PASCASARJANA (S2)
MAGISTER MANAJEMEN
Fakultas Ekonomi & Bisnis
Profesional, Unggul, Entrepreneurship & Islam

Mata Kuliah:
Financial Management
(Manajemen Keuangan)

Dr. Azhari, SE., M.Si Ak CA CPA

CHAPTER 1
An Overview of Financial Management

- Career Opportunities
- Issues of the New Millennium
- Forms of Businesses
- Goals of the Corporation
- Agency Relationships

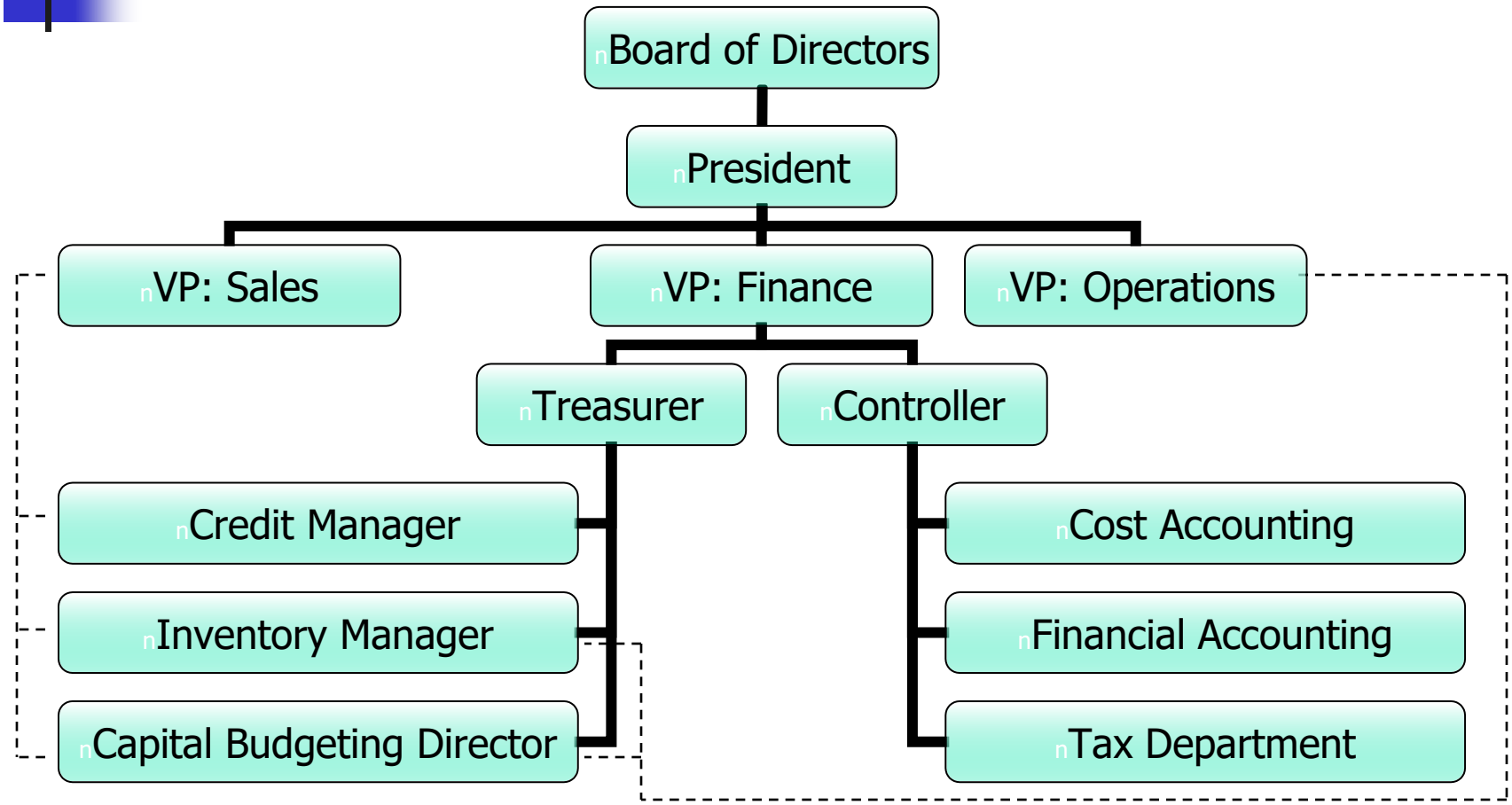
Career Opportunities in Finance

- Money and capital markets
- Investments
- Financial management

Responsibility of the Financial Staff

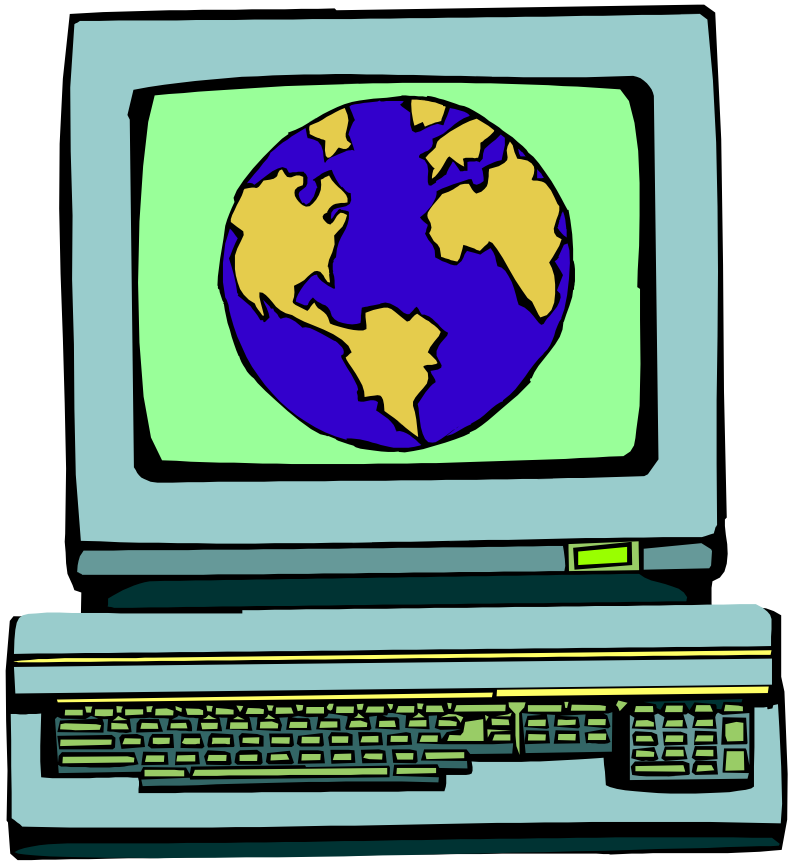
- Maximize stock value by:
  - Forecasting and planning
  - Investment and financing decisions
  - Coordination and control
  - Transactions in the financial markets
  - Managing risk

Role of Finance in a Typical Business Organization



Financial Management Issues of the New Millennium

- The effect of changing technology
- The globalization of business



Percentage of Revenue and Net Income from Overseas Operations for 10 Well-Known Corporations, 2020

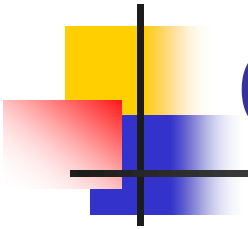
Company	% of Revenue from overseas	% of Net Income from overseas
Coca-Cola	60.8	35.9
Exxon Mobil	69.4	60.2
General Electric	32.6	25.2
General Motors	26.1	60.6
IBM	57.9	48.4
JP Morgan Chase & Co.	35.5	51.7
McDonald's	63.1	61.7
Merck	18.3	58.1
3M	52.9	47.0
Sears, Roebuck	10.5	7.8

Alternative Forms of Business Organization

- Sole proprietorship
- Partnership
- Corporation

Sole proprietorships & Partnerships

- Advantages
  - Ease of formation
  - Subject to few regulations
  - No corporate income taxes
- Disadvantages
  - Difficult to raise capital
  - Unlimited liability
  - Limited life



Corporation

- Advantages
  - Unlimited life
  - Easy transfer of ownership
  - Limited liability
  - Ease of raising capital
- Disadvantages
  - Double taxation
  - Cost of set-up and report filing

Financial Goals of the Corporation

- The primary financial goal is shareholder wealth maximization, which translates to maximizing stock price.
  - Do firms have any responsibilities to society at large?
  - Is stock price maximization good or bad for society?
  - Should firms behave ethically?

Is stock price maximization the same as profit maximization?

- No, despite a generally high correlation amongst stock price, EPS, and cash flow.
- Current stock price relies upon current earnings, as well as future earnings and cash flow.
- Some actions may cause an increase in earnings, yet cause the stock price to decrease (and vice versa).

Agency relationships

- An agency relationship exists whenever a principal hires an agent to act on their behalf.
- Within a corporation, agency relationships exist between:
  - Shareholders and managers
  - Shareholders and creditors

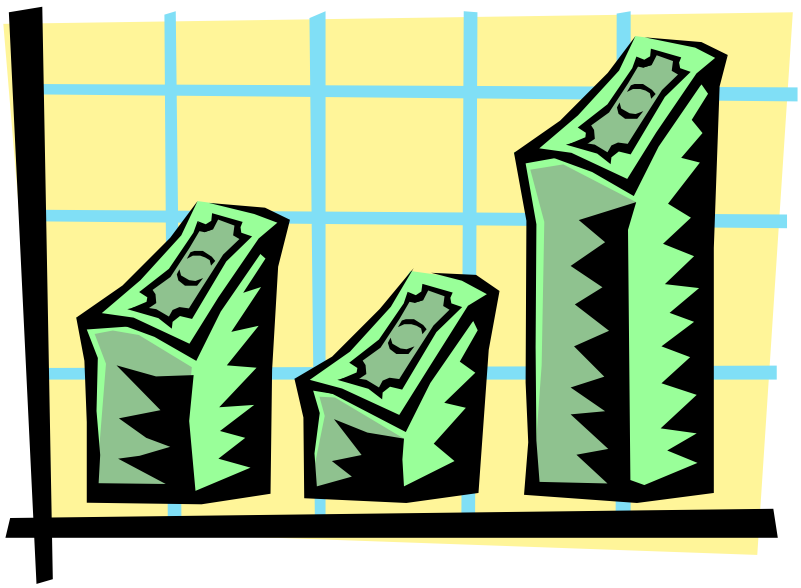
Shareholders versus Managers

- Managers are naturally inclined to act in their own best interests.
- But the following factors affect managerial behavior:
  - Managerial compensation plans
  - Direct intervention by shareholders
  - The threat of firing
  - The threat of takeover

Shareholders versus Creditors

- Shareholders (through managers) could take actions to maximize stock price that are detrimental to creditors.
- In the long run, such actions will raise the cost of debt and ultimately lower stock price.

Factors that affect stock price



- Projected cash flows to shareholders
- Timing of the cash flow stream
- Riskiness of the cash flows

Basic Valuation Model

$$\text{Value} = \frac{CF_1}{(1+k)^1} + \frac{CF_2}{(1+k)^2} + \cdots + \frac{CF_n}{(1+k)^n}$$

$$= \sum_{t=1}^{n} \frac{CF_t}{(1+k)^t}.$$

- To estimate an asset's value, one estimates the cash flow for each period t (CF_t), the life of the asset (n), and the appropriate discount rate (k)
- Throughout the course, we discuss how to estimate the inputs and how financial management is used to improve them and thus maximize a firm's value.

Factors that Affect the Level and Riskiness of Cash Flows

- Decisions made by financial managers:
  - Investment decisions
  - Financing decisions (the relative use of debt financing)
  - Dividend policy decisions
- The external environment

CHAPTER 2
Financial Statements, Cash Flow, and Taxes

- Balance sheet
- Income statement
- Statement of cash flows
- Accounting income vs. cash flow
- MVA and EVA
- Federal tax system

The Annual Report

- Balance sheet – provides a snapshot of a firm's financial position at one point in time.
- Income statement – summarizes a firm's revenues and expenses over a given period of time.
- Statement of retained earnings – shows how much of the firm's earnings were retained, rather than paid out as dividends.
- Statement of cash flows – reports the impact of a firm's activities on cash flows over a given period of time.

Balance Sheet: Assets

	2002	2001
Cash	7,282	57,600
A/R	632,160	351,200
Inventories	1,287,360	715,200
Total CA	1,926,802	1,124,000
Gross FA	1,202,950	491,000
Less: Dep.	263,160	146,200
Net FA	939,790	344,800
Total Assets	2,866,592	1,468,800

Balance sheet: Liabilities and Equity

	2002	2001
Accts payable	524,160	145,600
Notes payable	636,808	200,000
Accruals	489,600	136,000
Total CL	1,650,568	481,600
Long-term debt	723,432	323,432
Common stock	460,000	460,000
Retained earnings	32,592	203,768
Total Equity	492,592	663,768
Total L & E	2,866,592	1,468,800

Income statement

	2015	2016
Sales	6,034,000	3,432,000
COGS/HPP	5,528,000	2,864,000
Other expenses	519,988	358,672
EBITDA	(13,988)	209,328
Depr. & Amort.	116,960	18,900
EBIT	(130,948)	190,428
Interest Exp.	136,012	43,828
EBT	(266,960)	146,600
Taxes	(106,784)	58,640
Net income	(160,176)	87,960

Other data

	2002	2001
No. of shares	100,000	100,000
EPS	-$1.602	$0.88
DPS	$0.11	$0.22
Stock price	$2.25	$8.50
Lease pmts	$40,000	$40,000

Statement of Retained Earnings (2002)

Balance of retained earnings, 12/31/01	$203,768
Add: Net income, 2002	(160,176)
Less: Dividends paid	(11,000)
Balance of retained earnings, 12/31/02	$32,592

Statement of Cash Flows (2002)

OPERATING ACTIVITIES	
Net income	(160,176)
Add (Sources of cash):	
Depreciation	116,960
Increase in A/P	378,560
Increase in accruals	353,600
Subtract (Uses of cash):	
Increase in A/R	(280,960)
Increase in inventories	(572,160)
Net cash provided by ops.	(164,176)

Statement of Cash Flows (2002)

L-T INVESTING ACTIVITIES	
Investment in fixed assets	(711,950)
FINANCING ACTIVITIES	
Increase in notes payable	436,808
Increase in long-term debt	400,000
Payment of cash dividend	(11,000)
Net cash from financing	825,808
NET CHANGE IN CASH	(50,318)
Plus: Cash at beginning of year	57,600
Cash at end of year	7,282

What can you conclude about D'Leon's financial condition from its statement of CFs?

- Net cash from operations = -$164,176, mainly because of negative NI.
- The firm borrowed $825,808 to meet its cash requirements.
- Even after borrowing, the cash account fell by $50,318.

Did the expansion create additional net operating after taxes (NOPAT)?

NOPAT = EBIT (1 – Tax rate)

$NOPAT_{02}$ = -\$130,948(1 – 0.4)
= -\$130,948(0.6)
= -\$78,569

$NOPAT_{01}$ = \$114,257

What effect did the expansion have on net operating working capital?

NOWC = Current assets - Non-interest bearing CL

$NOWC_{02}$ = ($7,282 + $632,160 + $1,287,360)
– ($524,160 + $489,600)
= $913,042

$NOWC_{01}$ = $842,400

What effect did the expansion have on operating capital?

Operating capital = NOWC + Net Fixed Assets

$\text{Operating Capital}_{02}$ = \$913,042 + \$939,790

= \$1,852,832

$\text{Operating Capital}_{01}$ = \$1,187,200

What is your assessment of the expansion's effect on operations?

	2002	2001
Sales	$6,034,000	$3,432,000
NOPAT	-$78,569	$114,257
NOWC	$913,042	$842,400
Operating capital	$1,852,832	$1,187,200
Net Income	-$160,176	$87,960

What effect did the expansion have on net cash flow and operating cash flow?

NCF_{02} = NI + Dep = ($160,176) + $116,960

= -$43,216

NCF_{01} = $87,960 + $18,900 = $106,860

OCF_{02} = NOPAT + Dep

= ($78,569) + $116,960

= $38,391

OCF_{01} = $114,257 + $18,900

= $133,157

What was the free cash flow (FCF) for 2002?

FCF = OCF – Gross capital investment

- OR -

FCF_{02} = NOPAT – Net capital investment

= -$78,569 – ($1,852,832 - $1,187,200)

= -$744,201

Is negative free cash flow always a bad sign?

Economic Value Added (EVA)

EVA = After-tax Operating Income __ After-tax Capital costs

= Funds Available to Investors __ Cost of Capital Used

= NOPAT – After-tax Cost of Capital

EVA Concepts

- In order to generate positive EVA, a firm has to more than just cover operating costs. It must also provide a return to those who have provided the firm with capital.
- EVA takes into account the total cost of capital, which includes the cost of equity.

What is the firm's EVA? Assume the firm's after-tax percentage cost of capital was 10% in 2000 and 13% in 2001.

EVA_{02} = NOPAT – (A-T cost of capital) (Capital)

= -$78,569 – (0.13)($1,852,832)

= -$78,569 - $240,868

= -$319,437

EVA_{01} = $114,257 – (0.10)($1,187,200)

= $114,257 - $118,720

= -$4,463

Did the expansion increase or decrease MVA?

MVA = Market value of equity __ Equity capital supplied

During the last year, the stock price has decreased 73%. As a consequence, the market value of equity has declined, and therefore MVA has declined, as well.

Does D’Leon pay its suppliers on time?

- Probably not.
- A/P increased 260%, over the past year, while sales increased by only 76%.
- If this continues, suppliers may cut off D’Leon’s trade credit.

Does it appear that D’Leon’s sales price exceeds its cost per unit sold?

- NO, the negative NOPAT and decline in cash position shows that D’Leon is spending more on its operations than it is taking in.

What if D'Leon's sales manager decided to offer 60-day credit terms to customers, rather than 30-day credit terms?

- If competitors match terms, and sales remain constant …
  - A/R would ↑
  - Cash would ↓
- If competitors don't match, and sales double …
  - Short-run: Inventory and fixed assets ↑ to meet increased sales. A/R ↑, Cash ↓. Company may have to seek additional financing.
  - Long-run: Collections increase and the company's cash position would improve.

How did D’Leon finance its expansion?

- D’Leon financed its expansion with external capital.
- D’Leon issued long-term debt which reduced its financial strength and flexibility.

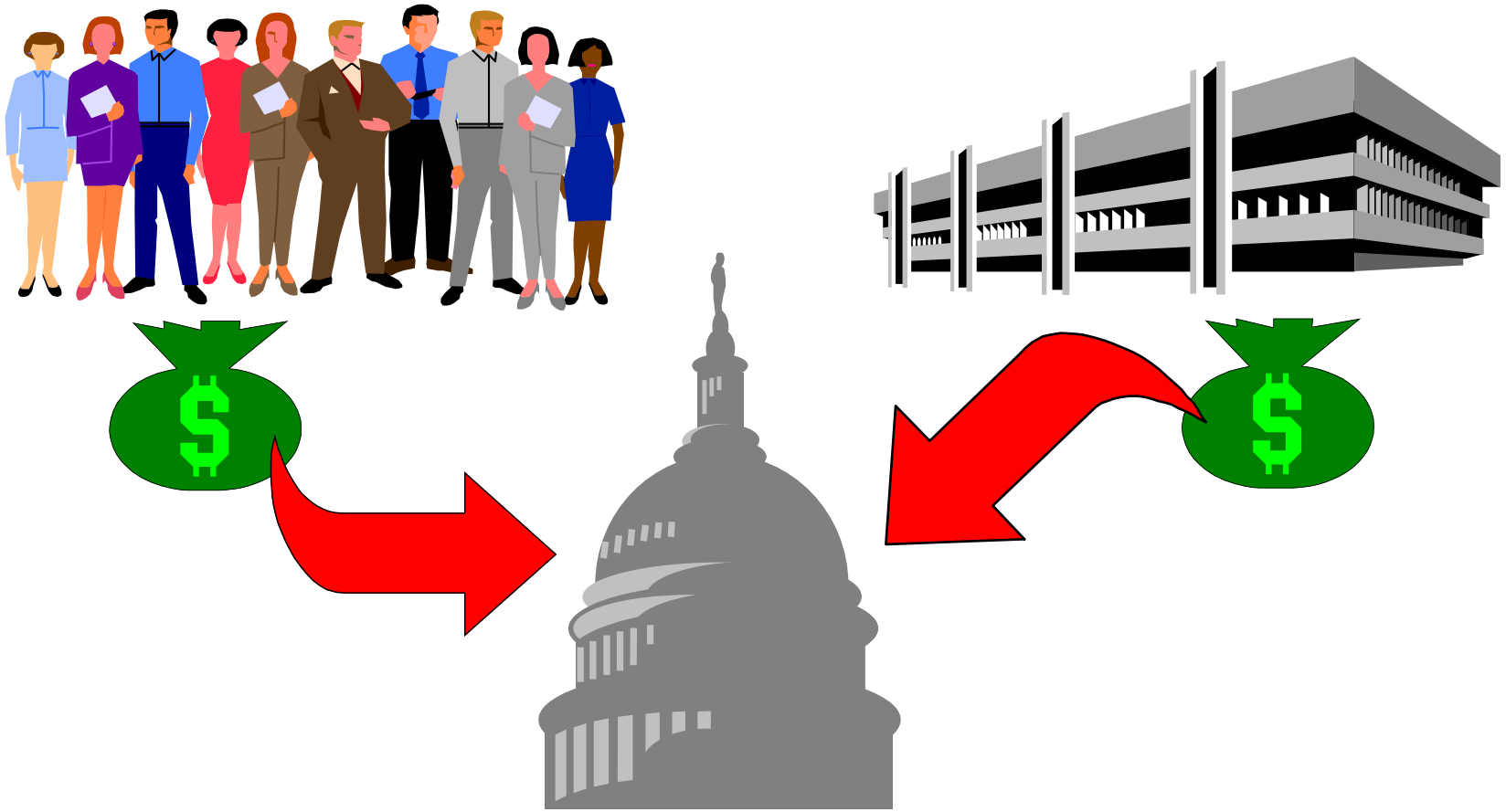
Would D'Leon have required external capital if they had broken even in 2001 (Net Income = 0)?

- YES, the company would still have to finance its increase in assets. Looking to the Statement of Cash Flows, we see that the firm made an investment of $711,950 in net fixed assets. Therefore, they would have needed to raise additional funds.

What happens if D'Leon depreciates fixed assets over 7 years (as opposed to the current 10 years)?

- No effect on physical assets.
- Fixed assets on the balance sheet would decline.
- Net income would decline.
- Tax payments would decline.
- Cash position would improve.

Federal Income Tax System



Corporate and Personal Taxes

- Both have a progressive structure (the higher the income, the higher the marginal tax rate).
- Corporations
  - Rates begin at 15% and rise to 35% for corporations with income over $10 million.
  - Also subject to state tax (around 5%).
- Individuals
  - Rates begin at 10% and rise to 38.6% for individuals with income over $307,050.
  - May be subject to state tax.

Tax treatment of various uses and sources of funds

- Interest paid – tax deductible for corporations (paid out of pre-tax income), but usually not for individuals (interest on home loans being the exception).
- Interest earned – usually fully taxable (an exception being interest from a (muni").
- Dividends paid – paid out of after-tax income.
- Dividends received – taxed as ordinary income for individuals ("double taxation"). A portion of dividends received by corporations is tax excludable, in order to avoid "triple taxation".

More tax issues

- Tax Loss Carry-Back and Carry-Forward – since corporate incomes can fluctuate widely, the tax code allows firms to carry losses back to offset profits in previous years or forward to offset profits in the future.
- Capital gains – defined as the profits from the sale of assets not normally transacted in the normal course of business, capital gains for individuals are generally taxed as ordinary income if held for less than a year, and at the capital gains rate if held for more than a year. Corporations face somewhat different rules.

