10/18

Inventories

15.501/516 **Corporate Financial Accounting**
Fall 2010
Lecture 10

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Housekeeping

- Problem sets
  - PS3 due 10/25
- Reading
  - Dyckman chapter 7
- Today's slides
  - Available on Stellar

exam distribution on post slides
double peak w/ Fin Finance students

Where we are in the course

- Should be able to:
  - Record transactions Goods held for sale in the normal course of business
  - Make some accrual entries & adjusting entries to match revenues & expense
  - Prepare financial statements in those limited cases
  - Recognize revenue, making allowance for future bad debts, sales returns etc.
- Next step
  - Expand on matching of expenditures with revenues
  - Beginning with inventories

work our way around the balance sheet

Nature of Inventory

- Inventories are:
  - Goods held for sale in the normal course of business

    &
  - Items to be used in the production of goods to be sold in the normal course of business

Importance of inventory & cost of goods sold (CGS)

- CGS often largest expense in income statement
  except service firms
- Inventory often one of largest assets on B/S
  - Costly to hold leading to sophisticated systems to reduce the amount of inventory while still meeting customer demand (e.g., just-in-time JIT)
- Alternative inventory accounting methods can distort interpretations of margins & turnovers if information in footnotes is not used

main → interest - forgoing rate of return
warehouse
tech change
spoilage

Types of Inventories

- Vary with the type of business
- Merchandisers such as retail stores or wholesalers
  - Purchased goods
- Manufacturers
  - Raw materials
  - Work in process (WIP)
  - Finished goods

) talk more about next semester

different methods allowed by IRS
need to look at the different methods

Cost of Inventory

- All costs necessary to bring inventory to saleable condition
- Includes
  - Purchase cost (net of any discount) of
    - Goods (merchandiser, e.g. retail store) or
    - Raw materials (manufacturer)
  - Freight-in cost
    - If borne by the purchaser (both merchandiser & manufacturer)
  - Direct labor cost (manufacturer)
    - Wages costs of production workers
  - Overhead cost (manufacturer)
    - Foreman's wages, factory cleaning costs, depreciation, insurance & taxes on manufacturing facilities, supplies for equipment, etc
    - In general indirect costs that firms cannot trace directly to products manufactured, but which provide a firm with productive capacity.

7

attached to good's cost
is head quarters included?

Retailer

Merchandiser's inventory cost example

- Buys $3,800 on May 4th on account
  - Credit terms 2/10, n/30
  - Freight costs of $150 to be paid by the buyer
- Returns $300 on May 8th
- Pays
  - freight costs on May 9th
  - suppliers on May 10th

2% → 10 days
nothing → 30 days

8

Example - solution

Buys $3,800 on May 4th on account, Credit terms 2/10,n/30, Buyer to pay freight costs of $150

Returns $300 on May 8th

Pays freight costs on May 9th, suppliers on May 10th

ASSETS			=	LIABILITIES & OWNERS' EQUITY		
Cash	INV			A/P	N/P	RE
	3,800			3,800		
	-300			-300		
-150	+150					
-3430	-70					

9

cost to inventory

discount reduces cost of inv

Example - solution

Merchandise Inventory

Purchase	May 4	3,800	May 8 300	Purchase return
Freight-in	May 9	150	May 14 70	Purchase discount
	Balance 3,580			

10

Merchandiser (e.g., retail store)

- Inventory
  - Consists of many items
  - Owned by the company
  - In a form ready for sale to customers
  - One inventory classification on the Balance Sheet
    - Merchandise inventory

11

Merchandiser

Type of Business

Merchandiser →

- One type of inventory
- Purchased goods ready for sale

Balance Sheet (in thousands)	
Current assets	
Cash	$ 285,000
Marketable securities	530,000
Accounts receivable	149,000
Merchandise inventory	777,000
Prepaids	33,000
Total current assets	1,774,000
Investments:	
Investment in ABC bonds	321,657
Investment in UC Inc.	253,980
Notes receivable	150,000
Land held for speculation	550,000
Sinking fund	225,000
Pension fund	653,798

12

Manufacturer

- Three different kinds of inventory
  - Raw materials inventory
  - Work in process inventory
  - Finished goods inventory

13

Raw Materials

- Basic materials
  - that will be used in production
  - but have not been placed in production
- Examples
  - Furniture maker
    - Lumber, glue, nails, screws etc
  - Automobile manufacturer
    - Steel, fiberglass, glass etc

14

Work in Process

- Inventory
  - that has been placed into production
  - but the product is not yet complete.
- What costs are included?
  - Actual Material Cost
  - Actual Labor Cost
  - Actual Overhead Cost
- Allocation issues often preclude some costs from being included

15

Finished Goods

- Manufactured items that
  - are complete
    &
  - ready for sale

16

Manufacturer

Type of Business

Manufacturer

Three types of inventory accounts
- Raw materials
- Work in process
- Finished goods

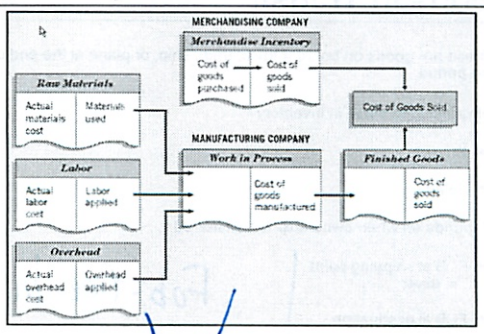
Balance Sheet (in thousands)

Current assets	
Cash	$285,000
Marketable securities	530,000
Accounts receivable	149,000
Inventory	
Raw materials	210,000
Work in process	417,000
Finished goods	150,000
Total inventory	777,000
Prepaids	33,000
Total current assets	1,774,000
Investments:	
Investment in ABC bonds	321,657

Often only total inventory is reported in the balance sheet with the break-up into raw materials, WIP & finished goods reported in the footnotes

17

Inventory flow



18

Tracking inventory

- **Perpetual system**
  - Tracks inventory directly
  - Accurate & timely but costly
- **Periodic system**
  - Infer quantity sold from
    - beginning and ending inventories &
    - purchases/production
  - More difficult to detect inventory "shrinkage" (i.e., theft, spoilage, etc.)
  - Requires an assumption about inventory flow

19

Determining Inventory Quantities

- Important for both systems
  - More important for periodic
- Determine quantities by counting, weighing or measuring each inventory type

20

Determining Ownership

- Do all the goods included in the count belong to the company?
- Does the company own any goods not included in the count?
- What kind of goods are of particular concern here?
  - Consigned goods
  - Goods-in-transit

21

Consigned Goods

- Goods of others you hold.
  - You do not pay for the goods until they sell.
- The company does not take ownership.

22

Goods in Transit

- These are goods on board a truck, train, ship, or plane at the end of the period.
- Who includes these in inventory?
  - **Buyer?**
  - **Seller?**
- Depends on when ownership is transferred
  - FOB at **shipping point**
    - **Buyer**
  - FOB at **destination**
    - **Seller**

23

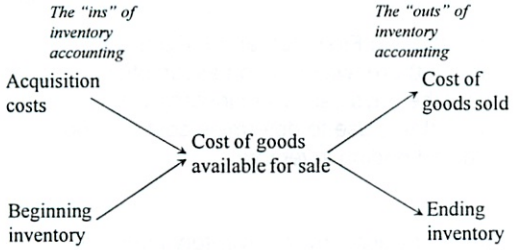
Periodic systems

1. Determine quantity of units of inventory
2. Apply unit costs to the quantities
3. Determine total cost of ending inventory
4. Determine cost of goods sold from
   1. Cost of ending inventory
   2. Cost of beginning inventory
   3. Cost of purchases of goods

Process can be complicated if units are purchased at different times & at different prices!

24

"Ins" & "Outs" of Inventory Accounting



BInv + Purchases = COGAS = COGS + EInv

25

Even w/ 1 product - how do you allocate cost?

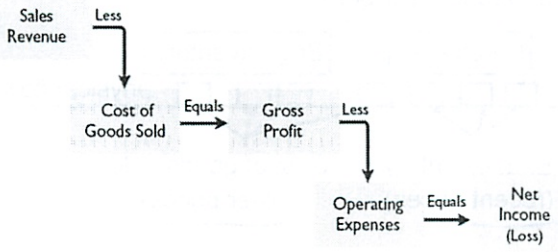
Inventory T-Account

Inventory	
BB Inventory	Cost of goods sold
Purchases/ Production	
EB Inventory	

BB INV + purchases/production - COGS = EB INV

26

Income Measurement



27

Inventory Costing

- **Specific Identification method** perpetual (all work w/ IRS)
- **Cost Flow Assumptions** periodic
  - **FIFO- First-in, First-Out- earliest goods purchased are the first to be sold**
  - **LIFO- Last-in,First-Out- latest goods purchased are the first to be sold**
  - **Average Cost Method- costs are charged on the basis of weighted average unit cost**

28

Specific Identification Method

- **Specific Identification method (rarely used)**

An actual physical flow costing method in which items still in inventory are specifically costed to arrive at the total cost of ending inventory

When would it tend to be used? easy + worthwile

For items that are

antiques, paintings

29

What Is a Cost Flow Assumption?

An assumption about the order in which goods are sold even if flow of costs is unrelated to the physical flow of goods.

What Makes Cost Flow Assumptions Necessary?

prices change

inventory costs change

30

Inventory Costing

- **Weighted-Average Cost** (Average Cost Method)

  The average cost method allocates the cost of goods available for sale on the basis of weighted-average unit cost incurred.

Cost of goods available for sale / Total Units

Available for Sale=Weighted Average Unit Cost

31

LIFO vs. FIFO

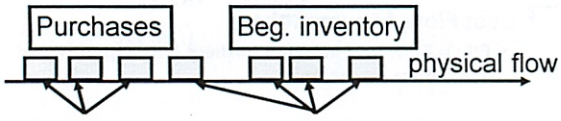
- LIFO (Last in First Out) and FIFO (First In First Out) are two common assumptions about the physical flow of inventory that accountants use to determine cost of goods sold and ending inventory
- Actual physical flow of inventory need not correspond with these assumptions

32

FIFO – Conveyor Belt

(FIFO assumes the *earliest goods* purchased are the first to be sold.)

FIFO (conveyor belt)



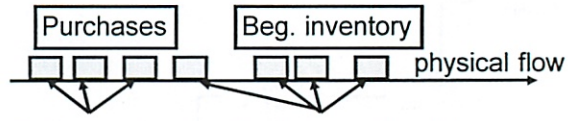
End. inventory Cost of goods sold

If 4 units are sold, COGS is the purchase price of the first 4 units put on the conveyor belt

33

FIFO – Conveyor Belt

FIFO (conveyor belt)



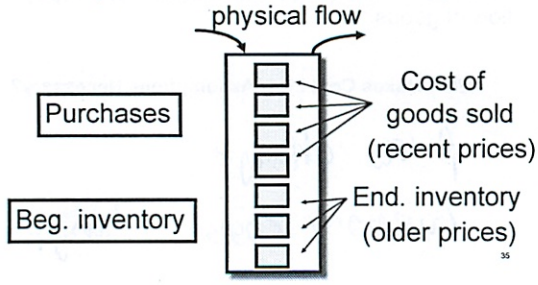
End. inventory (recent prices) Cost of goods sold (older prices)

34

LIFO – Cookie Jar

(LIFO assumes the *last goods* purchased are the first to be sold.)

LIFO (cookie jar) -- If 4 units sold, COGS is the purchase price of last 4 units put in the jar



35

Illustrative Example
Effect of price changes

Beginning inventory: 200 units @ $10/unit = $2,000

Quarter	Purchases Units	Scenario 1: Stable Prices Unit cost	Purchases Dollars	Scenario 2: Rising Prices Unit cost	Purchases Dollars
1	100	$ 10	$ 1,000	$ 11	$ 1,100
2	150	$ 10	$ 1,500	$ 12	$ 1,800
3	150	$ 10	$ 1,500	$ 13	$ 1,950
4	100	$ 10	$ 1,000	$ 14	$ 1,400
	500		$ 5,000		$ 6,250

Units sold: 100 units per quarter, or in total 400 units
Ending inventory: 300 units

Number of units available for sale: 200+ 500 = 700 units

- Use of FIFO vs. LIFO makes a difference when prices change.

36

Illustrative Example (cont'd)

A. FIFO

The 400 units sold (CGS) are assumed to carry the earliest costs incurred and the 300 units left in inventory carry that latest costs.

CoGS				Ending inventory			
200	@ $ 10	=	$2,000	100	@ $ 14	=	$1,400
100	@ $ 11	=	$1,100	150	@ $ 13	=	$1,950
100	@ $ 12	=	$1,200	50	@ $ 12	=	$600
400			$4,300	300			$3,950

B. LIFO

The 400 units sold (CGS) are assumed to carry the latest costs incurred and the 300 units left in inventory carry that earliest costs.

CoGS				Ending inventory			
100	@ $ 14	=	$1,400	200	@ $ 10	=	$2,000
150	@ $ 13	=	$1,950	100	@ $ 11	=	$1,100
150	@ $ 12	=	$1,800				
400			$5,150	300			$3,100

37

Reporting Trade-offs

- FIFO vs. LIFO:
  - Inventories closer to replacement (current) cost under FIFO – reliable B/S
  - CoGS closer to replacement cost under LIFO – High quality of earnings

FIFO

LIFO

better balance sheet

higher income

$$\text{Price - hist. cost} = \underbrace{(\text{Price - repl. cost})}_{\text{operating margin (economic profit)}} + \underbrace{(\text{repl. cost - hist. cost})}_{\text{Holding gain(influences only accounting earnings)}}$$

Independent of inventory method

Dependent on use of LIFO or FIFO

38

But what you use for reporting is also for tax - which w/ inflation? LIFO

Reporting Trade-offs (cont'd)

- **I/S perspective (CoGS): LIFO vs. FIFO**

  Example continued:
  - 400 units were sold.
  - At replacement cost ((i.e., the 4th quarter unit cost of $14) the CoGS equals 400 x $14 = $5,600

$$\underset{\$4,300}{\text{FIFO}} < \underset{\$5,150}{\text{LIFO}} < \underset{\$5,600}{\text{replacement cost}}$$

39

Reporting Trade-offs (cont'd)

- **B/S perspective (Inventory)**
  - Ending inventory 300 units
  - At replacement cost ($14 per unit) inventory has carrying value of: 300 x $14 = $4,200

$$\underset{\$4,200}{\text{Replacement cost}} > \underset{\$3,950}{\text{FIFO}} > \underset{\$3,100}{\text{LIFO}}$$

40

lower income = lower taxes

they pay less taxes

lower profits vs lower assets

Next class

- **A bigger example on FIFO, LIFO, and WA**
- **Reporting trade-offs**
  - Balance sheet effects
  - Income statement effects
  - Tax considerations
- **Ratio analysis of inventory**

41

10/20

Skipped Class

Inventories II

15.501/516 **Corporate Financial Accounting**
Fall 2010
Lecture 11

(Post-class notes)

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Massachusetts Instituteof Technology

1

Housekeeping

- Problem sets
  - PS3 due Monday
- Reading
  - Dyckman Chapter 7
- Today's slides
  - Available on Stellar

2

Monday

Covered Inventory – Chapter 7

- Nature of inventory
  - Goods held for sale
  - Items held to be used in production of goods
- Types of inventory
  - Merchandisers - purchased goods
  - Manufacturers
    - Raw materials
    - Work in process (WIP)
    - Finished goods

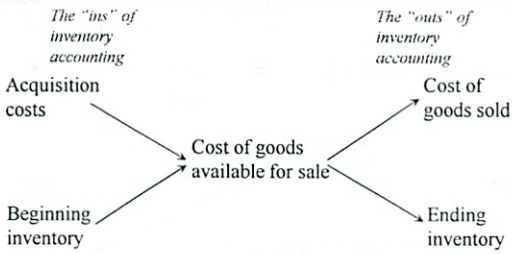
3

Monday

- Costs of inventory (costs necessary to bring to saleable condition)
  - Purchase costs
  - Freight-in costs
  - Direct labor costs
  - Overhead costs
- Tracking inventory
  - Perpetual system
  - Periodic system
  - Determining quantities
  - Determining ownership (consignment, goods in transit)

4

Monday
Cost flow assumptions



BInv + Purchases = COGAS = COGS + EInv

5

Inventory T-Account

Inventory	
BB Inventory	Cost of goods sold
Purchases/ Production	
EB Inventory	

BB INV + purchases/production - COGS = EB INV

6

Monday

- Cost Flow Assumptions for determining Cost of Goods Sold & Ending Inventory
  - FIFO- First-in, First-Out- earliest goods purchased are the first to be sold
  - LIFO- Last-in,First-Out- latest goods purchased are the first to be sold
  - Average Cost Method- costs are charged on the basis of weighted average unit cost

7

Monday
Reporting Trade-offs

- FIFO vs. LIFO:
  - Inventories closer to replacement (current) cost under FIFO
  - CoGS closer to replacement cost under LIFO
  - Which method gives more accurate measure of
    - Income?
    - Value of inventories in the B/S?

8

Monday
Reporting Trade-offs

- I/S perspective (CoGS): LIFO vs. FIFO

  Example:
  - 400 units were sold.
  - At replacement cost ((i.e., the 4th quarter unit cost of $14) the CoGS equals 400 x $14 = $5,600

FIFO $4,300 < LIFO $5,150 < replacement cost $5,600

9

Monday
Reporting Trade-offs (cont'd)

- B/S perspective (Inventory)
  - Ending inventory 300 units
  - At replacement cost ($14 per unit) inventory has carrying value of: 300 x $14 = $4,200

Replacement cost $4,200 > FIFO $3,950 > LIFO $3,100

10

LIFO vs. FIFO
Transaction analysis

Transactions:

1) Owners invest $24
2) Buy 1 unit of inventory in March for $10
3) Buy 1 unit of inventory in April for $12
4) Sell 1 unit in May for $21
5) Pay other expenses of $6

11

LIFO vs. FIFO Example

Cash	+	Inventory	=	CC	+	RE
+24				+24		
-10		+10				
-12		+12				
+21						+21
-6						-6

- FIFO COST OF GOODS SOLD?

