0001343101
WKN: 134310
Wertpapier: Deutsche Bank AG LI-Zero Bonds 1996(21)
Börse: Berlin
Datum: 16.10.2019 (08:00 - 22:00)

Zeit	Kurs	Stück
16.10.2019 / 08:43:06,080001	96,72	0
16.10.2019 / 13:30:18,660001	97,71	10.000.000

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