

Bonds

- **Key features of bonds**
- **Bond valuation**
- **Assessing risk**

Key Features of a Bond

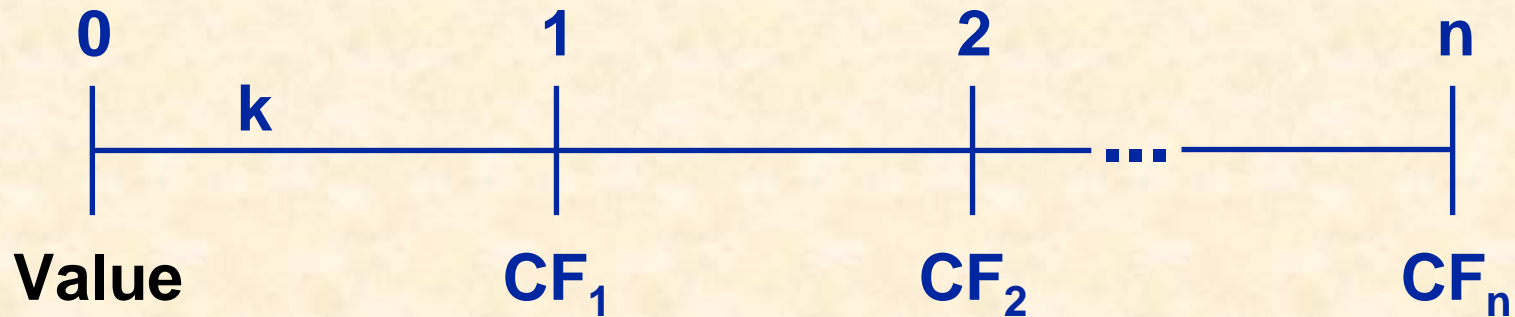
1. **Par value:** Face amount; paid at maturity. Assume \$1,000.
2. **Coupon interest rate:** Stated interest rate. Multiply by par to get \$ of interest. Generally fixed.

3. **Maturity:** Years until bond must be repaid. Declines.
4. **Issue date:** Date when bond was issued.

How does adding a “call provision” affect a bond?

- Issuer can refund if rates decline. That helps the issuer but hurts the investor.
- Therefore, borrowers are willing to pay more, and lenders require more, on callable bonds.
- Most bonds have a **deferred call** and a **declining call premium**.

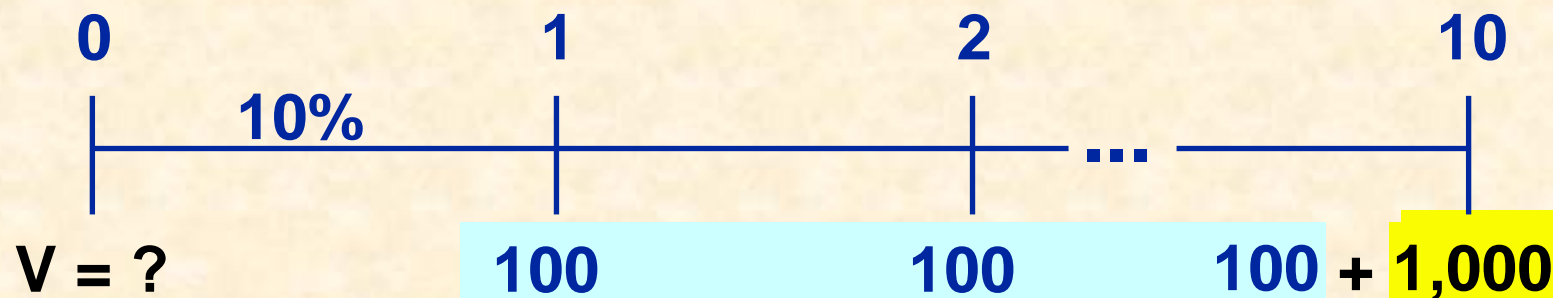
Financial Asset Values



$$PV = \frac{CF_1}{(1+k)^1} + \frac{CF_2}{(1+k)^2} + \dots + \frac{CF_n}{(1+k)^n}.$$

- **The discount rate (k_i) is the opportunity cost of capital, i.e., the rate that could be earned on alternative investments of equal risk.**

What's the value of a 10-year, 10% coupon bond if $k_d = 10\%$?