-10

-10

12

LIFO vs. FIFO Example

FIFO

Inc. Statement		Balance Sheet	
Sales	21	Cash	17
COGS	10	Inventory	12
GM	11	Assets	29
Oper. Exp.	6		
Pretax Inc.	5	CC	24
		RE	5
		SE	29

Old costs on I/S

Recent costs on B/S

13

LIFO vs. FIFO Example

Cash	+	Inventory	=	CC	+	RE
+24				+24		
-10		+10				
-12		+12				
+21						+21
-6						-6

LIFO cost of goods sold?

-12

-12

14

LIFO vs. FIFO Example

LIFO

Inc. Statement		Balance Sheet	
Sales	21	Cash	17
COGS	12	Inventory	10
GM	9	Assets	27
Oper. Exp.	6		
Pretax Inc.	3	CC	24
		RE	3
		SE	27

Recent costs on I/S

Old costs on B/S

15

LIFO vs. FIFO Example

	LIFO	FIFO
COGS	**12**	**10**
Ending Inv.	**10**	**12**

16

Weighted Average

Inc. Statement		Balance Sheet	
Sales	21	Cash	17
COGS	11	Inventory	11
GM	10	Assets	28
Oper. Exp.	6		
Pretax Inc.	4	CC	24
		RE	4
		SE	28

Mixture of old and new costs on the balance sheet and income statement

17

Income Statement Effects

- In periods of increasing prices
  - FIFO reports the highest net income
  - LIFO the lowest
  - average cost falls in the middle
- In periods of decreasing prices
  - FIFO will report the lowest net income
  - LIFO the highest
  - average cost in the middle

18

Balance Sheet Effects

In a period of increasing prices, costs allocated to ending inventory using:

- FIFO will approximate current costs
- LIFO will be significantly understated

19

What affects management's choice of methods?

- Income statement effects
  - Political costs
    - Oil & gas industry
  - Deter competition
  - Matching (LIFO gives Cost of Goods Sold in more current prices)
- Balance sheet effects
  - Desire for stronger balance sheet
- Tax effects

20

Why Do Companies Use LIFO?

- Tax use related to reporting use
- Which firms want to use LIFO for tax purposes?
  - Those whose input prices are rising
- Why?
  - Higher cost of goods sold
  - Lower net income
  - Lower Income Taxes
- Which firms would want to use FIFO for tax purposes?
  - Those whose input prices are falling

21

Consistency

Whatever cost flow method a company chooses, it must use it consistently…

OR

Disclose the change and its effects on net income in the financial statement

22

Lower of Cost or Market

When the value of inventory is lower than its cost, the inventory is written down to its market value by valuing the inventory at the lower of cost or market (LCM) in the period in which the price decline occurs.

23

Lower of Cost or Market (LCM)

- Under LCM, market is defined as current replacement cost – NOT selling price
- Departure from cost principle, but follows conservatism concept
- LCM applied after costing with one of methods (FIFO, LIFO, average, specific)
- Apply to individual items or major categories or total inventory

24

LIFO Reserve

- Standards require firms using LIFO to report the amount by which inventory would be increased (or on occasion decreased) if the firm had instead been using FIFO
- This amount is the LIFO reserve.
  - Reporting the LIFO reserve enables financial statement users to make adjustments to compare companies that use different cost flow methods

25

LIFO Layers Example

Beg. Inv. 2002: 30 units @$1.2 each
2001: 50 units @$1.1 each
2000: 100 units @$1 each

Purchase 2003: 340 units @ $2 each
Sell 500 units @ $3 each

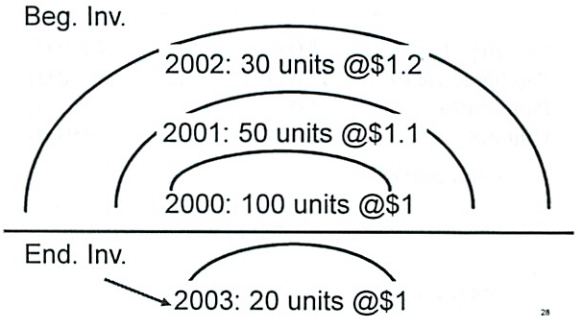
LIFO COGS? 340 @ $2
+30 @ $1.2
+50 @ $1.1
+80 @ $1
= $851,000

26

LIFO Layers Example

27

LIFO Layers Example



28

LIFO Reserve

- Difference between inventory value under LIFO and inventory value under FIFO
- Companies using LIFO must disclose this reserve
- Allows for comparison of LIFO and FIFO companies
- FIFO **inv value** = LIFO inv value + LIFO reserve
- FIFO **cogs** = LIFO cogs - Δ LIFO reserve

29

Review - FIFO

Inventory, Jan 1	8,000	$11	$ 88,000
Purchase June 19	13,000	12	156,000
Purchase Nov. 8	5,000	13	65,000
Units AS	26,000	CGAS	$309,000

Using the above data, assume there are 9,000 units on hand at Dec. 31, what is

1) the cost of ending inventory under FIFO?
2) the CGS under FIFO?

30

Review - FIFO

Inventory, Jan. 1	8,000	$11	$ 88,000
Purchase, June 19	13,000	12	156,000
Purchase, Nov. 8	5,000	13	65,000
Units AS	26,000	CGAS	$309,000

Inventory Cost Dec 31

5,000 Units @ $13 = $ 65,000
4,000 Units @ $12 = 48,000
9,000 Inv Cost $113,000

CGS for year

17,000 Units CGS 196,000
26,000 $309,000

31

Review - LIFO

Inventory, Jan 1	8,000	$11	$ 88,000
Purchase,June 19	13,000	12	156,000
Purchase,Nov. 8	5,000	13	65,000
UnitsAS	26,000	CGAS	$309,000

Using the above data, assume there are 9,000 units on hand at Dec. 31, what is

1) the cost of ending inventory under LIFO?
2) the CGS under LIFO?

32

Review - LIFO

Inventory, Jan 1	8,000	$11	$ 88,000
Purchase,June 19	13,000	12	156,000
Purchase,Nov. 8	5,000	13	65,000
UnitsAS	26,000	CGAS	$309,000

Inventory Cost Dec 31

8,000 Units @ $11 = $ 88,000
1,000 Units @$12 = $ 12,000
9,000 Inv Cost $100,000

CGS for year

17,000 CGS 209,000
26,000 $309,000

33

LIFO Reserve

FIFO inventory value = LIFO inventory value + LIFO reserve

LIFO Reserve at end of year

FIFO inventory	9,000 units	$113,000	
LIFO inventory	9,000 units	100,000	$13,000

LIFO Reserve at beginning of year

FIFO inventory	8,000 units @ $11	$88,000	
LIFO inventory	8,000 units @ $11	88,000	0

Change in LIFO reserve $13,000

FIFO CGS = LIFO CGS - Change in LIFO Reserve
$196,000 = $209,000 - $13,000

34

Review - Weighted Average Costs

Inventory, Jan 1	8,000	$11	$ 88,000
Purchase,June 19	13,000	12	156,000
Purchase,Nov. 8	5,000	13	65,000
UnitsAS	26,000	CGAS	$309,000

Using the above data, assume there are 9,000 units on hand at Dec. 31, what is the cost of ending inventory under Weighted-average costs?

35

Review - Weighted Average Costs

Inventory, Jan 1	8,000	$11	$ 88,000
Purchase,June 19	13,000	12	156,000
Purchase,Nov. 8	5,000	13	65,000
UnitsAS	26,000	CGAS	$309,000

Weighted average cost of CGAS

309,000/26,000 = $11.88

Cost of ending inventory

9,000 units X $11.88 = $106,920

- LIFO ending inventory $100,000
- FIFO ending inventory $113,000

36

Ratio Analysis

- Inventory turnover
- Days in inventory
- Adjustment for FIFO versus LIFO
- Implications for other ratios

37

Inventory Turnover Ratio =

$$\frac{\text{Cost of Goods Sold}}{\text{Average Inventory}}$$

An indication of how quickly a company sells its goods.

38

Days in Inventory =

$$\frac{365 \text{ days}}{\text{Inventory Turnover Ratio}}$$

Measures average number of days inventory is held

Dyckman calls this the average inventory days outstanding

39

FIFO vs. LIFO

- In comparing firms' inventory ratios
  - Firms' inventory accounting should be put on same basis
  - See p. 329 of text for example of how to do this
- Implications for:

	Inflation	Deflation
• Liquidity ratios	LIFO understates Current ratio	LIFO would overstate CR but LCM could affect
• Profitability ratios	FIFO overstates gross & net margins LIFO understates	LIFO overstates gross & net margins FIFO understates
• Other ratios?		

40

Compute Ratios: Apple

Selected financial information for Apple Computer, Inc for FY 2006 and FY 2005 (in $ millions):

	Apple	
	FY 2006	FY 2005
Gross A/R	$1,304	$941
Allowance	($52)	($46)
Net A/R	$1,252	$895
Inventory	$270	$165
Sales	$19,315	$13,931
Cost of Sales	$13,717	$9,889
Net Income	$1,989	$1,328

Compute Inventory TO & Days in Inventory

41

Compute Ratios: Dell

Selected financial information for Dell, Inc for FY 2006 and FY 2005 (in $ millions):

	Dell	
	FY 2006	FY 2005
Gross A/R	$4,186	$3,641
Allowance	($97)	($78)
Net A/R	$4,089	$3,563
Inventory	$576	$459
Sales	$55,908	$49,205
Cost of Sales	$45,958	$40,190
Net Income	$3,572	$3,043

Compute Inventory TO & Days in Inventory

42

Ratios: Inventory Turnover & Days in Inventory

	Inventory Turnover	Days in Inventory
Apple	63.07 = 13,717 / .5(270 + 165)	5.8 = 365 / 63.07
Dell	88.81 = 45,958 / .5(576 +459)	4.1 = 365 / 88.81

43

Compute Ratios: Toyota

Selected financial information for Toyota Motor Corp for FY 2005 and FY 2004 (in $ millions):

	Toyota	
	FY 2005	FY 2004
Gross A/R	$15,225	$14,533
Allowance	($174)	($270)
Net A/R	$15,051	$14,263
Inventory	$12,168	$10,088
Sales	$165,666	$154,372
Cost of Sales	$135,025	$125,769
Net Income	$10,907	$10,821

Compute Inventory TO & Days in Inventory

44

Compute Ratios: GM

Selected financial information for GM Corp for FY 2005 and FY 2004 (in $ millions):

	GM	
	FY 2005	FY 2004
Gross A/R	$8,096	$7,016
Allowance	($338)	($303)
Net A/R	$7,758	$6,713
Inventory	$13,851	$11,717
Sales	$158,221	$161,545
Cost of Sales	$162,173	$150,224
Net Income	($12,925)	($145)

Compute Inventory TO & Days in Inventory

45

Ratios: Inventory Turnover & Days in Inventory

	Inventory Turnover	Days in Inventory
Toyota	12.13 = 135,025 / .5(12,168 + 10,088)	30.1 = 365 / 12.13
GM	12.69 = 162,173 / .5(13,851 +11,717)	28.8 = 365 / 12.69

46

Ratios: Inventory Turnover & Days in Inventory

	Inventory Turnover	Days in Inventory
Apple	63.07 = 13,717 / .5(270 + 165)	5.8 = 365 / 63.07
Dell	88.81 = 45,958 / .5(576 +459)	4.1 = 365 / 88.81
Toyota	12.13 = 135,025 / .5(12,168 + 10,088)	30.1 = 365 / 12.13
GM	12.69 = 162,173 / .5(13,851 +11,717)	28.8 = 365 / 12.69

47

Chap 6 Inventory Reading

10/24

Home Depot - 2nd largest retailer
dependant on home building market
must manage costs through central purchasing + tech
large logistics program
carrying large invetory ties up $1

Reporting Op Ex

- can choose when to recognize expenses
- direct association - if can be directly connected w/ revenue
  - estimate future costs like warentees
- immediate recognition - admin + marketing costs can not be allocated to certain sales
  - but can be allocated to current time period
  - GAAP requires R+D canted immediatly
- systematic allocation - can't assign to 1 period
  - spread over all periods that benefit
    - ie depreciation

(2) Recording + Reporting Inventory Costs

When a inventory purchased/produced goes on balance sheet
When sold goes to income statement as an expense
Process costs removed from balance sheet is important
if higher cost units transfered gross profit lower
lower " " " " " higher

inventory on balance shet inc. transport + prepping goods for sale
can vary overtime or w/ changes in market conditions

gross profit = sales revenue − COGS

Cash discounts

if payment made in short time
sellers offer on sales on credit
basically a penalty for paying after that
inventory usually recorded at cost net of discount
So recorded assuming you will pay early
then after 10 days add "late fee" to COGS
- like a finance charge
highlights the missed discount

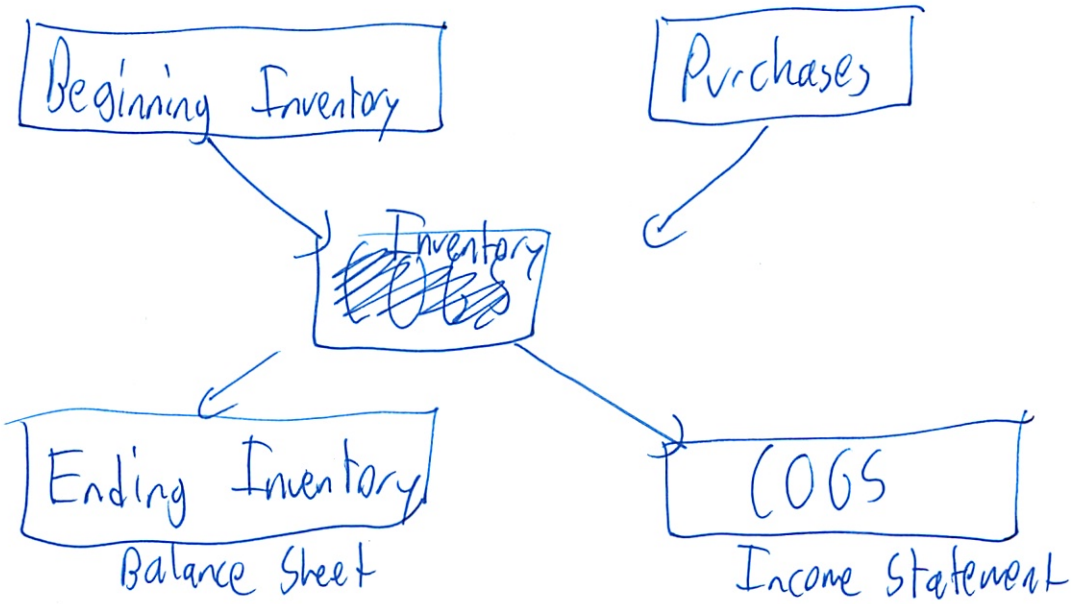
(3) Manufacturing Firms

3 categories
- raw materials
- work in progress
  - labor + materials + overhead added in as work done
- finished goods

Sometimes combined on balance sheet
- but can find in footnotes

Inventory Costing Methods

Calculation of COGS important

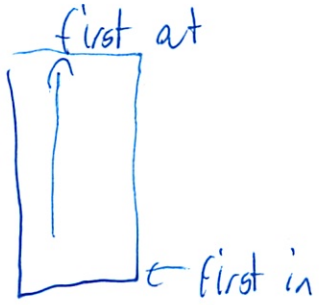


How to split inventory to
- ending inventory
- cogs ?

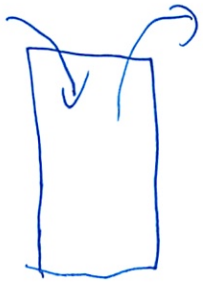
Which to take off? - 3 methods

(4) First In - First Out (FIFO)

- in order originally recorded
- begining inventory tapped 1st



Last In First Out (LIFO)



~~First~~ - most recent units purchased used 1st

Average Cost (AC)

averages the cost of all units ~~$~~ avalible for sale in that period

Lower of Cost or Market (LCM)

if reported cost > market value
↑ FIFO ↑ current replacement cost

inventories must be written down
- inventory book value written down to market value (↓ assets)
- reflected as an expense (part of COGS) reducing gross profit

(5)

Often during restructuring
Can shift income from 1 period to another
if agressivly write down values future gross profits would ↑
- lower COGS current " " ↓

GAAP says inventories can not be written down below
a floor = to net realizable value less normal markup
- must be substituted by auditors

LIFO not allowed in most international countries
(does not say why) except US + Germany

Financial Statement Effects + Disclosure

Home Depot uses FIFO, lower cost or market
- surveys inventory to account for shrink/swell

Chevron uses LIFO for oil, but avg cost for supplies
(? how does swell happen?)
- allowed to use diff. methods for diff things
- required to report diff b/w market value + LIFO #s
  - called the LIFO reserve
- must report LIFO profits - income from LIFO liquidation
(Apendix GA)
each time inventory purchased → make new LIFO layer

(6)

Older costs can stay in inventory for several years
When a lot of goods are sold need to go to older layers
↳ LIFO liquidation

- Usually much lower than current market costs
- So boosts current gross profits
- old prices matched with current revenues

Once layer used can only be replaced at current prices
distorts gross profit margins
Can happen because
- natural disaster
- Voluntary inventory ↓
- Earnings management

The extra gross profit is taxable
So companies avoid LIFO liquidation, have inefficiently high inventories
neither is in stockholder's best interests
(so why does anyone do LIFO???)

