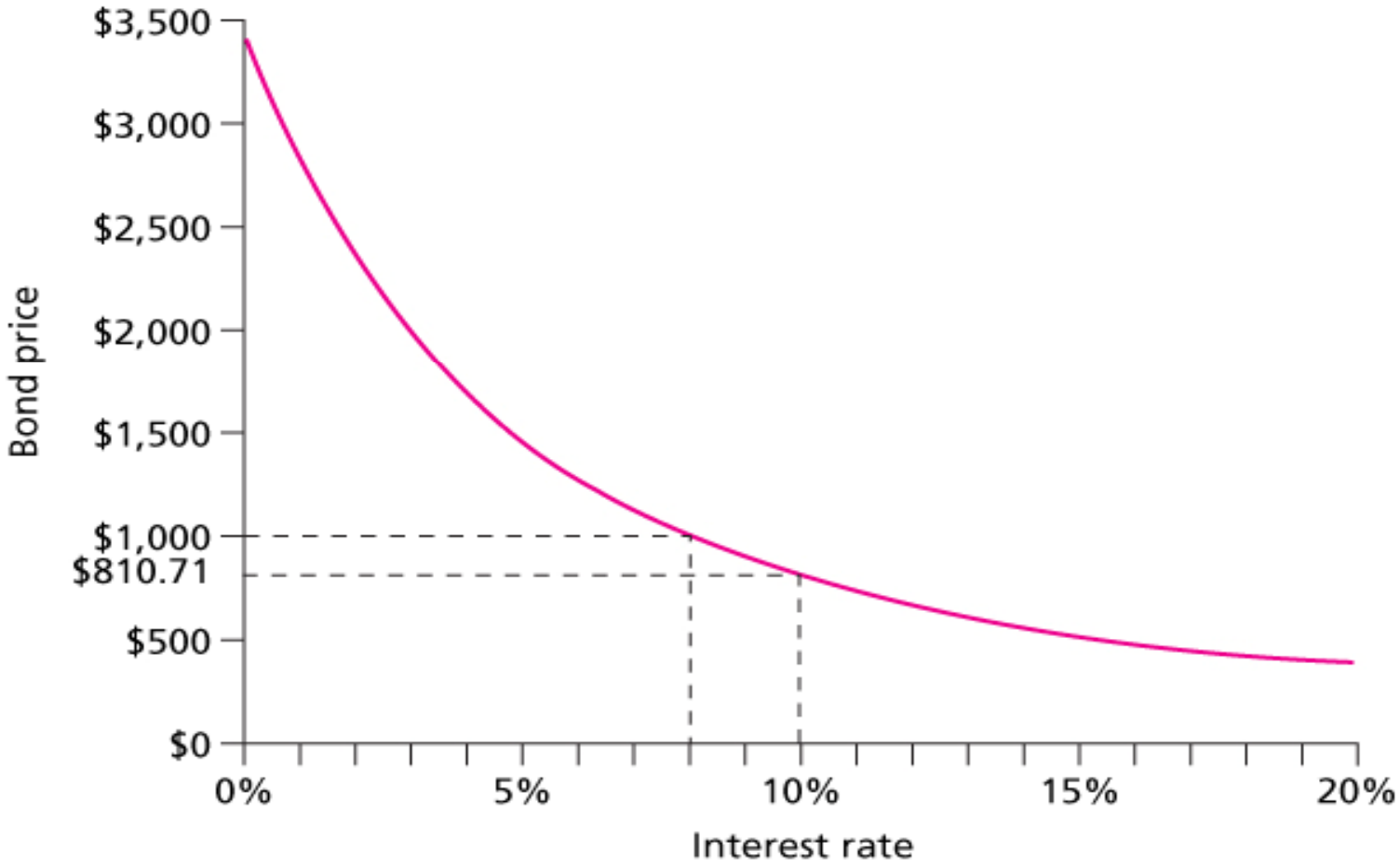
Chapter 10

Bond Prices and Yields (Cont'd)

Figure 10.3 The Inverse Relationship Between Bond Prices and Yields



Interest Rate Risk is Greater for Longer Maturity Bonds

Time to Maturity	Bond Price at Given Market Interest Rate				
	2%	4%	6%	8%	10%
1 year	$1,059.11	$1,038.83	$1,019.13	$1,000.00	$981.41
10 years	1,541.37	1,327.03	1,148.77	1,000.00	875.38
20 years	1,985.04	1,547.11	1,231.15	1,000.00	828.41
30 years	2,348.65	1,695.22	1,276.76	1,000.00	810.71