CHAPTER 3
Analysis of Financial Statements

- Ratio Analysis
- Du Pont system
- Effects of improving ratios
- Limitations of ratio analysis
- Qualitative factors

Balance Sheet: Assets

	2023E	2022
Cash	85,632	7,282
A/R	878,000	632,160
Inventories	1,716,480	1,287,360
Total CA	2,680,112	1,926,802
Gross FA	1,197,160	1,202,950
Less: Dep.	380,120	263,160
Net FA	817,040	939,790
Total Assets	3,497,152	2,866,592

Balance sheet: Liabilities and Equity

	2023E	2022
Accts payable	436,800	524,160
Notes payable	300,000	636,808
Accruals	408,000	489,600
Total CL	1,144,800	1,650,568
Long-term debt	400,000	723,432
Common stock	1,721,176	460,000
Retained earnings	231,176	32,592
Total Equity	1,952,352	492,592
Total L & E	3,497,152	2,866,592

Income statement

	2023E	2022
Sales	7,035,600	6,034,000
COGS	5,875,992	5,528,000
Other expenses	550,000	519,988
EBITDA	609,608	(13,988)
Depr. & Amort.	116,960	116,960
EBIT	492,648	(130,948)
Interest Exp.	70,008	136,012
EBT	422,640	(266,960)
Taxes	169,056	(106,784)
Net income	253,584	(160,176)

Other data

	2023E	2022
No. of shares	250,000	100,000
EPS	$1.014	-$1.602
DPS	$0.220	$0.110
Stock price	$12.17	$2.25
Lease pmts	$40,000	$40,000

Why are ratios useful?

- Ratios standardize numbers and facilitate comparisons.
- Ratios are used to highlight weaknesses and strengths.

What are the five major categories of ratios, and what questions do they answer?

- Liquidity: Can we make required payments?
- Asset management: right amount of assets vs. sales?
- Debt management: Right mix of debt and equity?
- Profitability: Do sales prices exceed unit costs, and are sales high enough as reflected in PM, ROE, and ROA?
- Market value: Do investors like what they see as reflected in P/E and M/B ratios?

Calculate D'Leon's forecasted current ratio for 2023.

Current ratio = Current assets / Current liabilities
= $2,680 / $1,145
= 2.34x

Comments on current ratio

	2023	2022	2021	Ind.
Current ratio	2.34x	1.20x	2.30x	2.70x

- Expected to improve but still below the industry average.
- Liquidity position is weak.

What is the inventory turnover vs. the industry average?

Inv. turnover = Sales / Inventories
= $7,036 / $1,716
= 4.10x

	2023	2022	2021	Ind.
Inventory Turnover	4.1x	4.70x	4.8x	6.1x

Comments on Inventory Turnover

- Inventory turnover is below industry average.
- D'Leon might have old inventory, or its control might be poor.
- No improvement is currently forecasted.

DSO is the average number of days after making a sale before receiving cash.

DSO = Receivables / Average sales per day

= Receivables / Sales/365

= $878 / ($7,036/365)

= 45.6

Appraisal of DSO

	2023	2022	2021	Ind.
DSO	45.6	38.2	37.4	32.0

- D'Leon collects on sales too slowly, and is getting worse.
- D'Leon has a poor credit policy.

Fixed asset and total asset turnover ratios vs. the industry average

FA turnover = Sales / Net fixed assets

= $7,036 / $817 = 8.61x

TA turnover = Sales / Total assets

= $7,036 / $3,497 = 2.01x

Evaluating the FA turnover and TA turnover ratios

	2023	2022	2021	Ind.
FA TO	8.6x	6.4x	10.0x	7.0x
TA TO	2.0x	2.1x	2.3x	2.6x

- FA turnover projected to exceed the industry average.
- TA turnover below the industry average. Caused by excessive currents assets (A/R and Inv).

Calculate the debt ratio, TIE, and EBITDA coverage ratios.

Debt ratio = Total debt / Total assets

= ($1,145 + $400) / $3,497 = 44.2%

TIE = EBIT / Interest expense

= $492.6 / $70 = 7.0x

Calculate the debt ratio, TIE, and EBITDA coverage ratios.

$$\text{EBITDA coverage} = \frac{\text{(EBITDA+Lease pmts)}}{\text{Int exp + Lease pmts + Principal pmts}}$$

$$= \frac{\$609.6 + \$40}{\$70 + \$40 + \$0}$$

$$= 5.9x$$

How do the debt management ratios compare with industry averages?

	2023	2022	2021	Ind.
D/A	44.2%	82.8%	54.8%	50.0%
TIE	7.0x	-1.0x	4.3x	6.2x
EBITDA coverage	5.9x	0.1x	3.0x	8.0x

- D/A and TIE are better than the industry average, but EBITDA coverage still trails the industry.

Profitability ratios: Profit margin and Basic earning power

Profit margin = Net income / Sales

= $253.6 / $7,036 = 3.6%

BEP = EBIT / Total assets

= $492.6 / $3,497 = 14.1%

Appraising profitability with the profit margin and basic earning power

	2023	2022	2021	Ind.
PM	3.6%	-2.7%	2.6%	3.5%
BEP	14.1%	-4.6%	13.0%	19.1%

- Profit margin was very bad in 2002, but is projected to exceed the industry average in 2003. Looking good.
- BEP removes the effects of taxes and financial leverage, and is useful for comparison.
- BEP projected to improve, yet still below the industry average. There is definitely room for improvement.

Profitability ratios:
Return on assets and Return on equity

ROA = Net income / Total assets

= $253.6 / $3,497 = 7.3%

ROE = Net income / Total common equity

= $253.6 / $1,952 = 13.0%

Appraising profitability with the return on assets and return on equity

	2023	2022	2021	Ind.
ROA	7.3%	-5.6%	6.0%	9.1%
ROE	13.0%	-32.5%	13.3%	18.2%

- Both ratios rebounded from the previous year, but are still below the industry average. More improvement is needed.
- Wide variations in ROE illustrate the effect that leverage can have on profitability.

Effects of debt on ROA and ROE

- ROA is lowered by debt--interest lowers NI, which also lowers ROA = NI/Assets.
- But use of debt also lowers equity, hence debt could raise ROE = NI/Equity.

Problems with ROE

- ROE and shareholder wealth are correlated, but problems can arise when ROE is the sole measure of performance.
  - ROE does not consider risk.
  - ROE does not consider the amount of capital invested.
  - Might encourage managers to make investment decisions that do not benefit shareholders.
- ROE focuses only on return. A better measure is one that considers both risk and return.

Calculate the Price/Earnings, Price/Cash flow, and Market/Book ratios.

P/E = Price / Earnings per share

= $12.17 / $1.014 = 12.0x

P/CF = Price / Cash flow per share

= $12.17 / [($253.6 + $117.0) ÷ 250]

= 8.21x

Calculate the Price/Earnings, Price/Cash flow, and Market/Book ratios.

M/B = Mkt price per share / Book value per share

= $12.17 / ($1,952 / 250) = 1.56x

	2003	2002	2001	Ind.
P/E	12.0x	-1.4x	9.7x	14.2x
P/CF	8.21x	-5.2x	8.0x	11.0x
M/B	1.56x	0.5x	1.3x	2.4x

Analyzing the market value ratios

- P/E: How much investors are willing to pay for $1 of earnings.
- P/CF: How much investors are willing to pay for $1 of cash flow.
- M/B: How much investors are willing to pay for $1 of book value equity.
- For each ratio, the higher the number, the better.
- P/E and M/B are high if ROE is high and risk is low.

Extended DuPont equation: Breaking down Return on equity

ROE = (Profit margin) x (TA turnover) x (Equity multiplier)

= 3.6% x 2 x 1.8

= 13.0%

	PM	TA TO	EM	**ROE**
2001	2.6%	2.3	2.2	**13.3%**
2002	-2.7%	2.1	5.8	**-32.5%**
2003E	3.6%	2.0	1.8	**13.0%**
Ind.	3.5%	2.6	2.0	**18.2%**

The Du Pont system

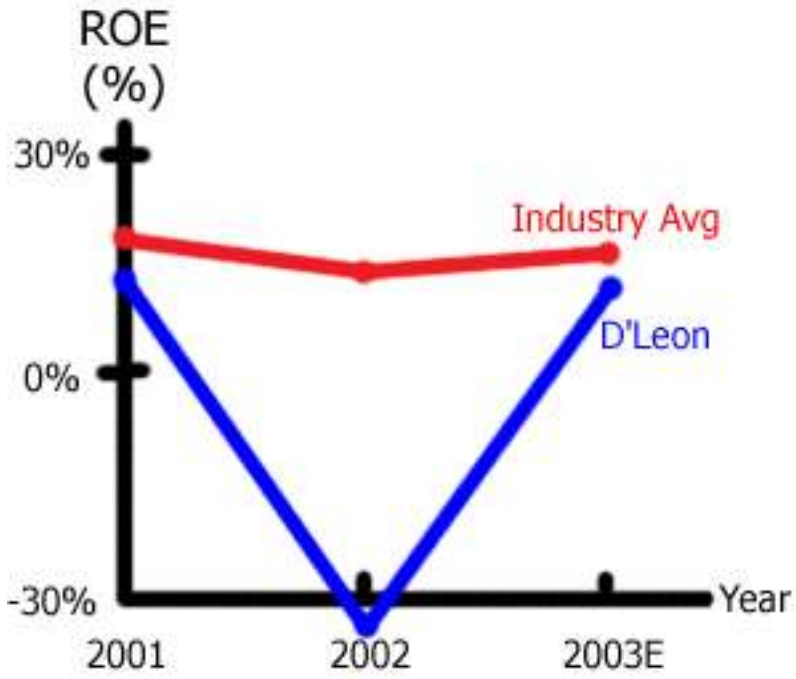
Also can be expressed as:

ROE = (NI/Sales) x (Sales/TA) x (TA/Equity)

- Focuses on:
  - Expense control (PM)
  - Asset utilization (TATO)
  - Debt utilization (Eq. Mult.)
- Shows how these factors combine to determine ROE.

Trend analysis

- Analyzes a firm's financial ratios over time
- Can be used to estimate the likelihood of improvement or deterioration in financial condition.



An example:
The effects of improving ratios

A/R	878	Debt	1,545	Other CA	1,802
	Equity	1,952			
Net FA	817				
TA	3,497	Total L&E	3,497		

Sales / day = $7,035,600 / 365 = $19,275.62

How would reducing the firm's DSO to 32 days affect the company?

Reducing accounts receivable and the days sales outstanding

- Reducing A/R will have no effect on sales

Old A/R = $19,275.62 x 45.6 = $878,000

New A/R = $19,275.62 x 32.0 = $616,820

Cash freed up: $261,180

Initially shows up as addition to cash.

Effect of reducing receivables on balance sheet and stock price

Added cash	$261	Debt	1,545
A/R	617	Equity	1,952
Other CA	1,802		
Net FA	817		
Total Assets	3,497	Total L&E	3,497

What could be done with the new cash?

How might stock price and risk be affected?

Potential uses of freed up cash

- Repurchase stock
- Expand business
- Reduce debt
- All these actions would likely improve the stock price.

Potential problems and limitations of financial ratio analysis

- Comparison with industry averages is difficult for a conglomerate firm that operates in many different divisions.
- “Average” performance is not necessarily good, perhaps the firm should aim higher.
- Seasonal factors can distort ratios.
- “Window dressing” techniques can make statements and ratios look better.

More issues regarding ratios

- Different operating and accounting practices can distort comparisons.
- Sometimes it is hard to tell if a ratio is “good” or “bad”.
- Difficult to tell whether a company is, on balance, in strong or weak position.

Qualitative factors to be considered when evaluating a company's future financial performance

- Are the firm's revenues tied to 1 key customer, product, or supplier?
- What percentage of the firm's business is generated overseas?
- Competition
- Future prospects
- Legal and regulatory environment

CHAPTER 4
The Financial Environment:
Markets, Institutions, and Interest Rates

- Financial markets
- Types of financial institutions
- Determinants of interest rates
- Yield curves

What is a market?

- A market is a venue where goods and services are exchanged.
- A financial market is a place where individuals and organizations wanting to borrow funds are brought together with those having a surplus of funds.

Types of financial markets

- Physical assets vs. Financial assets
- Money vs. Capital
- Primary vs. Secondary
- Spot vs. Futures
- Public vs. Private

How is capital transferred between savers and borrowers?

- Direct transfers
- Investment banking house
- Financial intermediaries

Types of financial intermediaries

- Commercial banks
- Savings and loan associations
- Mutual savings banks
- Credit unions
- Pension funds
- Life insurance companies
- Mutual funds

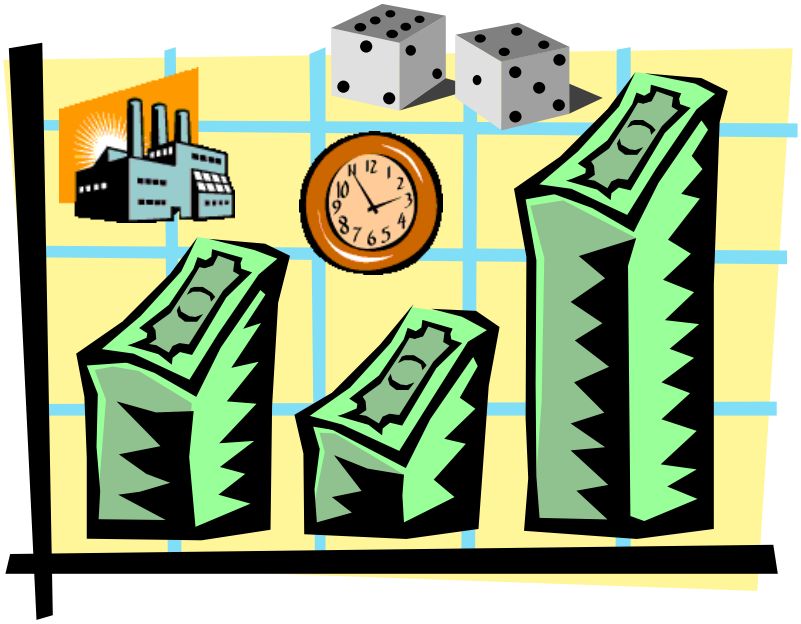
Physical location stock exchanges vs. Electronic dealer-based markets

- Auction market vs. Dealer market (Exchanges vs. OTC)
- NYSE vs. Nasdaq
- Differences are narrowing

The cost of money

- The price, or cost, of debt capital is the interest rate.
- The price, or cost, of equity capital is the required return. The required return investors expect is composed of compensation in the form of dividends and capital gains.

What four factors affect the cost of money?



- Production opportunities
- Time preferences for consumption
- Risk
- Expected inflation

“Nominal” vs. “Real” rates

k = represents any nominal rate

k* = represents the “real” risk-free rate of interest. Like a T-bill rate, if there was no inflation. Typically ranges from 1% to 4% per year.

k_{RF} = represents the rate of interest on Treasury securities.

Determinants of interest rates

$$k = k^* + IP + DRP + LP + MRP$$

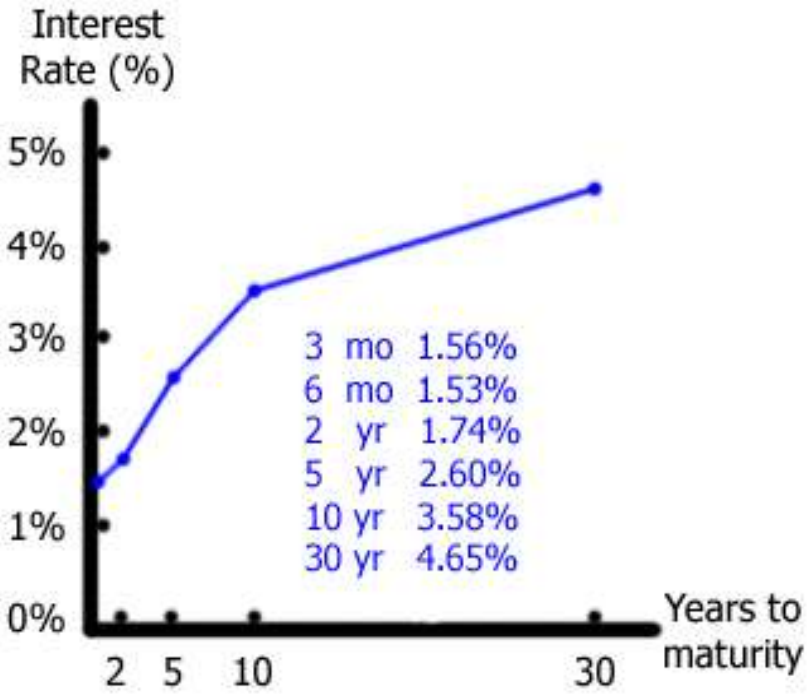
k	=	required return on a debt security
k*	=	real risk-free rate of interest
IP	=	inflation premium
DRP	=	default risk premium
LP	=	liquidity premium
MRP	=	maturity risk premium

Premiums added to k* for different types of debt

	IP	MRP	DRP	LP
S-T Treasury	✓			
L-T Treasury	✓	✓		
S-T Corporate	✓		✓	✓
L-T Corporate	✓	✓	✓	✓

Yield curve and the term structure of interest rates

- Term structure – relationship between interest rates (or yields) and maturities.
- The yield curve is a graph of the term structure.
- A Treasury yield curve from October 2002 can be viewed at the right.



Constructing the yield curve: Inflation

- Step 1 – Find the average expected inflation rate over years 1 to n:

$$IP_n = \frac{\sum_{t=1}^{n} INFL_t}{n}$$

Constructing the yield curve: Inflation

Suppose, that inflation is expected to be 5% next year, 6% the following year, and 8% thereafter.

$IP_1 = 5\% / 1 = 5.00\%$

$IP_{10} = [5\% + 6\% + 8\%(8)] / 10 = 7.50\%$

$IP_{20} = [5\% + 6\% + 8\%(18)] / 20 = 7.75\%$

Must earn these IPs to break even vs. inflation; these IPs would permit you to earn k* (before taxes).

Constructing the yield curve: Inflation

- Step 2 – Find the appropriate maturity risk premium (MRP). For this example, the following equation will be used find a security's appropriate maturity risk premium.

$$MRP_t = 0.1\%\,(t - 1)$$

Constructing the yield curve: Maturity Risk

Using the given equation:

$MRP_1 = 0.1\% \times (1-1) = 0.0\%$

$MRP_{10} = 0.1\% \times (10-1) = 0.9\%$

$MRP_{20} = 0.1\% \times (20-1) = 1.9\%$

Notice that since the equation is linear, the maturity risk premium is increasing in the time to maturity, as it should be.

Add the IPs and MRPs to k* to find the appropriate nominal rates

Step 3 – Adding the premiums to k*.

$k_{RF,\,t} = k^* + IP_t + MRP_t$

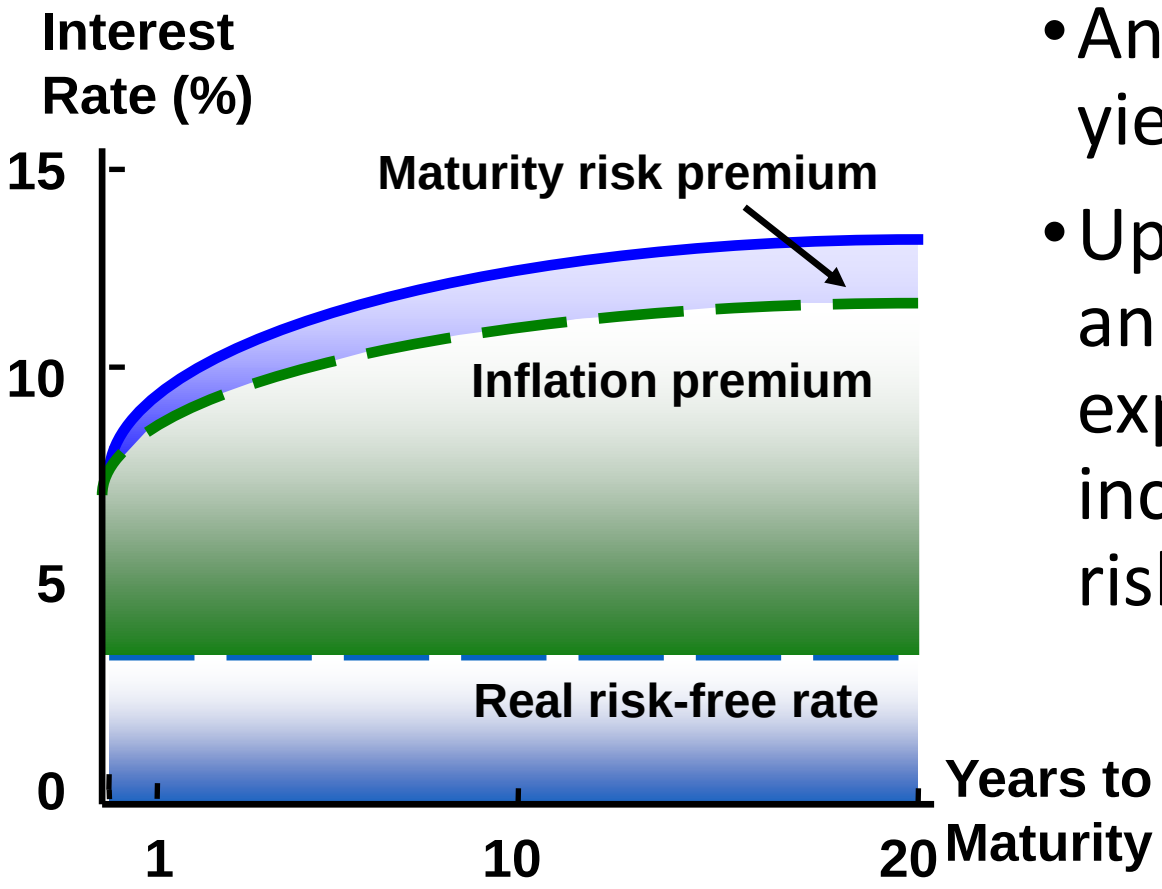
Assume k* = 3%,

$k_{RF,\,1}$ = 3% + 5.0% + 0.0% = 8.0%

$k_{RF,\,10}$ = 3% + 7.5% + 0.9% = 11.4%

$k_{RF,\,20}$ = 3% + 7.75% + 1.9% = 12.65%

Hypothetical yield curve

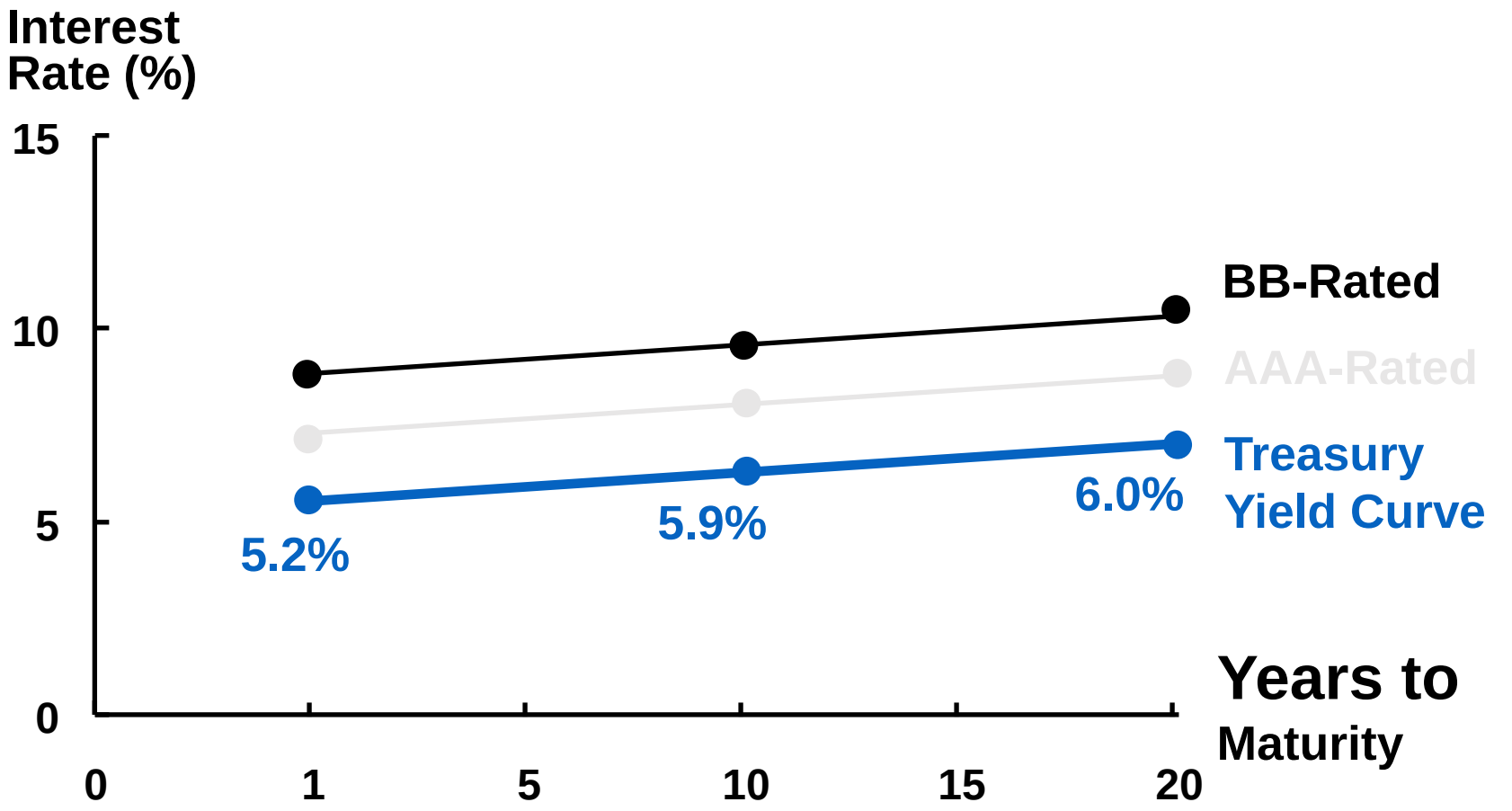


- An upward sloping yield curve.
- Upward slope due to an increase in expected inflation and increasing maturity risk premium.