Why is so much attention put on inventories?
- large magnitude on balance sheet + income statements
- risk of inventory loss - tech obsilence + consumer taste
- storage costs (warehouses)
- handling cost (wages)
- insurance cost
- provides insight into companies future

(7)

Financial Statements Effects of Inventory Costing

Income Statement effects

When inventory costs rise over period

FIFO	lower COGS	Higher Gross profits	← Uses up old low cost inventory holding gains from inflation
LIFO	high COGS	lower " "	
Avg Cost	mid COGS	mid " "	

↗ lower in recent years w/ low inflation + lean inventories
can still show up sometimes where high inflation or low inventory turnover

Balance Sheet Effects

LIFO does not accurately reflect replacement value
↳ LIFO reserve = Unrealized holding gain
from holding inventory as prices ↑
not recognized until inventory sold
FIFO has some of this too
- When market values fall, FIFO more likely to make adjustments

Cash Flow Effects

higher gross profits on FIFO = higher taxes
↳ assuming FIFO method also used for tax reporting
LIFO decreased Chevron's tax bill
↳ ah thats why want LIFO
Use LIFO reserves + LIFO inventory to compare w/ FIFO firm

To adjust income statement use change in LIFO reserves
- subtract amt from ~~Inventories~~ COGS, add to gross profit

LIFO enhances usefulness of income statement to determent of balance sheet
- So that is why must disclose LIFO reserve

LIFO income statements better reflect stock prices than FIFO income statements restated using LIFO reserve

Negitive relation b/w stock price and LIFO reserve
↳ LIFO reserve = inflation indicator - detrimental to company value

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Financial Statement Analysis

Gross profit analysis

Gross profit margin used to compare across companies + time
decline in GPM bad since means company can not pass cost increases on to customers

reasons
- product line is stale
  - needed sales/market downs or demand eroding
- new competition entering market
- general decline in economic activity
- inventory is overstocked

(9)

Gross margin varies b/w industries
companies rarely can increase their price
- so must ↓ supply chain costs

Inventory Turnover (INVT)

$$= \frac{COGS}{\text{Avg inventory}}$$ ← reported at cost

more turns = sold quicker

Avg Inv days outstanding (AIDO)

$$= \frac{\text{avg inventory}}{\text{avg daily COGS}} \quad \text{avg daily COGS} = \frac{COGS}{365}$$

indicates how long inventory is on the shelves
acceptable depends on industry
higher better (without needing a lot of discounting)
but depends on mix of products
- ie sells high margin low-turnover items

extra advertising can ↑ turnover
- but is SG+A cost not COGS

or can increase efficiency
better asset utilization
such as Dell only building when has order

Chap 7 Long Term Operating Assets

10/24

Reading

P+G largest Consumer products companies
ad budget 11% of sales
focuses on high margin items like beauty
innovates a lot

---

investments in long-term operating assets biggest item on balance sheet
can affect companies' performance for several years
tangible (physical) = PP+E
intangible - trademarks + patents
not for resale
but to produce + deliver goods + services

Property, Plant + Equipment (PPE)

- largest category for many companies

Determining Costs to Capitalize

- what portion of costs are this period's expense
- and what added to assets on balance sheet

- called capital expenditures

1. Must be owned + controlled by company
2. Must be expected to provide future benefits

(2)

all costs to acquire asset included → installation, shipping, taxes

can only capitalize costs directly linked to future benefits

- no incendental costs or costs incurred event w/o asset

Capitalized cost can not exceed future economic benefit

↳ so a $200 asset must be able to provide at least $200 in use and disposal

Capitalize all costs if build asset self

including interest <u>while building</u> = capitalized interest

- decreases current expenses

Maintance + repairs is a current expense

but if <u>improves</u> or <u>betters</u> asset then can capitalize

↳ extends usefulness or useful life

<u>Depreciation</u>

Cost must be trastered over time from balance sheet to income statement to be reported as an expense through a <u>systematic allocation</u> of cost to each period

- not change in market value!
- and can't say directly how much asset used up each period

depreciation reduces <u>book value</u>/<u>carrying value</u>

recorded as accumulated depreciation on balance sheet (XA)

(3) ~~Methods~~ Estimates Needed

1. Useful Life - period asset expected to provide economic benefit
   - not its physical life
   - set at or below period company plans to replace the asset
2. Residual/salvage value = expected value at end of useful life
   - disposal/scrap/resale value

factors estimated when asset is acquired

depreciate the depreciation base/non recoverable cost

= capitalized cost - residual value

Methods

Straight Line Method

- depreciation recorded evenly over useful life

$$\frac{\text{Cost} - \text{salvage value}}{\text{useful life}}$$

- depreciation rate

$$\frac{1}{\text{useful life}}$$

- accumulated depreciation
  - Σ depreciation to date
- book value
  - cost - accumulated depreciation

(4) Dable Declining Balance Method (DDB)

- GAAP allows accelerated depreciation
- recording more depreciation in early years of useful life
- total amt of depreciation same
- just diff amts each year.

* residual amt not subtracted off first

Depreciation rate

2 x straight line depreciation rate

- ie SL rate = 20%
- DDB rate year 1 = 40%
  " 2 = ~24% of original value
  " 3 = 14.4% " "
  " 4 = 8.64% " "
  " 5 = always 40% of current value

discontinued when salvage amt reached

Units of production Method

Useful life defined in # of units of service provided by asset
ie # of miles
So calculate cost per mile driven = depreciation rate

Companies use straight line for reporting
MACRS for tax (like DDB)
for maximum income on financial statements and minimal taxable income in early years - deter tax payments

(5) Changes in Accounting Estimates

can change estimates during useful life of asset
if useful life or residual value changes - must reestimate
- does not result in formal accounting entry
- just recalculate from now based on what's left

Asset Sales + Impairments

Gains + Losses on Asset sales

> Gains or Losses on Asset sales = Proceeds from sale − Book Value of Asset

- can be large - must be aware since non recurring
- then companies usually note it seperatly
- otherwise wrap gains into SG+A expenses

Asset Impairments

if expected future cash flows as result of asset fall below book value, asset needs to be written down to market value

6

Sum of undiscounted expected cash flows < Net book value of asset → Yes → Asset impaired - write down to market value

↓ No

No asset impairment

once written off, future depreciation charges reduced

↳ written off part is gone off balance sheet

often done w/ restructuring programs

Insufficient write downs - if management overoptimistic about future prospects

Aggressive write downs - big bath scenario - if income currently low, why not just make it all very low now

neither case condoned - but happens

Analyzing Financial Statements

PPE Turnover (PPET)

$$\frac{\text{Sales}}{\text{Avg PPE Assets}}$$

productivity or utilization of asset

want high number (low capex for given sales)

lower for capital intensive manufacturing

Percent Depreciated

$$\frac{\text{Accumulated depreciation}}{\text{Depreciable asset cost}}$$

↑ cost − salvage value

If assets replaced evenly each year would be 50% depreciated
if high - may need a lot of capex in coming years
if low - many assets are new
most companies are close to 50%

Intangable Assets

provide future benefits but lack physical substance

Patents, trademarks, contracts = identifiable intangable assets

Goodwill - not protected anywhere, but can be seperated, sold + transfered
- Customer lists, unpatented software, formulas, processes, db.

must decide which costs to capitalize and when to put on income statements

but future benefits very hard to quantify + uncertain
hard to estimate useful life

R+D costs

can exceed 10% of revenues at tech + pharma companies
R+D personell, contract services, plant asset costs

(8)

Companies expect future benefits from R+D
but don't know which projects or how many
So follow uniform method: expense cost as incurred
- applies to all R+D costs before starting production
must expense R+D equipment immediately unless can be used elsewhere
↳ no depreciation ↳ in R+D or otherwise

Patents

exclusive right to use invented technology
Market value depends on commercial sucess of product or tech
between 0 and billions of dollars
if purchased from inventor → capitalize + treat as assets
if developed internally → only capitalize legal + app costs
↳ R+D costs gone

Trade Marks

name, logo, package design, image, jingle, slogan
Companies spend millions developing, protecting + promoting
if purchased from other company → purchase price capitalized
Otherwise just cost of developing internally
all ad. costs expensed immediately even if trademark helped by advertising
So often trademark not on balance sheet

(9)

Franchise Rights

- and Operating rights and licenses
- purchase price capitalized + treated as an asset

Amortization and the Impairment of Identifyable Intangable Assets

must decide if asset has a ~~useful life~~ definite life

↳ if it does must amortize the costs over useful life

↑ systematic allocation of costs of intangable asset to periods benefited - matching principle

generally using straight line method

Costs generally go into GA+S costs

impairment -

- Some assets have infefinite lives, can't estimate useful life
- can't amortize
- but must ~~test~~ test anually if value has been impared

if book value > fair market value

Good will

recorded only when 1 company acquires another company

= excess of purchase price over fair market value of identifiable net assets (inc. intangable identifiable assets)

good will can not be linked to identifyable source

or sold + seperated from company

value of company above specific assets on balance sheet

Good will has an indefinite life
- can't be amortized

But can be subject to annual imparment test

When acquired company worth less than book value

transfers value from balance sheet to current income statement as an expense

timing largly discretionary

AOL time Warner had a very large writeoff $54 billion

Footnote Disclosures

read → explains what company did

Analysis Implications

if assets created internally do not show up on balance sheet

Makes it hard to compare companies

large companies regularly turnover R+D equipment so net effect on balance sheet is small

---

Natural Resources

Wasting assets → Consumed as used

Oil, minerals, timberlands

↓

(11) Cost Capitalization + Depletion

- acquisition cost + prep cost should of course go as PPE
- When natural resources extracted & get transfered to inventory "depletion"

$$\text{Depletion} = \frac{\text{Acq cost} - \text{Residual Value}}{\text{est. quant. resource available}}$$

like depreciation of tangable operating assets

annual. Depreciation / Depletion = Depreciation / Depletion rate • Year depletion

Michael Plasmeier

15.501/15.516
Corporate Financial Accounting
Problem Set #3
Fall 2010
Due October 25th in class

IMPORTANT INFORMATION:
Please hand in a hard copy of your answers in class on the due date. **Soft copy submissions will not be accepted.** Only one copy per group is required. Maximum of three people per group. If you cannot attend class, you may drop off the problem set before the due date in Lynn Lei Li's mail tray during business hours. The mail tray is located in E62-655.

Question 1 – Lower of Cost or Market

The inventory of Boitano Company on December 31, 2010, consists of these items:

Part No.	Quantity	Cost per Unit	Cost to Replace per Unit
110	1,000	$90	$100
111	600	60	52
112	500	80	76
113	200	170	180
120	400	205	208
121*	1,600	16	14
122	200	240	235

*Part No. 121 is obsolete and has a realizable value of $0.20 each as scrap.

Instructions:

a. **Determine the inventory as of December 31, 2010, by the method of cost or market, whichever is lower, applying this method directly to each item.**

b. **Determine the inventory by cost or market, whichever is lower, applying the method to the total of the inventory.**

Question 2 – Comparison of FIFO, LIFO, and Average Cost

Summarized below are certain quarterly data from Nostromo, Inc. Assume that there was no inventory on hand at the beginning of the first quarter.

	Purchases			Sales		
First quarter	8,000	@	$3.00	7,000	@	$6.00
	5,000	@	3.20	3,000	@	6.10
Second quarter	7,000	@	3.40	5,000	@	6.30
	6,000	@	3.50	4,000	@	6.50
Third quarter	9,000	@	3.60	10,000	@	6.60
	3,000	@	3.70	3,000	@	6.70
Fourth quarter	8,000	@	3.80	5,000	@	6.80
	6,000	@	4.00	7,000	@	7.00

Instructions:

a. **Compute the gross profit for Nostromo, Inc. by quarters under each of the following methods of inventory pricing, assuming that inventory costs are determined only at the end of each quarter:**

   1. **First-in, first-out (FIFO)**

   2. **Last-in, first-out (LIFO)**

   3. **Average cost (carry unit costs to the nearest cent)**

b. **Evaluate the effect of each of these three methods on gross profit in a period of rising prices as presented above.**

Question 3 – Periodic vs. Perpetual Inventory Systems

The following is a record of Kaster Company's transactions for ceramic brake pads for the month of October 2010:

October	1	Balance	400 units @ $20	October	10	Sale	300 units @ $38
	12	Purchase	600 units @ $25		20	Sale	500 units @ $38
	28	Purchase	400 units @ $30				

Instructions:

a. **Assuming a periodic inventory system is used and a physical count at the end of the month shows 600 units on hand, what is the cost of the ending inventory using**

   1. **FIFO?**
   2. **LIFO?**

b. **Assuming a perpetual inventory system is used, calculate the ending inventory using**

   1. **FIFO.**
   2. **LIFO.**

Question 4 – Financial Statement Effects of FIFO and LIFO

The management of Oscar Wilde Company has asked its accounting department to describe the effect upon the company's financial position and its income statements of accounting for inventories on the LIFO rather than the FIFO basis during 2009 and 2010. The accounting department is to assume that the change to LIFO would have been effective on January 1, 2009, and that the initial LIFO base would have been the inventory value on December 31, 2008. Presented below are the company's financial statements and other data for the years 2009 and 2010 when the FIFO method was in fact employed.

Financial Position as of	**12/31/2008**	**12/31/2009**	**12/31/2010**
Cash	$ 90,000	$ 130,000	$ 154,000
Accounts receivable	80,000	100,000	120,000
Inventory	120,000	140,000	176,000
Other assets	160,000	170,000	200,000
Total assets	$450,000	$540,000	$650,000
Accounts payable	$ 40,000	$ 60,000	$ 80,000
Other liabilities	70,000	80,000	110,000
Common stock	200,000	200,000	200,000
Retained earnings	140,000	200,000	260,000
Total equities	$ 450,000	$ 540,000	$ 650,000

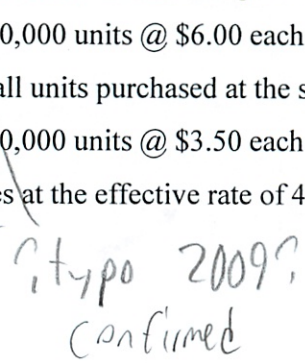
Income for Years Ended	**12/31/2009**	**12/31/2010**
Sales	$ 900,000	$ 1,350,000
Less: Cost of goods sold	505,000	756,000
Other expense	205,000	304,000
	710,000	1,060,000
Net income before income taxes	190,000	290,000
Income taxes (40%)	76,000	116,000
Net income	$ 114,000	$ 174,000

Other data:

1. Inventory on hand at 12/31/08 consisted of 40,000 units valued at $3.00 each.
2. Sales (all units sold at the same price in a given year):

   2008--150,000 units @ $6.00 each 2010--180,000 units @ $7.50 each
3. Purchases (all units purchased at the same price in a given year):

   2008--150,000 units @ $3.50 each 2010--180,000 units @ $4.40 each
4. Income taxes at the effective rate of 40% are paid on December 31 each year.



Instructions:

Name the account(s) presented in the financial statement that would have different amounts for 2010 if LIFO rather than FIFO had been used and state the new amount for each account that is named. Show computations.

Question 5: Effect of Dipping into LIFO Inventories

Rooibos Corporation uses a LIFO cost flow assumption for inventories and cost of goods sold. Its beginning inventory for the current year totaled $58,800 and its ending inventory totaled $52,400. Cost of goods sold to for the year totaled $346,500. A note to its financial statements discloses that income before taxes would have been $3,200 lower if it had not dipped into LIFO layers during the year.

Instructions:
Compute the purchase price of merchandise that Rooibos Corporation would have had to acquire to avoid dipping into its LIFO layers.

(13)

But we don't know how much that good would have cost them to avoid going into LIFO layers.

Or is that $3200 the difference

Market Price − LIFO Layer Price.