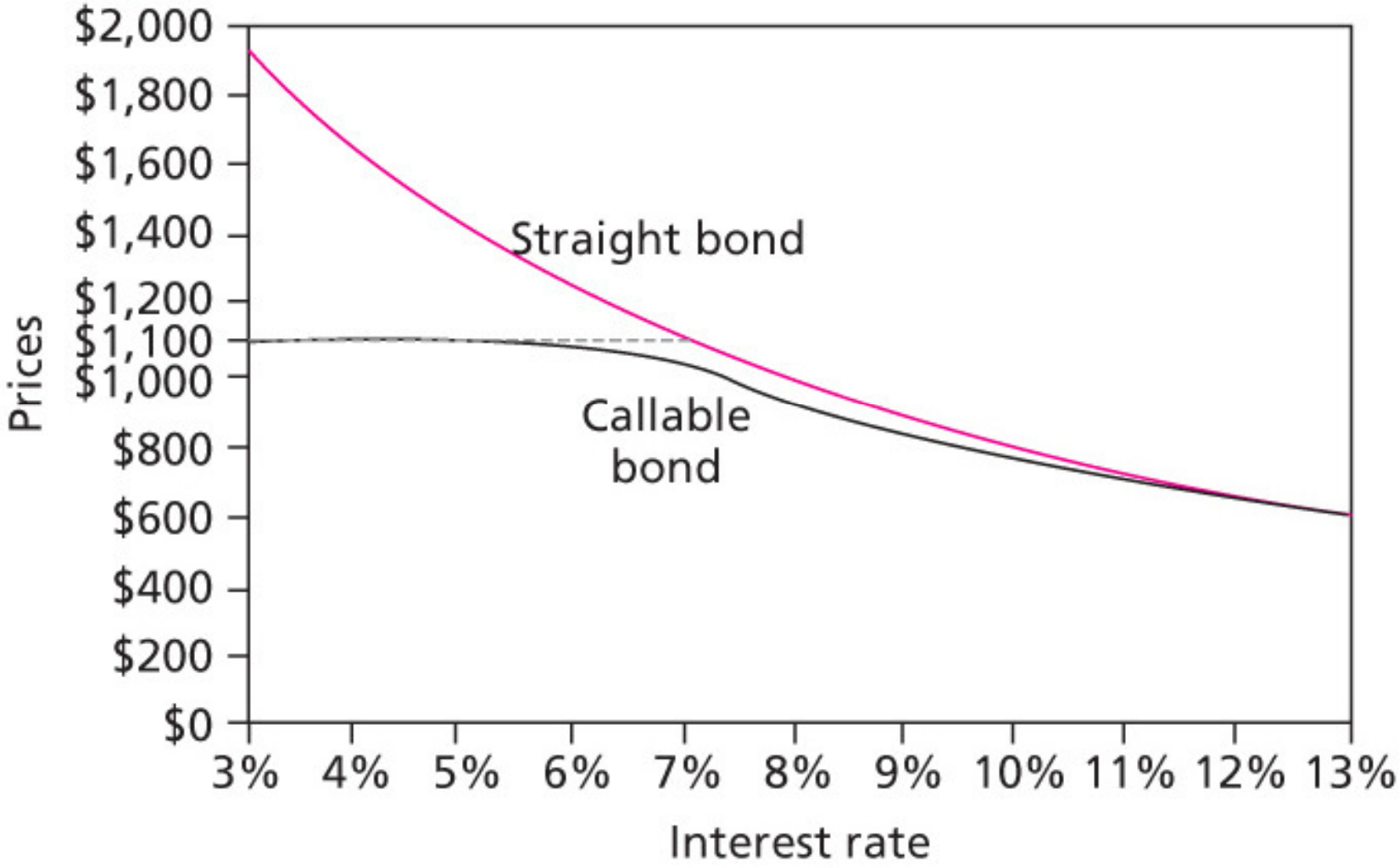
Premium Bonds:

Coupon Rate > Current Yield > YTM

Discount Bonds:

