## CFIN ${ }^{5}$

CORPORATE FINANCE

## Chapter 5 The Cost OF Money (Interest Rates)

## Learning Outcomes

LO. 1 Describe the cost of money and factors that affect the cost of money.
LO. 2 Describe how interest rates are determined.
LO. 3 Describe a yield curve and discuss how a yield curve might be used to forecast future interest rates.

## Learning Outcomes (cont.)

LO. 4 Discuss how government actions and general business activity affect interest rates.

LO. 5 Describe how changes in interest rates (returns) affect the values of stocks and bonds.

## Realized Returns (Yields)

$$
\text { Yield }=\frac{\text { Dollar return }}{\text { Beginning value }}=\frac{\text { Dollar income }+ \text { Capital gains }}{\text { Beginning value }}
$$

$$
=\frac{\text { Dollar income }+(\text { Ending value }- \text { Beginning value })}{\text { Beginning value }}
$$

## Factors that Affect the Cost of Money

- Production opportunities
- Time preferences for consumption
o Risk
- Inflation


## Interest Rate Levels

## - Interest Rates as a Function of Supply and Demand



## Interest Rate Levels



## Rate of Return (Interest Rate)



## Determinants of Market Interest Rates

Rate of

$$
=r=\text { Risk-free rate }+\quad \text { Risk premium }
$$

return

$$
\begin{array}{lll}
= & = & r_{\mathrm{RF}} \\
= & + & \mathrm{RP} \\
= & \mathrm{r}_{\mathrm{RF}} & +[\mathrm{DRP}+\mathrm{LP}+\mathrm{MRP}]
\end{array}
$$

$r=$ Quoted or nominal rate
$r_{\mathrm{RF}}=$ The quoted risk-free rate
$R P=$ Risk premium $=D R P+L P+M R P$

## "Real" versus "Nominal" Rates

or = the nominal rate of any investment, which might include a risk premium (RP)
○ $r^{*}=$ the real risk-free rate of return, which does not include inflation

- $r_{\text {RF }}=$ nominal risk-free rate, which includes an inflation premium, IP, that is equal to the average inflation rate expected during the life of the investment
- $r_{R F}=r^{*}+I P$
$o r=r_{R F}+R P$


# Premiums Added to r* for Different Types of Debt 

- IP = Inflation premium
- DRP = Default risk premium
- LP = Liquidity premium
- MRP = Maturity risk premium
$r=r_{\mathrm{RF}}+[\mathrm{DRP}+\mathrm{LP}+\mathrm{MRP}]$
$r=\left(r^{*}+I P\right)+[D R P+L P+M R P]$


## Premiums Added to r* for Different Types of Debt

- Short-Term (S-T) Treasury: only IP for S-T inflation
- Long-Term (L-T) Treasury: IP for L-T inflation, MRP
- S-T corporate: Short-Term IP, DRP, LP
- L-T corporate: IP, DRP, MRP, LP


## The Term Structure of Interest Rates

- Term structure-the relationship between interest rates (or yields) and maturities
- Yield curve-a graph of the term structure.


## U.S. Treasury Bond Interest Rates on Different Dates

| Term to | Interest Rates |  |  |
| :--- | :---: | :---: | :---: |
| Maturity | July 2006 | February 2007 | September 2 |
| 3 months | $5.0 \%$ | $5.2 \%$ | $0.9 \%$ |
| 1 year | 5.1 | 5.0 | 1.9 |
| 5 years | 5.1 | 4.7 | 2.9 |
| 10 years | 5.1 | 4.7 | 3.7 |
| 20 years | 5.3 | 4.9 | 4.3 |

Source: Federal Reserve, http://www.federalreserve.gov

## U.S. Treasury Bond Interest Rates on Different Dates (Yield Curves)



# Three Explanations for the Shape of the Yield Curve 

- Liquidity Preference Theory
- Market Segmentation Theory
o Expectations Theory


## Liquidity Preference Theory

o Everything else equal, investors (lenders) prefer S-T securities to L-T securities because S-T securities are subject to less interest rate risk, thus are more easily bought and sold in the market.

- As a result, S-T rates should be lower than LT rates, and the yield curve should be slope upward.