What is the relationship between the Treasury yield curve and the yield curves for corporate issues?

- Corporate yield curves are higher than that of Treasury securities, though not necessarily parallel to the Treasury curve.
- The spread between corporate and Treasury yield curves widens as the corporate bond rating decreases.

Illustrating the relationship between corporate and Treasury yield curves



Pure Expectations Hypothesis

- The PEH contends that the shape of the yield curve depends on investor's expectations about future interest rates.
- If interest rates are expected to increase, L-T rates will be higher than S-T rates, and vice-versa. Thus, the yield curve can slope up, down, or even bow.

Assumptions of the PEH

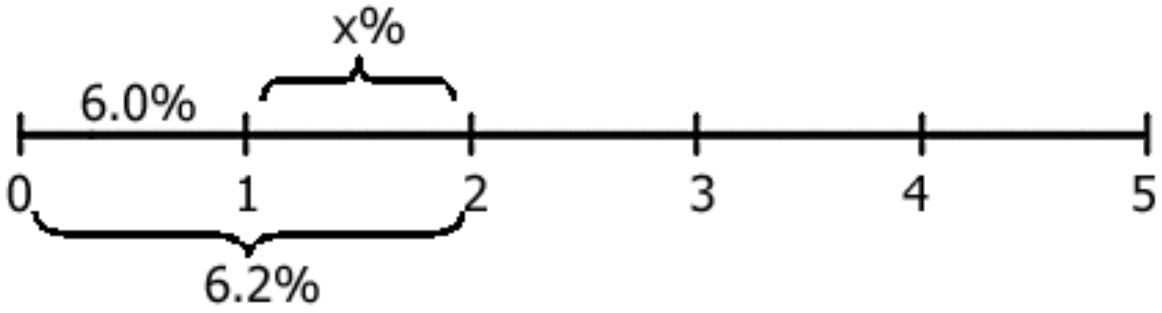
- Assumes that the maturity risk premium for Treasury securities is zero.
- Long-term rates are an average of current and future short-term rates.
- If PEH is correct, you can use the yield curve to “back out” expected future interest rates.

An example:
Observed Treasury rates and the PEH

Maturity	Yield
1 year	6.0%
2 years	6.2%
3 years	6.4%
4 years	6.5%
5 years	6.5%

If PEH holds, what does the market expect will be the interest rate on one-year securities, one year from now? Three-year securities, two years from now?

One-year forward rate



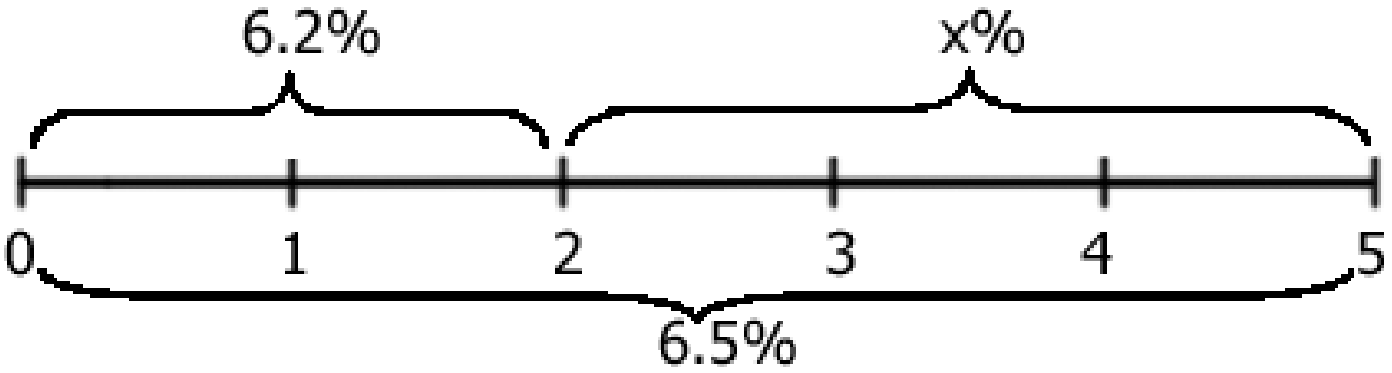
6.2% = (6.0% + x%) / 2

12.4% = 6.0% + x%

6.4% = x%

PEH says that one-year securities will yield 6.4%, one year from now.

Three-year security, two years from now



6.5% = [2(6.2%) + 3(x%) / 5

32.5% = 12.4% + 3(x%)

6.7% = x%

PEH says that one-year securities will yield 6.7%, one year from now.

Conclusions about PEH

- Some would argue that the MRP ≠ 0, and hence the PEH is incorrect.
- Most evidence supports the general view that lenders prefer S-T securities, and view L-T securities as riskier.
- Thus, investors demand a MRP to get them to hold L-T securities (i.e., MRP > 0).

Other factors that influence interest rate levels

- Federal reserve policy
- Federal budget surplus or deficit
- Level of business activity
- International factors

Risks associated with investing overseas

- Exchange rate risk – If an investment is denominated in a currency other than U.S. dollars, the investment's value will depend on what happens to exchange rates.
- Country risk – Arises from investing or doing business in a particular country and depends on the country's economic, political, and social environment.

Factors that cause exchange rates to fluctuate

- Changes in relative inflation
- Changes in country risk

CHAPTER 5

Risk and Rates of Return

- Stand-alone risk
- Portfolio risk
- Risk & return: CAPM / SML

Investment returns

The rate of return on an investment can be calculated as follows:

$$\text{Return} = \frac{\text{(Amount received – Amount invested)}}{\text{Amount invested}}$$

For example, if $1,000 is invested and $1,100 is returned after one year, the rate of return for this investment is:

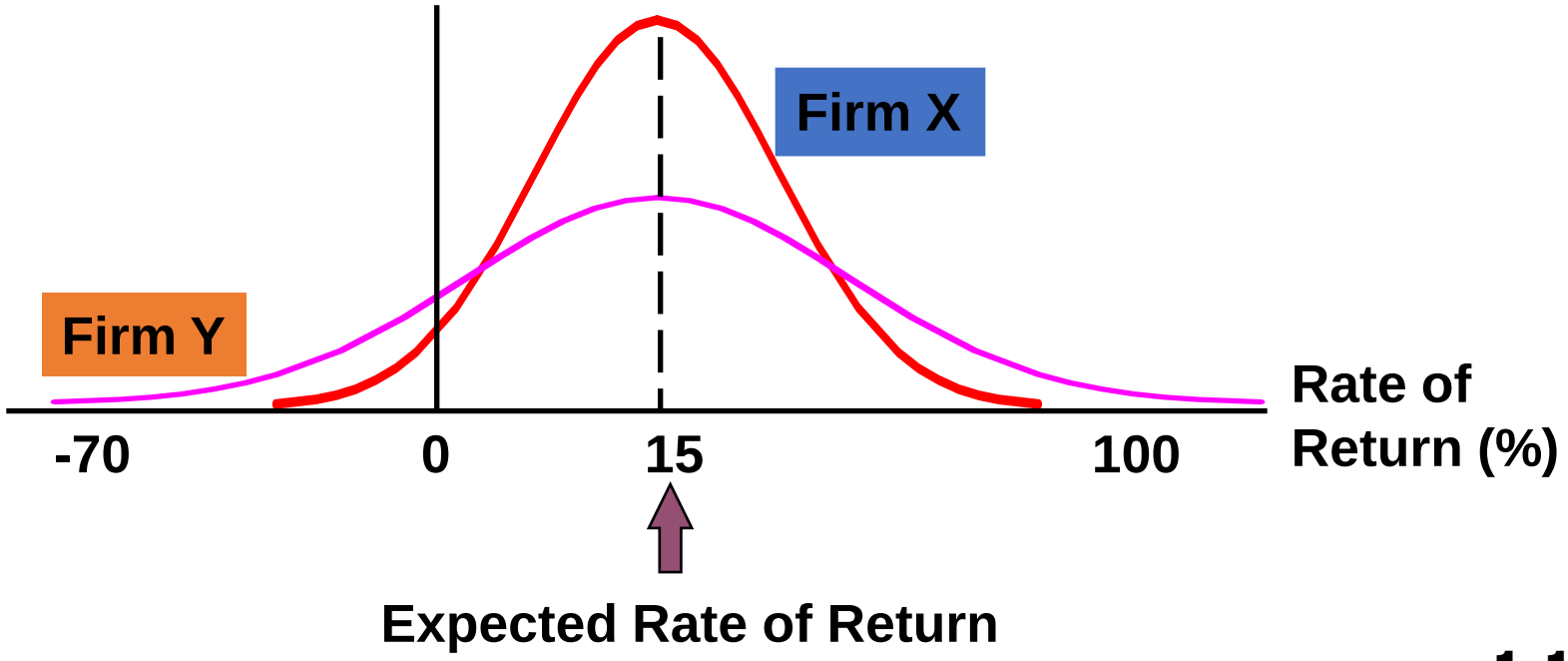
($1,100 - $1,000) / $1,000 = 10%.

What is investment risk?

- Two types of investment risk
  - Stand-alone risk
  - Portfolio risk
- Investment risk is related to the probability of earning a low or negative actual return.
- The greater the chance of lower than expected or negative returns, the riskier the investment.

Probability distributions

- A listing of all possible outcomes, and the probability of each occurrence.
- Can be shown graphically.



Selected Realized Returns, 1926 – 2001

	Average Return	Standard Deviation
Small-company stocks	17.3%	33.2%
Large-company stocks	12.7	20.2
L-T corporate bonds	6.1	8.6
L-T government bonds	5.7	9.4
U.S. Treasury bills	3.9	3.2

Source: Based on *Stocks, Bonds, Bills, and Inflation: (Valuation Edition) 2002 Yearbook* (Chicago: Ibbotson Associates, 2002), 28.

Investment alternatives

Economy	Prob.	T-Bill	HT	Coll	USR	MP
Recession	0.1	8.0%	-22.0%	28.0%	10.0%	-13.0%
Below avg	0.2	8.0%	-2.0%	14.7%	-10.0%	1.0%
Average	0.4	8.0%	20.0%	0.0%	7.0%	15.0%
Above avg	0.2	8.0%	35.0%	-10.0%	45.0%	29.0%
Boom	0.1	8.0%	50.0%	-20.0%	30.0%	43.0%

Why is the T-bill return independent of the economy? Do T-bills promise a completely risk-free return?

T-bills will return the promised 8%, regardless of the economy.

No, T-bills do not provide a risk-free return, as they are still exposed to inflation. Although, very little unexpected inflation is likely to occur over such a short period of time.

T-bills are also risky in terms of reinvestment rate risk.

T-bills are risk-free in the default sense of the word.

How do the returns of HT and Coll. behave in relation to the market?

- HT – Moves with the economy, and has a positive correlation. This is typical.
- Coll. – Is countercyclical with the economy, and has a negative correlation. This is unusual.

Return: Calculating the expected return for each alternative

$$\hat{k} = \text{expected rate of return}$$

$$\hat{k} = \sum_{i=1}^{n} k_i P_i$$

$$\hat{k}_{HT} = (-22.\%)(0.1) + (-2\%)(0.2) + (20\%)(0.4) + (35\%)(0.2) + (50\%)(0.1) = 17.4\%$$

Summary of expected returns for all alternatives

	Exp return
HT	17.4%
Market	15.0%
USR	13.8%
T-bill	8.0%
Coll.	1.7%

HT has the highest expected return, and appears to be the best investment alternative, but is it really? Have we failed to account for risk?

Risk: Calculating the standard deviation for each alternative

$$\sigma = \text{Standard deviation}$$

$$\sigma = \sqrt{\text{Variance}} = \sqrt{\sigma^2}$$

$$\sigma = \sqrt{\sum_{i=1}^{n} (k_i - \hat{k})^2 P_i}$$

Standard deviation calculation

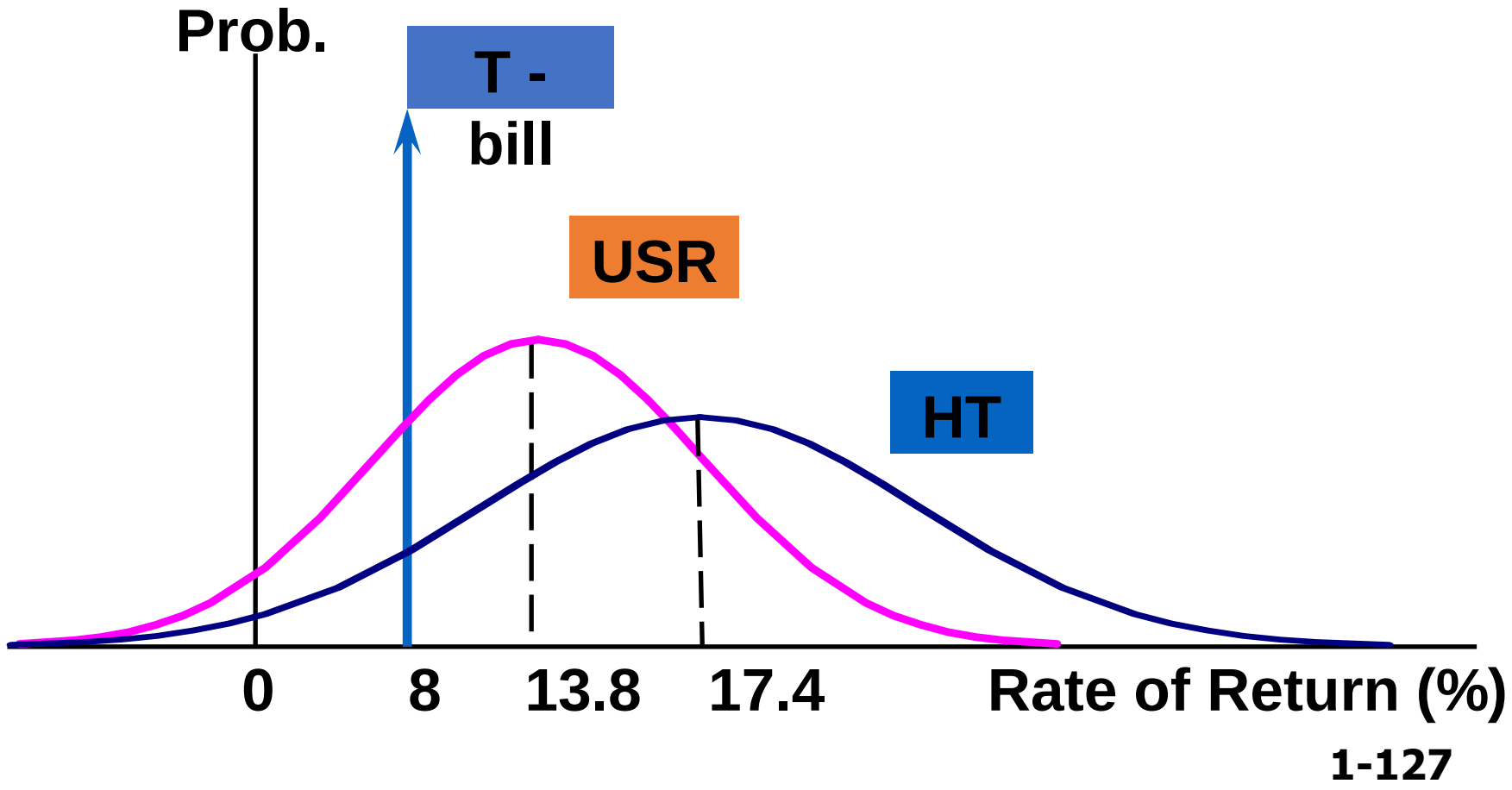
$$\sigma = \sqrt{\sum_{i=1}^{n} (k_i - \hat{k})^2 P_i}$$

$$\sigma_{T-bills} = \left[\begin{array}{l} (8.0 - 8.0)^2(0.1) + (8.0 - 8.0)^2(0.2) \\ + (8.0 - 8.0)^2(0.4) + (8.0 - 8.0)^2(0.2) \\ + (8.0 - 8.0)^2(0.1) \end{array} \right]^{1/2}$$

$$\sigma_{T-bills} = 0.0\%$$
$$\sigma_{HT} = 20.0\%$$

$$\sigma_{Coll} = 13.4\%$$
$$\sigma_{USR} = 18.8\%$$
$$\sigma_{M} = 15.3\%$$

Comparing standard deviations



Comments on standard deviation as a measure of risk

- Standard deviation (σ_i) measures total, or stand-alone, risk.
- The larger σ_i is, the lower the probability that actual returns will be closer to expected returns.
- Larger σ_i is associated with a wider probability distribution of returns.
- Difficult to compare standard deviations, because return has not been accounted for.

Comparing risk and return

Security	Expected return	Risk, σ
T-bills	**8.0%**	**0.0%**
HT	**17.4%**	**20.0%**
Coll*	**1.7%**	**13.4%**
USR*	**13.8%**	**18.8%**
Market	**15.0%**	**15.3%**

* Seem out of place.

Coefficient of Variation (CV)

A standardized measure of dispersion about the expected value, that shows the risk per unit of return.

$$CV = \frac{\text{Std dev}}{\text{Mean}} = \frac{\sigma}{\hat{k}}$$

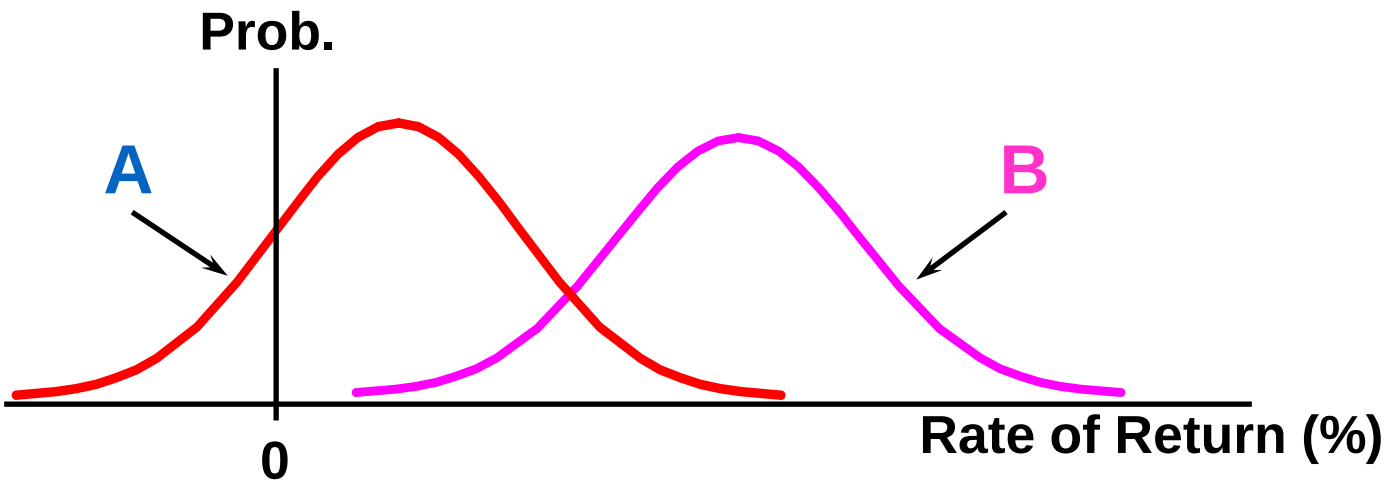
Risk rankings, by coefficient of variation

	CV
T-bill	0.000
HT	1.149
Coll.	7.882
USR	1.362
Market	1.020

Collections has the highest degree of risk per unit of return.

HT, despite having the highest standard deviation of returns, has a relatively average CV.

Illustrating the CV as a measure of relative risk



$\sigma_A = \sigma_B$, but A is riskier because of a larger probability of losses. In other words, the same amount of risk (as measured by σ) for less returns.

Investor attitude towards risk

- Risk aversion – assumes investors dislike risk and require higher rates of return to encourage them to hold riskier securities.
- Risk premium – the difference between the return on a risky asset and less risky asset, which serves as compensation for investors to hold riskier securities.

Portfolio construction: Risk and return

Assume a two-stock portfolio is created with $50,000 invested in both HT and Collections.

- Expected return of a portfolio is a weighted average of each of the component assets of the portfolio.
- Standard deviation is a little more tricky and requires that a new probability distribution for the portfolio returns be devised.