Coupon Rate < Current Yield < YTM

Yield to Call Illustrated



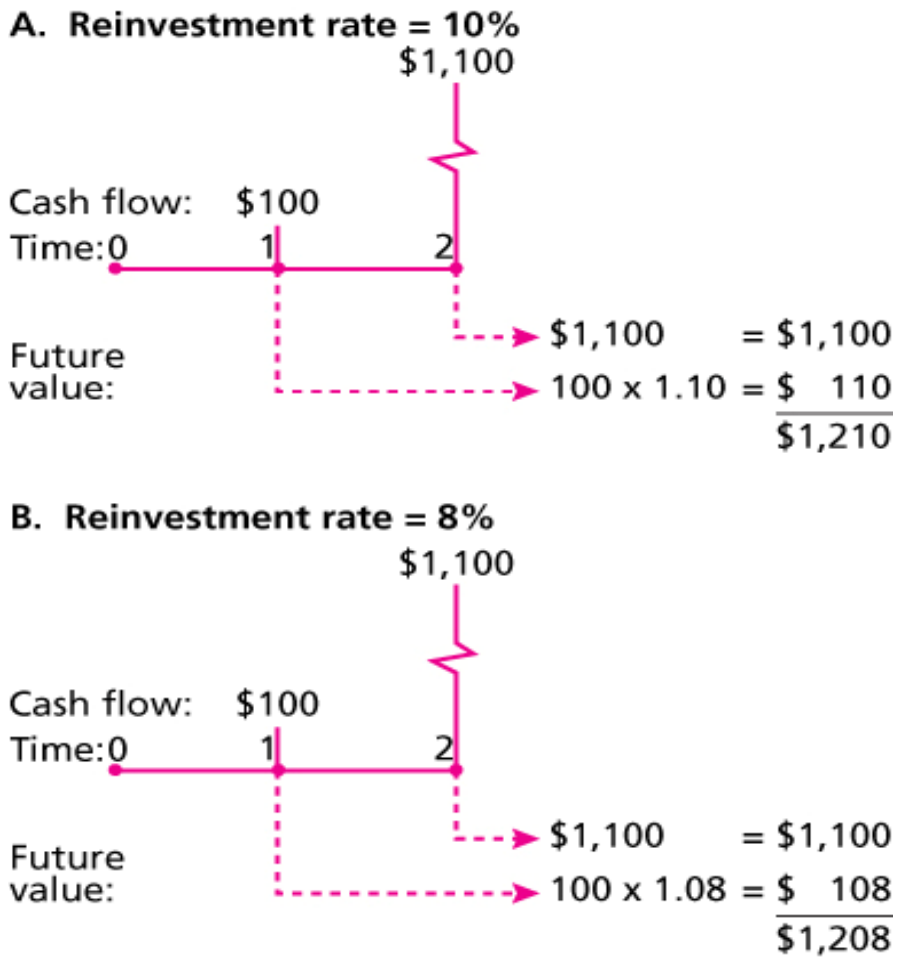
Alternative Measures of Yield

- Current Yield
  - Annual dollar coupon divided by the price
- Yield to Call
  - Call price replaces par
  - Call date replaces maturity
- Holding Period Yield
  - Considers actual reinvestment rate on coupons
  - Considers any change in price if the bond is sold prior to maturity

Suppose the 8% coupon, 30 year bond sells for $1,150 and is callable in 10 years at a call price of $1,100.

	Yield to Call	Yield to Maturity
Coupon payment	$40	$40
Number of semiannual periods	20 periods	60 periods
Final payment	$1,100	$1,000
Price	$1,150	$1,150