In which case purchases would be $343,300

Michael Plasmeier — P-Set 3 — 10/25

1. Lower of Cost or Market

a) Determine the inventory as of by cost or market by applying at each item

Lot	Cost	Market Value
110	90,000 ∈	100,000
111	36,000	31,200 ∈
112	40,000	38,000 ∈
113	34,000 ∈	36,000
120	82,000 ∈	83,200
121	25,600	320 ∈
122	48,000	47,000 ∈

total value (add up values with ∈) = 322,520

b) Value of entire inventory

Cost	Market
355,600	335,720

↑ lower value

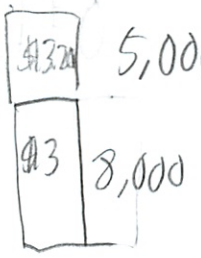
Method b is less exact

(2)

2. Comparison of FIFO, LIFO, AC

a) Compute gross profits for each quarter for each method

Q1



Sales - just combine sales

$7{,}000 \cdot 6 + 3{,}000 \cdot 6.10 = 60300$

10,000 items

FIFO (from bottom)

$8{,}000 \cdot 3.00 + 2000 \cdot 3.20 = 30400$ Gross profit $29,400

LIFO (from top)

$5{,}000 \cdot 3.20 + 5{,}000 \cdot 3.00 = 31{,}000$ $29,600

AC

$$\frac{5{,}000 \cdot 3.20 + 8{,}000 \cdot 3}{13{,}000} = 3.07 \cdot 10{,}000 = 30\,700$$ $29,600

Q2

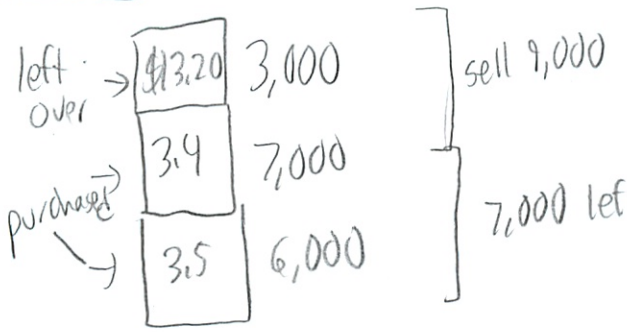
New inventory depends on method

Sales $= 5{,}000 \cdot 6.3 + 4{,}000 \cdot 6.5 = 57{,}500$

$Q_{sold} = 9{,}000$

(3)

FIFO

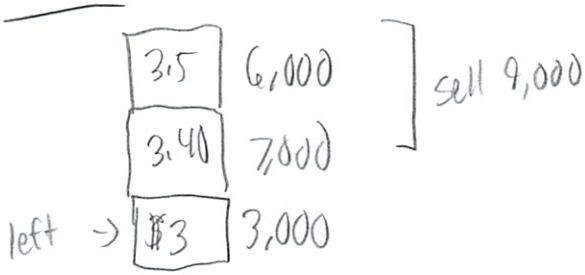


$3{,}000 \cdot 3.20 + 6{,}000 \cdot 3.4 = 30{,}000$

Gross profits

$27,500

LIFO



$6{,}000 \cdot 3.50 + 3{,}000 \cdot 3.4 = 31{,}200$

$26,300

AC

"hmm how to handle this - what is left over from before?

total cost / amt — So last time 3,000 left over at $3.07 each $9210

$$\frac{3.07 \cdot 3{,}000 + 3.4 \cdot 7{,}000 + 3.5 \cdot 6{,}000}{16{,}000} = 3.38$$

Sold $3.38 \cdot 9{,}000 = \$30{,}420$

$27080

Left

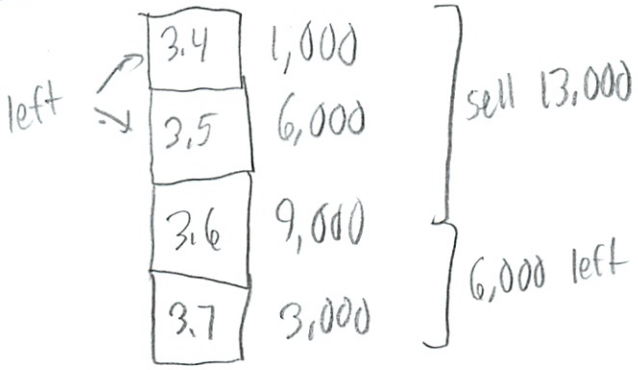
$3.38 \cdot 7{,}000 = \$23660$

(4)

Q3

Sales $10{,}000 \cdot 6.60 + 3{,}000 \cdot 6.70 = 86{,}100$

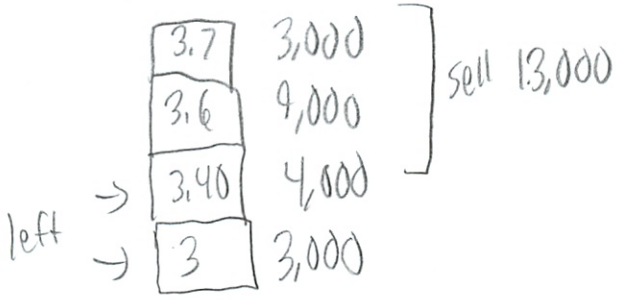
FIFO



Gross profits

$1{,}000 \cdot 3.4 + 6{,}000 \cdot 3.5 + 6{,}000 \cdot 3.6 = 46{,}000$ $40,100

LIFO



$3{,}000 \cdot 3.7 + 9{,}000 \cdot 3.6 + 1{,}000 \cdot 3.4 = 46{,}900$ $39,200

AC

$$\frac{3.38 \cdot 7000 + 3.6 \cdot 9{,}000 + 3.7 \cdot 3000}{19{,}000} = \$3.54$$

Sold

$3.53 \cdot 13000 = \$45890$ $46,210

(5)

Q4

Sales $5{,}000 \cdot 6.8 + 7{,}000 \cdot 7 = 83{,}000$

$Q = 12{,}000$

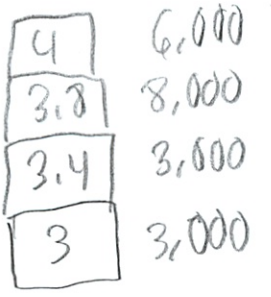
FIFO

$3{,}000 \cdot 3.6 + 3{,}000 \cdot 3.7 + 6{,}000 \cdot 3.8 = 44{,}700$

Profits

$38,300

LIFO



$6{,}000 \cdot 4 + 6{,}000 \cdot 3.8 = 46{,}800$

$36,200

AC

$$\frac{3.53 \cdot 6{,}000 + 3.8 \cdot 8{,}000 + 4 \cdot 6{,}000}{20{,}000} = 3.78$$

Sold $3.78 \cdot 12{,}000 = \$45{,}360$

$37,640

(6)

b. In a period of rising prices

FIFO - produces larger gross profits and thus larger tax bills ↑income statement

closer to how the company is actually doing (ie no unrecognized gains)

gains FIFO profit

LIFO - smaller current tax bill as tax liability is pushed into the future when inflation

[smaller gross revenue in short-term]

but issues could surface if a natural disaster causes company to draw into its LIFO reserve, decreasing current profits artificially

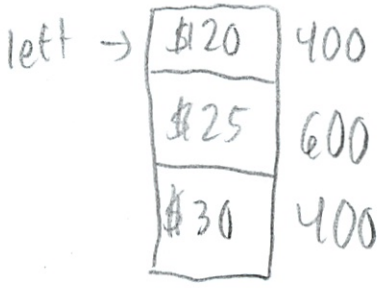
this LIFO reserve distorts the companies' results - unrealized holding gains on balance sheet

AC - produces a gross profit somewhere in the middle of FIFO and LIFO balancing the earnings of FIFO and the tax advantage of LIFO

(7)

3. Periodic vs Perpetual Inventory Systems

a) Assuming periodic inventory system is used and physical count shows 600 units on hand at end. What is cost of ending inventory using FIFO, LIFO?



Sales
$800 \cdot \$38 = \$30,400$
Left
$1400 - 800 = 600$
good no shrink

FIFO

$COGS = 400 \cdot 20 + 400 \cdot 25 = 18,000$

Inv. Left $= 200 \cdot 25 + 400 \cdot 30 = 17,000$ ✓

LIFO

$COGS = 400 \cdot 30 + 400 \cdot 25 = 22,000$

Inv. Left $= 200 \cdot 25 + 400 \cdot 20 = 13,000$ ✓

(8)

b) Perpetual Inventory System

"I where described?
-not in lecture notes or textbook
inventory continuously updated
reconcile after every transaction
outcome would still be same?
Or wait

Oct 10

Have 400 units @ 20
Sell 300 units @ 38
Under either method from the 20 stock

Oct 12

Have 100 units @ 20
600 @ 25

Oct 20

Sell 500 units @ 38

FIFO

sold { 100 units @ 20
400 units @ 25
left 200 units @ 25

LIFO

sold 500 units @ 25
left 100 units @ 25
left 100 units @ 20

Oct 28

Get 400 units @ 30

(9)

So end up with

FIFO

200 units @ 25
400 units @ 30

$17,500

LIFO

400 units @ 30
100 units @ 25
600 units @ 20

$16,500

Ok does end up a bit different, I see why

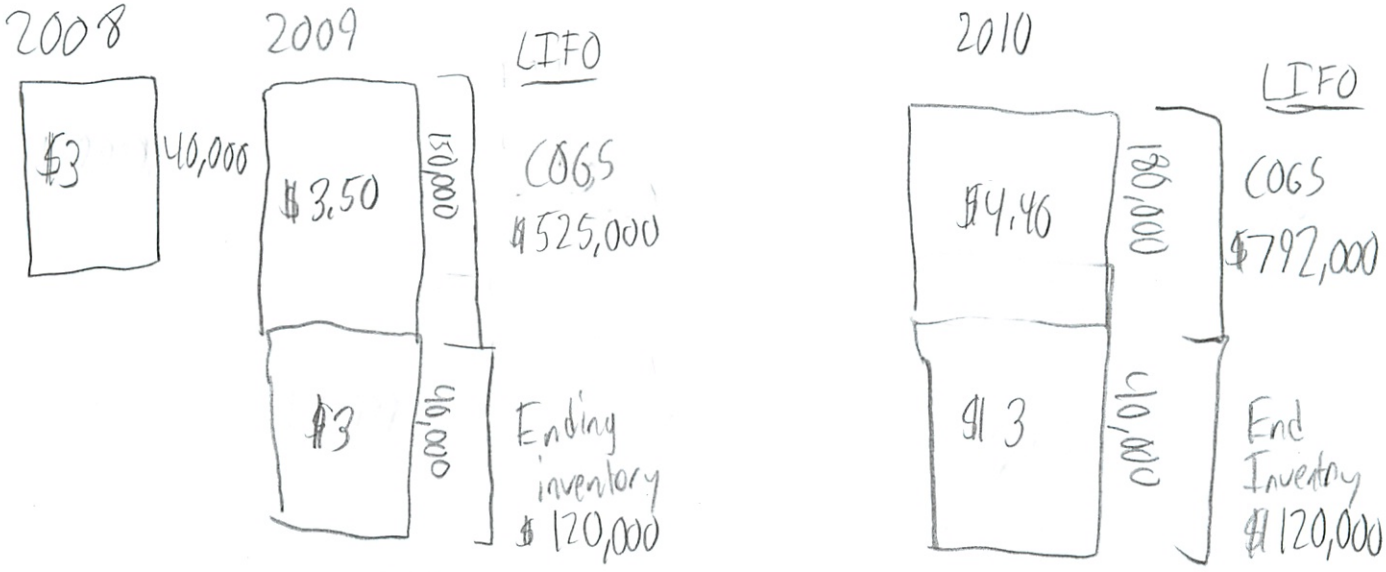
(10)

4. Financial Statement Effects of FIFO and LIFO

How would the statement change if LIFO was used instead?

LIFO base = $ 120,000

LIFO starting Jan 1, 2009



		LIFO		FIFO	change	
2009	COGS	$ 525,000	vs	$ 505,000	+ 20,000	
	Net Income Before taxes	$ 170,000	vs	$ 190,000	- 20,000	e after other expenses uncharged
	Taxes	$ 68,000	vs	$ 76,000	- 8,000	
	Cash	$ 138,000	vs	$ 130,000	+ 8,000	less taxes paid
2010	COGS	$ 1,792,000	vs	$ 1,756,000	+36,000	
	N. Income Before Taxes	$ 254,000	vs	$ 290,000	-36,000	
	Taxes	$ 101,600	vs	$ 116,000	- 15,000	

Cash?

(11) And of course

2009 Inventory $120,000 vs $140,000 −$20,000

2010 Inventory $120,000 vs $176,000 −$56,000

Some others

2009 Retained Earnings

$148,000 $140,000 + 8,000

2010 Cash $177,000 vs $154,000 + 23,000

2010 Retained Earnings

$283,000 vs $260,000 +23,000

Totals and subtotals change in addition

(12).

5. Effects of Dipping into LIFO Inventories

- uses LIFO
- Starting inventory $58,000
- Ending " $52,400
- COGS = $346,500
- Income would have been $3,200 lower if not dipped into LIFO layers.
- Calculate purchase price of merch it would have to pay

$58,800 ?

Start + purchases ← currently 340,100 -not relevant here.

↘ ↙

Inventory

↙ ↘

End COGS

$52,400 $346,500

∴ It would have to pay market price on whatever cost $3,200 how-ever many years ago they bought that inventory to avoid losing $3,200, would need end inventory of $55,600

or purchases of ~~$343,300~~

nic15.501/15.516
Corporate Financial Accounting
Problem Set #3
Fall 2010
Due October 25th in class

IMPORTANT INFORMATION:
Please hand in a hard copy of your answers in class on the due date. **Soft copy submissions will not be accepted.** Only one copy per group is required. Maximum of three people per group. If you cannot attend class, you may drop off the problem set before the due date in Lynn Lei Li's mail tray during business hours. The mail tray is located in E62-655.

Question 1 – Lower of Cost or Market

The inventory of Boitano Company on December 31, 2010, consists of these items:

Part No.	Quantity	Cost per Unit	Cost to Replace per Unit
110	1,000	$90	$100
111	600	60	52
112	500	80	76
113	200	170	180
120	400	205	208
121*	1,600	16	14
122	200	240	235

*Part No. 121 is obsolete and has a realizable value of $0.20 each as scrap.

Instructions:

a. **Determine the inventory as of December 31, 2010, by the method of cost or market, whichever is lower, applying this method directly to each item.**

b. **Determine the inventory by cost or market, whichever is lower, applying the method to the total of the inventory.**

ANSWER:

Applying the method of lower of cost or market to each item yields an inventory value of $322,520, while applying the method of lower of cost or market to total inventory yields an inventory value of $335,720.

Part No.	Quantity	Cost per Unit	Cost to Replace per Unit	Lower of Cost or Market	Cost	Market
110	1,000	$90	$100	$90,000	$90,000	$100,000
111	600	60	52	31,200	36,000	31,200
112	500	80	76	38,000	40,000	38,000
113	200	170	180	34,000	34,000	36,000
120	400	205	208	82,000	82,000	83,200
121*	1,600	16	14	320	25,600	320
122	200	240	235	47,000	48,000	47,000
				$322,520	$355,600	$335,720

Question 2 – Comparison of FIFO, LIFO, and Average Cost

Summarized below are certain quarterly data from Nostromo, Inc. Assume that there was no inventory on hand at the beginning of the first quarter.

	Purchases			Sales		
First quarter	8,000	@	$3.00	7,000	@	$6.00
	5,000	@	3.20	3,000	@	6.10
Second quarter	7,000	@	3.40	5,000	@	6.30
	6,000	@	3.50	4,000	@	6.50
Third quarter	9,000	@	3.60	10,000	@	6.60
	3,000	@	3.70	3,000	@	6.70
Fourth quarter	8,000	@	3.80	5,000	@	6.80
	6,000	@	4.00	7,000	@	7.00

Instructions:

a. **Compute the gross profit for Nostromo, Inc. by quarters under each of the following methods of inventory pricing, assuming that inventory costs are determined only at the end of each quarter:**

1. **First-in, first-out (FIFO)**

2. **Last-in, first-out (LIFO)**

3. **Average cost (carry unit costs to the nearest cent)**

b. **Evaluate the effect of each of these three methods on gross profit in a period of rising prices as presented above.**

ANSWER:

a.

	Purchases	Sales	Revenue
Q1	8,000 @ $3.00	7,000 @ $6.00	7,000*$6.00 + 3,000*$6.10 = $60,300
	5,000 @ $3.20	3,000 @ $6.10	
Q2	7,000 @ $3.40	5,000 @ $6.30	5,000*$6.30 + 4,000*$6.50 = $57,500
	6,000 @ $3.50	4,000 @ $6.50	
Q3	9,000 @ $3.60	10,000 @ $6.60	10,000*$6.60 + 3,000*$6.70 = $86,100
	3,000 @ $3.70	3,000 @ $6.70	
Q4	8,000 @ $3.80	5,000 @ $6.80	5,000*$6.80 + 7,000*$7.00 = $83,000
	6,000 @ $4.00	7,000 @ $7.00	

	FIFO COGS	FIFO Gross Profit	FIFO Inventory
Q1	8000 @ $3.00 + 2,000 @ $3.20 = $30,400	$60,300 - $30,400 = $29,900	3000 @ $3.20 = $9,600
Q2	3000 @ $3.20 + 6,000 @ $3.40 = $30,000	$57,500 - $30,000 = $27,500	1,000 @ $3.40 + 6,000 @$3.50 = $24,400
Q3	1,000 @ $3.40 + 6,000 @ $3.50 + 6000 @ $3.60 = $46,000	$86,100 - $46,000 = $40,100	3,000 @ $3.60 + 3,000 @ 3.70 = $21,900
Q4	3,000 @ $3.60 + 3,000 @ $3.70 + 6,000 @ 3.80 = $44,700	$83,000 - $44,700 = $38,300	2,000 @$3.80 + 6,000 @ 4.00 = $31,600

	LIFO COGS	LIFO Gross Profit	LIFO Inventory
Q1	5000 @ $3.20 + 5,000 @ $3.00 = $31,000	$60,300 - $31,000 = $29,300	3000 @ $3.00 = $9,000
Q2	6000 @ $3.50 + 3,000 @ $3.40 = $31,200	$57,500 - $31,200 = $26,300	4,000 @ $3.40 + 3000 @ $3.00 = $22,600
Q3	3,000 @ $3.70 + 9,000 @ $3.60 + 1,000 @ $3.40 = $46,900	$86,100 - $47,000 = $39,200	3,000 @ $3.40 + 3000 @ $3.00 = $19,200
Q4	6,000 @ $4.00 + 6,000 @ 3.80 = $46,800	$83,000 - $46,800 = $36,200	2,000 @$3.80 + 3,000 @ $3.40 + 3000 @ $3.00 = $26,800

	Average COGS	Average Gross Profit	Average Inventory
Q1	10,000*[(8000*3+5000*3.2)/13000]=10,000*3.08=30,800	$60,300 - $30,800 = $29,500	3000 @ $3.08 = $9,000
Q2	9,000*[(6000*3.5+7000*3.4+3000 *3.08)/16000]=9,000*3.38=30,420	$57,500 - $30,420 = $27,080	7000 @ $3.38 = $23,660
Q3	13,000*[(3000*3.7+9,000*3.6+700 0*3.38)/19000]=13,000*3.53=45,8 90	$86,100 - $45,890 = $40,210	6000 @ $3.53 = $21,180
Q4	12,000*[(6000*4+8000*3.8+6000* 3.53)/20000]=12,000*3.78=45,360	$83,000 - $45,360 = $37,640	8000 @ $3.78 = $30,240

b. In times of rising prices, FIFO gross profits > Average gross profits > LIFO gross profits.

Question 3 – Periodic vs. Perpetual Inventory Systems

The following is a record of Kaster Company's transactions for ceramic brake pads for the month of October 2010:

October	1	Balance	400 units @ $20	October	10	Sale	300 units @ $38
	12	Purchase	600 units @ $25		20	Sale	500 units @ $38
	28	Purchase	400 units @ $30				

Instructions:

a. **Assuming a periodic inventory system is used and a physical count at the end of the month shows 600 units on hand, what is the cost of the ending inventory using**

   1. **FIFO?**
   2. **LIFO?**

b. **Assuming a perpetual inventory system is used, calculate the ending inventory using**

   1. **FIFO.**
   2. **LIFO.**

Slide 21 ("Tracking inventory") of Lecture 10 discusses the distinction between perpetual and periodic inventory systems

a. If we are following a periodic system, we'll take care of COGS through an adjusting entry on October 31st.