Calculating portfolio expected return

$\hat{k}_p$ is a weighted average:

$$\hat{k}_p = \sum_{i=1}^{n} w_i \hat{k}_i$$

$$\hat{k}_p = 0.5\,(17.4\%) + 0.5\,(1.7\%) = 9.6\%$$

An alternative method for determining portfolio expected return

Economy	Prob.	HT	Coll	**Port.**
Recession	0.1	-22.0%	28.0%	**3.0%**
Below avg	0.2	-2.0%	14.7%	**6.4%**
Average	0.4	20.0%	0.0%	**10.0%**
Above avg	0.2	35.0%	-10.0%	**12.5%**
Boom	0.1	50.0%	-20.0%	**15.0%**

$$\hat{k}_p = 0.10\,(3.0\%) + 0.20\,(6.4\%) + 0.40\,(10.0\%) + 0.20\,(12.5\%) + 0.10\,(15.0\%) = 9.6\%$$

Calculating portfolio standard deviation and CV

$$\sigma_p = \left[\begin{array}{l} 0.10\,(3.0 - 9.6)^2 \\ +\,0.20\,(6.4 - 9.6)^2 \\ +\,0.40\,(10.0 - 9.6)^2 \\ +\,0.20\,(12.5 - 9.6)^2 \\ +\,0.10\,(15.0 - 9.6)^2 \end{array} \right]^{1/2} = 3.3\%$$

$$CV_p = \frac{3.3\%}{9.6\%} = 0.34$$

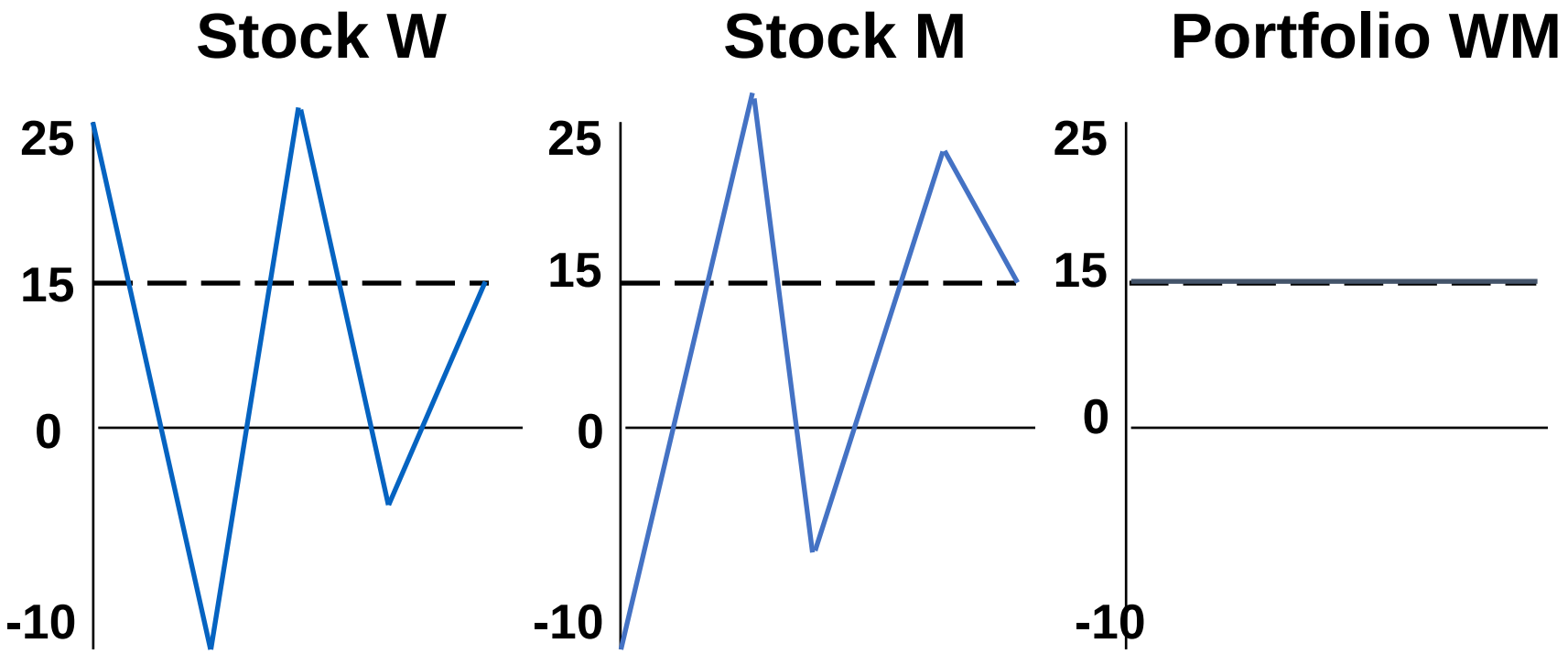
Comments on portfolio risk measures

- σ_p = 3.3% is much lower than the σ_i of either stock (σ_{HT} = 20.0%; $\sigma_{Coll.}$ = 13.4%).
- σ_p = 3.3% is lower than the weighted average of HT and Coll.'s σ (16.7%).
- ∴ Portfolio provides average return of component stocks, but lower than average risk.
- Why? Negative correlation between stocks.

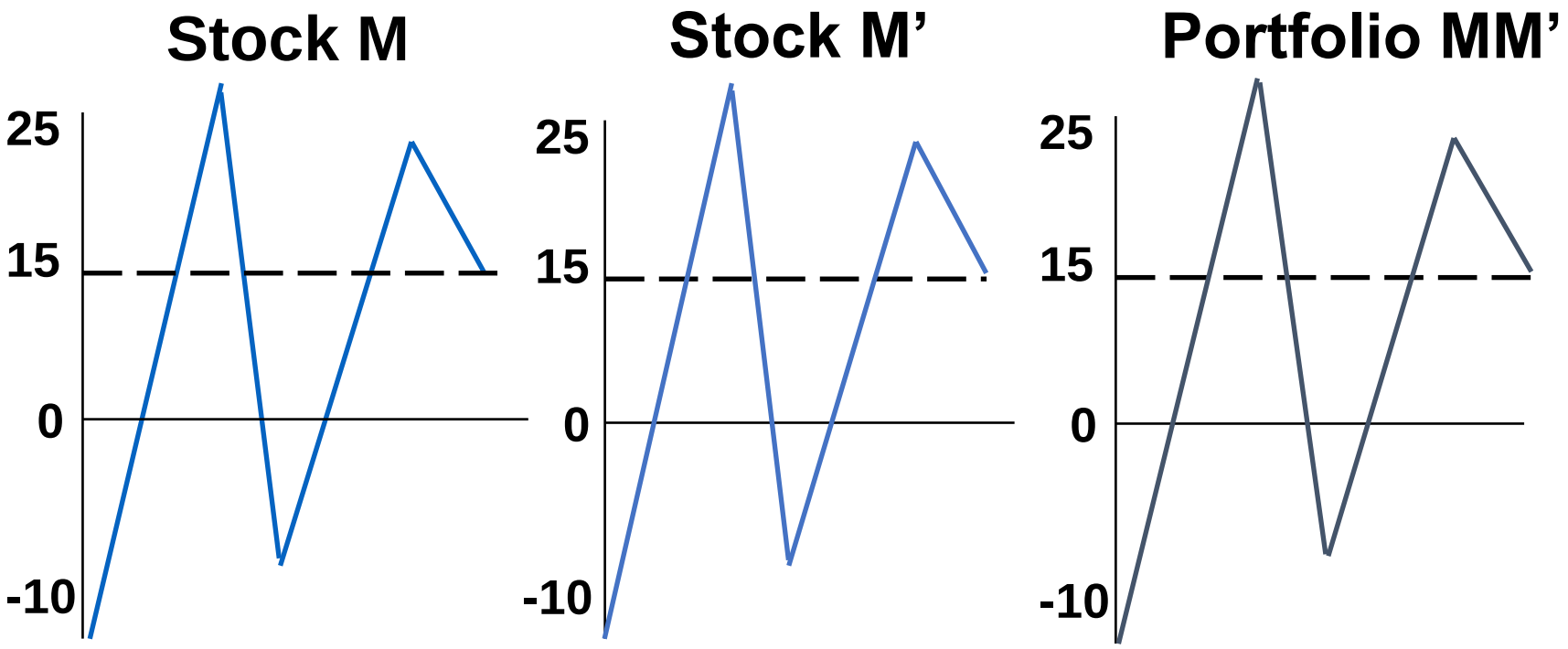
General comments about risk

- Most stocks are positively correlated with the market ($\rho_{k,m} \approx 0.65$).
- $\sigma \approx 35\%$ for an average stock.
- Combining stocks in a portfolio generally lowers risk.

Returns distribution for two perfectly negatively correlated stocks (ρ = -1.0)



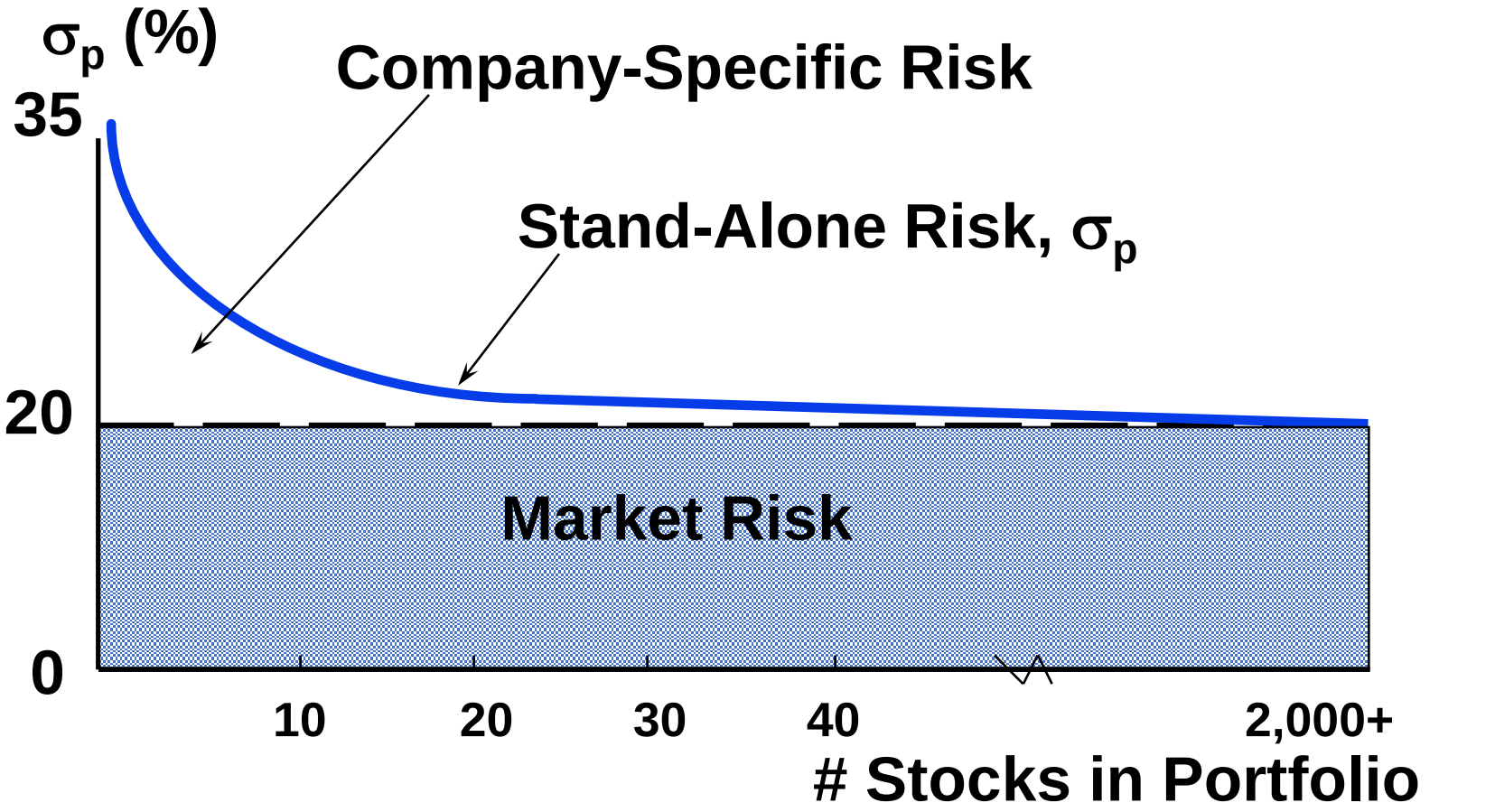
Returns distribution for two perfectly positively correlated stocks (ρ = 1.0)



Creating a portfolio: Beginning with one stock and adding randomly selected stocks to portfolio

- σ_p decreases as stocks added, because they would not be perfectly correlated with the existing portfolio.
- Expected return of the portfolio would remain relatively constant.
- Eventually the diversification benefits of adding more stocks dissipates (after about 10 stocks), and for large stock portfolios, σ_p tends to converge to $\approx$ 20%.

Illustrating diversification effects of a stock portfolio



Breaking down sources of risk

Stand-alone risk = Market risk + Firm-specific risk

- Market risk – portion of a security's stand-alone risk that cannot be eliminated through diversification. Measured by beta.
- Firm-specific risk – portion of a security's stand-alone risk that can be eliminated through proper diversification.

Failure to diversify

- If an investor chooses to hold a one-stock portfolio (exposed to more risk than a diversified investor), would the investor be compensated for the risk they bear?
  - NO!
  - Stand-alone risk is not important to a well-diversified investor.
  - Rational, risk-averse investors are concerned with σ_p, which is based upon market risk.
  - There can be only one price (the market return) for a given security.
  - No compensation should be earned for holding unnecessary, diversifiable risk.

Capital Asset Pricing Model (CAPM)

- Model based upon concept that a stock's required rate of return is equal to the risk-free rate of return plus a risk premium that reflects the riskiness of the stock after diversification.
- Primary conclusion: The relevant riskiness of a stock is its contribution to the riskiness of a well-diversified portfolio.

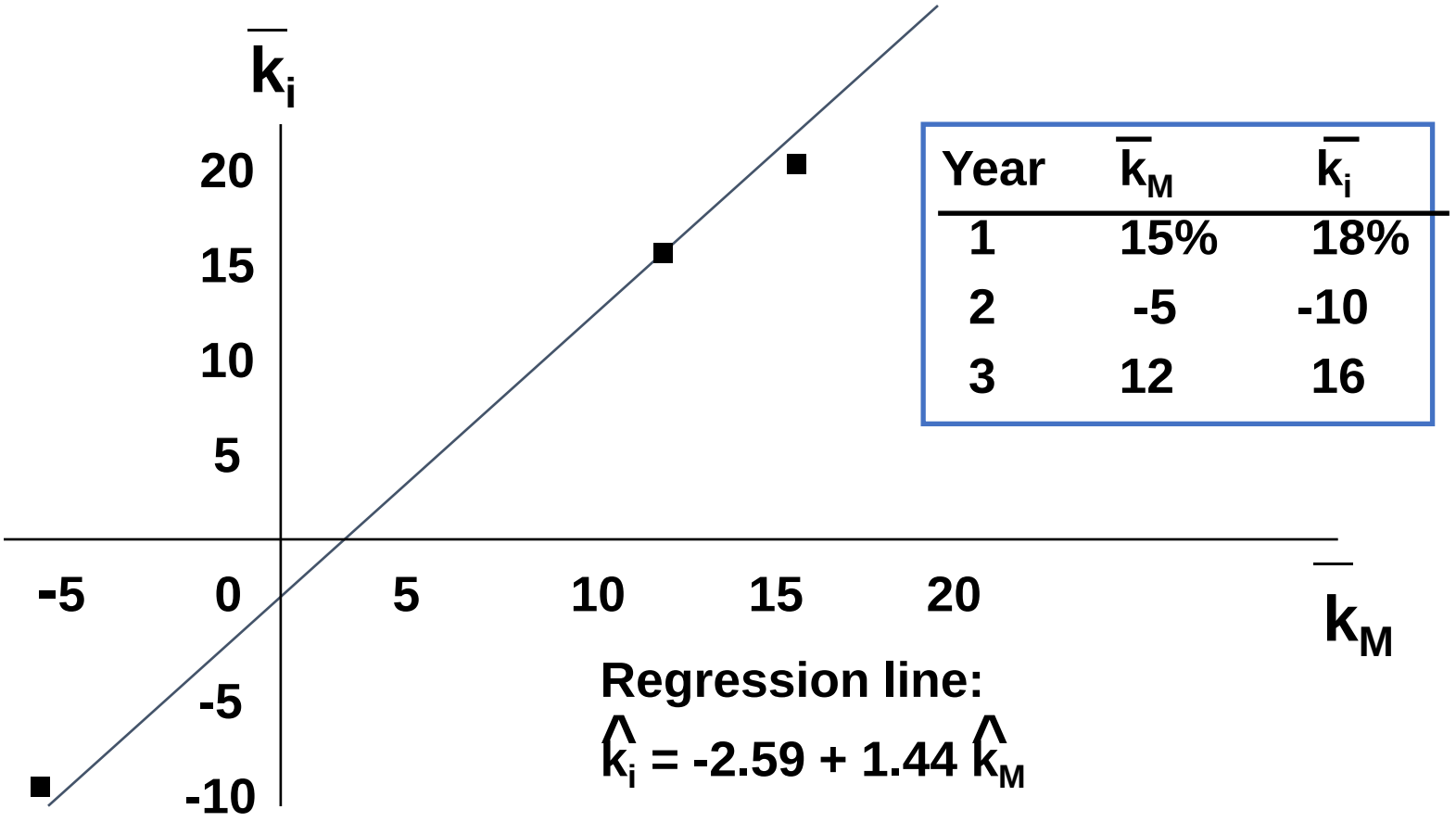
Beta

- Measures a stock's market risk, and shows a stock's volatility relative to the market.
- Indicates how risky a stock is if the stock is held in a well-diversified portfolio.

Calculating betas

- Run a regression of past returns of a security against past returns on the market.
- The slope of the regression line (sometimes called the security's characteristic line) is defined as the beta coefficient for the security.

Illustrating the calculation of beta



Year	$\bar{k}_M$	$\bar{k}_i$
1	15%	18%
2	-5	-10
3	12	16

Regression line:

$\hat{k}_i = -2.59 + 1.44\ \hat{k}_M$

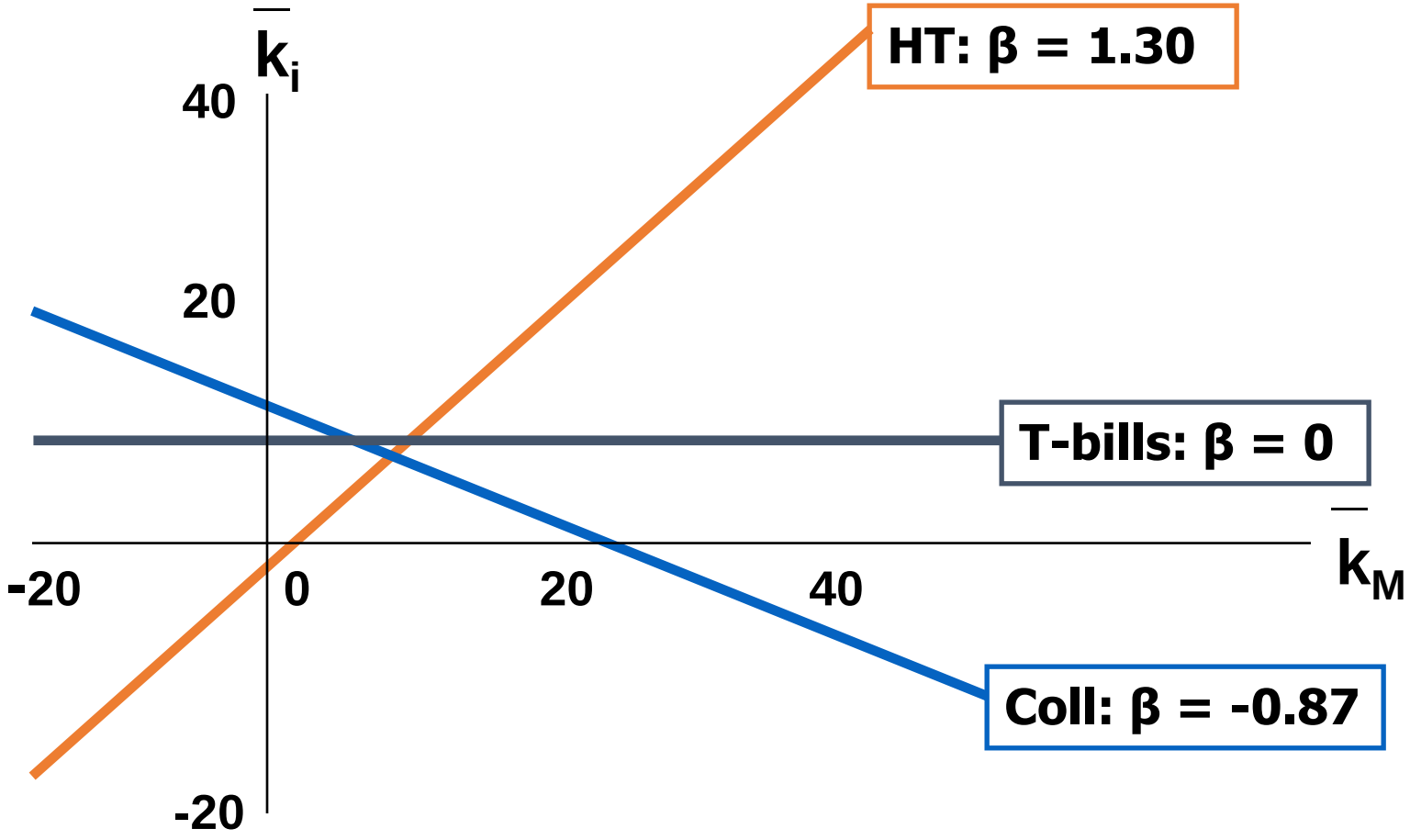
Comments on beta

- If beta = 1.0, the security is just as risky as the average stock.
- If beta > 1.0, the security is riskier than average.
- If beta < 1.0, the security is less risky than average.
- Most stocks have betas in the range of 0.5 to 1.5.

Can the beta of a security be negative?

- Yes, if the correlation between Stock i and the market is negative (i.e., $\rho_{i,m} < 0$).
- If the correlation is negative, the regression line would slope downward, and the beta would be negative.
- However, a negative beta is highly unlikely.

Beta coefficients for HT, Coll, and T-Bills



Comparing expected return and beta coefficients

Security	Exp. Ret.	Beta
HT	17.4%	1.30
Market	15.0	1.00
USR	13.8	0.89
T-Bills	8.0	0.00
Coll.	1.7	-0.87

Riskier securities have higher returns, so the rank order is OK.

The Security Market Line (SML): Calculating required rates of return

$$SML: k_i = k_{RF} + (k_M - k_{RF})\,\beta_i$$

- Assume $k_{RF} = 8\%$ and $k_M = 15\%$.
- The market (or equity) risk premium is $RP_M = k_M - k_{RF} = 15\% - 8\% = 7\%$.

What is the market risk premium?

- Additional return over the risk-free rate needed to compensate investors for assuming an average amount of risk.
- Its size depends on the perceived risk of the stock market and investors' degree of risk aversion.
- Varies from year to year, but most estimates suggest that it ranges between 4% and 8% per year.