HPY: Growth of $1000 invested in a 2 year bond



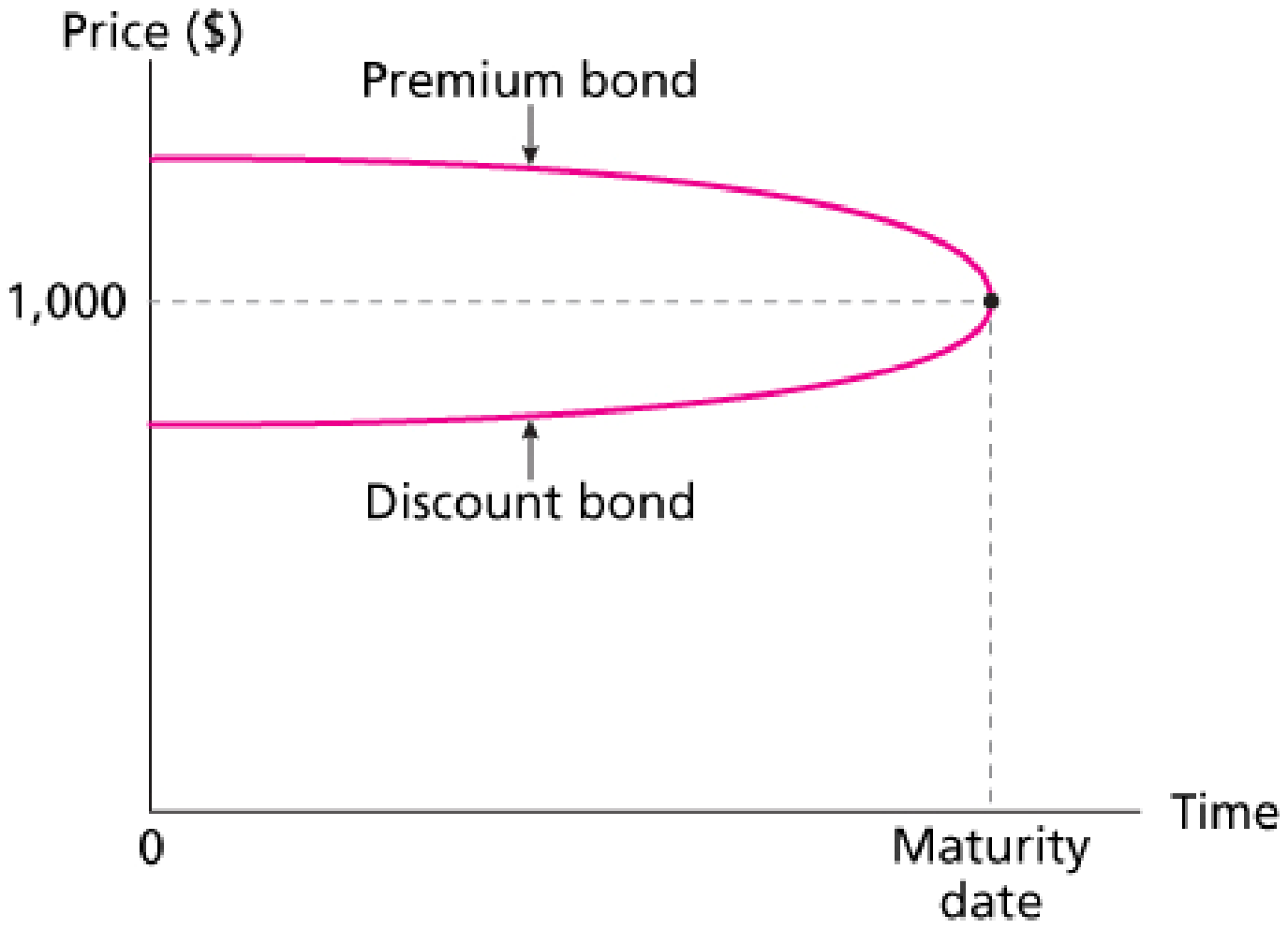
10.4 BOND PRICES OVER TIME

Premium and Discount Bonds

- Premium Bond
  - Coupon rate exceeds yield to maturity
  - Bond price will decline to par over its maturity

