Problem 13
Cost & Profit

E217 – Inventory Management

SCHOOL OF ENGINEERING

Strategic Role of Inventory

- **Inventory as a buffer**
  - Smooth operations as stock provides a buffer between production and sales or supply and sales.

- **Inventory is money**
  - Financial performance of company is affected by stock holdings and valuation of stocks

Depending on demand of stock

Methods to Value Inventory - FIFO

First-In-First-Out (FIFO)

- Oldest items (those that are first purchased) are assumed to be the ones to be sold first
- For example, perishables like fresh milk, fresh cheese, fresh fruits and vegetables with expiry dates
- Assigns:
  - *Oldest costs to COGS*
  - *Recent costs to ending inventory*

Methods to Value Inventory - LIFO

Last-In-First-Out (LIFO)

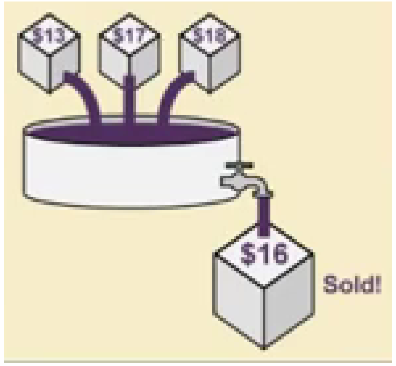
- Newest items (those that are most recently purchased) are assumed to be the first sold.
- For example, people who enter the lift last will be the ones to get out of the lift first
- Other examples include raw materials or components that do not have expiry dates and are kept in such a way that those stored recently are usually retrieved first.
- Assigns:
  - *Most recent costs to COGS*
  - *Oldest costs to ending inventory*

Methods to Value Inventory – Average Costing

Average Costing Method

- This method is quite straightforward.
- Regardless new or old, items are retrieved randomly or mixed and taken out together, e.g. anything in the form of liquid
- The average cost is based on the *weighted average* of all units available for sales during the accounting period.

$$\text{Average Costing in a period} = \frac{\text{Total Cost of Goods Available for Sale in this period}}{\text{Total Quantity of Goods Available for Sale in this period}}$$



Income Statement & Cost Of Goods Sold

- The Profit & Loss statement (P&L), also known as the Income Statement, is a company's financial statement that indicates how the revenue is transformed into net income.
- The purpose of the P&L is to show managers and investors whether the company made or lost money during the period being reported.
- COGS reflects the cost of obtaining raw materials and producing finished goods or services that are sold to consumers.
  - Equal to the beginning inventory plus the cost of goods purchased during some period minus the ending inventory.
  - Or simply add up all the costs of the products sold
  - It is also called “cost of sales” and listed on the Income Statement

Revenue

- **Revenue** is the income that a company receives from its normal business activities, usually from the sale of goods and services to customers.

- Revenue for FY 2017

  = ∑ (sales quantity x selling price)

  = $**472,500**

Selling quantity	Selling price
15	$900
20	$900
10	$900
50	$900
50	$900
55	$900
55	$900
45	$900
70	$900
80	$900
45	$900
30	$900
Total Revenue	472500

COGS by Using FIFO - Method 1

					FIFO Method				
	Units In (Bought)			Units Out (Sold)				Ending Inventory	
	# Units	Cost/Unit	Total Cost	# Units		Cost/Unit	Total Cost	# Units	Total Cost
Jan-17	20	$570	$11,400	15	15	$570	$8,550	5	$2,850
Feb-17	30	$570	$17,100	20	5	$570	$2,850	30	$17,100
					15	$570	$8,550	15	$8,550
Mar-17	20	$560	$11,200	10	10	$570	$5,700	25	$14,050
Apr-17	50	$550	$27,500	50	5	$570	$2,850	70	$38,700
					20	$560	$11,200	50	$27,500
					25	$550	$13,750	25	$13,750
May-17	55	$550	$30,250	50	25	$550	$13,750	55	$30,250
					25	$550	$13,750	30	$16,500
Jun-17	50	$545	$27,250	55	30	$550	$16,500	50	$27,250
					25	$545	$13,625	25	$13,625
Jul-17	45	$530	$23,850	55	25	$545	$13,625	45	$23,850
					30	$530	$15,900	15	$7,950
Aug-17	80	$530	$42,400	45	15	$530	$7,950	80	$42,400
					30	$530	$15,900	50	$26,500
Sep-17	60	$520	$31,200	70	50	$530	$26,500	60	$31,200
					20	$520	$10,400	40	$20,800
Oct-17	45	$510	$22,950	80	40	$520	$20,800	45	$22,950
					40	$510	$20,400	5	$2,550
Nov-17	80	$500	$40,000	45	5	$510	$2,550	80	$40,000
					40	$500	$20,000	40	$20,000
Dec-17	0	$0	$0	30	30	$500	$15,000	10	$5,000
	535		$285,100	525	525				
						COGS1:	$280,100		
						COGS2:	$280,100		