Calculating required rates of return

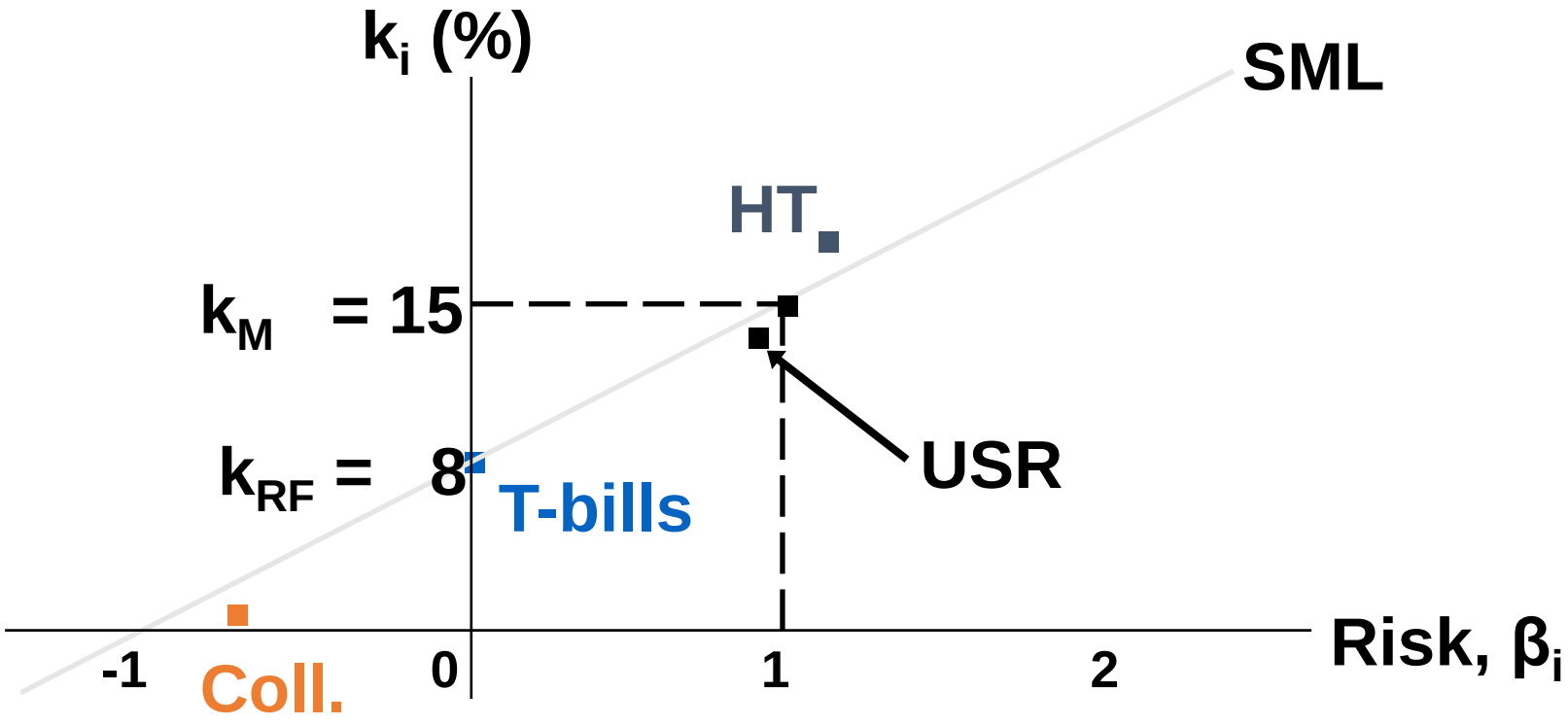
- k_{HT} = 8.0% + (15.0% - 8.0%)(1.30)
  = 8.0% + (7.0%)(1.30)
  = 8.0% + 9.1% = 17.10%
- k_{M} = 8.0% + (7.0%)(1.00) = 15.00%
- k_{USR} = 8.0% + (7.0%)(0.89) = 14.23%
- $k_{T\text{-}bill}$ = 8.0% + (7.0%)(0.00) = 8.00%
- k_{Coll} = 8.0% + (7.0%)(-0.87) = 1.91%

Expected vs. Required returns

	$\hat{k}$	k	
HT	17.4%	17.1%	Undervalued ($\hat{k} > k$)
Market	15.0	15.0	Fairly valued ($\hat{k} = k$)
USR	13.8	14.2	Overvalued ($\hat{k} < k$)
T - bills	8.0	8.0	Fairly valued ($\hat{k} = k$)
Coll.	1.7	1.9	Overvalued ($\hat{k} < k$)

Illustrating the Security Market Line

SML: $k_i = 8\% + (15\% - 8\%)\ \beta_i$



An example: Equally-weighted two-stock portfolio

- Create a portfolio with 50% invested in HT and 50% invested in Collections.
- The beta of a portfolio is the weighted average of each of the stock's betas.

$$\beta_P = w_{HT}\,\beta_{HT} + w_{Coll}\,\beta_{Coll}$$

$$\beta_P = 0.5\,(1.30) + 0.5\,(-0.87)$$

$$\beta_P = 0.215$$

Calculating portfolio required returns

- The required return of a portfolio is the weighted average of each of the stock's required returns.

$$k_P = w_{HT}\, k_{HT} + w_{Coll}\, k_{Coll}$$

$$k_P = 0.5\ (17.1\%) + 0.5\ (1.9\%)$$

$$k_P = 9.5\%$$

- Or, using the portfolio's beta, CAPM can be used to solve for expected return.

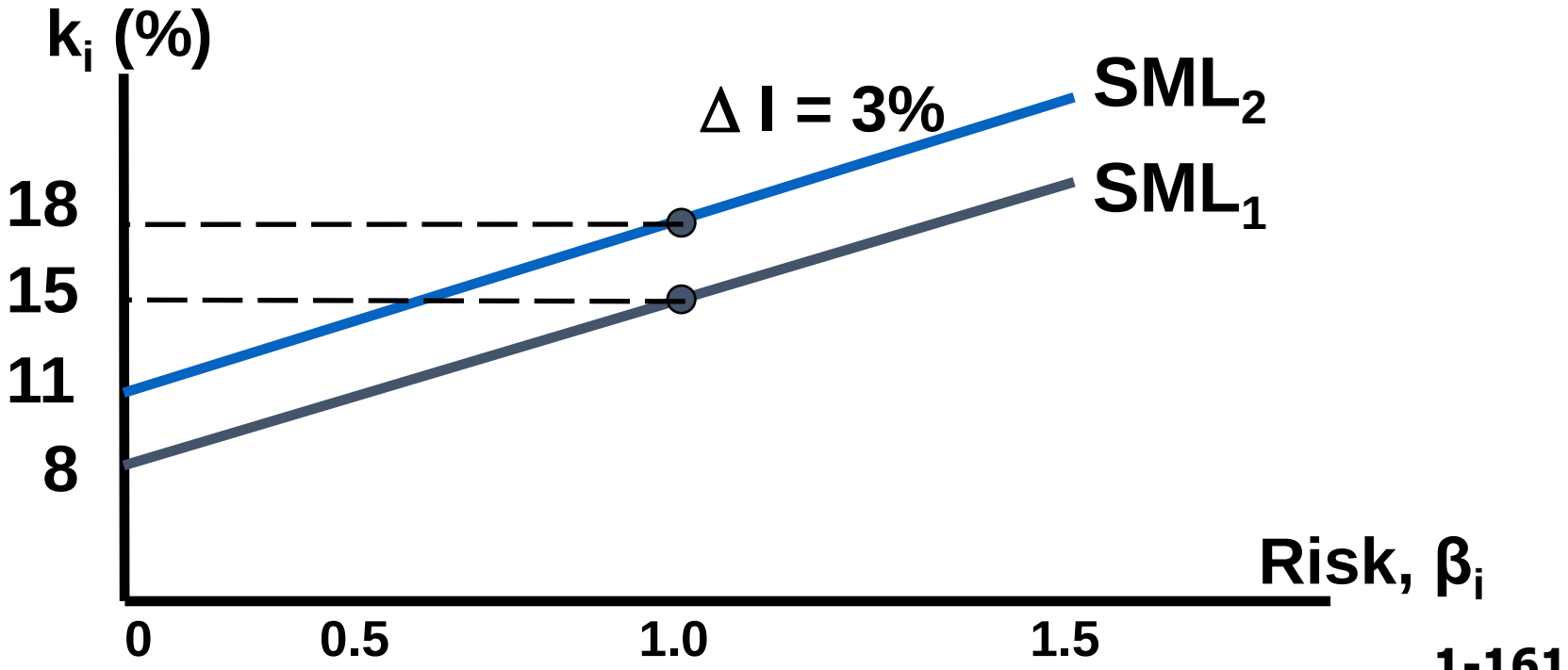
$$k_P = k_{RF} + (k_M - k_{RF})\ \beta_P$$

$$k_P = 8.0\% + (15.0\% - 8.0\%)\ (0.215)$$

$$k_P = 9.5\%$$

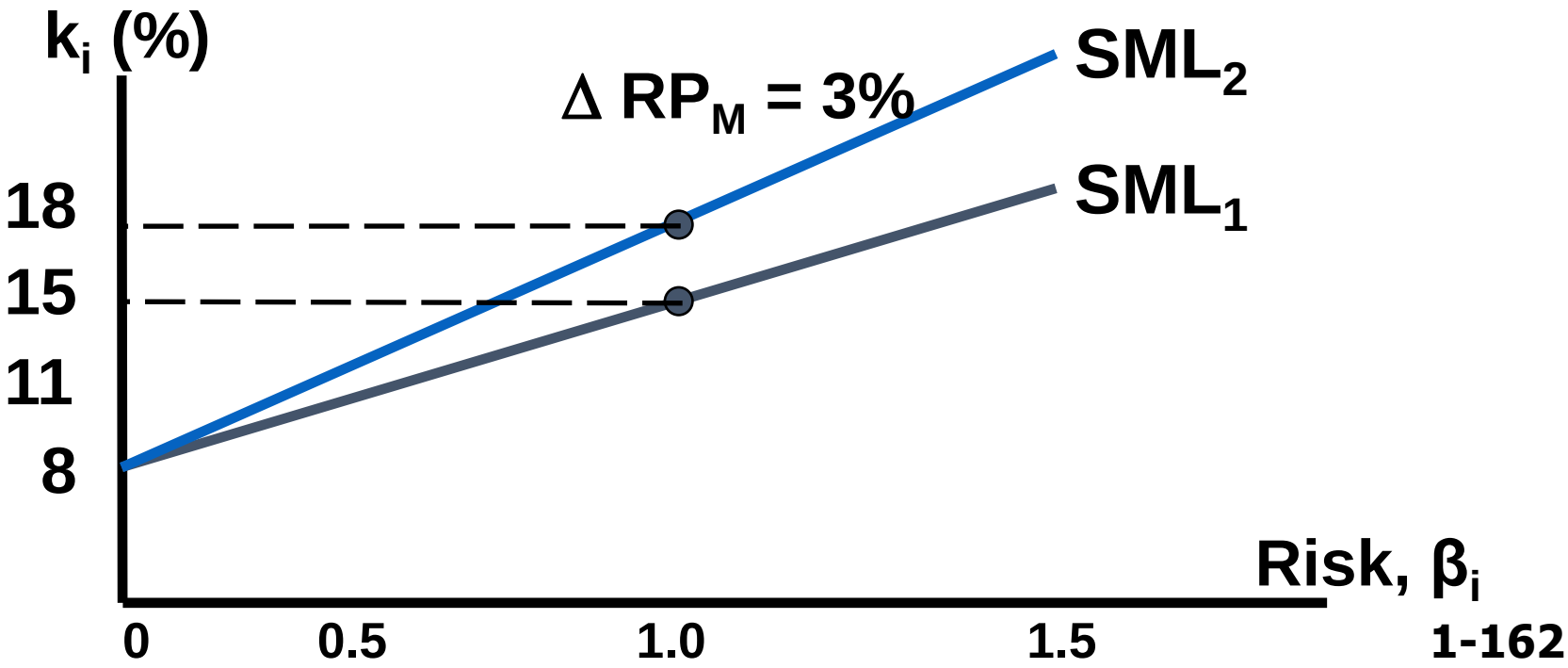
Factors that change the SML

- What if investors raise inflation expectations by 3%, what would happen to the SML?



Factors that change the SML

- What if investors' risk aversion increased, causing the market risk premium to increase by 3%, what would happen to the SML?



Verifying the CAPM empirically

- The CAPM has not been verified completely.
- Statistical tests have problems that make verification almost impossible.
- Some argue that there are additional risk factors, other than the market risk premium, that must be considered.

More thoughts on the CAPM

- Investors seem to be concerned with both market risk and total risk. Therefore, the SML may not produce a correct estimate of k_i.

$$k_i = k_{RF} + (k_M - k_{RF})\,\beta_i + ???$$

- CAPM/SML concepts are based upon expectations, but betas are calculated using historical data. A company's historical data may not reflect investors' expectations about future riskiness.

CHAPTER 6
Time Value of Money

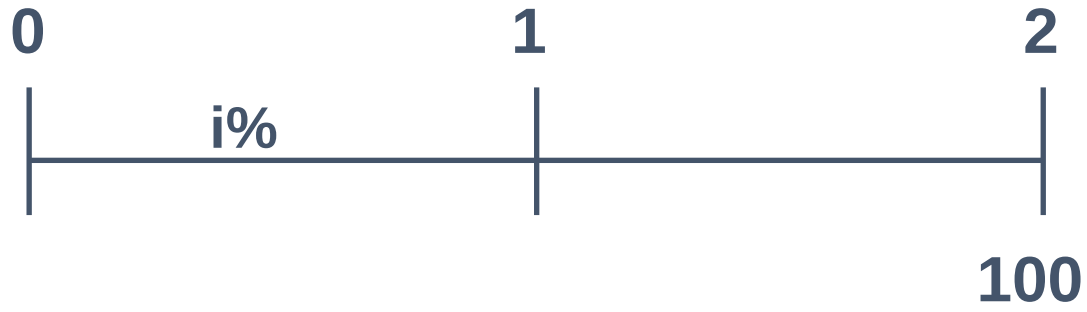
- Future value
- Present value
- Annuities
- Rates of return
- Amortization

Time lines

- Show the timing of cash flows.
- Tick marks occur at the end of periods, so Time 0 is today; Time 1 is the end of the first period (year, month, etc.) or the beginning of the second period.

Drawing time lines:
$100 lump sum due in 2 years;
3-year $100 ordinary annuity

$100 lump sum due in 2 years



3 year $100 ordinary annuity

Drawing time lines:

Uneven cash flow stream; CF_0 = -$50, CF_1 = $100, CF_2 = $75, and CF_3 = $50

Uneven cash flow stream

What is the future value (FV) of an initial $100 after 3 years, if I/YR = 10%?

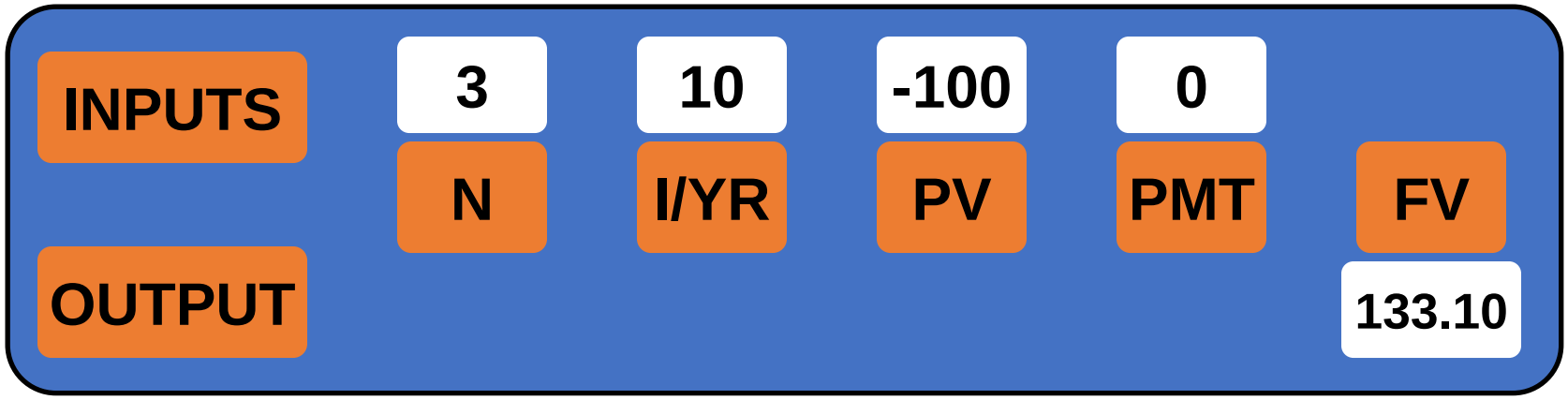
- Finding the FV of a cash flow or series of cash flows when compound interest is applied is called compounding.
- FV can be solved by using the arithmetic, financial calculator, and spreadsheet methods.

Solving for FV:
The arithmetic method

- After 1 year:
  - $FV_1 = PV (1 + i) = \$100 (1.10)$
    $= \$110.00$
- After 2 years:
  - $FV_2 = PV (1 + i)^2 = \$100 (1.10)^2$
    $= \$121.00$
- After 3 years:
  - $FV_3 = PV (1 + i)^3 = \$100 (1.10)^3$
    $= \$133.10$
- After n years (general case):
  - $FV_n = PV (1 + i)^n$

Solving for FV:
The calculator method

- Solves the general FV equation.
- Requires 4 inputs into calculator, and will solve for the fifth. (Set to P/YR = 1 and END mode.)



What is the present value (PV) of $100 due in 3 years, if I/YR = 10%?

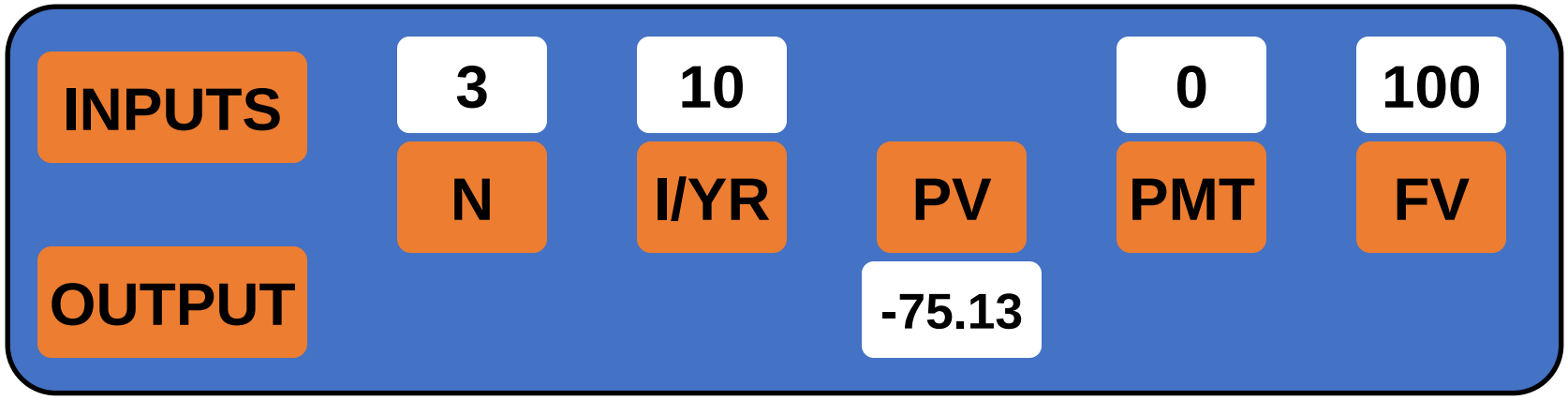
- Finding the PV of a cash flow or series of cash flows when compound interest is applied is called discounting (the reverse of compounding).
- The PV shows the value of cash flows in terms of today's purchasing power.

Solving for PV:
The arithmetic method

- Solve the general FV equation for PV:
  - $PV = FV_n / (1 + i)^n$
  - $PV = FV_3 / (1 + i)^3$
    $= \$100 / (1.10)^3$
    $= \$75.13$

Solving for PV:
The calculator method

- Solves the general FV equation for PV.
- Exactly like solving for FV, except we have different input information and are solving for a different variable.



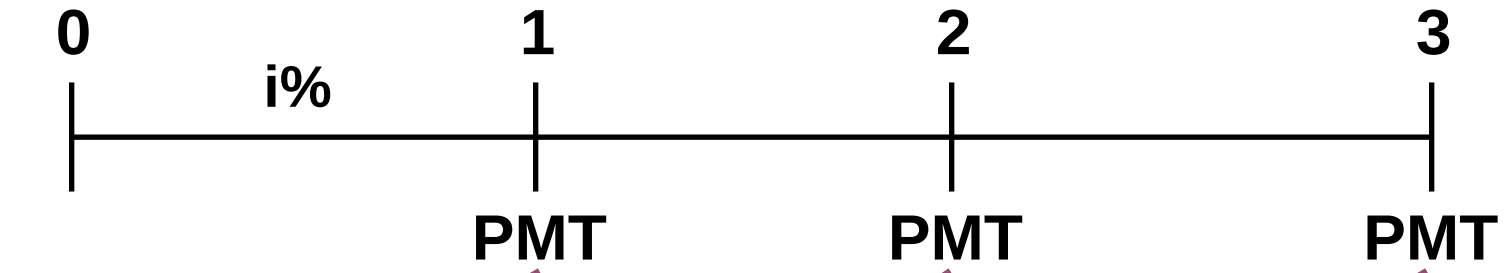
Solving for N:
If sales grow at 20% per year, how long before sales double?

- Solves the general FV equation for N.
- Same as previous problems, but now solving for N.

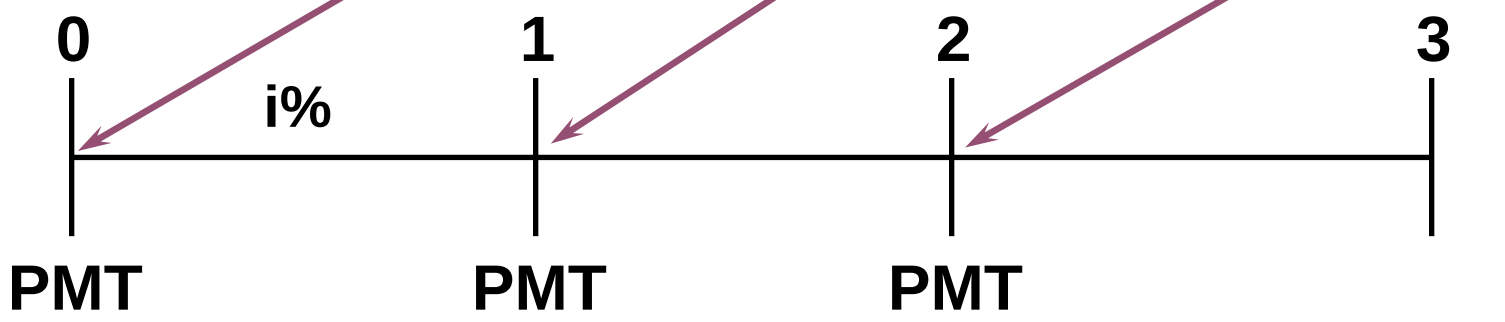
	N	I/YR	PV	PMT	FV
INPUTS		20	-1	0	2
OUTPUT	3.8				

What is the difference between an ordinary annuity and an annuity due?

Ordinary Annuity

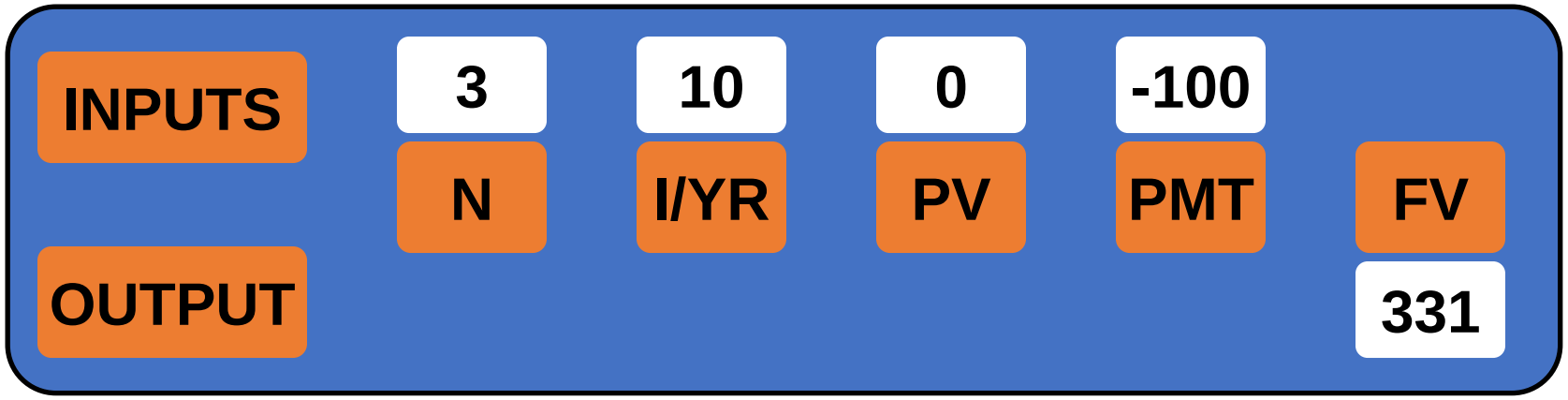


Annuity Due



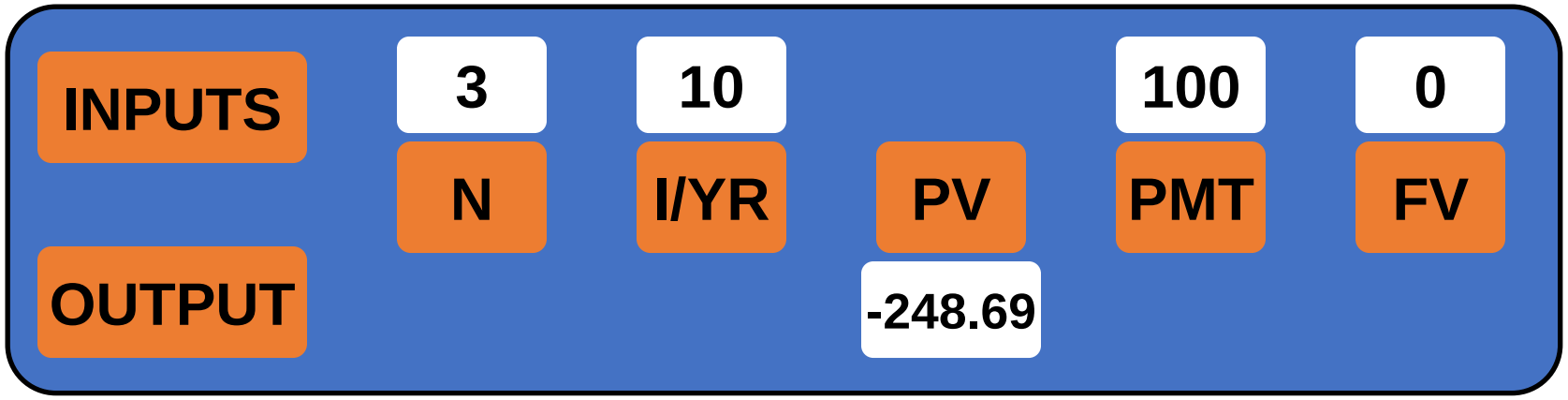
Solving for FV:
3-year ordinary annuity of $100 at 10%

- $100 payments occur at the end of each period, but there is no PV.