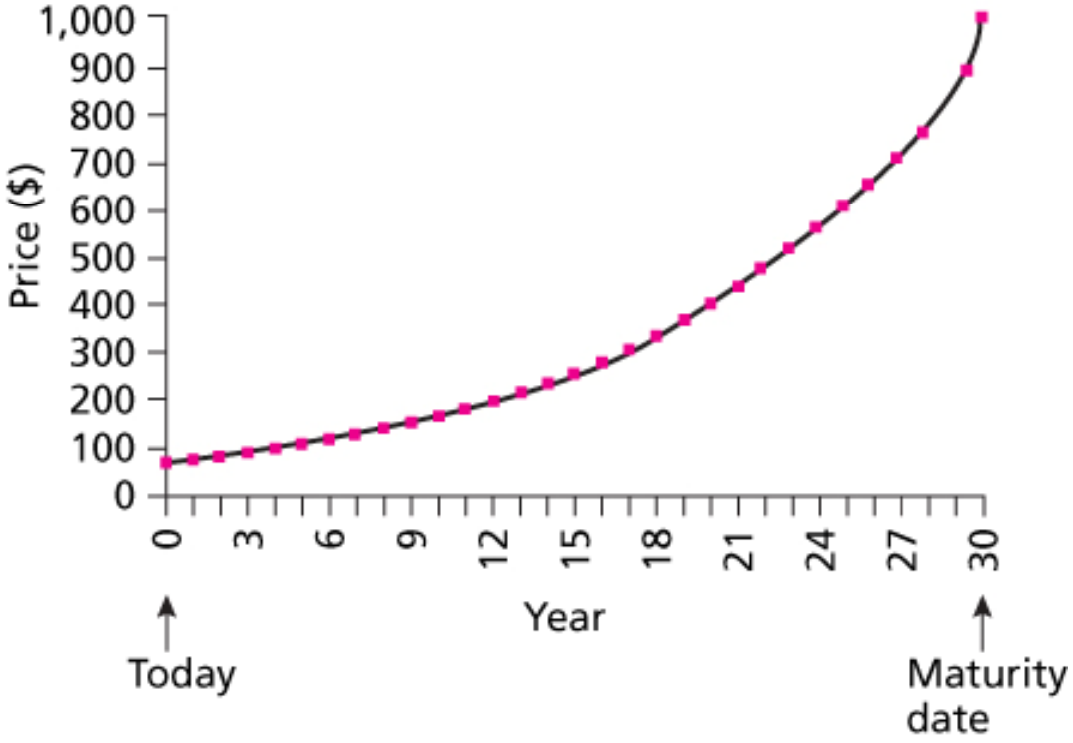
- Discount Bond
  - Yield to maturity exceeds coupon rate
  - Bond price will increase to par over its maturity

Figure 10.6 Premium and Discount Bonds over Time



The Price of a Zero Coupon Bond over Time

How does one earn a rate of return on a zero coupon bond?



$$P = \frac{Par}{(1+r)^N}$$

What are STRIPS?

How is the price appreciation taxed?

10.5 DEFAULT RISK AND BOND PRICING

Default Risk and Ratings

- Main Ratings Companies
  - Moody's Investor Service
  - Standard & Poor's
  - Fitch
- Main Rating Categories
  - Investment grade
  - Speculative grade (junk bonds)

Definitions of Bond Rating Classes

	Bond Ratings			
	Very High Quality	High Quality	Speculative	Very Poor
Standard & Poor's	AAA AA	A BBB	BB B	CCC D
Moody's	Aaa Aa	A Baa	Ba B	Caa C

At times both Moody's and Standard & Poor's use adjustments to these ratings. S&P uses plus and minus signs: A+ is the strongest A rating and A− the weakest. Moody's uses a 1, 2, or 3 designation—with 1 indicating the strongest.

Moody's	S&P	
Aaa	AAA	Debt rated Aaa and AAA has the highest rating. Capacity to pay interest and principal is extremely strong.
Aa	AA	Debt rated Aa and AA has a very strong capacity to pay interest and repay principal. Together with the highest rating, this group comprises the high-grade bond class.
A	A	Debt rated A has a strong capacity to pay interest and repay principal, although it is somewhat more susceptible to the adverse effects of changes in circumstances and economic conditions than debt in higher-rated categories.
Baa	BBB	Debt rated Baa and BBB is regarded as having an adequate capacity to pay interest and repay principal. Whereas it normally exhibits adequate protection parameters, adverse economic conditions or changing circumstances are more likely to lead to a weakened capacity to pay interest and repay principal for debt in this category than in higher-rated categories. These bonds are medium grade obligations.
Ba	BB	Debt rated in these categories is regarded, on balance, as predomi-
B	B	nantly speculative with respect to capacity to pay interest ad repay
Caa	CCC	principal in accordance with the terms of the obligation. BB and Ba
Ca	CC	indicate the lowest degree of speculation, and CC and Ca the highest degree of speculation. Although such debt will likely have some quality and protective characteristics, these are outweighed by large uncertainties or major risk exposures to adverse conditions. Some issues may be in default.
C	C	This rating is reserved for income bonds on which no interest is being paid.
D	D	Debt rated D is in default, and payment of interest and/or repayment of principal is in arrears.