We'll want to include only the first or the last 600 units (depending on whether we use LIFO or FIFO, respectively). The LIFO ending inventory will be $13,000 (=400 units @ $20 + 200 units @ $25), while the FIFO ending inventory will be $17,000 (=400 units @ $30 + 200 units @ $25).

b. If we are following a perpetual system, we'll take care of COGS at every sale. That means we'll do it on October 10th and October 20th.

On October 10th, it's easy: you only have units at $20, so ending inventory after the October 10th sale is 100 units @ $20 = $2,000. You then add 600 units on the 12th at $25. On October 20th, the ending inventory depends on FIFO or LIFO. If you use FIFO, you'll have ending inventory of 200 units @ $25 = $5,000. If you use LIFO, you'll have ending inventory of 100 units @ $20 + 100 units @ $25 = $4,500. Then you add the October 28th purchases of 400 units @ $30 = $12,000. You have no more sales to worry about, so ending inventory on October 31st is $17,000 under FIFO, and $16,500 under LIFO.

The gap between the figures is smaller – this is not surprising, because Slide 21 of Lecture 10 mentions that perpetual systems are "accurate and timely." Consider Slide 40 of Lecture 10

("Reporting Trade-offs"). Usually, ending inventory is closer to replacement cost under FIFO. When you are constantly tracking inventory with a perpetual system, the reporting trade-off is less striking. This is because of the timeliness of the perpetual system.

Question 4 – Financial Statement Effects of FIFO and LIFO

The management of Oscar Wilde Company has asked its accounting department to describe the effect upon the company's financial position and its income statements of accounting for inventories on the LIFO rather than the FIFO basis during 2009 and 2010. The accounting department is to assume that the change to LIFO would have been effective on January 1, 2009, and that the initial LIFO base would have been the inventory value on December 31, 2008. Presented below are the company's financial statements and other data for the years 2009 and 2010 when the FIFO method was in fact employed.

Financial Position as of	**12/31/2008**	**12/31/2009**	**12/31/2010**
Cash	$ 90,000	$ 130,000	$ 154,000
Accounts receivable	80,000	100,000	120,000
Inventory	120,000	140,000	176,000
Other assets	160,000	170,000	200,000
Total assets	$450,000	$540,000	$650,000
Accounts payable	$ 40,000	$ 60,000	$ 80,000
Other liabilities	70,000	80,000	110,000
Common stock	200,000	200,000	200,000
Retained earnings	140,000	200,000	260,000
Total equities	$ 450,000	$ 540,000	$ 650,000

Income for Years Ended	**12/31/2009**	**12/31/2010**
Sales	$ 900,000	$ 1,350,000
Less: Cost of goods sold	505,000	756,000
Other expense	205,000	304,000
	710,000	1,060,000
Net income before income taxes	190,000	290,000
Income taxes (40%)	76,000	116,000
Net income	$ 114,000	$ 174,000

Other data:

1. Inventory on hand at 12/31/08 consisted of 40,000 units valued at $3.00 each.
2. Sales (all units sold at the same price in a given year):

   2009--150,000 units @ $6.00 each 2010--180,000 units @ $7.50 each
3. Purchases (all units purchased at the same price in a given year):

   2009--150,000 units @ $3.50 each 2010--180,000 units @ $4.40 each
4. Income taxes at the effective rate of 40% are paid on December 31 each year.

Instructions:

Name the account(s) presented in the financial statement that would have different amounts for 2010 if LIFO rather than FIFO had been used and state the new amount for each account that is named. Show computations.

From the slide titled "'Ins' & 'Outs' of Inventory Accounting" (Lecture 10, Slide 27), we know that your inventory cost flow assumption affects cost of goods sold and ending inventory. This tells us that the accounts that will be affected are (1) retained earnings because of the income effect, and (2) inventory. As we will see, though, there is also an effect on (3) cash, because of the *tax* effect.

Because sales equal purchases in 2009 and 2010, ending inventory will be unchanged for each year. Currently, the company uses FIFO. The sales of 150,000 units under FIFO led to 2009 COGS of $505,000 (40,000 @ $3.00 and 110,000 @ $3.50), and the sales of 180,000 units led to 2010 COGS of $756,000 (40,000 @ $3.50 and 140,000 @ $4.40). Ending inventory in 2009 is 40,000 units @ $3.50 = $140,000 and ending inventory in 2010 is 40,000 units @ $4.40 = $176,000.

If we switch to LIFO, the most recent additions to inventory are expensed first. In 2009, the expense is 150,000 units @ $3.50 = $525,000 and in 2010, the expense is 180,000 units @ $4.40 = $792,000. Because ending inventory is never rising or falling (it stays at the 40,000 units @ $3.00 from 2008), the ending inventory is $120,000 in 2009 and 2010.

These higher COGS figures will reduce your taxable income, and reduce the company's tax obligation. Amending the income statements from above to reflect the new COGS:

Income for Years Ended	**12/31/2009**	**12/31/2010**
Sales	$ 900,000	$ 1,350,000
Less: Cost of goods sold	525,000	792,000
Other expense	205,000	304,000
	730,000	1,096,000
Net income before income taxes	170,000	254,000
Income taxes (40%)	68,000	101,600
Net income	$ 102,000	$ 152,400

Retained earnings grew $60,000 in 2009 and 2010, so there must have been dividends. Rather than think about them, though, I'll just note that net income fell from $114,000 to $102,000 in 2009 and from $174,000 to $152,400 in 2010. These decreases of $12,000 and $21,600 should show up in the retained earnings accounts of 2009 and 2010.

So far, inventory has fallen $20,000 and retained earnings has fallen $12,000 in 2009. Inventory has fallen $56,000 and retained earnings has fallen $33,600 (=$12,000+$21,600) in 2010. How do you get the balance sheet to balance? Well, the only other effect was on income taxes, which were $8,000 lower in 2009, and $14,400 lower in 2010. Hence, cash will be $8,000 higher under LIFO in 2009, and $22,400 (=$8,000+$14,400) higher in 2010. The new balance sheets are:

Financial Position as of	12/31/2009	12/31/2010
Cash	*$ 138,000*	*$ 176,400*
Accounts receivable	100,000	120,000
Inventory	*120,000*	*120,000*
Other assets	170,000	200,000
Total assets	$528,000	$616,400
Accounts payable	$ 60,000	$ 80,000
Other liabilities	80,000	110,000
Common stock	200,000	200,000
Retained earnings	*188,000*	*226,400*
Total equities	$ 528,000	$ 616,400

Accounts that have been affected by the LIFO change are in italics.

Question 5: Effect of Dipping into LIFO Inventories

Rooibos Corporation uses a LIFO cost flow assumption for inventories and cost of goods sold. Its beginning inventory for the current year totaled $58,800 and its ending inventory totaled $52,400. Cost of goods sold to for the year totaled $346,500. A note to its financial statements discloses that income before taxes would have been $3,200 lower if it had not dipped into LIFO layers during the year.

Instructions:
Compute the purchase price of merchandise that Rooibos Corporation would have had to acquire to avoid dipping into its LIFO layers.

If Rooibos Corporation had not dipped into its LIFO layers, it would have had to make purchases of merchandise to keep inventory quantities at the end of the year the same as at the beginning of the year. It would have paid more for this merchandise than the acquisition cost embedded in the LIFO layers that it liquidated. The acquisition cost embedded in the LIFO layers liquidated was $6,400 (= $58,800 – $52,400). The increase in income before taxes that resulted from using $6,400 from the LIFO layers instead of the higher current purchase prices is $3,200. Thus, the additional units would cost $9,600 (= $6,400 + $3,200). The original purchase price $340,100, which is calculated as 52,400 + 346,500 – 58,800, which means the new purchase price is $340,100 + $9,600 = $349,700

10/25

Long-term Assets 1+2

15.501/516 **Corporate Financial Accounting**
Fall 2010
Lectures 12 & 13

Professor Ross Watts

Sloan School of Management
Massachusetts Institute of Technology

Housekeeping

- Problem sets
  - PS3 due Today
- Reading — Pset 4 Due 11/10
  - Dyckman Chapter 8
- Today's slides
  - Available on Stellar

Midterm a few lectures later

Long-term Assets

- Investments in Securities
  - Will be covered in the last lecture
    - This includes subprimesvalued at fair value
  - See Chapter 12 if interested
- Plant Assets
  (aka Property, Plant & Equipment [PP&E] or Fixed Assets)
  - Understand depreciation concept
  - Tax issues
- Intangible assets
  - Goodwill, patents etc

You should understand

- How the matching principle affects
  - capitalization of long-lived assets
  - expensing of capitalized costs to match revenues generated in the use of long-lived assets
- How differences in "book" vs. tax accounting for depreciation lead to deferred taxes

Matching Principle Review

- Capitalize versus Expense
  - Capitalize costs as Assets on the Balance Sheet when
    - The costs have future benefits
  - Expense costs when the costs'
    - benefits are immediate OR
    - future benefits are too uncertain or immaterial (e.g., R&D)
- Assets are consumed as they generate future revenues
  - Current Assets like Inventory, Prepaid Rent, and Insurance
  - Non-current assets like Plant, Buildings, Machinery
  - NC Intangible assets like Patents, Acquired Goodwill

Types of Expenditures

- Revenue Expenditure - immediately charged against revenue as an expense (maintenance)
- Capital Expenditure - capitalized as an asset, not immediately expensed

Plant assets

- **Are resources that**
  - have physical substance
  - are used in the operations of a business
  - are not intended for sale to customers
  - deliver service potential over their useful lives (except land)

Plant assets

- Questions that have to be answered in accounting for plant assets:
  - What is the acquisition cost? total inc shipping
  - What is the expected useful service life?
  - What is the salvage value?
  - What pattern of depreciation should be used to allocate expense over the useful life?
- Note
  - Land is never depreciated or amortized

mineral rights may in depreciation not so much carefully done

Determining Acquisition Cost

- What is given up to obtain the asset?
  - Include all costs required to bring the asset into serviceable or usable condition and location.
- Purchased Assets: Purchase price + cost to prepare the asset for use (installation, transport in)
  - Case 1: Cash
  - Case 2: Financing (down payment plus loan/note)
- Self-Constructed Assets
  - Direct costs of construction
  - Financing costs (interest on funds borrowed to finance construction)

interest does not go in ↑ is included here

Plant Assets

- **Cost is measured by**
  - the cash paid in a cash transaction, or
  - the cash equivalent price paid when noncash assets are used in payment.
- **The cash equivalent price is equal to**
  - the fair market value of the asset given up, or
  - the fair market value of the asset received, whichever is more clearly determinable.

need to remove financing discount

Plant Assets: Land

Cost of land includes:

- Cash price, closing costs, brokers' commissions, accrued property taxes, etc.
- Can also include costs to raze a building, drain and fill the land
- Proceeds from sale of salvaged materials are deducted from the cost

Cost to prepare land for use

Cost of Land Improvements

- All expenditures necessary to make the improvements ready for their intended use
  - Driveways
  - Parking lots
  - Fences
  - Underground sprinklers

each could have different lives

Plant Assets: Buildings

- Capitalize all necessary expenditures relating to the purchase or construction of a building
- When a building is purchased such costs include:
  - purchase price
  - closing costs (attorney's fees, title insurance)
  - real estate broker's commissions

13

Plant Assets: Buildings

- If a building is purchased, but needs to be readied for its intended use, cost includes
  - expenditures for remodeling rooms or offices
  - replacing or repairing
    - o roof
    - o floors
    - o electrical wiring
    - o plumbing

capitalized as well

14

Plant Assets: Buildings

- When a building is constructed, its cost consists of
  - the contract price
  - architect's fees
  - building permits
  - excavation cost
  - interest costs during construction

all capitalized

15

Plant Assets: Equipment

- What is equipment?
  - Assets used in operations
    - Factory machines
    - Checkout counters
    - Delivery trucks etc.
- Cost of equipment includes
  - purchase price
  - sales tax
  - freight charges and insurance during transit
  - expenditures required in assembling, installing and testing the unit

16

Plant Assets: Equipment

- Two criteria for determining the cost of equipment
  - frequency of cost - one time or recurring
    - Recurring could be an expense (e.g., if annual)
  - benefit period - the life of the asset or 1 year
    - For example tools
- Potential for manipulation in this decision
  - Car manufacturer subsidiary

no capitalize

than capitalize

if life < 1 year do not need to Capitalize

manipulate to get desired income level

17

Determining acquisition cost - Purchased assets: example 1

- Lowery, Inc. purchases new equipment on 1/1/02
  The firm
  - pays $920,000 to the vendor of the machine
  - pays $62,000 to transport the equipment
  - pays $10,000 for insurance during transportation
  - estimates maintenance will cost $4,000 in the first year & rise by about 20% annually for 10 years
- What amount is capitalized on the balance sheet on 1/1/02?

920,000 + 62,000 + 10,000

not the maintance

18

Determining acquisition cost
- Purchased assets: example 2

- Portland Products acquires a workstation on 1/1/02

  The firm
  - pays a $20,000 down payment to the vendor ✓
  - signs a 3-year note payable for $180,000 at an annual interest rate of 10% ✓ cost principal
  - pays employees $5,500 to configure the work-station for daily operations and run appropriate tests ✓ getting ready
  - spends $12,000 to train the employees who will operate the work-station

  no employees can leave

- What amount is capitalized on the balance sheet on 1/1/02?

20 + 180 + 5.5

19

Determining acquisition cost
- Self-constructed assets example

- Myers Manufacturing is constructing a new production facility. Expected completion date is 6/1/2002.

- During 2001, the company ✓
  - spends $1.2 million for materials
  - pays $1.6 million to architects and laborers ✓
  - accrues interest payable equal to 10% on a $1.5 million construction loan ✓
  - incurs fees related to zoning, inspection, etc. of $65,000 ✓

- What amount is capitalized on the balance sheet on 12/31/01?

1.2 + 1.6 + .1 · 1.5 + .065

Funcritical

20

To match expense to revenue:
Have to estimate Salvage Value & Useful Life

- Determining Salvage Value
  - Requires managerial judgment
  - SV = estimated proceeds at disposal, net of selling costs
  - What factors can affect this estimate?
  - **Depreciable basis = Acquisition cost – SV**
- Determining Useful life
  - Requires managerial judgment
  - The time period over which the asset will be used
  - What factors can affect the estimate?
- Choose depreciation method
  - What does GAAP allow?

a lot of judgement - tech becomes obsilete fast

Depreciation Methods

- Units of Production
- Straight-line
  - Most commonly used
- Accelerated method
  - Mainly used for tax purposes

Sooner the tax deduction lower interest costs

does have to not be same tax + accounting

22

Depreciation methods
- Units of Production: Example 1

- Depreciation cost per machine-hour = depreciable basis/service life (in machine-hours)
- Depreciation Expense = Actual hours used * hourly rate
- Example:
  - A machine with depreciable basis of $50,000 is expected to provide 20,000 hours of service. During Year 1, the machine is used for 2,500 hours.
  - What is the depreciation expense for Year 1?

$50000 \cdot \frac{2500}{20,000} = 6,250$

  - What is the machine's book value at the end of Year 1?

#Cost − 6,250

23

Depreciation methods
- Units of Production: Example 2

- Machine with acquisition cost of $1.2M and salvage value of $0.2M is expected to extract 500,000 tons of iron
- Ore actually extracted in the first 3 years:
  - Year 1: 100,000 tons
  - Year 2: 150,000 tons
  - Year 3: 50,000 tons
- What is depreciation expense in the first 3 years?

1/3 of depreciable basis

1/3 · 200,000

2/3

- What is the accumulated expense at year 3?

24

Depreciation methods
- Straight-line depreciation

- Annual Depreciation Expense =
  Depreciable basis/service life =
  (Acquisition Cost – Salvage Value) / Years
- Used by an overwhelming majority of US firms
- Why?

opportunity cost

Evening cost out
Steady profits

historically lot an expense - till tax code added

most analysts look at EBDT - 60 don't care

Depreciation methods
- Straight-line depreciation example

- Hertz acquires cars for its rental fleet for $30,000 each.
  - It expects to rent each car for 2 years, then sell them for $15,000 each.
- What is the depreciation expense per car for Year 1?

$7,500

- What is each car's book value at the end of Year 1

$22,500

26

Depreciation Bookkeeping
- Straight-line depreciation example

- Journal entry at the time of acquisition of the asset:

Dr PP+E $30,000
Cr Cash $30,000

- At end of the first year

Dr Depreciation Expense $7,500
Cr Accumulated Depreciation $7,500

27

Depreciation Bookkeeping
- Straight-line depreciation example

At the beginning of first year
PP&E

At the end of first year
Gross PP&E
Less: Acc Depr
Net PP&E

Income effect

At the end of first year

PP&E | Acc. Depr. | Depr. Expense (RE)

28

Depreciation methods
- Accelerated depreciation

- Accelerated Depreciation
  - Mostly confined to tax reporting
  - Higher depreciation expense is recognized in the earlier years of an asset's useful life
- Differences between
  - **Tax** depreciation deductions &
  - **Financial Reporting** depreciation expense
- Give rise to **Deferred Tax accounts**
  - More on this at end of lecture

for tax

← larger tax break early on

firms w/ losses don't like it
- since can only carry losses so far forward

29

Depreciation methods
- Accelerated depreciation example

- Hertz acquires cars for its rental fleet for $30,000 each, uses them for 2 years, then sells them for $15,000 each.
- It uses an accelerated depreciation method with 60% depreciation at year 1 and 40% at year 2.
- What is the depreciation expense per car for years 1 & 2?
- What is each car's book value at the end of Year 1?