COGS calculated by Method 1
→ sum up all the total cost (Sold)

COGS: $280,100

Ending Inventory Cost

COGS by Using FIFO - Method 2

				FIFO Method					
	Units In (Bought)			Units Out (Sold)				Ending Inventory	
	# Units	Cost/Unit	Total Cost	# Units		Cost/Unit	Total Cost	# Units	Total Cost
Jan-17	20	$570	$11,400	15	15	$570	$8,550	5	$2,850
Feb-17	30	$570	$17,100	20	5	$570	$2,850	30	$17,100
					15	$570	$8,550	15	$8,550
Mar-17	20	$560	$11,200	10	10	$570	$5,700	25	$14,050
Apr-17	50	$550	$27,500	50	5	$570	$2,850	70	$38,700
					20	$560	$11,200	50	$27,500
					25	$550	$13,750	25	$13,750
May-17	55	$550	$30,250	50	25	$550	$13,750	55	$30,250
					25	$550	$13,750	30	$16,500
Jun-17	50	$545	$27,250	55	30	$550	$16,500	50	$27,250
					25	$545	$13,625	25	$13,625
Jul-17	45	$530	$23,850	55	25	$545	$13,625	45	$23,850
					30	$530	$15,900	15	$7,950
Aug-17	80	$530	$42,400	45	15	$530	$7,950	80	$42,400
					30	$530	$15,900	50	$26,500
Sep-17	60	$520	$31,200	70	50	$530	$26,500	60	$31,200
					20	$520	$10,400	40	$20,800
Oct-17	45	$510	$22,950	80	40	$520	$20,800	45	$22,950
					40	$510	$20,400	5	$2,550
Nov-17	80	$500	$40,000	45	5	$510	$2,550	80	$40,000
					40	$500	$20,000	40	$20,000
Dec-17	0	$0	$0	30	30	$500	$15,000	10	$5,000
	535		$285,100	525	525				
					OGS1:	$280,100			
					OGS2:	$280,1			

COGS equals to beginning inventory plus the cost of goods purchased minus the ending inventory (A + B – C)

COGS: $280,100

Results by Using LIFO

					LIFO Method				
	Units In (Bought)				Units Out (Sold)			Ending Inventory	
	# Units	Cost/Unit	Total Cost	# Units		Cost/Unit	Total Cost	# Units	Total Cost
Jan-17	20	$570	$11,400	15	15	$570	$8,550	5	$2,850
Feb-17	30	$570	$17,100	20	20	$570	$11,400	15	$8,550
Mar-17	20	$560	$11,200	10	10	$560	$5,600	25	$14,150
Apr-17	50	$550	$27,500	50	50	$550	$27,500	25	$14,150
May-17	55	$550	$30,250	50	50	$550	$27,500	30	$16,900
Jun-17	50	$545	$27,250	55	50	$545	$27,250	30	$16,900
					5	$550	$2,750	25	$14,150
Jul-17	45	$530	$23,850	55	45	$530	$23,850	25	$14,150
					10	$560	$5,600	15	$8,550
Aug-17	80	$530	$42,400	45	45	$530	$23,850	50	$27,100
Sep-17	60	$520	$31,200	70	60	$520	$31,200	50	$27,100
					10	$530	$5,300	40	$21,800
Oct-17	45	$510	$22,950	80	45	$510	$22,950	40	$21,800
					25	$530	$13,250	15	$8,550
					10	$570	$5,700	5	$2,850
Nov-17	80	$500	$40,000	45	45	$500	$22,500	40	$20,350
Dec-17			$0	30	30	$500	$15,000	10	$5,350
	535		$285,100	525	525				
						COGS1:	$279,750		
						COGS2:	$279,750		