Factors Used by Rating Companies

- Coverage ratios
  - TIE and Fixed Charges Coverage ratio
- Leverage ratios
  - Debt to equity or Debt to assets
- Liquidity ratios
  - Current and quick ratio
- Profitability ratios
  - Return on assets and return on equity
- Cash flow to debt
  - Cash flow to debt

Financial Ratios and Default Risk

	Three-Year (2002 to 2004) Medians						
	AAA	AA	A	BBB	BB	B	CCC
EBIT interest coverage multiple	23.8	19.5	8.0	4.7	2.5	1.2	0.4
EBITDA interest coverage multiple	25.5	24.6	10.2	6.5	3.5	1.9	0.9
Funds from operations/total debt (%)	203.3	79.9	48.0	35.9	22.4	11.5	5.0
Free operating cash flow/total debt (%)	127.6	44.5	25.0	17.3	8.3	2.8	(002.1)
Total debt/EBITDA multiple	0.4	0.9	1.6	2.2	3.5	5.3	7.9
Return on capital (%)	27.6	27.0	17.5	13.4	11.3	8.7	3.2
Total debt/total debt + equity (%)	12.4	28.3	37.5	42.5	53.7	75.9	113.5

Note: EBITDA is earnings before interest, taxes, depreciation, and amortization.

Source: *Corporate Rating Criteria,* Standard & Poor's, 2006. Reproduced by permission of Standard & Poor's, a division of The McGraw-Hill Companies, Inc.

9% Coupon, has 10 year left, selling at $750. In case of default receive 70%.

	Expected YTM	Stated YTM
Coupon payment	$45	$45
Number of semiannual periods	20 periods	20 periods
Final payment	$700	$1,000
Price	$750	$750

Protection Against Default

- Sinking funds
  - Issuer may repurchase a given fraction of the outstanding bonds each year, or
  - Issuer may either repurchase at the lower of open market price or at a pre-specified price, usually par; bonds are chosen randomly
- Serial bonds
  - Staggered maturity dates
- Subordination of future debt
  - Senior debt holders must be paid in full before junior debt holders.

Protection Against Default

- Dividend restrictions
  - Limit on liquidating dividends

- Collateral
  - A specific asset pledged against possible default on a bond.

  - What is a bond called that has no specific collateral?

Figure 10.9 Callable Bond Issued by Mobil

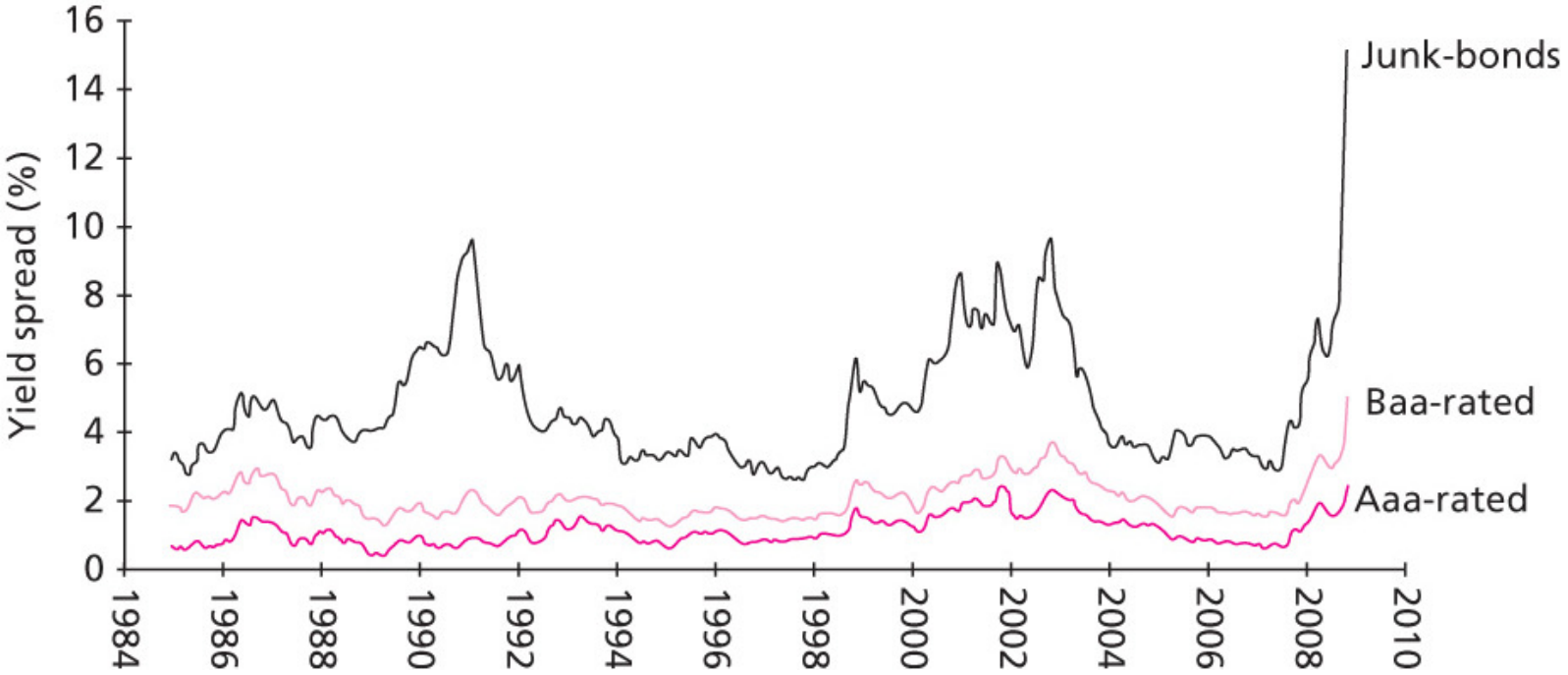
& Mobil Corp. debenture 8s, due 2032:
Rating — Aa2