## Market Segmentation Theory

o Borrowers and lenders have preferred maturities, generally either S-T or L-T.

- Slope of yield curve depends on supply and demand for funds in both the L-T and S-T markets (curve could be flat, upward, or downward sloping).


## Expectations Theory

- Shape of the yield curve depends on investors' expectations about future inflation rates.
- If inflation is expected to increase, S-T rates will be lower than L-T rates-the yield curve will slope upward (a normal yield curve).
- If inflation is expected to decrease, S-T rates will be higher than L-T rates-the yield curve will slope downward (an inverted yield curve).


# Forecasting Interest Rates: Expectations Theory 

## $\begin{aligned} & \text { Inflation } \\ & \text { premium }\end{aligned}=\mathrm{IP}_{\mathrm{n}}=\frac{\operatorname{lnfl}_{1}+\operatorname{Inf|_{2}+\ldots +\text {Inf}_{n}}}{\mathrm{n}}$ <br> $\operatorname{lnfl}_{\mathrm{t}}=$ inflation expected in Year t

# Forecasting Interest Rates: Expectations Theory 

## Yield (\%) on an $=\underline{R_{1}+R_{2}+\ldots+R_{n}}$ $n$ - year bond n

$$
\begin{aligned}
R_{t} & =\text { one-year interest rate in Year } t \\
& =\left(r^{*}+I P_{t}\right)+[D R P+L P+M R P]
\end{aligned}
$$

## Forecasting Interest Rates: <br> Example

- Following are investors' inflation expectations for the next three years:

|  | Expected Annual <br> (One-Year) <br> Inflation Rate | Expected Average Inflation <br> Rate from Jan 2 of Year 1 <br> to Dec. 31 of Indicated Year |  |
| :---: | :---: | :---: | ---: |
| 1 | $2.0 \%$ | $\mathrm{IP}_{1}=$ | $(2 \%) / 1=2.0 \%$ |
| 2 | 4.0 | $\mathrm{IP}_{2}=$ | $(2 \%+4 \%) / 2=3.0 \%$ |
| 3 | 6.0 | $\mathrm{IP}_{3}=(2 \%+4 \%+6 \%) / 3=4.0 \%$ |  |

## Forecasting Interest Rates: Example

- Suppose the real risk-free rate, $r^{*}$, is $3 \%$ :

| Bond <br> Type | Real Risk-Free <br> Rate $\left(r^{*}\right)$ | Inflation Premium <br> $\mathrm{IP}_{\mathrm{t}}=$ Average <br> Expected Inflation | Nominal Rate <br> for Each Type <br> of Bond, $\mathrm{r}_{\mathrm{RF}}$ |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: |
| 1-year | $3.0 \%$ | + | $2.0 \%$ | $=$ | $5.0 \%$ |
| 2-year | 3.0 | + | $3.0 \%$ | $=$ | $6.0 \%$ |
| 3 -year | 3.0 | + | $4.0 \%$ | $=$ | $7.0 \%$ |

## Other Factors That

 Influence Interest Rate Levels- Federal Reserve Policy
- Federal deficits
- International Business (Foreign Trade Balance)
- Business Activity


## Interest Rate Levels and Stock Prices

- The higher the rate of interest, the lower a firm's profits.
- Interest rates affect the level of economic activity, and economic activity affects corporate profits.


## The Cost of Money as a Determinant of Value (Preview of Asset Valuation!)

$$
\begin{aligned}
\text { Value of } & \begin{aligned}
\text { an asset } & =\frac{\hat{\mathrm{CF}}_{1}}{(1+\mathrm{r})^{1}}+\frac{\hat{\mathrm{CF}}_{2}}{(1+\mathrm{r})^{2}}+\cdots+\frac{\hat{\mathrm{CF}}_{\mathrm{n}}}{(1+\mathrm{r})^{n}} \\
& =\sum_{\mathrm{t}=1}^{\mathrm{n}} \frac{\hat{\mathrm{CF}}_{\mathrm{t}}}{(1+\mathrm{r})^{t}}
\end{aligned}
\end{aligned}
$$

$\hat{C F}_{t}=$ the cash flow that the asset is expected to generate in Period t
$r \quad=$ the cost of funds; the required rate of return