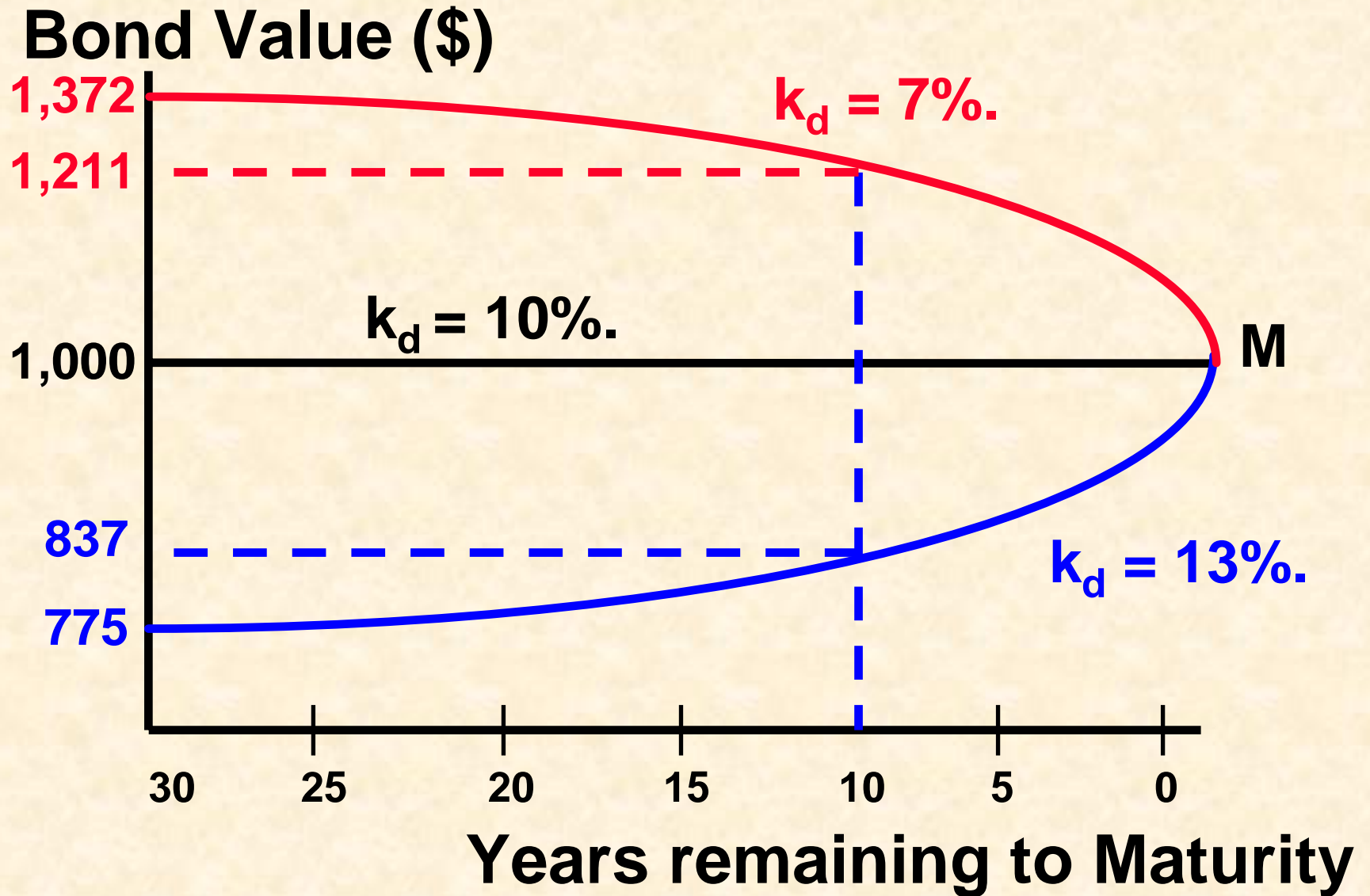
$$\begin{aligned}
 V_B &= \frac{\$100}{(1 + k_d)^1} + \dots + \frac{\$100}{(1 + k_d)^{10}} + \frac{\$1,000}{(1 + k_d)^{10}} \\
 &= \$90.91 + \dots + \$38.55 + \$385.54 \\
 &= \$1,000.
 \end{aligned}$$