Year	
1	$9,000
2	$6,000

30

Depreciation methods
- Accelerated depreciation example

- Depreciation expense:

- What is each car's book value at the end of Year 1?
  $30,000 - $9,000 = $21,000

31

Depreciation bookkeeping

What accounts does depreciation affect?

Which financial statements are affected?

Does depreciation affect cash?

32

Changes in Depreciation Estimates

- Caused by:
  - Change in Asset Life or
  - Change in Salvage Value
- Apply the change prospectively
  - i.e., to future years
  - No restatement of past years' results

33

Changes in Depreciation Estimates
- Example

- Data at purchase
  - Cost = $100K
  - SV = 0
  - Initial useful life estimate = 5 years.
- Estimated life change
  - After 2nd year, spend $30K on improvement that extends useful life by 3 years (i.e., to total of 8).
- Questions
  - What is annual depreciation expense for each of the first two years (assume straight-line)?
  - What is book value at the end of 2nd year?
  - How do we account for the improvement?
  - What is annual depreciation expense for years 3 and beyond?

34

Changes in Depreciation Estimates
- Example

- Data at purchase
  - Cost = $100K, SV = 0, Initial useful life estimate = 5 years.
- Estimated life change
  - After 2nd year, $30K improvement extends useful life by 3 years (to 8yrs).
- What is annual depreciation expense for each of the first two years?
- What is book value at the end of 2nd year?
- How do we account for the improvement?
- What is annual depreciation expense for years 3 and beyond?

35

Capitalize improvement Costs
- can't go back - go forward from now

Changes in Depreciation Estimates
- Example

	Cash	PP&E	Acc. Depr	= L	Ret. Earn
Acquire PP&E	-100	100			
Yr 1 Depr.			-20		-20
Yr 2 Depr			-20		-20
Improvement	-30	30			
Year 3 Depr.			-15		-15

36

Partial Year Depreciation

If an asset is purchased during the year rather than on January 1, the annual depreciation is prorated for the proportion of a year it is used.

37

Sale of Long-Term Assets

- An asset's sale requires removal from the books of the asset's
  - historical cost &
  - accumulated depreciation
- Sale transaction also requires recognition of proceeds
- Difference between sale proceeds & the asset's net gives rise to a gain/loss on sale

book value

38

Disposal of PP&E

- Computation:
  - Gain (Loss) = Proceeds from asset sale - book value,
  - *where BV = Acquisition cost - Accumulated Depreciation associated with the asset*
- Bookkeeping:
  - Remove asset's historical cost & accumulated depreciation from balance sheet & record Gain (Loss).

39

Disposal of PP&E - Example

From earlier example:

Cost = $100K, SV = 0, Initial UL estimate of 5 years. After 2nd year, spend $30K on improvement that extends UL by 3 years (i.e., to total of 8).

At end of 7th year, when BV is $15K, sell asset for scrap value of $2K.

40

Disposal of PP&E - Example

	Cash	PP&E	Acc. Depr	= L	Ret. Earn
EB- Year 7 Prior to sale		130	-115		
Sale	2	-130	115		-13
EB – Year 7 After sale		0	0		

41

Disposal – T- Accounts

Gross PP&E | Acc. Depr.

Book value at time of sale = 15
Sale value = 2
Book value after sale = 0

Cash | Loss on sale (RE)

42

Disposal – Book Keeping

Dr Cash 2 k
Dr Loss on sale of asset 13 k
Dr Acc. Depreciation 115 k
Cr PP&E 130 k

43

Asset Impairments

- A permanent decline in the market value of an asset.
- The asset is written down to the new market value during the year in which the decline occurs.
- The impairment amount is recognized as an expense.

44

10/27

Tax and Timing Effects

- Tax Reporting ≠ Financial Reporting ==> timing differences in measurement of income
  - Why would a firm prefer accelerated depreciation for tax purposes?
  - Why does government allow this?
  - Why not use the tax method for financial reporting?
- Different depreciation methods for tax and financial reporting gives rise to *Deferred Taxes*
- Depreciation for tax purposes can be accelerated (MACRS) or straight-line
  - schedules determined by IRS

Spur new investment activities - incentives like now growth

- would give biased view of income

45

useful life pre specified

reporting - want clear system
tax - re-jiggered for incentives

other differences
- allowance for doubtful accounts allowed for fin reporting
- must write off for taxes

Tax & Timing Effects

Cooke Company bought a $90,000 asset at the beginning of 2000.

	Financial reporting	*Tax reporting*
Asset life	3 years	2 years
Depreciation rate	Straight line	MACRS: 60%, 40%
Residual value	$0	$0

Schedule of depreciation

Year	Financial reporting depreciation	Tax reporting depreciation	Depreciation difference	Accumulated difference, end of the year
2000	30,000	54,000	24,000	24,000
2001	30,000	36,000	6,000	30,000
2002	30,000	0	-30,000	0

ends up same

bigger tax deduction now

company making losses would not want MACRS

- although same total tax deduction but can earn interest if take deduction earlier

46

Deferred Taxes Example

- In Year 1, income before depreciation is $80,000 for both financial and tax reporting. The tax rate is 30% with no anticipated change.

	Financial reporting	*Tax reporting*
NI before Depr.	80,000	80,000
– Depreciation	30,000	54,000
= NI before taxes	50,000	26,000
	× 30%	× 30%
Tax Payable		7,800
Tax Expense	15,000	

Tax Expense = Tax Payable + ???

??? = $7,200 is "Deferred Tax Expense"

47

Deferred Taxes Example

In 2000

A = L + SE

Tax Payable 7,800

Deferred Taxes Liability 7,200

RE - Tax Expense 15,000

48

Deferred Taxes Example

- In 2001, income before depreciation is $80K with a tax rate of 30%

	Financial	Tax
Net income before depr.	$80,000	$80,000
- Depreciation	$30,000	$36,000
= Pre-tax income	$50,000	$44,000
	x30%	x30%
Tax expense	15,000	
Tax payable		13,200
Deferred Tax expense		1,800

49

Deferred Taxes Example

In 2001

A = L + SE

Tax Payable | 13,200

Deferred Taxes Liability | $7,200 | 1,800

RE - Tax Expense | 15,000

50

Deferred Taxes Example

- In 2002, income before depreciation is $80K with a tax rate of 30%

	Financial	Tax
Net income before dep.	$80,000	$80,000
- Depreciation	$30,000	$ 0
= Pre-tax income	$50,000	$80,000
	x30%	x30%
Tax expense	$ 15,000	
Deferred tax expense RE		24,000
Tax payable		9,000

51

Deferred Taxes Example

In 2002

A = L + SE

Tax Payable | 24,000

Deferred Taxes Liability | 9,000 | $7,200 | $1,800

RE | 15,000

Expense/income

52

taking advantage of interest free loan from gov

Deferred Taxes over Time

Deferred taxes caused by timing differences are temporary; they reverse over time.

Year	Financial reporting depreciation	Tax reporting depreciation	Depreciation difference	Deferred Tax Expense	Acc. Depr Difference,	Def Tax Liability
2000	30,000	54,000	24,000	7,200	24,000	7,200
2001	30,000	36,000	6,000	1,800	30,000	9,000
2002	30,000	-	(30,000)	(9,000)	0	0

timing differences

called originating differences

this is reversing differences

Intangible Assets

- Intangible assets are rights, privileges, or competitive advantages
- Intangible assets result from ownership of long-lived assets that do not possess physical substance
- Intangible assets are often a company's most valuable assets

other than goodwill

different spin than textbook

54

Types of Intangible Assets

- Patents
- Copyrights
- Trademark and trade names
- Franchises and Licenses
- Goodwill

only gets on balance sheet if you buy it

- otherwise only costs of building it up

Intangible Assets

- Intangible assets are recorded at cost
- If the intangible has a limited useful life, its cost is allocated (amortized) over the useful life (e.g., patent). ↑ aka depreciated
- If the intangible has an indefinite life, it is not amortized (e.g., goodwill).

Patents

- Patents are an exclusive right that enables the recipient to manufacture, sell, or control a patent for 20 years from the date of grant.
- The initial cost of a patent is cash or cash equivalent price paid to *acquire* the patent.
- Legal costs of protecting a patent are added to the Patent account and amortized over the remaining life of the patent.

oh can add legal costs in

↑ only small amt if develop self - not the R+D expense

Or can buy it

Copyrights

- Copyrights are granted by the federal government giving the owner the exclusive right to reproduce and sell artistic or published work.
- Copyrights extend for the life of the creator plus 70 years.

Trademarks / Trade Names

- A word, phrase, jingle, or symbol that distinguishes or identifies a particular enterprise or product
- Trademark or trade name has legal protection for indefinite number of 10 year renewal periods
- No amortization since indefinite

Franchises and Licenses

- A franchise is a contractual agreement under which the franchiser grants the franchisee the right
  - to sell certain products
  - to render specific services, or
  - to use certain trademarks or trade names
- Franchise (or license) with a limited life should be amortized to expense over the life of the franchise.
- Franchise with an indefinite life should be carried at cost and not amortized.

why would ya pay for a company above its book value and future cash flow discounted at inflation

"rent"

Goodwill

- **Goodwill is essentially a comparative advantage that enables the firm to earn an above competitive rate of return on its investments**
  - **Note that this definition differs from that in your text book (p.368)**
- **Goodwill cannot be sold individually, it is associated with the business as a whole**
- **Goodwill is only recorded when an entire business is purchased**

DuPont

for same assets, higher income, since lower cost

61

Research and Development Costs

- R&D costs are expenditures that may lead to a patent, copyright, or other intangible asset
- R&D costs are usually expensed as incurred

those are the rules

no estimating how much will pay off

supposed to be impaired (reduced) when value drops

many don't do

b/c balance sheet is for assets not valuation

62

? CEO who over pays for firm - this is where accounts record it

Analyzing Plant Assets

- Return on Assets Ratio
  - Asset Turnover Ratio
  - Profit Margin

ROA = (NI / av(assets)) = (sales/av(assets))* (NI / sales)

$\frac{\text{net income}}{\text{avg. assets}} = \frac{\text{sales}}{\text{avg assets}} \cdot \frac{\text{Net income}}{\text{sales}}$

63

FSIB in US wanted to make SE a valuation

lots of freedom to management

- debt covenants (bank can reset loan bad for shareholder)
- CEO compensation
- CEO's ego - his fault

Return on Assets Ratio

- Indicates the amount of net income generated by each dollar invested in assets

Return on Assets Ratio = Net Income / Average Total Assets		
	2004	2003
AirTran ($ in millions)	$12 / ($906 + $868)/2 = 1.4%	$63 / ($868 + $478)/2 = 9.4%
Southwest Airlines ($ in millions)	$313 / ($11,337 + $9,878)/2 = 3.0%	$171 / ($9,878 + $8,954)/2 = 1.8%
Industry average	0.69%	

*Amounts in the ratio calculations have been rounded.

9.8

1.8

64

Asset Turnover Ratio

- Indicates
  - (1) how efficiently a company uses its assets, and
  - (2) how many dollars of sales are generated by each dollar invested in assets

Asset Turnover Ratio = Net Sales / Average Total Assets	
AirTran ($ in millions)	Southwest Airlines ($ in millions)
$1,041 / ($906 + $868)/2 = 1.21 times	$6,530 / ($11,337 + $9,878)/2 = .62 times

65

Analyzing Plant Assets

- A company can increase its return on assets by
  - (1) increasing profit per sale as measured by profit margin ratio, or
  - (2) increasing its volume of sales as measured by the asset turnover ratio

Profit Margin	×	Asset Turnover	=	Return on Assets
Net Income / Net Sales	×	Net Sales / Average Total Assets	=	Net Income / Average Total Assets

66

know if book value > market value

unverifiable - why did we give this power to managers

Dupont Analysis

- Decomposes ROE into:
  - Asset Turnover Ratio
  - Profit Margin
  - Leverage

ROE = (NI / av(equity)) = (NI/E) = (A/E)*(S/A)* (NI/S)

67

ROA & ROE Ratios: Apple

Selected financial information for Apple Computer, Inc for FY 2006 and FY 2005 (in $ millions):

	Apple	
	FY 2006	FY 2005
Total Assets	$17,205	$11,516
Total Liabilities	$7,221	$4,088
Shareholders' Equity	$9,984	$7,428
Sales	$19,315	$13,931
Cost of Sales	$13,717	$9,889
Net Income	$1,989	$1,328

Compute ROA and ROE

68

ROA & ROE Ratios: Dell

Selected financial information for Dell, Inc for FY 2006 and FY 2005 (in $ millions):

	Dell	
	FY 2006	FY 2005
Total Assets	$23,109	$23,215
Total Liabilities	$18,980	$16,730
Shareholders' Equity	$4,129	$6,485
Sales	$55,908	$49,205
Cost of Sales	$45,958	$40,190
Net Income	$3,572	$3,043

Compute ROA and ROE

69

ROA & ROE: Apple vs. Dell

		Profit Margin	Asset Turnover	Leverage Ratio
Apple				
ROA =	13.85% = 1,989 / [0.5 * (17,205 + 11,516)]	10.30%	1.345	
ROE =	22.85% = 1,989 / [0.5 * (9,984 + 7,428)]	10.30%	1.345	1.649
Dell				
ROA =	15.42% = 3,572 / [0.5 * (23,109 + 23,215)]	6.39%	2.414	
ROE =	67.31% = 3,572 / [0.5 * (4,129 + 6,485)]	6.39%	2.414	4.364

70

ROA & ROE Ratios: Toyota

Selected financial information for Toyota Motor Corp for FY 2005 and FY 2004 (in $ millions):

	Toyota	
	FY 2005	FY 2004
Total Assets	$226,604	$205,235
Total Liabilities	$142,379	$129,077
Shareholders' Equity	$84,225	$76,158
Sales	$165,666	$154,372
Cost of Sales	$135,025	$125,769
Net Income	$10,907	$10,821

Compute ROA and ROE

71

ROA & ROE Ratios: GM

Selected financial information for GM Corp for FY 2005 and FY 2004 (in $ millions):

	GM	
	FY 2005	FY 2004
Total Assets	$161,653	$159,543
Total Liabilities	$168,059	$154,461
Shareholders' Equity	($6,406)	$5,082
Sales	$158,221	$161,545
Cost of Sales	$162,173	$150,224
Net Income	($12,925)	($145)

Compute ROA and ROE

72

ROA & ROE: Toyota vs. GM

		Profit Margin	Asset Turnover	Leverage Ratio
Toyota				
ROA =	5.05% = 10,907 / [0.5 * (226,604 + 205,235)]	6.58%	0.767	
ROE =	13.60% = 10,907 / [0.5 * (84,225 + 76,158)]	6.58%	0.767	2.693
GM				
ROA =	-8.05% = -12,925 / [0.5 * (161,653 + 159,543)]	-8.17%	0.985	
ROE =	1,952% = -12,925 / [0.5 * (-6,406 + 5,082)]	-8.17%	0.985	-242.595

73

also FSIAB rules set at different times w/ different people

Post

Long-term Assets

15.501/516 **Corporate Financial Accounting**
Fall 2010
Lecture 13

Professor Ross Watts

Sloan School of Management
Massachusetts Institute of Technology

Housekeeping

- Problem sets
  - PS4 due 11/10
- Reading
  - Dyckman Chapter 8 & chapter 10, pp 456-463
- Today's slides
  - Available on Stellar

Tax and Timing Effects

- Tax Reporting ≠ Financial Reporting ==> timing differences in measurement of income
  - Why would a firm prefer accelerated depreciation for tax purposes?
  - Why does government allow this?
  - Why not use the tax method for financial reporting?
- Different depreciation methods for tax and financial reporting gives rise to *Deferred Taxes*
- Depreciation for tax purposes can be accelerated (MACRS) or straight-line
  - schedules determined by IRS

Tax & Timing Effects

Cooke Company bought a $90,000 asset at the beginning of 2000.

	Financial reporting	*Tax reporting*
Asset life	3 years	2 years
Depreciation rate	Straight line	MACRS: 60%, 40%
Residual value	$0	$0

Schedule of depreciation

Year	Financial reporting depreciation	Tax reporting depreciation	Depreciation difference	Accumulated difference, end of the year
2000	30,000	54,000	24,000	24,000
2001	30,000	36,000	6,000	30,000
2002	30,000	-	(30,000)	0

Deferred Taxes Example

- In 2000, income before depreciation is $80,000 for both financial and tax reporting. The tax rate is 30% with no anticipated change.

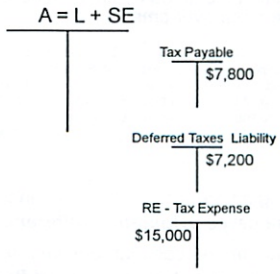
	Financial reporting	*Tax reporting*
NI before Depr.	80,000	80,000
– Depreciation	30,000	54,000
= NI before taxes	50,000	26,000
	× 30%	× 30%
Tax Payable		7,800
Tax Expense	15,000	

Tax Expense = Tax Payable + ???

??? = $7,200 is "Deferred Tax Expense"

Deferred Taxes Example

In 2000



Deferred Taxes Example

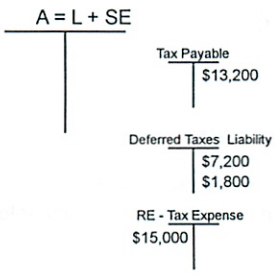
- In 2001, income before depreciation is $80K with a tax rate of 30%

	Financial	Tax
Net income before depr.	$80,000	$80,000
- Depreciation	$30,000	$36,000
= Pre-tax income	$50,000	$44,000
	x30%	x30%
Tax expense	$15,000	
Tax payable		$13,200
Deferred Tax expense		$ 1,800

7

Deferred Taxes Example

In 2001



8

Deferred Taxes Example

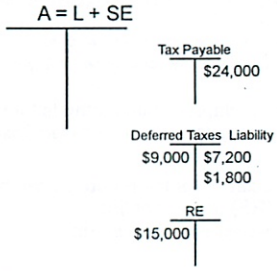
- In 2002, income before depreciation is $80K with a tax rate of 30%

	Financial	Tax
Net income before dep.	$80,000	$80,000
- Depreciation	$30,000	$ 0
= Pre-tax income	$50,000	$80,000
	x30%	x30%
Tax expense	$15,000	
Deferred tax expense RE	9,000	
Tax payable		$24,000

9

Deferred Taxes Example

In 2002



10

Deferred Taxes over Time

Deferred taxes caused by timing differences are temporary; they reverse over time.