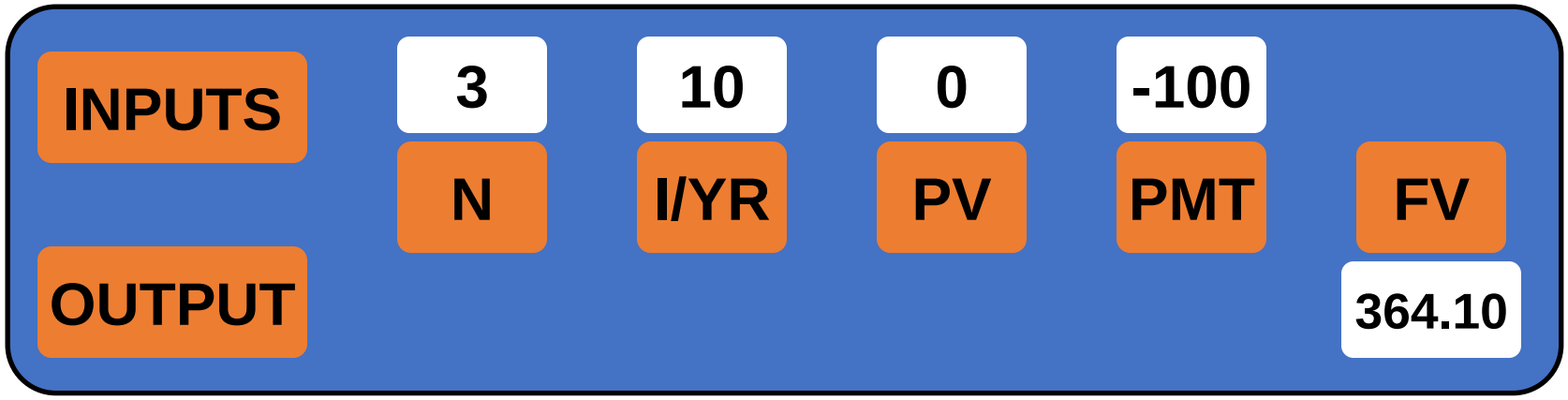
Solving for PV:
3-year ordinary annuity of $100 at 10%

- $100 payments still occur at the end of each period, but now there is no FV.



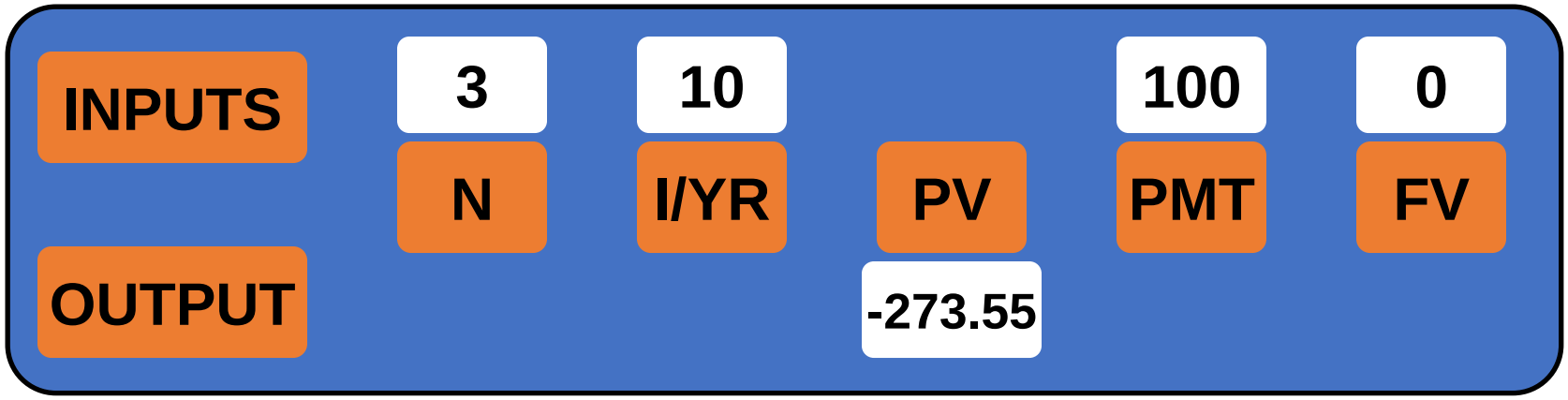
Solving for FV:
3-year annuity due of $100 at 10%

- Now, $100 payments occur at the beginning of each period.
- Set calculator to “BEGIN” mode.

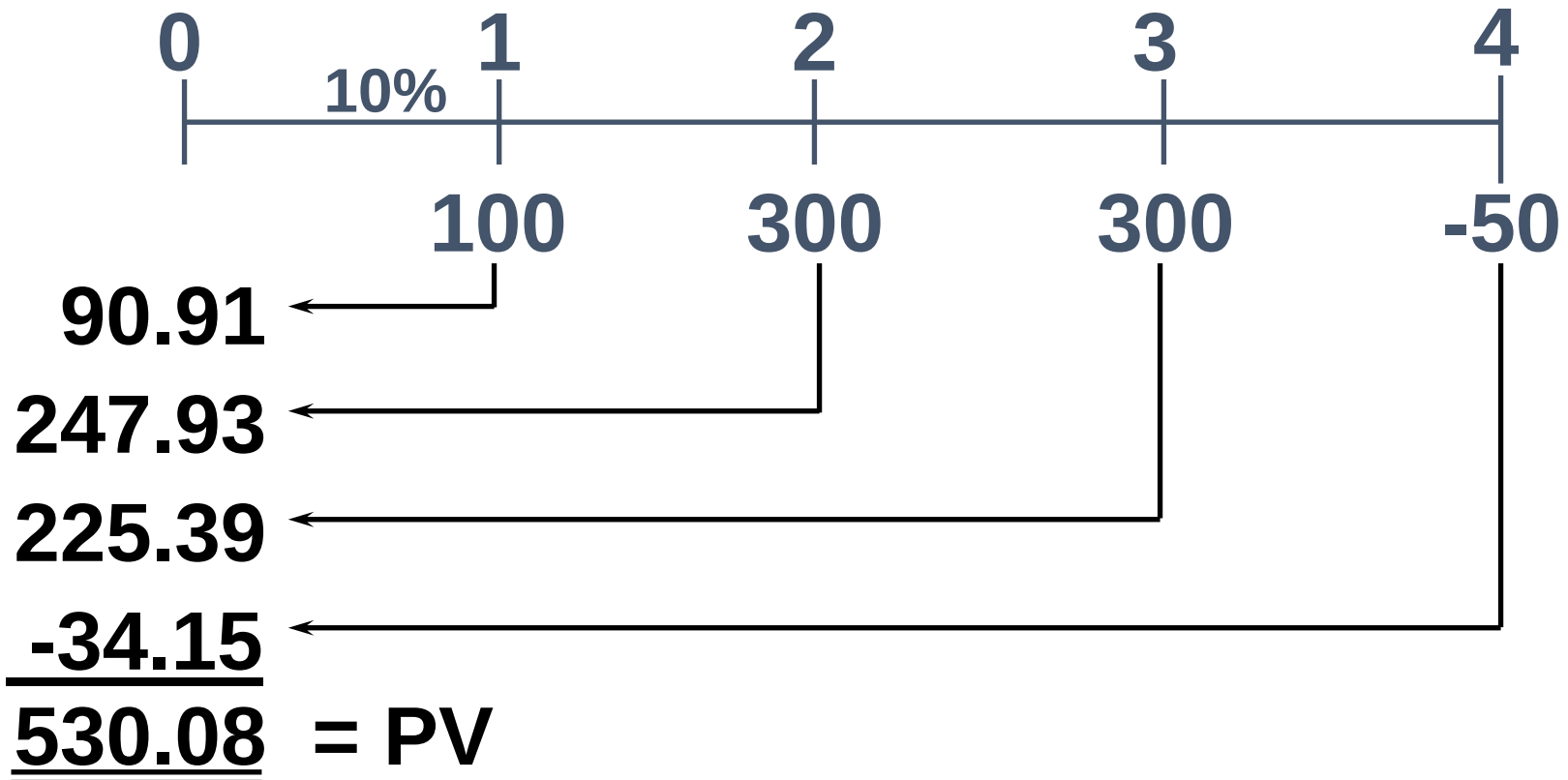


Solving for PV:
3 year annuity due of $100 at 10%

- Again, $100 payments occur at the beginning of each period.
- Set calculator to “BEGIN” mode.



What is the PV of this uneven cash flow stream?

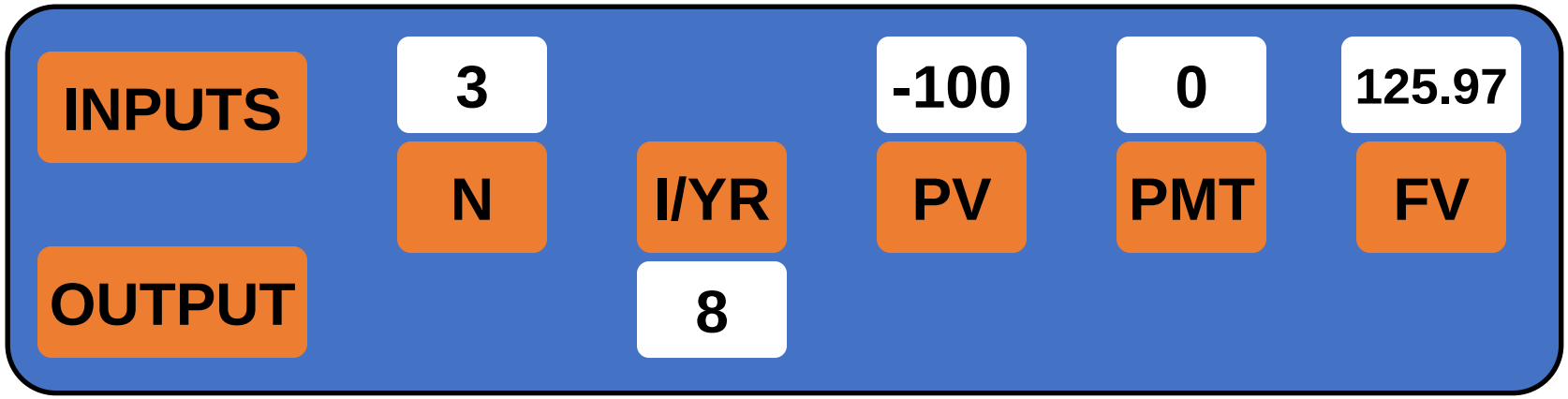


Solving for PV: Uneven cash flow stream

- Input cash flows in the calculator's "CFLO" register:
  - $CF_0 = 0$
  - $CF_1 = 100$
  - $CF_2 = 300$
  - $CF_3 = 300$
  - $CF_4 = -50$
- Enter I/YR = 10, press NPV button to get NPV = $530.09. (Here NPV = PV.)

Solving for I:
What interest rate would cause $100 to grow to $125.97 in 3 years?

- Solves the general FV equation for I.



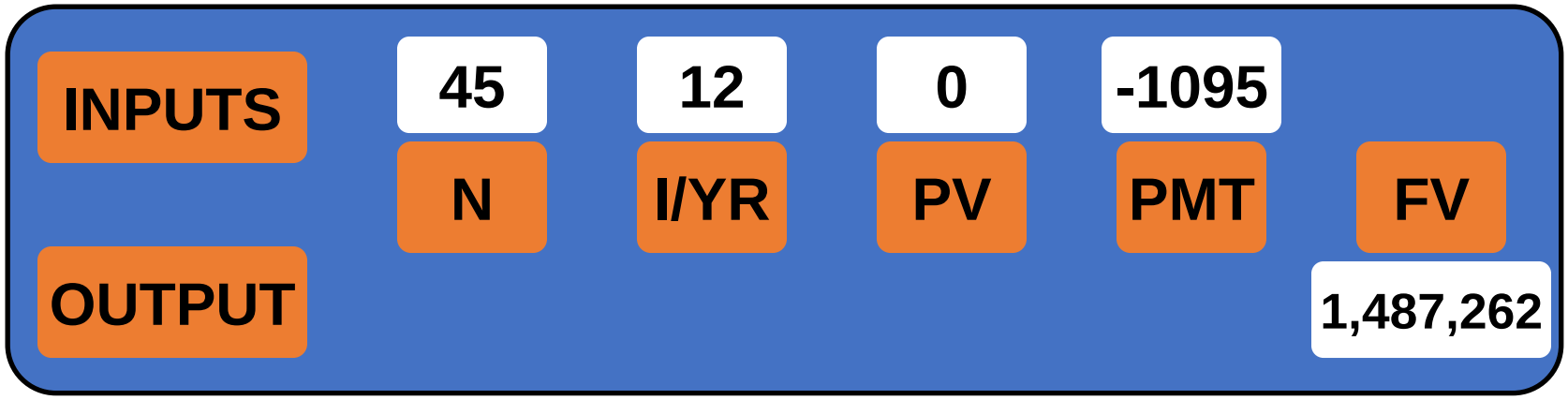
The Power of Compound Interest

A 20-year-old student wants to start saving for retirement. She plans to save $3 a day. Every day, she puts $3 in her drawer. At the end of the year, she invests the accumulated savings ($1,095) in an online stock account. The stock account has an expected annual return of 12%.

How much money will she have when she is 65 years old?

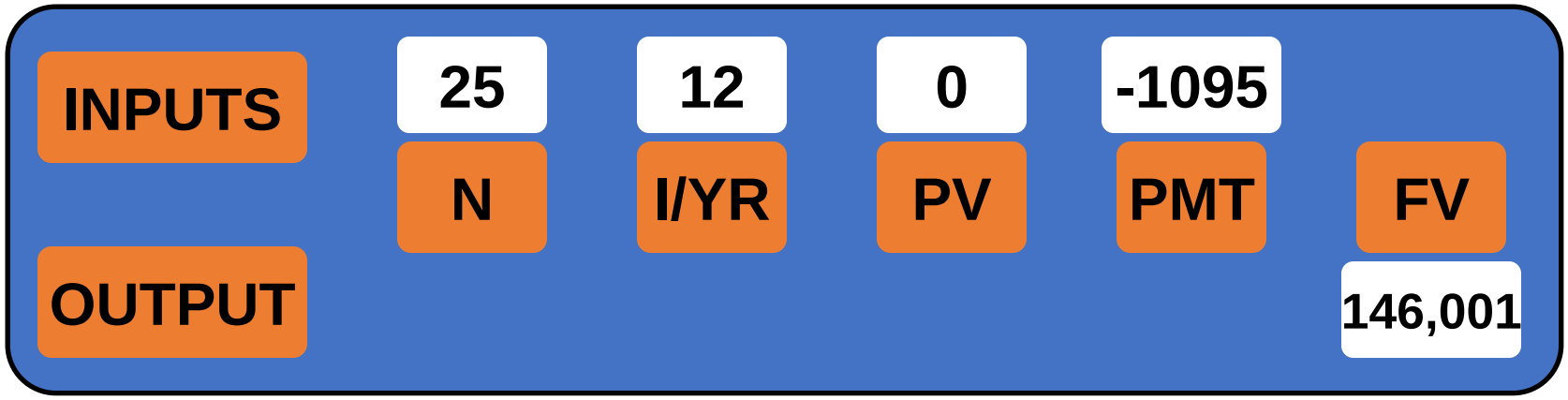
Solving for FV: Savings problem

- If she begins saving today, and sticks to her plan, she will have $1,487,261.89 when she is 65.



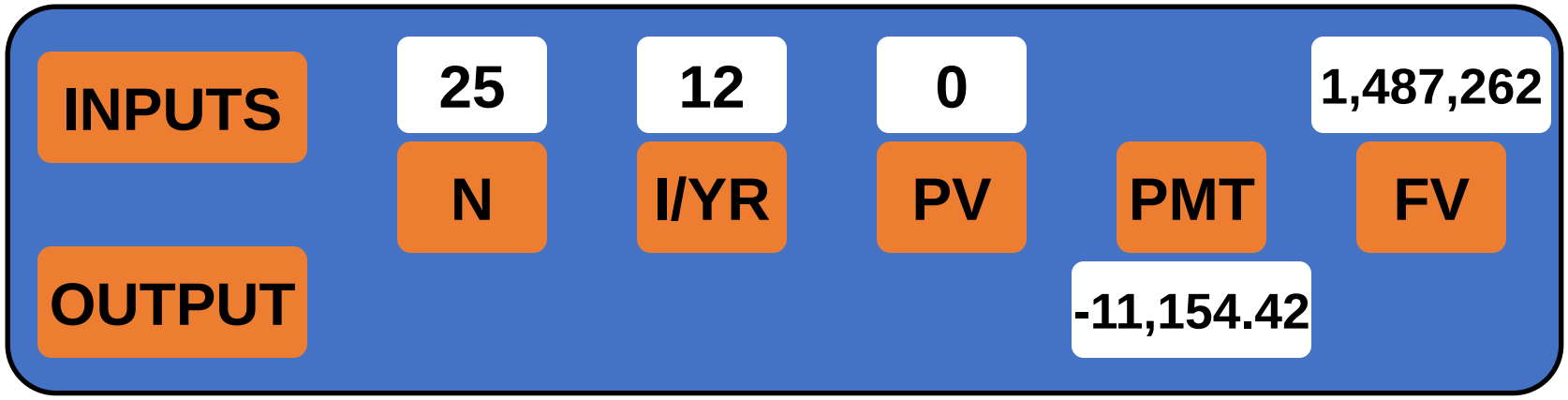
Solving for FV:
Savings problem, if you wait until you are 40 years old to start

- If a 40-year-old investor begins saving today, and sticks to the plan, he or she will have $146,000.59 at age 65. This is $1.3 million less than if starting at age 20.
- Lesson: It pays to start saving early.



Solving for PMT:
How much must the 40-year old deposit annually to catch the 20-year old?

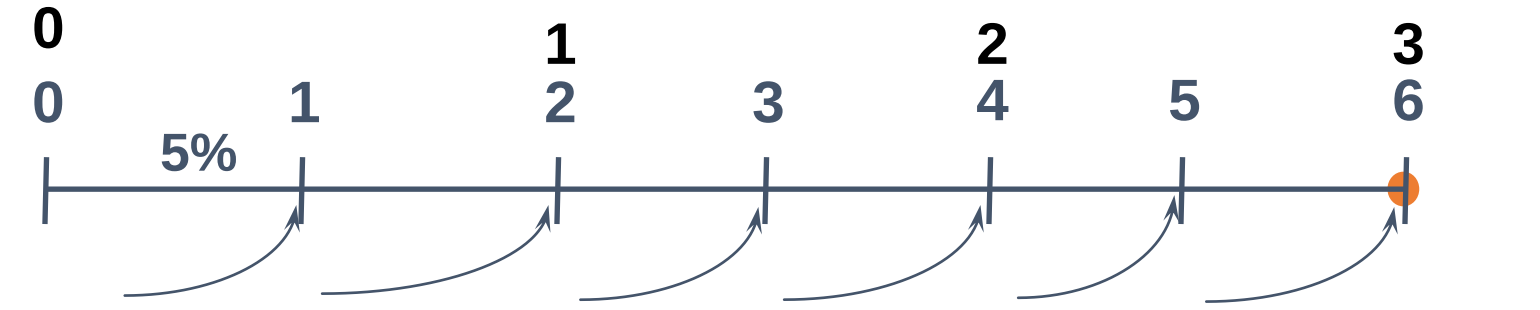
- To find the required annual contribution, enter the number of years until retirement and the final goal of $1,487,261.89, and solve for PMT.



Will the FV of a lump sum be larger or smaller if compounded more often, holding the stated I% constant?

- LARGER, as the more frequently compounding occurs, interest is earned on interest more often.

Annually: $FV_3 = \$100(1.10)^3 = \$133.10$



Semiannually: $FV_6 = \$100(1.05)^6 = \$134.01$

Classifications of interest rates

- Nominal rate (i_{NOM}) – also called the quoted or state rate. An annual rate that ignores compounding effects.
  - i_{NOM} is stated in contracts. Periods must also be given, e.g. 8% Quarterly or 8% Daily interest.
- Periodic rate (i_{PER}) – amount of interest charged each period, e.g. monthly or quarterly.
  - $i_{PER} = i_{NOM} / m$, where m is the number of compounding periods per year. m = 4 for quarterly and m = 12 for monthly compounding.

Classifications of interest rates

- Effective (or equivalent) annual rate (EAR = EFF%) – the annual rate of interest actually being earned, taking into account compounding.
  - EFF% for 10% semiannual investment

    $$EFF\% = \left(1 + i_{NOM} / m \right)^m - 1$$
    $$= \left(1 + 0.10 / 2 \right)^2 - 1 = 10.25\%$$

  - An investor would be indifferent between an investment offering a 10.25% annual return and one offering a 10% annual return, compounded semiannually.

Why is it important to consider effective rates of return?

- An investment with monthly payments is different from one with quarterly payments. Must put each return on an EFF% basis to compare rates of return. Must use EFF% for comparisons. See following values of EFF% rates at various compounding levels.

EAR_{ANNUAL}	10.00%
$EAR_{QUARTERLY}$	10.38%
$EAR_{MONTHLY}$	10.47%
$EAR_{DAILY\ (365)}$	10.52%

Can the effective rate ever be equal to the nominal rate?

- Yes, but only if annual compounding is used, i.e., if m = 1.
- If m > 1, EFF% will always be greater than the nominal rate.

When is each rate used?

- i_{NOM} written into contracts, quoted by banks and brokers. Not used in calculations or shown on time lines.
- i_{PER} Used in calculations and shown on time lines. If m = 1, $i_{NOM} = i_{PER}$ = EAR.
- EAR Used to compare returns on investments with different payments per year. Used in calculations when annuity payments don't match compounding periods.

What is the FV of $100 after 3 years under 10% semiannual compounding? Quarterly compounding?