The bond consists of a 10-year, 10% annuity of \$100/year plus a \$1,000 lump sum at $t = 10$:

PV annuity	=	\$ 614.46
PV maturity value	=	385.54
PV bond	=	<u>\$1,000.00</u>

INPUTS	10	10		100	1000
	N	I/YR	PV	PMT	FV
OUTPUT			-1,000		

The bond was issued 20 years ago and now has 10 years to maturity. What would happen to its value over time if the required rate of return remained at 10%, or at 13%, or at 7%?

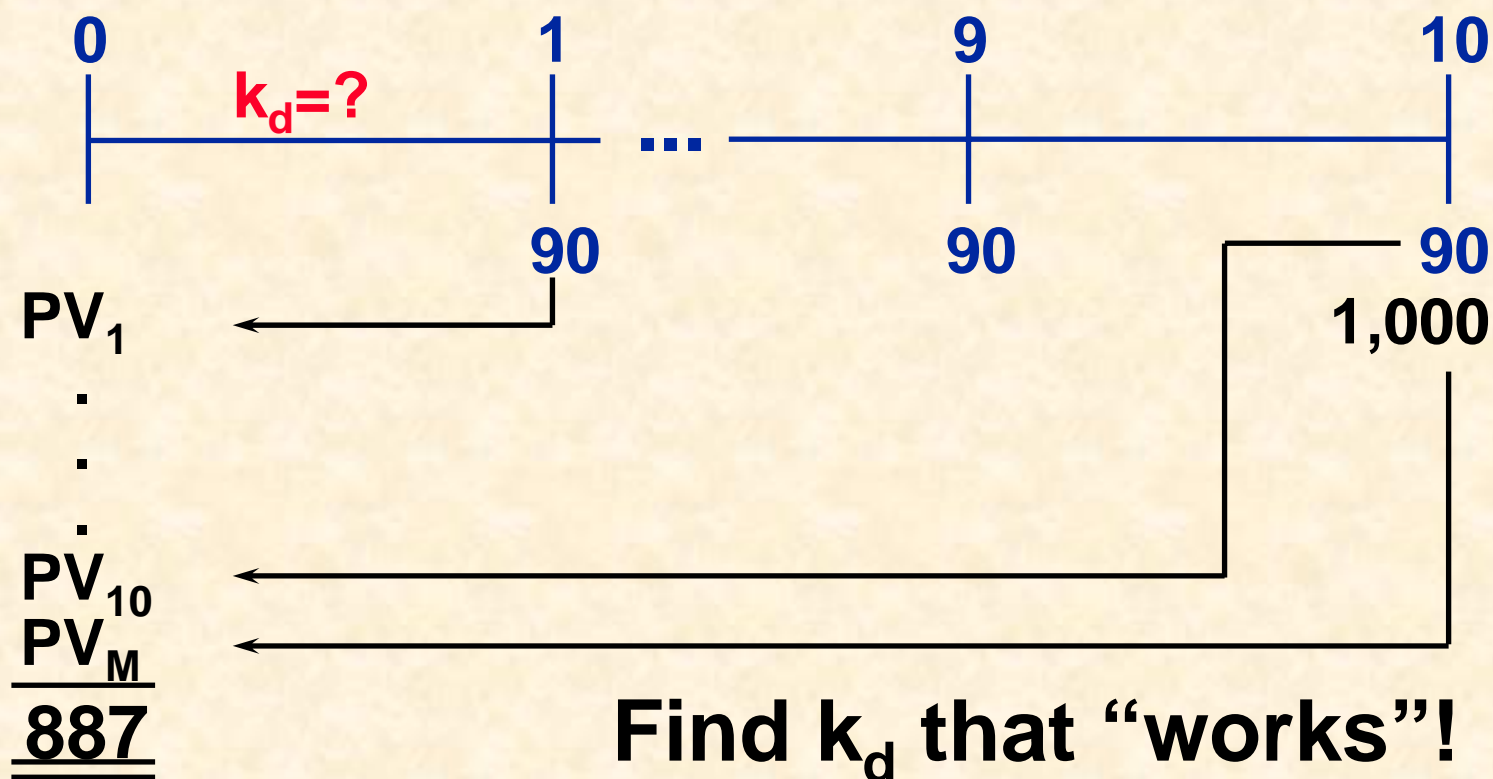


- **At maturity, the value of any bond must equal its par value.**
- **The value of a premium bond would decrease to \$1,000.**
- **The value of a discount bond would increase to \$1,000.**
- **A par bond stays at \$1,000 if k_d remains constant.**

What is the “yield to maturity”?

- **YTM** is the rate of return earned on a bond held to maturity. Also called the “promised yield.”

What's the YTM on a 10-year, 9% annual coupon, \$1,000 par value bond that sells for \$887?



Find k_d

$$V_B = \frac{INT}{(1 + k_d)^1} + \dots + \frac{INT}{(1 + k_d)^N} + \frac{M}{(1 + k_d)^N}$$

$$887 = \frac{90}{(1 + k_d)^1} + \dots + \frac{90}{(1 + k_d)^{10}} + \frac{1,000}{(1 + k_d)^{10}}$$

INPUTS

10

N

I/YR

-887

PV

90

PMT

1000

FV

OUTPUT

10.91

- If coupon rate $< k_d$, discount.
- If coupon rate $= k_d$, par bond.
- If coupon rate $> k_d$, premium.