AUTH — $250,000,000.
OUTSTG — Dec. 31, 1993, $250,000,000.
DATED — Oct. 30, 1991.
INTEREST — F&A 12.
TRUSTEE — Chemical Bank.
DENOMINATION — Fully registered, $1,000 and integral multiples thereof. Transferable and exchangeable without service charge.
CALLABLE — As a whole or in part, at any time, on or after Aug. 12, 2002, at the option of Co. on at least 30 but not more than 60 days' notice to each Aug. 11 as follows:

2003	105.007	2004	104.756	2005	104.506
2006	104.256	2007	104.005	2008	103.755
2009	103.505	2010	103.254	2011	103.004
2012	102.754	2013	102.503	2014	102.253
2015	102.003	2016	101.752	2017	101.502
2018	101.252	2019	101.001	2020	100.751
2021	100.501	2022	100.250		

and thereafter at 100 plus accrued interest.
SECURITY — Not secured. Ranks equally with all other unsecured and unsubordinated indebtedness of Co. Co. nor any Affiliate will not incurr any indebtedness; provided that Co. will not create as sucurity for any indebtedness for borrowed money, any mortgage, pledge, security interest or lien on any stock or indebtedness is directly owned by Co., without effectively providing that the debt securities shall be secured equally and ratably with such indebtedness, so long as such indebtedness shall be so secured.
INDENTURE MODIFICATION — Indenture may be modified, except as provided with, consent of 66⅔% of debs. outstg.
RIGHTS ON DEFAULT — Trustee, or 25% of debs. outstg., may declare principal dua nad payable (30 days' grace for payment of interest).
LISTED — On New York Stock Exchange.
PURPOSE — Proceeds used for general corporate purposes.
OFFERED — ($250,000,000) at 99.51 plus accrued interest (proceeds to Co., 99.11) on Aug. 5, 1992 thru Merrill Lynch & Co., Donaldson, Lufkin & Jenerette Securities Corp., PaineWebber Inc., Prudential Securities Inc., Smith Barney, Harris Upham & Co. Inc. and associates.

Example 10.10 YTM and Default



Credit Default Swaps

A credit default swap (CDS) is an insurance policy on the default risk of a bond or loan.

