

Chapter 4

Interest Rates and
Rates of Return

Copyright © 2002 Pearson Education, Inc.

Slide 4-2

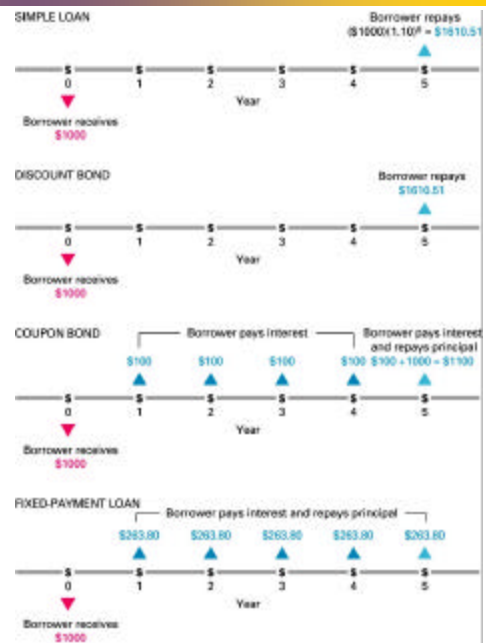
Types of Bonds

- Simple loan
- Discount bond
- Coupon bond
- Fixed-payment loan

Copyright © 2002 Pearson Education, Inc.

Slide 4-3

Figure 4.1 Time Lines for Credit Market Instruments



Copyright © 2002 Pearson Education, Inc.

Slide 4-4

Present Value

- Comparing returns across debt types is difficult since timing of repayment differs.
- Solution is the concept of present value.
- The present value of \$1 received n years in the future is $\$1/(1 + i)^n$.

Copyright © 2002 Pearson Education, Inc.

Slide 4-5

Compound Interest

- $\$100$ in one year = $\$100(1 + i)$
- ($\$100$ principle repayment + $i(\$100)$ in interest)
- EX: If $i = 10\%$, in one year, $\$100$ will be: $\$100 (1.1) = \110 ($\$100$ principle + $\$10$ interest)
- If you reinvest $\$110$ at 10% , then at the end of two years you will have $\$110(1.1) = \121
- OR $\$100 (1.1)(1.1) = \$100(1.1)^2 = \$121$

Copyright © 2002 Pearson Education, Inc.

Slide 4-6

Present Value

If $\$121 = \$100(1.1)^2$, then \$121 is the future value (FV) of \$100 today. We found this by compounding interest.

Alternatively, we could divide both sides of the above equation by $(1.1)^2$:

$$\$121/(1.1)^2 = \$100$$

In this form we call the \$100 the present value (PV) of receiving \$121 in two years.

PRESENT VALUE

- In general, $PV = FV / (1 + i)^n$

Where FV is the future value

PV is the present value

i is the interest rate

n is the number of years in the future
you have to wait before receiving the FV.

Bond yields and Prices

- The price of a debt instrument is equal to its Present Value
- EX: One period discount bond with a face value of \$100 :
 - If $i = 10\%$, $PV = \$100 / (1.1) = \90.90
 - If $i = 5\%$, $PV = \$100 / (1.05) = \95.24

Copyright © 2002 Pearson Education, Inc.

Slide 4-9

PRICE OF A COUPON BOND

- $PV = PRICE = C / (1+i) + C / (1+i)^2 +$
 - $\dots + C / (1+i)^n + FV / (1+i)^n$
 - Current Yield = C/P
 - Coupon Yield = C/FV

Copyright © 2002 Pearson Education, Inc.

Slide 4-10

A CONSOL BOND

- A coupon bond with infinite maturity is a perpetual, or consol, bond.
- The price of a consol is:
- $PV = C/i$

Present Value

- Comparing returns across debt types is difficult since timing of repayment differs.
- Solution is the concept of present value.
- The present value of \$1 received n years in the future is $\$1/(1 + i)^n$.

Which is the best deal?

- Signing bonus today: \$3,000,000
- In 1 year: \$6,000,000
- In 2 years: \$7,000,000
- In 3 years: \$8,000,000
- Signing bonus today: \$6,000,000
- In 1 year: \$5,500,000
- In 2 years: \$6,000,000
- In 3 years: \$6,000,000

Copyright © 2002 Pearson Education, Inc.

Slide 4-13

Current Price and Face Value

- If current price = face value, then yield to maturity = current yield = coupon rate.
- If current price < face value, then yield to maturity > current yield > coupon rate.
- If current price > face value, then yield to maturity < current yield < coupon rate.

Copyright © 2002 Pearson Education, Inc.

Slide 4-14

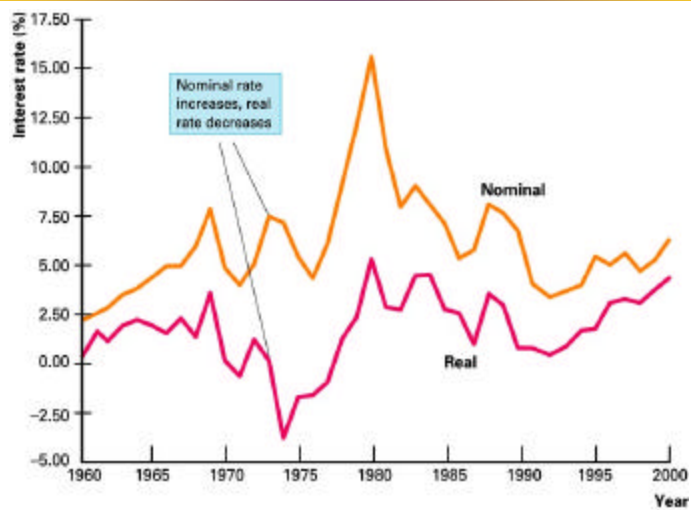
Total Rate of Return

- The total rate of return is the sum of current yield and actual capital gain or loss.
- Rate of return can differ from yield to maturity.
- The formula for total rate of return is:
$$R = C/P_t + (P_{t+1} - P_t)/P_t.$$

Real and Nominal Interest Rates

- Expected real interest rate = nominal interest rate - the expected rate of inflation.
- Fisher hypothesis: change in expected inflation = change in nominal interest rate.
- The real rate of return equals the nominal rate of return adjusted for expected inflation.

Figure 4.3 Real and Nominal Interest Rates, 1960-2000



Copyright © 2002 Pearson Education, Inc.

Slide 4-17