- If k_d rises, price falls.
- Price = par at maturity.

What is reinvestment rate risk?

The risk that CFs will have to be reinvested in the future at lower rates, reducing income.

Illustration: Suppose you just won \$500,000 playing the lottery. You'll invest the money and live off the interest. You buy a 1-year bond with a YTM of 10%.

Year 1 income = \$50,000. At year-end get back \$500,000 to reinvest.

If rates fall to 3%, income will drop from \$50,000 to \$15,000. Had you bought 30-year bonds, income would have remained constant.

- **Long-term bonds: High interest rate risk, low reinvestment rate risk.**
- **Short-term bonds: Low interest rate risk, high reinvestment rate risk.**
- **Nothing is riskless!**

Bond Ratings Provide One Measure of Default Risk

	<u>Investment Grade</u>				<u>Junk Bonds</u>			
Moody's	Aaa	Aa	A	Baa	Ba	B	Caa	C
S&P	AAA	AA	A	BBB	BB	B	CCC	D

What factors affect default risk and bond ratings?

- **Financial performance**
 - **Debt ratio**
 - **TIE ratio**
 - **Current ratio**

- **Provisions in the bond contract**
 - **Secured vs. unsecured debt**
 - **Senior vs. subordinated debt**
 - **Guarantee provisions**
 - **Sinking fund provisions**
 - **Debt maturity**

■ Other factors

- Earnings stability
- Regulatory environment
- Potential product liability
- Accounting policies