Year	Financial reporting depreciation	Tax reporting depreciation	Depreciation difference	Deferred Tax Expense	Acc. Depr Difference,	Def Tax Liability
2000	30,000	54,000	24,000	7,200	24,000	7,200
2001	30,000	36,000	6,000	1,800	30,000	9,000
2002	30,000	-	(30,000)	(9,000)	0	0

- Timing differences that create / increase deferred taxes are called ***originating differences***
- Timing differences that remove / decrease deferred taxes are called ***reversing differences***

11

Intangible Assets

- Intangible assets are rights, privileges, or competitive advantages
- Intangible assets result from ownership of long-lived assets that do not possess physical substance
- Intangible assets are often a company's most valuable assets

12

Types of Intangible Assets

- Patents
- Copyrights
- Trademark and trade names
- Franchises and Licenses
- Goodwill

13

Intangible Assets

- Intangible assets are recorded at cost
- If the intangible has a limited useful life, its cost is allocated (amortized) over the useful life (e.g., patent).
- If the intangible has an indefinite life, it is not amortized (e.g., goodwill).

14

Patents

- Patents are an exclusive right that enables the recipient to manufacture, sell, or control a patent for 20 years from the date of grant.
- The initial cost of a patent is cash or cash equivalent price paid to *acquire* the patent.
- Legal costs of protecting a patent are added to the Patent account and amortized over the remaining life of the patent.

15

Copyrights

- Copyrights are granted by the federal government giving the owner the exclusive right to reproduce and sell artistic or published work.
- Copyrights extend for the life of the creator plus 70 years.

16

Trademarks / Trade Names

- A word, phrase, jingle, or symbol that distinguishes or identifies a particular enterprise or product
- Trademark or trade name has legal protection for indefinite number of 10 year renewal periods
- No amortization

17

Franchises and Licenses

- A franchise is a contractual agreement under which the franchiser grants the franchisee the right
  - to sell certain products
  - to render specific services, or
  - to use certain trademarks or trade names
- Franchise (or license) with a limited life should be amortized to expense over the life of the franchise.
- Franchise with an indefinite life should be carried at cost and not amortized.

18

Goodwill

- Goodwill should be a comparative advantage that enables the firm to earn an above competitive rate of return on its investments
  - Note this definition differs from that in your text book (p.368)
- Goodwill cannot be sold individually, it is associated with the business as a whole
- Goodwill is only recorded when an entire business is purchased for a price greater than the value of the business' net assets

19

Goodwill

- Goodwill is supposed to be impaired (reduced) when its value drops
- Frequently the management does not make that impairment
- Why not?

20

Table 4

BTM ratios relative to impairment period t

Panel A: SFAS 142		BTM t-2	BTM t-1	BTM t
No impairment in t	86	0.8043	1.6756	1.4133
Impairment in t	38	0.7158[A]	1.5420[B]	1.9284[C]

The p-values for difference in means (no impairment v. impairment firms) are as follows: A=0.3756; B=0.5239; C=0.0666.

21

Table 4

BTM ratios relative to impairment period t

Panel B: SFAS 121		BTM t-2	BTM t-1	BTM t-3
No impairment in t	337	0.5793	1.4301	2.0193
Impairment in t	61	0.6526[A]	1.7787[B]	3.3202[C]

The p-values for difference in means (no impairment v. impairment firms) are as follows: A=0.5876; B=0.0066; C=0.0014.

22

Research and Development Costs

- R&D costs are expenditures that may lead to a patent, copyright, or other intangible asset
- R&D costs are usually expensed as incurred
- Why?

23

Analyzing Plant Assets

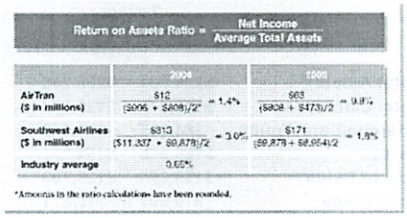
- Return on Assets Ratio
  - Asset Turnover Ratio
  - Profit Margin

ROA = (NI / av(assets)) = (sales/av(assets))* (NI / sales)

24

Return on Assets Ratio

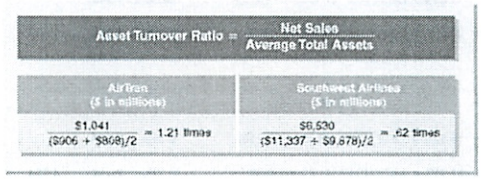
- Indicates the amount of net income generated by each dollar invested in assets



25

Asset Turnover Ratio

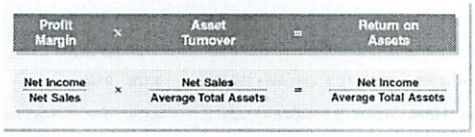
- Indicates
  - (1) how efficiently a company uses its assets, and
  - (2) how many dollars of sales are generated by each dollar invested in assets



26

Analyzing Plant Assets

- A company can increase its return on assets by
  - (1) increasing profit per sale as measured by profit margin ratio, or
  - (2) increasing its volume of sales as measured by the asset turnover ratio



27

Dupont Analysis

- Decomposes ROE into:
  - Asset Turnover Ratio
  - Profit Margin
  - Leverage

ROE = (NI / av(equity)) = (NI/E) = (A/E)*(S/A)* (NI/S)

28

ROA & ROE Ratios: Apple

Selected financial information for Apple Computer, Inc for FY 2006 and FY 2005 (in $ millions):

	Apple	
	FY 2006	FY 2005
Total Assets	$17,205	$11,516
Total Liabilities	$7,221	$4,088
Shareholders' Equity	$9,984	$7,428
Sales	$19,315	$13,931
Cost of Sales	$13,717	$9,889
Net Income	$1,989	$1,328

Compute ROA and ROE

29

ROA & ROE Ratios: Dell

Selected financial information for Dell, Inc for FY 2006 and FY 2005 (in $ millions):

	Dell	
	FY 2006	FY 2005
Total Assets	$23,109	$23,215
Total Liabilities	$18,980	$16,730
Shareholders' Equity	$4,129	$6,485
Sales	$55,908	$49,205
Cost of Sales	$45,958	$40,190
Net Income	$3,572	$3,043

Compute ROA and ROE

30

ROA & ROE: Apple vs. Dell

		Profit Margin	Asset Turnover	Leverage Ratio
Apple				
ROA =	13.85% = 1,989 / [0.5 * (17,205 + 11,516)]	10.30%	1.345	
ROE =	22.85% = 1,989 / [0.5 * (9,984 + 7,428)]	10.30%	1.345	1.649
Dell				
ROA =	15.42% = 3,572 / [0.5 * (23,109 + 23,215)]	6.39%	2.414	
ROE =	67.31% = 3,572 / [0.5 * (4,129 + 6,485)]	6.39%	2.414	4.364

31

ROA & ROE Ratios: Toyota

Selected financial information for Toyota Motor Corp for FY 2005 and FY 2004 (in $ millions):

	Toyota	
	FY 2005	FY 2004
Total Assets	$226,604	$205,235
Total Liabilities	$142,379	$129,077
Shareholders' Equity	$84,225	$76,158
Sales	$165,666	$154,372
Cost of Sales	$135,025	$125,769
Net Income	$10,907	$10,821

Compute ROA and ROE

32

ROA & ROE Ratios: GM

Selected financial information for GM Corp for FY 2005 and FY 2004 (in $ millions):

	GM	
	FY 2005	FY 2004
Total Assets	$161,653	$159,543
Total Liabilities	$168,059	$154,461
Shareholders' Equity	($6,406)	$5,082
Sales	$158,221	$161,545
Cost of Sales	$162,173	$150,224
Net Income	($12,925)	($145)

Compute ROA and ROE

33

ROA & ROE: Toyota vs. GM

		Profit Margin	Asset Turnover	Leverage Ratio
Toyota				
ROA =	5.05% = 10,907 / [0.5 * (226,604 + 205,235)]	6.58%	0.767	
ROE =	13.60% = 10,907 / [0.5 * (84,225 + 76,158)]	6.58%	0.767	2.693
GM				
ROA =	-8.05% = -12,925 / [0.5 * (161,653 + 159,543)]	-8.17%	0.985	
ROE =	1,952% = -12,925 / [0.5 * (-6,406 + 5,082)]	-8.17%	0.985	-242.595

34

Valuation Lecture

4/1

- Prof did not post slides
- Most based on historical cost
- fair value - dead now?
  - can't observe market value
- if no market difficult to price
  - huge range of possible values

Investors use fin reports to try to value shares
need a rudementry knowledge of valuation

---

bond valuation Wed
time valuation
  - entire class on this

$ a $1 today is worth more than $1 in the future

interest would be there even w/o inflation
  ↳ people would rather consume sooner rather than later

Compare present value (PV) and future value (FV)
Should I buy or lease a car?
If I win the lotto, what payout should I pick?

(2)

ie 10% interest

$1 today = $1.10 in a year | 2 years $1 · (1+.1)² = 1.21

today $\frac{1}{(1+.1)^2} = .83$ market price today of $1 in 2 years

everything abstracts from risk

the ↓ risker it is, the more interest you would need

Changes the discount rate

allows one to compare different investments

Capital markets let people transfer cash flows to the future

Can use it to compare lotto payouts

(see post slides)

need to make assumptions of interest rates you can get

tax concerns we are ignoring

then do it the other way around

(need to read + think more about)

but will still choose same value

$FV = (1+r)^n$ of $1

$PV = \frac{1}{(1+r)^n}$

(3)

Use tables to simply calculations
↑ precomputed factors

2 ways of asking qu
- have $1 now - what is it in future
- want $1 in future, how much need now
↑ use inverse table?

Annuities
- so not spent all at once
- insurance companies run

perpetituity - annuity that continues forever
- British consol did
- approximates 20 year plus ... ↙ close to perpituity

$$PV = \frac{1}{r}$$

---

interest rate picked is market rate of investments at that risk

---

Bond issued at par - at face value
- calculate the PV of the bond
- evens out so = value on face
interest added makes up for lost principal
- means they are paying the rate of ~~interest~~ inflation

(4)

at ~~discount~~ premium
~~is some risk~~
~~so they pay more than inflation to account for risk~~ sells higher than face value

coupon rate ~~#~~ > ~~#~~ market rate
hard to sell
at discount

coupon rate < market rate
issued at discount, want to resell
↑ since had to do all this before selling

note discrepency w/ 11/3 notes

discount - have to discount to sell

preimum - buyers want to have

(still a bit confused)
coupon rate is rate company pays

Can also value a building
- discount cash flows it will add to

patent
- risk of cash flows
- interest rate for that risk

division of a company

Goodwill - imparement need to valve every year to see if it is impared
Valve of firm - (assets - liabilities)

company
- M+A (need to learn this)

Shareholder equity
- inticipated dividends, price in 5 years, discount or discount earnings

(5)

See slides for ~~Vista~~ goodwill valuation

More Valuation

11/3

Need transaction to establish goodwill

Allocated to each reporting unit

Must be reviewed at each unit for impairment

goodwill = units fair value + $\sum$ non-goodwill net assets

Can go 0, but not −

↳ would dump the assets

if estimated FV goodwill > book value goodwill

no impairment

" < "

is impairment write down ↑ estimated FV goodwill ↓

book value to

lots of discretion

- park acquired goodwill in units w/ internally created (by definition unrecognized) Goodwill
- estimates of future cash flow unverifiable
- hard to prove estimate is wrong + would have known
  - looks like systemic loss

(2)

Valuing a firm's equity

- technical
- but all based on discounted cash flow
- discounted dividends
- earnings model

Discounted Dividends Model (DDM)

- infinite life

$$V_0 = \frac{Div_1}{(1+r_E)} + \frac{Div_2}{(1+R_E)^2} + \frac{Div_3}{(1+R_3)^3} + \cdots$$

? Value now

- finite life

" " " + $\frac{\text{terminal value}}{(1+R_E)^3}$

Firms OE = net present value of future cash flows to investors

if constant forever at D_0

Market rate of return → constant at r

$$V_0 = \frac{D_0}{r}$$

so valued at perpetuity of D_0

if dividends grow forever at rate g

$$V_0 = \frac{D_0(1+g)}{r-g} \qquad r > g$$

(3)

Earnings Valuation Models

- if dividends in proportional to earnings

all $V_0 = \frac{E_0}{r}$

- some fraction

$$V_0 = \frac{dE_0(1+g)}{r-g}$$

Valuation use Earnings

models say market values cash flows, so why earnings

earnings can be better measure of cash flow from that year than operating cash flows

Since many operating accurals are short term

11/1

Notes not printed before class
after class Review

Valuation

15.501/516 **Corporate Financial Accounting**
Fall 2010
Lecture 14

Professor Ross Watts
Sloan School of Management
Massachusetts Institute of Technology

Housekeeping

- Problem sets
  - PS4 due 11/10
- Reading
  - Dyckman, Appendix C
- Today's slides
  - Available on Stellar

Chap does not appear in my book!

Valuation

How it fits into what we've been doing

- As we have seen, most assets & liabilities are recorded on the basis of transactions at historical cost.
- Occasionally accounting marks assets & liabilities to observed market prices
  - Examples include:
    - Inventory marked to the lower of cost or market where replacement prices are observable
    - Marketable securities marked to observed market prices at the end of the period
- However, fair value has led financial reporting to report valuations in situations where we cannot observe market prices
  - This makes some knowledge of valuation methods important
    - For example, impairment of goodwill & sub-prime mortgage backed securities

Valuation

What most people use valuation for

- At least as importantly, readers of financial reports often use financial reports as a source of inputs to valuation
  - Analysts use accounting earnings as an input to the valuation of shares
  - Balance sheet is used by lenders to give an estimate of liquidation value of the firm
- An informed user of financial reports has to have a rudimentary knowledge of valuation

How to value something?
How to know when to take an impairment

Outline

- Present Value
  - Time value of money
- Valuation of a bond (asset or liability)
- Valuation of the firm or a division of the firm
- Valuation of goodwill
- Valuation of shares

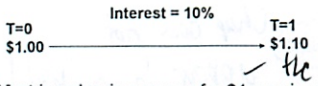
PV - Time Value of Money

- $1 today is worth more than $1 in the future
- Interest is the price of money
- Present value (PV) & future value (FV) concepts allow comparison of monetary flows at different points in time
- Understanding PV & FV allows you to answer questions such as:
  - Should I buy or lease that car?
  - Should I go to graduate school?
  - What lottery payout should I pick?

not just from inflation just to "rent" $

PV - Time Value Mechanics

- Would you rather have $1 today or one year from now?



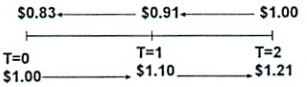
the FV

- What is value in a year of a $1 received today?
  - $1.00 today = $1.00 * (1+10%) = $1.10 one year from now
  - Answer: $1 today
- What is value today of a $1 received in a year? The PV
  - $1.00 one year from now = $1.00 / (1+10%) = $0.91 today

7

PV - Time Value Mechanics

- First lets abstract from risk remove it
  - everything is certain
- Would you rather have $1 today or two years from now?



- What is value in two years of a $1 received today?
  - $1.00 today = $1.00 * (1+10%) * (1+10%) = $1.00 * (1+10%)^2 = $1.21 two years from now
- What is value today of a $1 received in two years?
  - $1.00 one year from now = $1.00 / (1+10%)^2 = $0.83 today

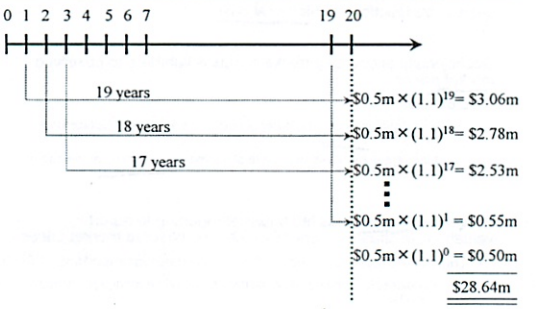
8

Lottery Example

- You have just won lottery & have 3 alternative ways of collecting your winnings
  - Alternative 1: Payments of $500,000 at the end of each year for the next 20 years
  - Alternative 2: Lump-sum payment today of $4.5M
  - Alternative 3: Lump-sum payment of $1M today followed by $2.1M at end of years 5, 6, and 7
- Ignore taxes and assume $ can be invested at 10%
- Which alternative should you choose?

in real life maybe not

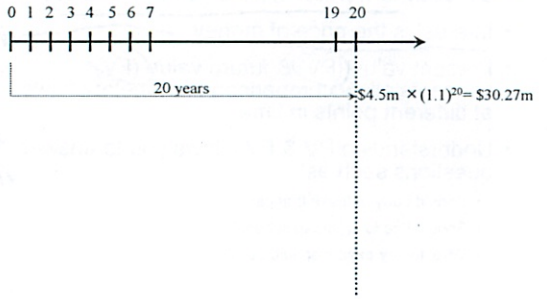
Future Value of Alternative 1



10

Value after 20%
- make 10% interest on it when you have it

Future Value of Alternative 2



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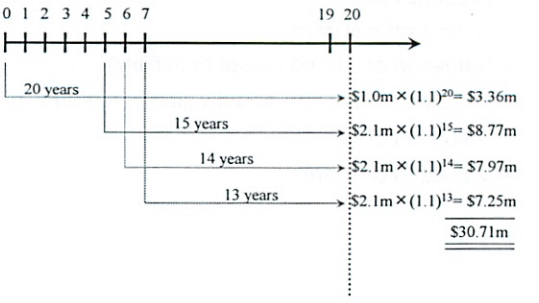
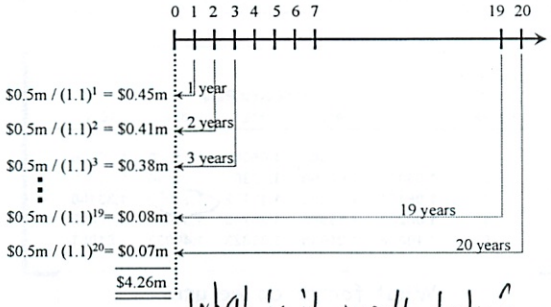
Future Value of Alternative 3



12

#1. Payout value does decrease each year due to inflation - but not considered here
instead you lose ability to invest at 10%
this assumes you don't spend anything, ever

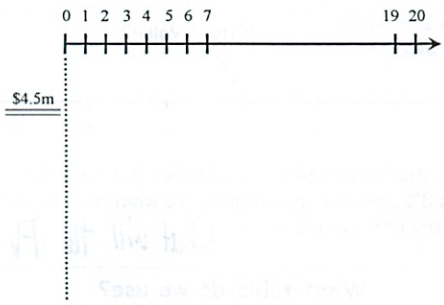
Present Value of Alternative 1



what is it worth today?