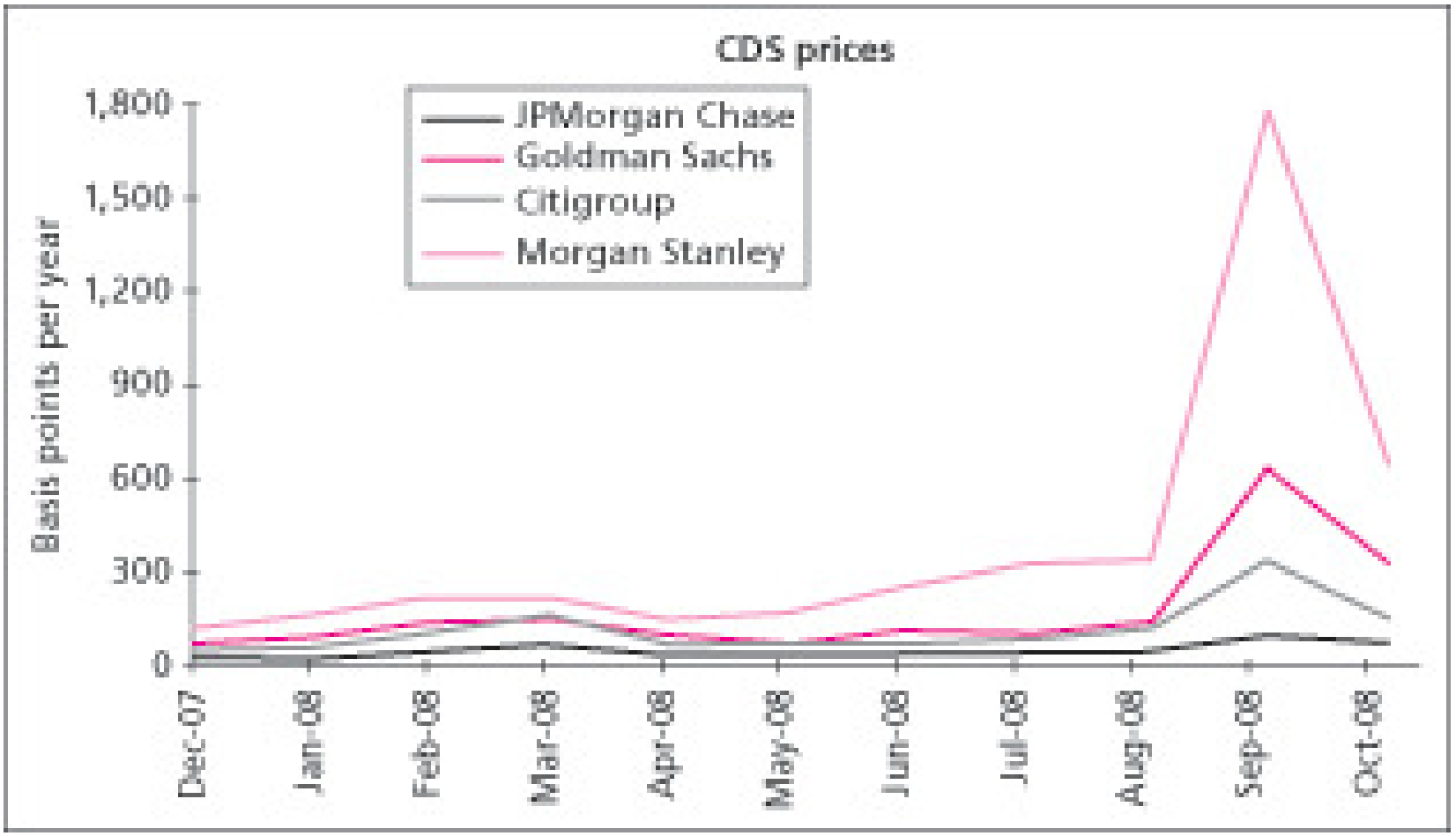
- The seller of the swap collects an annual premium (and sometimes an upfront fee) from the swap buyer.

- The buyer of the swap collects nothing unless the bond issuer or loan borrower defaults, in which case the seller of the swap essentially pays the drop in value from par to the swap buyer.

Credit Default Swaps

- CDSs can be used to speculate on financial health of firms.
  - Swap buyer need not hold the underlying bond or loan.
  - At their peak there were reportedly $63 trillion worth of CDS; US GDP is about $14 trillion.
  - What is the implication of the size of this market if the economy experiences greater than expected defaults?
  - Did this contribute to the Financial Crisis of 2008?

Credit Default Swaps



Credit Default Swaps

- New regulations on CDS will be implemented
  - CDS contracts will be required to be traded on an exchange with collateral requirements to limit risk.
  - Exchange trading will also increase transparency of positions of institutions.

Credit Default Swaps

Video