COGS: $279,750

Comparison of FIFO and LIFO

FIFO Method	Oldest cost	Goes into	Cost of Goods Sold
	Recent cost		Ending Inventory
LIFO Method	Recent cost	Goes into	Cost of Goods Sold
	Oldest cost		Ending Inventory

Results Using Average Costing Method

					Average Costing Method				
	Units In (Bought)				Units Out (Sold)			Ending Inventory	
	# Units	Cost/Unit	Total Cost		# Units	Cost/Unit	Total Cost	# Units	Total Cost
Jan-17	20	$570	$11,400.00		15	$532.90	$7,993	5	$2,664
Feb-17	30	$570	$17,100.00		20	$532.90	$10,658	15	$7,993
Mar-17	20	$560	$11,200.00		10	$532.90	$5,329	25	$13,322
Apr-17	50	$550	$27,500.00		50	$532.90	$26,645	25	$13,322
May-17	55	$550	$30,250.00		50	$532.90	$26,645	30	$15,987
Jun-17	50	$545	$27,250.00		55	$532.90	$29,309	25	$13,322
Jul-17	45	$530	$23,850.00		55	$532.90	$29,309	15	$7,993
Aug-17	80	$530	$42,400.00		45	$532.90	$23,980	50	$26,645
Sep-17	60	$520	$31,200.00		70	$532.90	$37,303	40	$21,316
Oct-17	45	$510	$22,950.00		80	$532.90	$42,632	5	$2,664
Nov-17	80	$500	$40,000.00		45	$532.90	$23,980	40	$21,316
Dec-17			$0.00		30	$532.90	$15,987	10	$5,329
Total	535		$285,100.00		525	COGS1:	$279,771		
						COGS2:	$279,771		
Average:	$532.90								

Average = $285100 / 535 = $532.90

COGS: $279,771

Recommendations for Today's problem

- Gross Profit is the difference between revenue and the cost of making a product or providing a service, before deducting overhead, payroll, taxation, and interest payments.
- Gross Profit = Revenue – COGS
- Profit Before Taxes = Gross Profit – Expenses
- Profit After Tax (After Tax Income) = Profit Before Tax - Tax

Income Statement	FIFO	LIFO	Avg. Costing
Revenues	$472,500	$472,500	$472,500
Less: Cost of Goods Sold (COGS)	$280,100	$279,750	$279,771
Gross profit	$192,400	$192,750	$192,729
Less: Sales Expenses	$3,000	$3,000	$3,000
Depreciation & Amortization Expenses	$2,000	$2,000	$2,000
General & Administrative Expenses	$1,000	$1,000	$1,000
Profit Before Taxes	$186,400	$186,750	$186,729
Less: Company Tax (assuming 14%)	$26,096	$26,145	$26,142
Profit After Taxes (After Tax Income)	$160,304	$160,605	$160,587

- The *highest* Profit After Taxes is obtained by using *LIFO* method as LIFO has the *lowest COGS.*

Further Considerations

- If purchasing price keeps going *up* all the time
  - Companies choosing to minimize their taxable income can choose the LIFO method to value inventories.
  - Companies choosing to maximize their reported income typically select FIFO or other non-LIFO method, such as Average Costing Method.

- If purchasing price keeps going *down* all the time
  - Companies choosing to maximize their taxable income have to select LIFO method due to lowest COGS

- Other factors to consider when choosing the valuation methods:
  - Expiry dates, usage, fixed shelf-life, storage and material flow systems will also affect the inventory movement & valuation policy.
  - Accounting standards allowed in each country
    - E.g. to use LIFO in Singapore, you need to apply to IRAS

Learning Objectives

- Describe the concepts of First-In-First-Out (FIFO), Last-In-First-Out (LIFO) and Average Costing
- Explain the Cost of Goods Sold (COGS)
- Perform inventory valuations by using FIFO, LIFO and Average Costing respectively:
  - Calculate COGS
  - Calculate Revenue
  - Calculate Gross Profit
  - Calculate After Tax Income

- Describe the impact of different inventory valuation methods on the Profit and Loss (P&L) Account