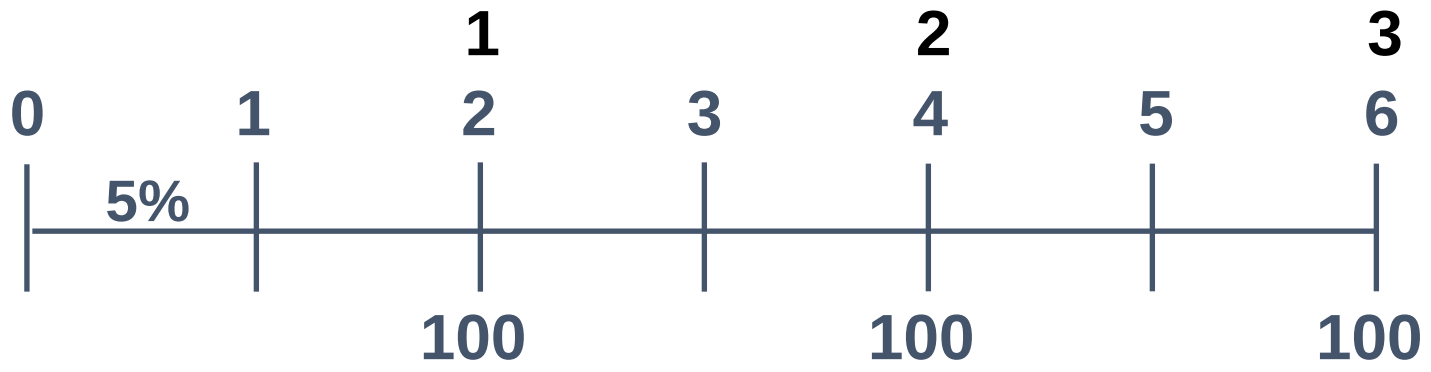
$$FV_n = PV\left(1 + \frac{i_{NOM}}{m}\right)^{m \times n}$$

$$FV_{3S} = \$100\left(1 + \frac{0.10}{2}\right)^{2 \times 3}$$

$$FV_{3S} = \$100\,(1.05)^6 = \$134.01$$

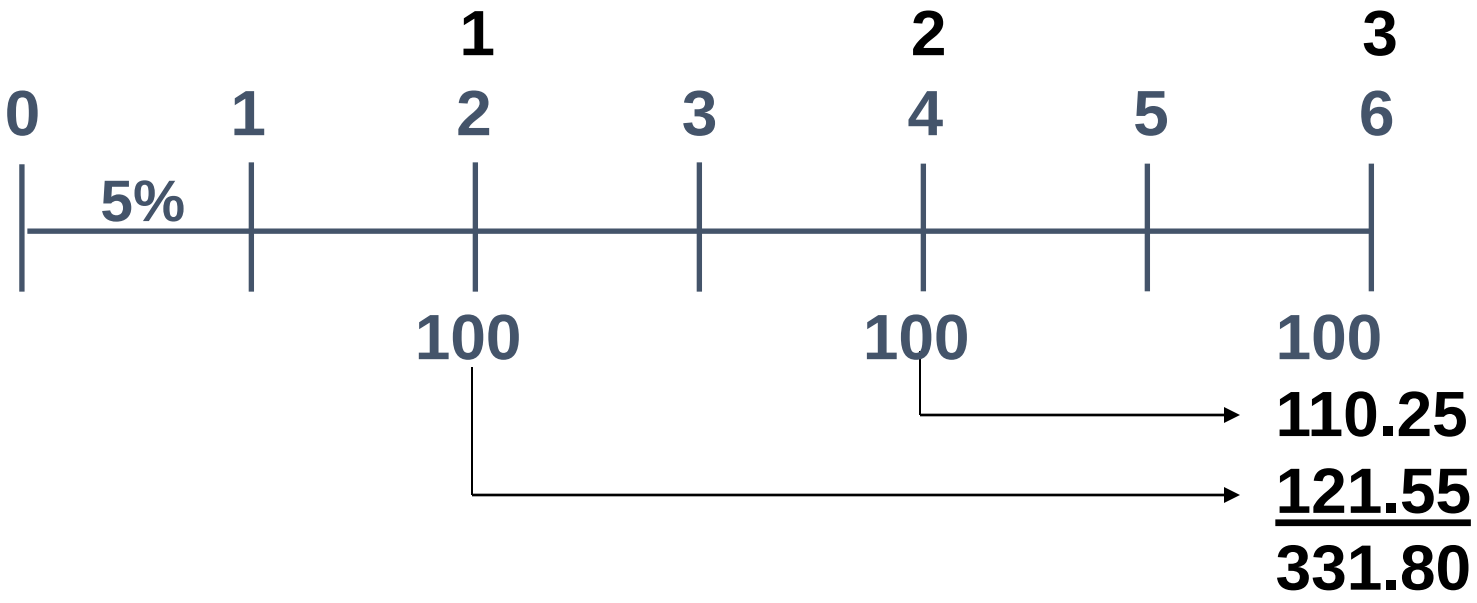
$$FV_{3Q} = \$100\,(1.025)^{12} = \$134.49$$

What's the FV of a 3-year $100 annuity, if the quoted interest rate is 10%, compounded semiannually?



- Payments occur annually, but compounding occurs every 6 months.
- Cannot use normal annuity valuation techniques.

Method 1:
Compound each cash flow

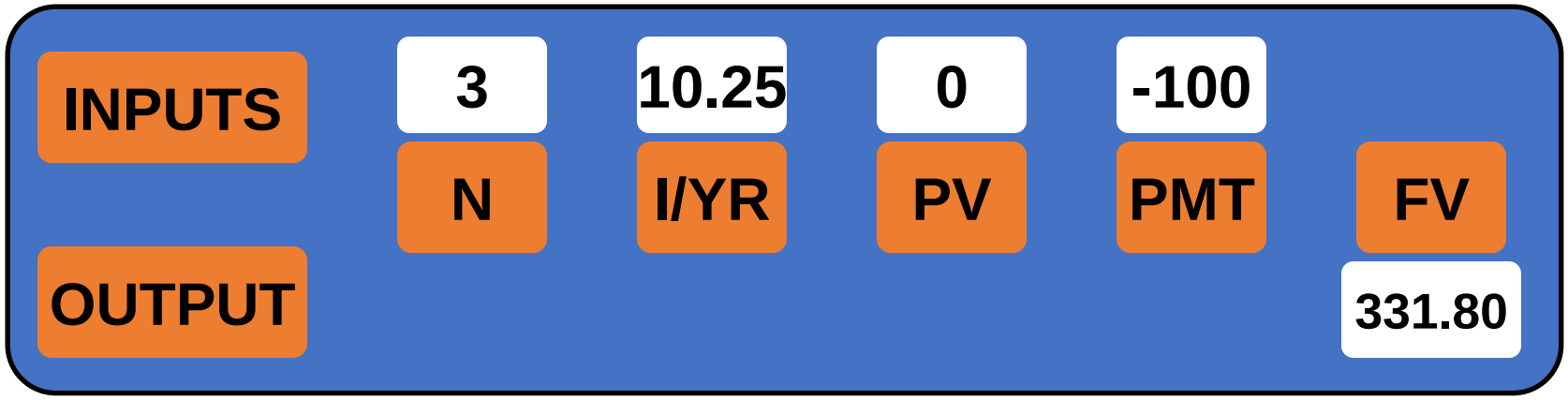


$FV_3 = \$100(1.05)^4 + \$100(1.05)^2 + \$100$

$FV_3 = \$331.80$

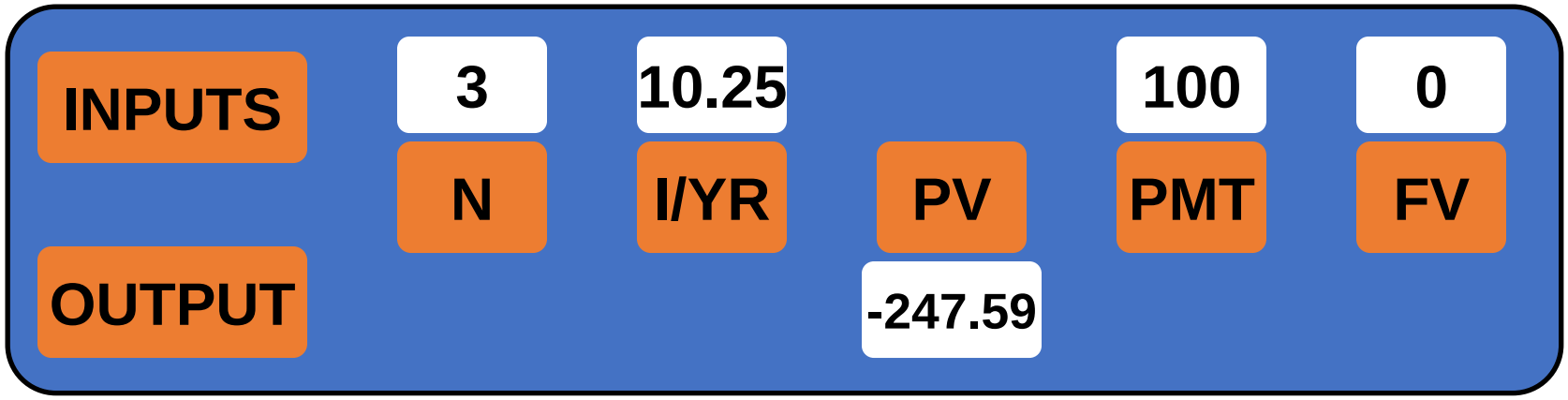
Method 2:
Financial calculator

- Find the EAR and treat as an annuity.
- EAR = (1 + 0.10 / 2)^2 – 1 = 10.25%.



Find the PV of this 3-year ordinary annuity.

- Could solve by discounting each cash flow, or …
- Use the EAR and treat as an annuity to solve for PV.



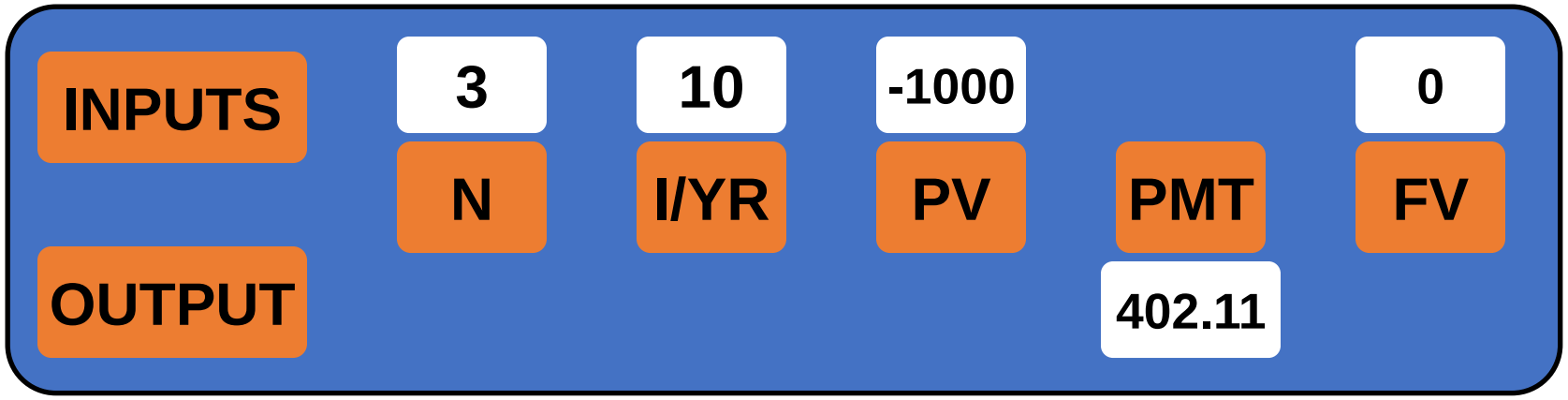
Loan amortization

- Amortization tables are widely used for home mortgages, auto loans, business loans, retirement plans, etc.
- Financial calculators and spreadsheets are great for setting up amortization tables.

- EXAMPLE: Construct an amortization schedule for a $1,000, 10% annual rate loan with 3 equal payments.

Step 1:
Find the required annual payment

- All input information is already given, just remember that the FV = 0 because the reason for amortizing the loan and making payments is to retire the loan.



Step 2:
Find the interest paid in Year 1

- The borrower will owe interest upon the initial balance at the end of the first year. Interest to be paid in the first year can be found by multiplying the beginning balance by the interest rate.

$INT_t = \text{Beg bal}_t\ (i)$

$INT_1 = \$1{,}000\ (0.10) = \$100$

Step 3:
Find the principal repaid in Year 1

- If a payment of $402.11 was made at the end of the first year and $100 was paid toward interest, the remaining value must represent the amount of principal repaid.

PRIN = PMT – INT

= $402.11 - $100 = $302.11

Step 4:
Find the ending balance after Year 1

- To find the balance at the end of the period, subtract the amount paid toward principal from the beginning balance.

END BAL = BEG BAL – PRIN

= $1,000 - $302.11

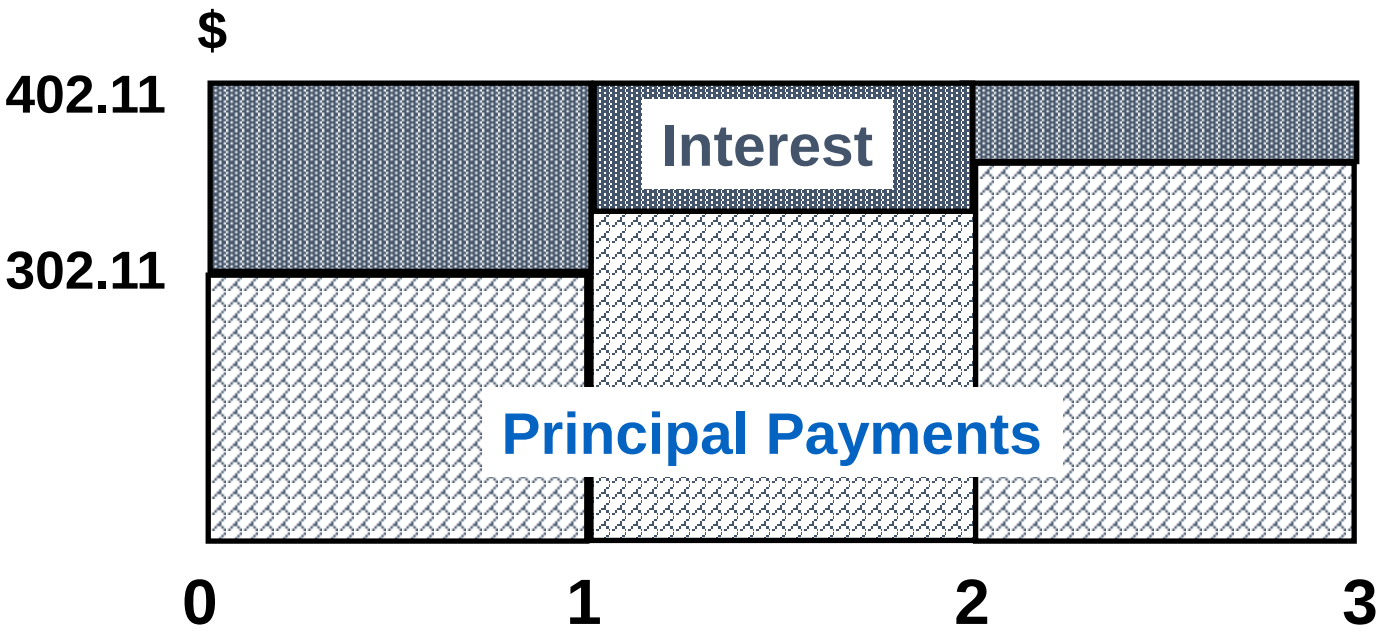
= $697.89

Constructing an amortization table: Repeat steps 1 – 4 until end of loan

Year	BEG BAL	PMT	INT	PRIN	END BAL
1	$1,000	$402	$100	$302	$698
2	698	402	70	332	366
3	366	402	37	366	0
TOTAL		1,206.34	206.34	1,000	-

- Interest paid declines with each payment as the balance declines. What are the tax implications of this?

Illustrating an amortized payment: Where does the money go?



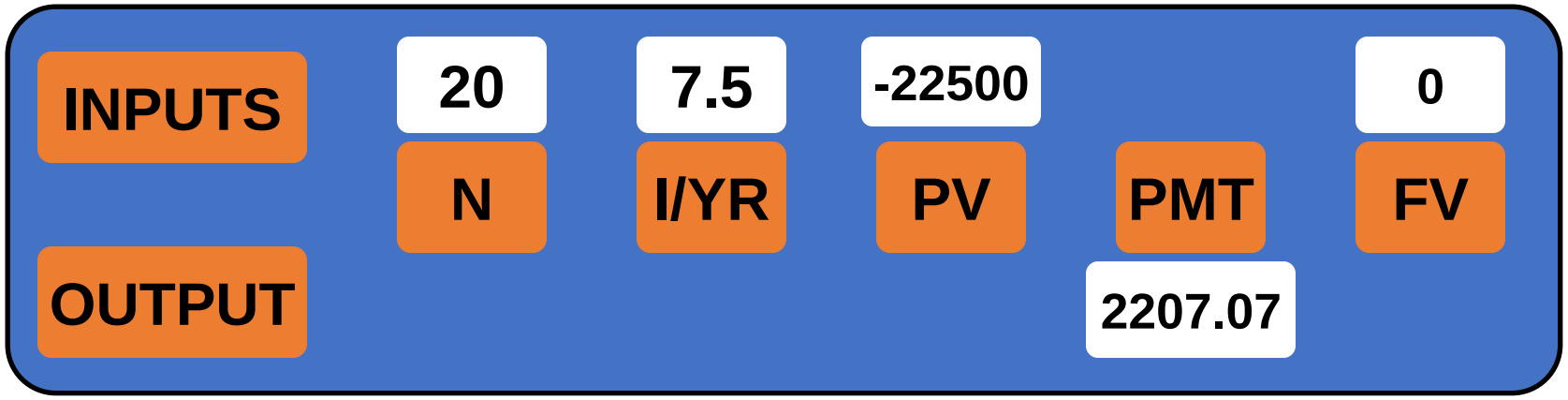
- Constant payments.
- Declining interest payments.
- Declining balance.

Partial amortization

- Bank agrees to lend a home buyer $220,000 to buy a $250,000 home, requiring a $30,000 down payment.
- The home buyer only has $7,500 in cash, so the seller agrees to take a note with the following terms:
  - Face value = $22,500
  - 7.5% nominal interest rate
  - Payments made at the end of the year, based upon a 20-year amortization schedule.
  - Loan matures at the end of the 10^{th} year.

Calculating annual loan payments

- Based upon the loan information, the home buyer must make annual payments of $2,207.07 on the loan.



Determining the balloon payment

- Using an amortization table (spreadsheet or calculator), it can be found that at the end of the 10^{th} year, the remaining balance on the loan will be $15,149.54.
- Therefore,
  - Balloon payment = $15,149.54
  - Final payment = $17,356.61

CHAPTER 7
Bonds and Their Valuation

- Key features of bonds
- Bond valuation
- Measuring yield
- Assessing risk

What is a bond?

- A long-term debt instrument in which a borrower agrees to make payments of principal and interest, on specific dates, to the holders of the bond.

Bond markets

- Primarily traded in the over-the-counter (OTC) market.
- Most bonds are owned by and traded among large financial institutions.
- Full information on bond trades in the OTC market is not published, but a representative group of bonds is listed and traded on the bond division of the NYSE.

Key Features of a Bond

- Par value – face amount of the bond, which is paid at maturity (assume $1,000).
- Coupon interest rate – stated interest rate (generally fixed) paid by the issuer. Multiply by par to get dollar payment of interest.
- Maturity date – years until the bond must be repaid.
- Issue date – when the bond was issued.
- Yield to maturity - rate of return earned on a bond held until maturity (also called the "promised yield").

Effect of a call provision

- Allows issuer to refund the bond issue if rates decline (helps the issuer, but hurts the investor).
- Borrowers are willing to pay more, and lenders require more, for callable bonds.
- Most bonds have a deferred call and a declining call premium.

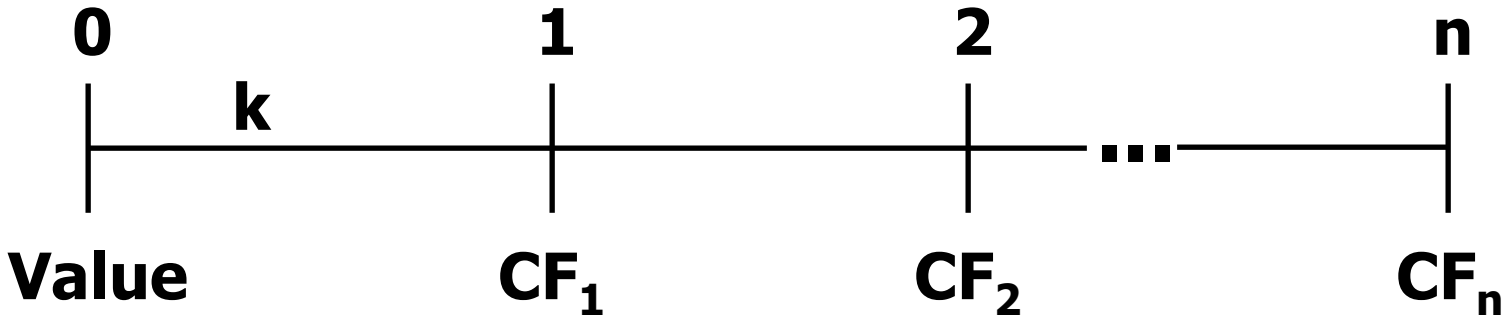
What is a sinking fund?

- Provision to pay off a loan over its life rather than all at maturity.
- Similar to amortization on a term loan.
- Reduces risk to investor, shortens average maturity.
- But not good for investors if rates decline after issuance.

How are sinking funds executed?

- Call x% of the issue at par, for sinking fund purposes.
  - Likely to be used if k_d is below the coupon rate and the bond sells at a premium.
- Buy bonds in the open market.
  - Likely to be used if k_d is above the coupon rate and the bond sells at a discount.

The value of financial assets



$$\text{Value} = \frac{CF_1}{(1+k)^1} + \frac{CF_2}{(1+k)^2} + \ldots + \frac{CF_n}{(1+k)^n}$$

Other types (features) of bonds

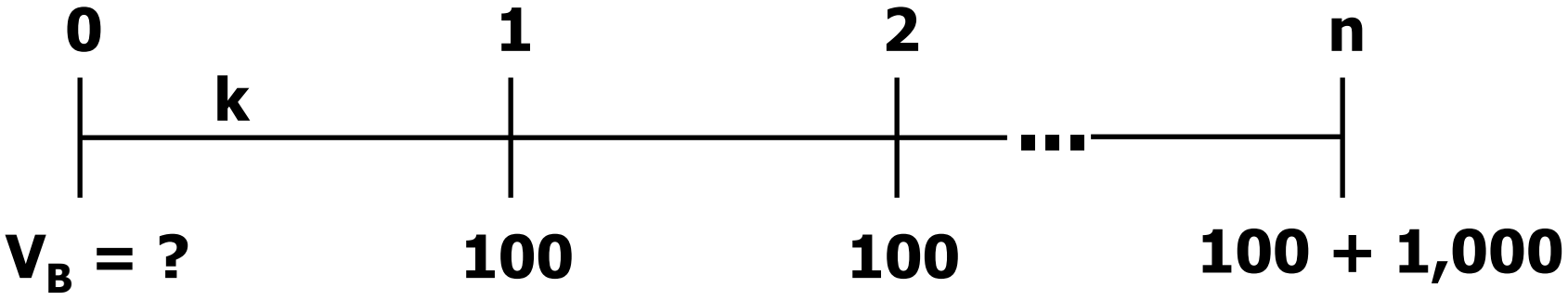
- Convertible bond – may be exchanged for common stock of the firm, at the holder's option.
- Warrant – long-term option to buy a stated number of shares of common stock at a specified price.
- Putable bond – allows holder to sell the bond back to the company prior to maturity.
- Income bond – pays interest only when interest is earned by the firm.
- Indexed bond – interest rate paid is based upon the rate of inflation.

What is the opportunity cost of debt capital?

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

$$k_i = k^* + IP + MRP + DRP + LP$$

What is the value of a 10-year, 10% annual coupon bond, if k_d = 10%?



