

CHAPTER 4

Understanding Interest Rates

Present Value

Four Types of Credit Instruments

1. Simple loan
2. Fixed-payment loan
3. Coupon bond
4. Discount (zero coupon) bond

Concept of Present Value

Simple loan of \$1 at 10% interest

Year	1	2	3	n
	\$1.10	\$1.21	\$1.33	$\$1 \times (1+i)^n$

$$\text{PV of future \$1} = \frac{\$1}{(1+i)^n}$$

Yield to Maturity: Loans

Yield to maturity = interest rate that equates today's value with present value of all future payments

1. Simple Loan ($i = 10\%$)

$$\$100 = \$110 / (1+i) \Rightarrow$$

$$i = \frac{\$110 - \$100}{\$100} = \frac{\$10}{\$100} = 0.10 = 10\% \text{ (simple } i = \text{yield to maturity)}$$

2. Fixed Payment Loan ($i = 12\%$) fully amortized loan

$$\$1000 = \frac{\$126}{(1+i)} + \frac{\$126}{(1+i)^2} + \frac{\$126}{(1+i)^3} + \dots + \frac{\$126}{(1+i)^{25}}$$

$$\text{LV} = \frac{FP}{(1+i)} + \frac{FP}{(1+i)^2} + \frac{FP}{(1+i)^3} + \dots + \frac{FP}{(1+i)^n}$$

Maturity and the Volatility of Bond Returns

Key Findings from Table 2

1. Only bond whose return = yield is one with maturity = holding period
2. For bonds with maturity > holding period, $i \uparrow \Rightarrow P \downarrow$ implying capital loss
3. Longer is maturity, greater is % price change associated with interest rate change
4. Longer is maturity, more return changes with change in interest rate
5. Bond with high initial interest rate can still have negative return if $i \uparrow$

Conclusion from Table 2 Analysis

1. Prices and returns more volatile for long-term bonds because have higher interest-rate risk
2. No interest-rate risk for any bond whose maturity equals holding period

Distinction Between Real and Nominal Interest Rates

Real Interest Rate

Interest rate that is adjusted for expected changes in the price level

$$i_r = i - \pi^e$$

1. Real interest rate more accurately reflects true cost of borrowing
2. When real rate is low, greater incentives to borrow and less to lend

if $i = 5\%$ and $\pi^e = 3\%$ then:

$$i_r = 5\% - 3\% = 2\%$$

if $i = 8\%$ and $\pi^e = 10\%$ then

$$i_r = 8\% - 10\% = -2\%$$

U.S. Real and Nominal Interest Rates