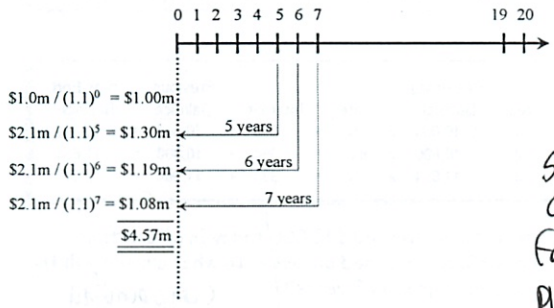
13

Present Value of Alternative 2



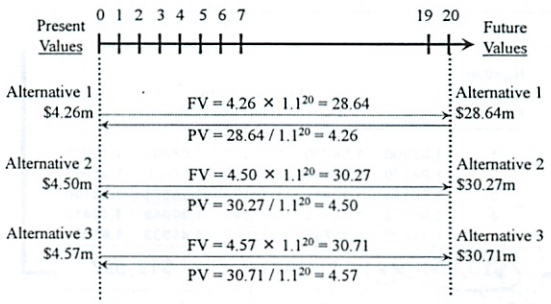
14

Present Value of Alternative 3



same order for both PV + FV

Present vs. Future Values



16

actually in my book

Three Tables in Appendix A

diff order

Table A.1 - Future Value of $1 $= (1+i)^t$

Table A.2 – Present Value of $1 $= \frac{1}{(1+i)^t}$

Table A.3 - Present Value of an Annuity of $1

How would you find the Future Value of an Annuity of $1? $= \frac{\left(1 - \frac{1}{(1+i)^t}\right)}{i}$

Find the Present Value of an Annuity of $1 and multiply it by the Future Value of $1

i = rate
t = years

17

Single sum formulas

Future Value = FV($1) = $(1+r)^n$ of $

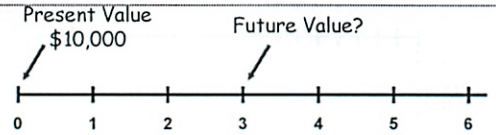
Present Value = PV($1) = $1/(1+r)^n$

$FV(X) = X(1+r)^n$

$PV(X) = \frac{X}{(1+r)^n}$

18

Future Value



Steve Allen invested $10,000 today in a fund that earns 8% compounded annually. To what amount will the investment grow in 3 years? What will the FV be

What table do we use?

19

PV = 10,000
i = 8
t = 3

Future Value – table A.1

Number of Periods	Discount Rate 2%	4%	6%	8%	10%
1	1.02000	1.04000	1.06000	1.08000	1.10000
2	1.04040	1.08160	1.12360	1.16640	1.21000
3	1.06121	1.12486	1.19102	1.25971	1.33100
4	1.08243	1.16986	1.26248	1.36049	1.46410
5	1.10408	1.21665	1.33823	1.46933	1.61051

What factor do we use?

20

What is discount rate?
Is in this case synonym for interest rate

Future Value – table A.1

Number of Periods	Discount Rate 2%	4%	6%	8%	10%
1	1.02000	1.04000	1.06000	1.08000	1.10000
2	1.04040	1.08160	1.12360	1.16640	1.21000
3	1.06121	1.12486	1.19102	1.25971	1.33100
4	1.08243	1.16986	1.26248	1.36049	1.46410
5	1.10408	1.21665	1.33823	1.46933	1.61051

$10,000 (×) 1.25971 = $12,597

Present Value — Factor — Future Value

21

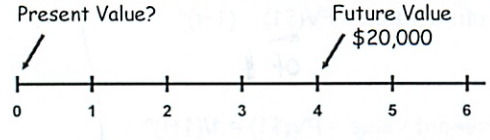
PROOF - Future Value of a Single Sum

Year	Beginning Balance		Rate		Interest		Previous Balance		Year-End Balance
1	$ 10,000	x	8%	=	800	+	10,000	=	$ 10,800
2	10,800	x	8%	=	864	+	10,800	=	11,664
3	11,664	x	8%	=	933	+	11,664	=	12,597

Steve Allen invested $10,000 today in a fund that earns 8% compounded annually. To what amount will the investment grow in 3 years? compounding each year!

22

Present Value



Itzak Perlman needs $20,000 in 4 years. What amount must he invest today if his investment earns 12% compounded annually? What if the PV?

What table do we use?

23

Present Value – table A.2

Number of Periods	Discount Rate 4%	6%	8%	10%	12%
2	.92456	.89000	.85734	.82645	.79719
4	.85480	.79209	.73503	.68301	.63552
6	.79031	.70496	.63017	.56447	.50663
8	.73069	.62741	.54027	.46651	.40388

interest rate

What factor do we use?

24

20,000 × .63553

Present Value – table A.2

Number of Periods	Discount Rate 4%	6%	8%	10%	12%
2	.92456	.89000	.85734	.82645	.79719
4	.85480	.79209	.73503	.68301	.63552
6	.79031	.70496	.63017	.56447	.50663
8	.73069	.62741	.54027	.46651	.40388

$20,000 x .63552 = $12,710

Future Value | Factor | Present Value

25

Annuity Terminology

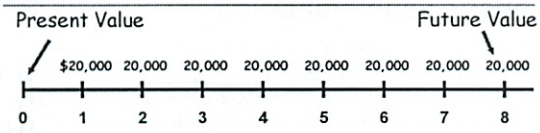
- Terminology comes from insurance industry
- Annuity => A stream of fixed-dollar payments made at different points in time
  - Ordinary annuity => payments occur at end of period
  - Annuity due => payments occur at beginning of period

weird

- Perpetuity => Annuity that continues forever
  - British Consol

26

Future Value of an Annuity



Bayou Inc. will deposit $20,000 in a 12% fund at the end of each year for 8 years beginning December 31, Year 1. What amount will be in the fund immediately after the last deposit?

What table do we use?

27

Put in 20,000 a year and has earned interest.

So ↙

FV of an Annuity (not in text)

Number of Periods	Discount Rate 4%	6%	8%	10%	12%
2	2.04000	2.06000	2.08000	2.10000	2.12000
4	4.24646	4.37462	4.50611	4.64100	4.77933
6	6.63298	6.97532	7.33592	7.71561	8.11519
8	9.21423	9.89747	10.63663	11.43589	12.29969
10	12.00611	13.18079	14.48656	15.93743	17.54874

What factor do we use?

28

FV of an Annuity – (not in text)

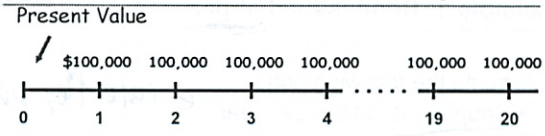
Number of Periods	Discount Rate 4%	6%	8%	10%	12%
2	2.04000	2.06000	2.08000	2.10000	2.12000
4	4.24646	4.37462	4.50611	4.64100	4.77933
6	6.63298	6.97532	7.33592	7.71561	8.11519
8	9.21423	9.89747	10.63663	11.43589	12.29969
10	12.00611	13.18079	14.48656	15.93743	17.54874

$20,000 x 12.29969 = $245,994

Deposit | Factor | Future Value

29

Present Value of an Annuity



Jaime Yuen wins $2,000,000 in the state lottery. She will be paid $100,000 at the end of each year for the next 20 years. How much has she actually won? Assume an appropriate interest rate of 8%.

each year

What table do we use?

national rate?
aka rate of inflation?

30

PV of an Annuity – table A.3

Number of Periods	Discount Rate 4%	6%	8%	10%	12%
1	0.96154	0.94340	0.92593	0.90900	0.89286
5	4.45183	4.21236	3.99271	3.79079	3.60478
10	8.11090	7.36009	6.71008	6.14457	5.65022
15	11.11839	9.71225	8.55948	7.60608	6.81086
20	13.59033	11.46992	9.81815	8.51356	7.46944

What factor do we use?

31

PV of an Annuity – table A.3

Number of Periods	Discount Rate 4%	6%	8%	10%	12%
1	0.96154	0.94340	0.92593	0.90900	0.89286
5	4.45183	4.21236	3.99271	3.79079	3.60478
10	8.11090	7.36009	6.71008	6.14457	5.65022
15	11.11839	9.71225	8.55948	7.60608	6.81086
20	13.59033	11.46992	9.81815	8.51356	7.46944

$100,000	×	9.81815	=	$981,815
Receipt		Factor		Present Value

32

if got all at once
or is it " and invested at 8%
or it earns interest while in lotto?

Perpetuities

- A perpetuity is a constant amount received at the end of each period

$$\text{Sum of infinite series}: \sum_{n=1}^{\infty} \frac{1}{k^n} = \frac{1}{k-1} \quad e.g., \frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\ldots = 1$$

$$\text{PV of a perpetuity}: \sum_{n=1}^{\infty} \frac{1}{(1+r)^n} = \frac{1}{(1+r)-1} = \frac{1}{r}$$

33

Generic asset valuation

The value of any asset, in general, is equal to the sum of all future payments from the asset discounted to present value at an appropriate rate of interest (the *discount rate, r*), where the rate of interest is supposed to reflect the riskiness of the payment stream:

so must "discount" payments to 8%

$$Value_0 = \frac{Payment_1}{(1+r)} + \frac{Payment_2}{(1+r)^2} + \frac{Payment_3}{(1+r)^3} + \ldots = \sum_{t=1}^{\infty} \frac{Payment_t}{(1+r)^t}$$

The appropriate rate of interest is usually the market rate for the investments of that risk

34

this I was confused about during lecture

Valuation of a Bond

Example 1: Bond issued at par

- Assume the following bond:
  - Coupon rate of 6% per year ← rate they pay
  - Three annual payments
  - Principal payment of $10,000 at the end of three years
  - Assume market rate is 6% ← rate you could get elsewhere
- What is the present value (market value) of the bond?

35

Valuation of a Bond

Example 1: Bond issued at par

- Present value
  - Coupon
    - PV of ordinary annuity, n = 3, r = 6%, Table A.3
    - $600 x 2.67301 = $1,603.81
  - Principal
    - PV of $10,000, n = 3, r = 6%, Table A.2
    - $10,000 x 0.83962 = $8,396.20
- PV = $1,603.81 + $8,396.20 = $10,000

the coupon amt → expand
→ decrease

36

They need to pay interest at market value, so $ amt is same

I think I am confused w/ regard to interest

Valuation of a Bond
Example 2: Bond issued at discount

- Assume the following bond:
  - Coupon rate of 6% per year
  - Three annual payments
  - Principal payment of $10,000 at the end of three years
  - Assume market rate is 8% below market rate
- What is the present value of the bond?

37

Valuation of a Bond
Example 2: Bond issued at discount

- Present value
  - Coupons
    - PV of ordinary annuity, n = 3, r = 8%, Table A.3
    - $600 x 2.57710 = $1,546.26
  - Principal
    - PV of $10,000, n = 3, r = 8%, Table A.2
    - $10,000 x 0.79383 = $7,938.30
  - PV = $1,546.26 + $7,938.30 = $9,484.56

~~You will lose $, right?~~

~~No bond below face value PV — So it will sell!~~

38

Valuation of a Bond
Example 3: Bond issued at premium

- Assume the following bond:
  - Coupon rate of 6% per year
  - Three annual payments
  - Principal payment of $10,000 at the end of three years
  - Assume market rate is 4%
- What is the present value of the bond?

39

Valuation of a Bond
Example 3: Bond issued at premium

- Present value
  - Coupons
    - PV of ordinary annuity, n = 3, r = 4%, Table A.3
    - $600 x 2.77509 = $1,665.05
  - Principal
    - PV of $10,000, n = 3, r = 4%, Table A.2
    - $10,000 x 0.88900= $8,890.00
  - PV = $1,665.05 + $ 8,890.00 = $10,555.55

above face value, won't sell

~~kinda confused on this~~

prof said wrong thing, see 11/3 slide 10

discount - must discount price

premium - all investors want

40

Use of valuation in financial reporting

- As we have seen, in accounting most assets & liabilities are recorded on the basis of transactions

41

Can extend this PV valuation to value:

A building

A patent

A division of a company

collection of buildings, patents, equipment etc.

Goodwill

A company

A company's shareholders' equity where shareholders receive payments in the form of dividends or price upon selling shares

42

no wonder I was confused

Goodwill valuation + impairment

- When a company buys another co. & paysmore than the fair value of the net asset value it records that excess as goodwill
- If the acquiring co. has morethan one "reporting unit", goodwillis allocated to one or more reporting units (essentiallyoperating segments)
- Under SFAS 142 managementhas to regularlyreview the goodwill valuation for impairment.
  - A unit's fair value (often the PV of its future cash flows) is compared to the unit's book value. If it is larger there is no impairment.
  - If it is smaller, the fair value of goodwill is estimated as the difference between the unit's fair value & the sum of the fair values of the unit's non-goodwill net assets.
    - often estimatedusing PVs
  - If the unit's estimated fair value of goodwill > the unit's book value of goodwill, there is no impairment. If it is less, the book value of goodwill is written down to its estimated fair value.

43

Goodwill valuation

- Layers of managerial discretion in the impairment process
  1. Acquired goodwillis allocated across units
     Can be parkedin units with unrecognized internally created goodwill
  2. Estimated future cash flowsof a unit are unverifiable & so can be easilyoverstated
     Many things canhappen between the currentestimate & the futurerealization
     Banks can blame systemiclosses
  3. Current fair valuesof the unit's net assets (including non-goodwill intangibles) must be estimated. Many of those assets & liabilities may be thinly or not traded

So not verifiable

44

Valuing a firm's equity (or net assets)

- A firm's equity can be valued many ways
  - Many very highly technical
- The following slides illustrate 2 very simple, commonly used models
  - Discounted dividends model
  - Earnings valuation model

45

Discounted Dividends Model (DDM)

Going concern assumption... → *infinite life*

$$Value_0 = \frac{DIV_1}{(1+r_E)} + \frac{DIV_2}{(1+r_E)^2} + \frac{DIV_3}{(1+r_E)^3} + \ldots$$

Assuming a finite life

$$Value_0 = \frac{DIV_1}{(1+r_E)} + \frac{DIV_2}{(1+r_E)^2} + \frac{DIV_3}{(1+r_E)^3} + \frac{Terminal\ Value}{(1+r_E)^3}$$

where

V_0 = Value at time zero
DIV_t = Dividend for period t
r = Cost of equity capital

46

Discounted Dividends Model

- Assumes the value of the firm's owners' equity is the present value of the net future cash flows to shareholders

dividend
"discounted" to PV

47

Discounted Dividends Model

- If dividends are expected to be constant forever at D_0 & the market return is expected to be constant at r, what is the value of the firm's equity?

$$V_0 = \frac{D_0}{r}$$

- The value of the equity is the value of a perpetuity of D_0

48

a $ in Future only worth 19¢ today

Discounted Dividends Model

- If dividends are expected to grow forever at rate g & the market return is expected to be constant at r, what is the value of the firm's equity?

$$V_0 = \frac{D_0(1+g)}{r-g}$$

- The formula assumes r>g

49

Earnings Valuation Model

- If we assume dividends have a constant relation to earnings, the previous two formulas can be converted into earnings-based formulas
- For example, if all earnings are paid out as dividends and earnings are expected to be constant at E_0.

$$V_0 = \frac{E_0}{r}$$

- Or, if a constant fraction (d) of earnings are paid out as dividends and retained earnings are invested to generate growth in earnings

$$V_0 = \frac{dE_0(1+g)}{r-g}$$

part of earnings = dividends

50

Discounted Earnings Model (DEM)

Going concern assumption... → *infinite life*

$$Value_0 = \frac{ERN_1}{(1+r_E)} + \frac{ERN_2}{(1+r_E)^2} + \frac{ERN_3}{(1+r_E)^3} + \ldots$$

Assuming a finite life

$$Value_0 = \frac{ERN_1}{(1+r_E)} + \frac{ERN_2}{(1+r_E)^2} + \frac{ERN_3}{(1+r_E)^3} + \frac{\text{Terminal Value}}{(1+r_E)^3}$$

where

V_0 = Value at time zero
ERN_t = Accounting earnings for period t
r = Cost of equity capital

review

51

Valuation using Earnings

- Economic models assume the market values cash flows, why use earnings-base models?
- Earnings for year can be a better measure of cash flow for year than operating cash flows
- Reason is many operating accruals are very short term.
  - For example, accounts receivable are likely received in 30 days
  - Using CFO those cash flows would be assumed to be received in another 365 days

(operating cash flows)

52