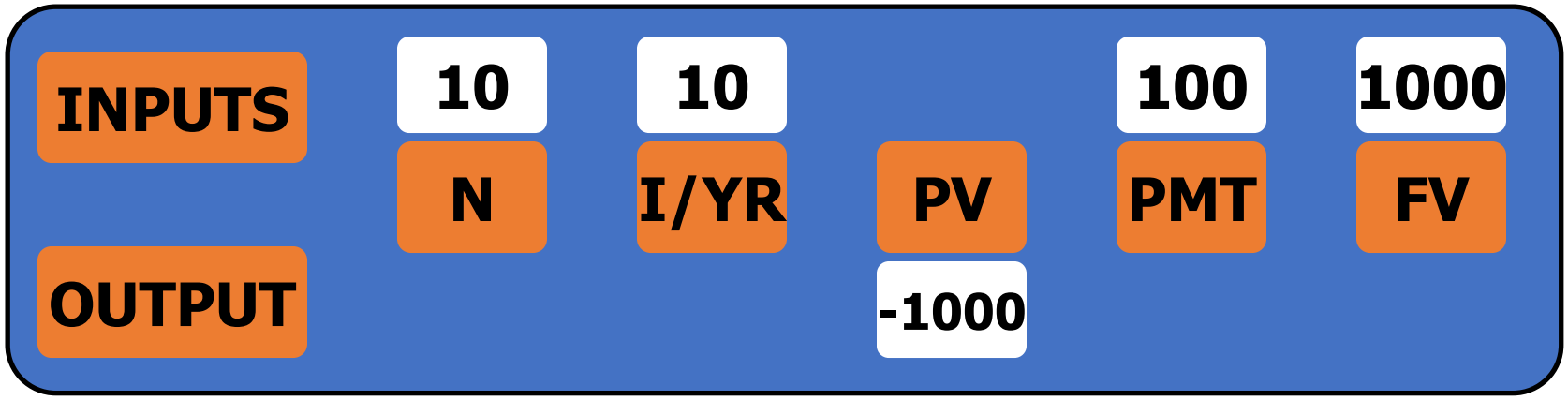
$$V_B = \frac{\$100}{(1.10)^1} + \ldots + \frac{\$100}{(1.10)^{10}} + \frac{\$1{,}000}{(1.10)^{10}}$$

$$V_B = \$90.91 + \ldots + \$38.55 + \$385.54$$

$$V_B = \$1{,}000$$

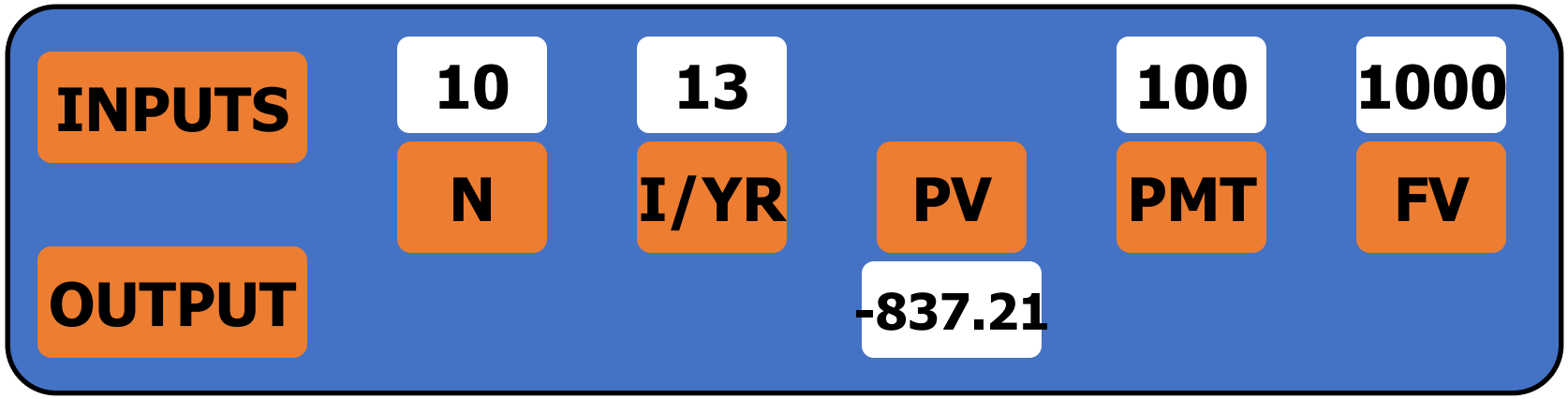
Using a financial calculator to value a bond

- This bond has a $1,000 lump sum due at t = 10, and annual $100 coupon payments beginning at t = 1 and continuing through t = 10, the price of the bond can be found by solving for the PV of these cash flows.



An example: Increasing inflation and k_d

- Suppose inflation rises by 3%, causing k_d = 13%. When k_d rises above the coupon rate, the bond's value falls below par, and sells at a discount.



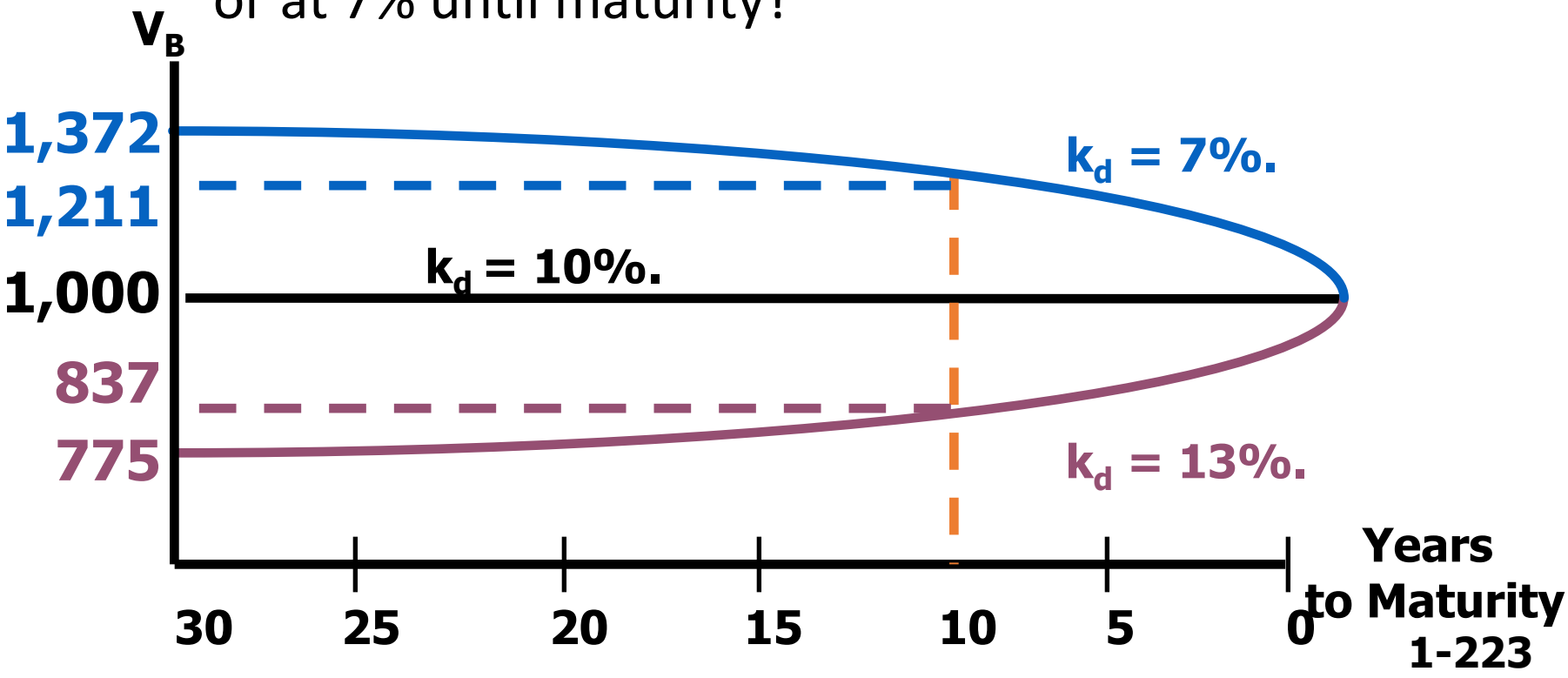
An example: Decreasing inflation and k_d

- Suppose inflation falls by 3%, causing k_d = 7%. When k_d falls below the coupon rate, the bond's value rises above par, and sells at a premium.

	N	I/YR	PV	PMT	FV
INPUTS	10	7		100	1000
OUTPUT			-1210.71		

The price path of a bond

- What would happen to the value of this bond if its required rate of return remained at 10%, or at 13%, or at 7% until maturity?



Bond values over time

- At maturity, the value of any bond must equal its par value.
- If k_d remains constant:
  - The value of a premium bond would decrease over time, until it reached $1,000.
  - The value of a discount bond would increase over time, until it reached $1,000.
  - A value of a par bond stays at $1,000.

What is the YTM on a 10-year, 9% annual coupon, $1,000 par value bond, selling for $887?

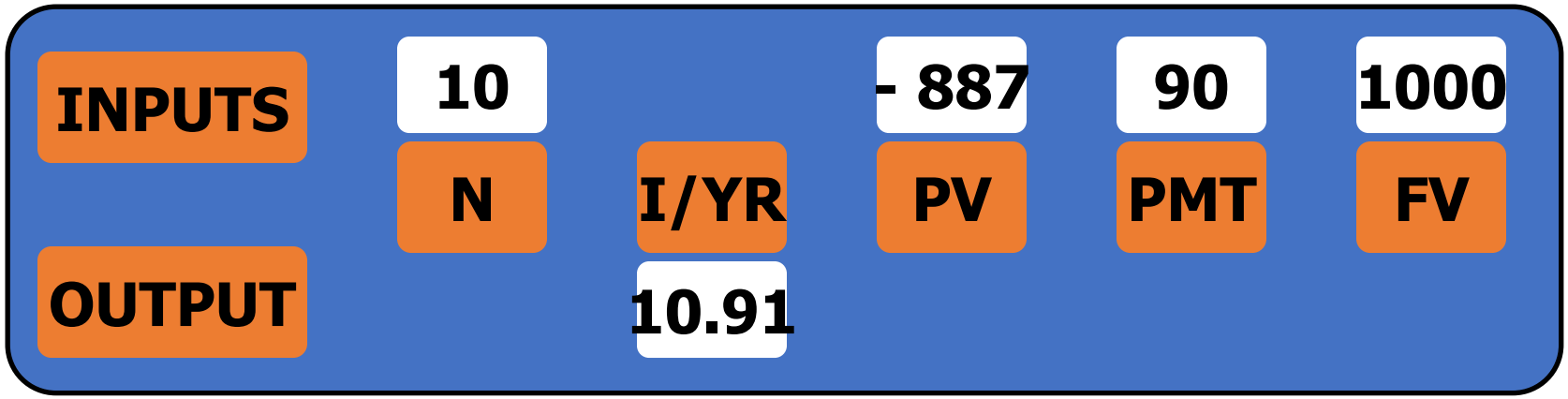
- Must find the k_d that solves this model.

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

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

Using a financial calculator to find YTM

- Solving for I/YR, the YTM of this bond is 10.91%. This bond sells at a discount, because YTM > coupon rate.



Find YTM, if the bond price was $1,134.20.

- Solving for I/YR, the YTM of this bond is 7.08%. This bond sells at a premium, because YTM < coupon rate.

INPUTS	10		-1134.2	90	1000
	N	I/YR	PV	PMT	FV
OUTPUT		7.08			

Definitions

$$\text{Current yield (CY)} = \frac{\text{Annual coupon payment}}{\text{Current price}}$$

$$\text{Capital gains yield (CGY)} = \frac{\text{Change in price}}{\text{Beginning price}}$$

$$\text{Expected total return} = \text{YTM} = \begin{pmatrix} \text{Expected} \\ \text{CY} \end{pmatrix} + \begin{pmatrix} \text{Expected} \\ \text{CGY} \end{pmatrix}$$

An example:
Current and capital gains yield

- Find the current yield and the capital gains yield for a 10-year, 9% annual coupon bond that sells for $887, and has a face value of $1,000.

Current yield = $90 / $887

= 0.1015 = 10.15%

Calculating capital gains yield

YTM = Current yield + Capital gains yield

$$\begin{aligned} CGY &= YTM - CY \\ &= 10.91\% - 10.15\% \\ &= 0.76\% \end{aligned}$$

Could also find the expected price one year from now and divide the change in price by the beginning price, which gives the same answer.

What is interest rate (or price) risk?

- Interest rate risk is the concern that rising k_d will cause the value of a bond to fall.

% change	1 yr	k_d	10yr	% change
+4.8%	$1,048	**5%**	$1,386	+38.6%
	$1,000	*10%*	*$1,000*	
-4.4%	$956	**15%**	$749	-25.1%

The 10-year bond is more sensitive to interest rate changes, and hence has more interest rate risk.

What is reinvestment rate risk?

- Reinvestment rate risk is the concern that k_d will fall, and future CFs will have to be reinvested at lower rates, hence reducing income.

EXAMPLE: Suppose you just won $500,000 playing the lottery. You intend to invest the money and live off the interest.

Reinvestment rate risk example

- You may invest in either a 10-year bond or a series of ten 1-year bonds. Both 10-year and 1-year bonds currently yield 10%.
- If you choose the 1-year bond strategy:
  - After Year 1, you receive $50,000 in income and have $500,000 to reinvest. But, if 1-year rates fall to 3%, your annual income would fall to $15,000.
- If you choose the 10-year bond strategy:
  - You can lock in a 10% interest rate, and $50,000 annual income.

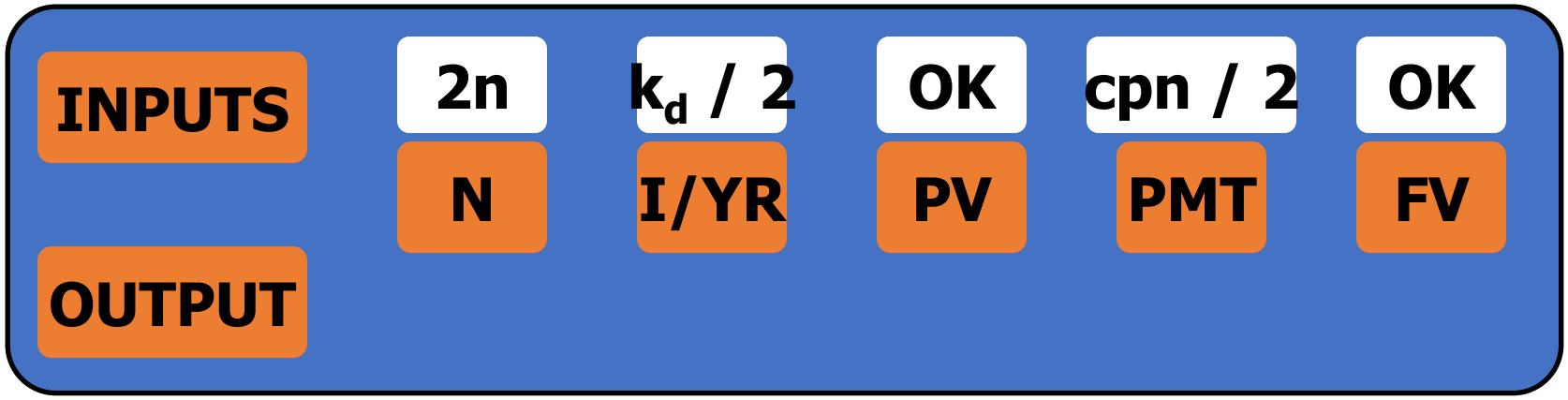
Conclusions about interest rate and reinvestment rate risk

	Short-term AND/OR High coupon bonds	Long-term AND/OR Low coupon bonds
Interest rate risk	Low	High
Reinvestment rate risk	High	Low

- CONCLUSION: Nothing is riskless!

Semiannual bonds

1. Multiply years by 2 : number of periods = 2n.
2. Divide nominal rate by 2 : periodic rate (I/YR) = k_d / 2.
3. Divide annual coupon by 2 : PMT = ann cpn / 2.



What is the value of a 10-year, 10% semiannual coupon bond, if k_d = 13%?

1. Multiply years by 2 : N = 2 * 10 = 20.
2. Divide nominal rate by 2 : I/YR = 13 / 2 = 6.5.
3. Divide annual coupon by 2 : PMT = 100 / 2 = 50.

	N	I/YR	PV	PMT	FV
INPUTS	20	6.5		50	1000
OUTPUT			- 834.72		

Would you prefer to buy a 10-year, 10% annual coupon bond or a 10-year, 10% semiannual coupon bond, all else equal?

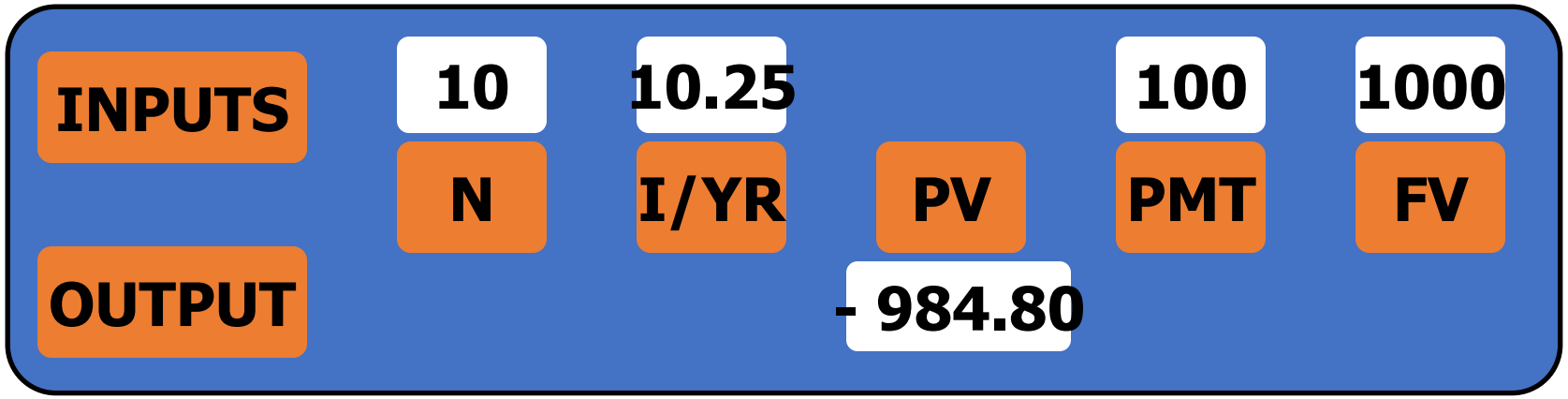
The semiannual bond's effective rate is:

$$EFF\% = \left(1 + \frac{i_{Nom}}{m}\right)^{m} - 1 = \left(1 + \frac{0.10}{2}\right)^{2} - 1 = 10.25\%$$

10.25% > 10% (the annual bond's effective rate), so you would prefer the semiannual bond.

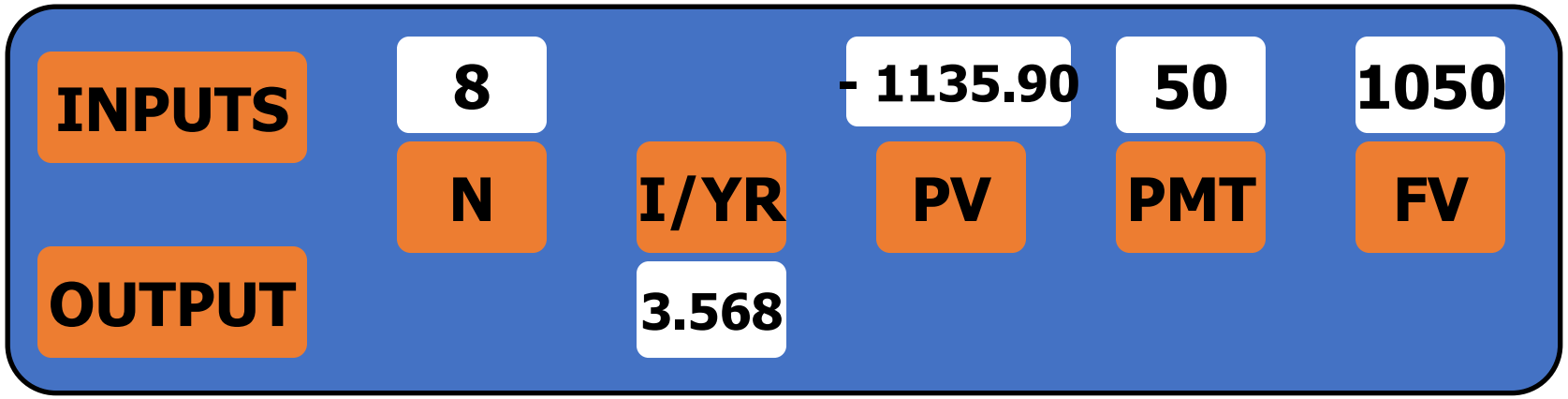
If the proper price for this semiannual bond is $1,000, what would be the proper price for the annual coupon bond?

- The semiannual coupon bond has an effective rate of 10.25%, and the annual coupon bond should earn the same EAR. At these prices, the annual and semiannual coupon bonds are in equilibrium, as they earn the same effective return.



A 10-year, 10% semiannual coupon bond selling for $1,135.90 can be called in 4 years for $1,050, what is its yield to call (YTC)?

- The bond's yield to maturity can be determined to be 8%. Solving for the YTC is identical to solving for YTM, except the time to call is used for N and the call premium is FV.



Yield to call

- 3.568% represents the periodic semiannual yield to call.
- $YTC_{NOM} = k_{NOM} = 3.568\% \times 2 = 7.137\%$ is the rate that a broker would quote.
- The effective yield to call can be calculated
  - $YTC_{EFF} = (1.03568)^2 - 1 = 7.26\%$

If you bought these callable bonds, would you be more likely to earn the YTM or YTC?

- The coupon rate = 10% compared to YTC = 7.137%. The firm could raise money by selling new bonds which pay 7.137%.
- Could replace bonds paying $100 per year with bonds paying only $71.37 per year.
- Investors should expect a call, and to earn the YTC of 7.137%, rather than the YTM of 8%.

When is a call more likely to occur?

- In general, if a bond sells at a premium, then (1) coupon > k_d, so (2) a call is more likely.
- So, expect to earn:
  - YTC on premium bonds.
  - YTM on par & discount bonds.

Default risk

- If an issuer defaults, investors receive less than the promised return. Therefore, the expected return on corporate and municipal bonds is less than the promised return.
- Influenced by the issuer's financial strength and the terms of the bond contract.

Types of bonds

- Mortgage bonds
- Debentures
- Subordinated debentures
- Investment-grade bonds
- Junk bonds

Evaluating default risk: Bond ratings

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

- Bond ratings are designed to reflect the probability of a bond issue going into default.

Factors affecting default risk and bond ratings

- Financial performance
  - Debt ratio
  - TIE ratio
  - Current ratio
- Bond contract provisions
  - Secured vs. Unsecured debt
  - Senior vs. subordinated debt
  - Guarantee and sinking fund provisions
  - Debt maturity

Other factors affecting default risk

- Earnings stability
- Regulatory environment
- Potential antitrust or product liabilities
- Pension liabilities
- Potential labor problems
- Accounting policies

Bankruptcy

- Two main chapters of the Federal Bankruptcy Act:
  - Chapter 11, Reorganization
  - Chapter 7, Liquidation
- Typically, a company wants Chapter 11, while creditors may prefer Chapter 7.

Chapter 11 Bankruptcy

- If company can't meet its obligations …
  - It files under Chapter 11 to stop creditors from foreclosing, taking assets, and closing the business.
  - Has 120 days to file a reorganization plan.
  - Court appoints a "trustee" to supervise reorganization.
  - Management usually stays in control.
- Company must demonstrate in its reorganization plan that it is "worth more alive than dead".
  - If not, judge will order liquidation under Chapter 7.

Priority of claims in liquidation

1. Secured creditors from sales of secured assets.
2. Trustee's costs
3. Wages, subject to limits
4. Taxes
5. Unfunded pension liabilities
6. Unsecured creditors
7. Preferred stock
8. Common stock

Reorganization

- In a liquidation, unsecured creditors generally get zero. This makes them more willing to participate in reorganization even though their claims are greatly scaled back.
- Various groups of creditors vote on the reorganization plan. If both the majority of the creditors and the judge approve, company "emerges" from bankruptcy with lower debts, reduced interest charges, and a chance for success.