

READING

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Inventories: Implications for Financial Statements and Ratios

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LEARNING OUTCOMES

<i>Mastery</i>	<i>The candidate should be able to:</i>
☐	a. calculate and explain how inflation and deflation of inventory costs affect the financial statements and ratios of companies that use different inventory valuation methods;
☐	b. explain LIFO reserve and LIFO liquidation and their effects on financial statements and ratios;
☐	c. convert a company's reported financial statements from LIFO to FIFO for purposes of comparison;
☐	d. describe the implications of valuing inventory at net realisable value for financial statements and ratios;
☐	e. analyze and compare the financial statements and ratios of companies, including those that use different inventory valuation methods;
☐	f. explain issues that analysts should consider when examining a company's inventory disclosures and other sources of information.

Note: New rulings and/or pronouncements issued after the publication of the readings in financial reporting and analysis may cause some of the information in these readings to become dated. Candidates are expected to be familiar with the overall analytical framework contained in the study session readings, as well as the implications of alternative accounting methods for financial analysis and valuation, as provided in the assigned readings. Candidates are not responsible for changes that occur after the material was written.

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INTRODUCTION

Inventories and cost of sales (cost of goods sold) are significant items in the financial statements of many companies. Comparing the performance of these companies is challenging because of the allowable choices for valuing inventories: Differences in the choice of inventory valuation method can result in significantly different amounts being assigned to inventory and cost of sales. Financial statement analysis would be much easier if all companies used the same inventory valuation method or if inventory price levels remained constant over time. If there was no inflation or deflation with respect to inventory costs and thus unit costs were unchanged, the choice of inventory valuation method would be irrelevant. However, inventory price levels typically do change over time.

International Financial Reporting Standards (IFRS) permit the assignment of inventory costs (costs of goods available for sale) to inventories and cost of sales by three cost formulas: specific identification, first-in, first-out (FIFO), and weighted average cost.¹ US generally accepted accounting principles (US GAAP) allow the same three inventory valuation methods, referred to as cost flow assumptions in US GAAP, but also include a fourth method called last-in, first-out (LIFO).² The choice of inventory valuation method affects the allocation of the cost of goods available for sale to ending inventory and cost of sales.

To evaluate a company's performance over time and relative to industry peers, analysts must clearly understand the various inventory valuation methods that companies use and the related impact on financial statements and financial ratios. This reading is organised as follows: Section 2 explains the effects of changing price levels on the financial statements of companies that use different inventory valuation methods. Section 3 discusses the LIFO method, LIFO reserve, and the effects of LIFO liquidations, and demonstrates the adjustments required to compare a company that uses LIFO with one that uses FIFO. Section 4 discusses the financial statement effects of a change in inventory valuation method. Section 5 demonstrates the financial statement effects of a decline in inventory value. Section 6 discusses issues analysts should consider when evaluating companies that carry inventory. A summary and practice problems in the CFA Institute item set format complete the reading.

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INVENTORY AND CHANGING PRICE LEVELS

Each of the allowable inventory valuation methods involves a different assumption about cost flows. The choice of cost formula (IFRS terminology) or cost flow assumption (US GAAP terminology) determines how the cost of goods available for sale during a period is allocated between inventory and cost of sales. Specific identification assumes that inventory items are not ordinarily interchangeable and that the cost flows match the actual physical flows of the inventory items. Cost of sales and inventory reflect the actual costs of the specific items sold and unsold (remaining in inventory).

First-in, first-out (FIFO) assumes that the inventory items purchased or manufactured first are sold first. The items remaining in inventory are assumed to be those most recently purchased or manufactured. In periods of rising inventory prices (inflation), the costs assigned to the units in ending inventory are higher than the costs assigned to the units sold. Conversely, in periods of declining inventory prices (deflation), the

¹ International Accounting Standard (IAS) 2 [Inventories].

² Financial Accounting Standards Board *Accounting Standards Codification* (FASB ASC) Topic 330 [Inventory].

costs assigned to the units in ending inventory using FIFO are lower than the costs assigned to the units sold. In periods of changing prices, ending inventory values determined using FIFO more closely reflect current costs than do the cost of sales.

Weighted average cost assumes that the inventory items sold and those remaining in inventory are the same average age and cost. In other words, a mixture of older and newer inventory items is assumed to be sold and remaining in inventory. Weighted average cost assigns the average cost of the goods available for sale (beginning inventory plus purchases, conversion, and other costs) during the accounting period to the units that are sold as well as to the units in ending inventory. Weighted average cost per unit is calculated as total cost of goods available for sale divided by total units available for sale.

Companies typically record changes to inventory using either a periodic inventory system or a perpetual inventory system. Under a **periodic inventory system**, inventory values and costs of sales are determined at the end of the accounting period. Under a **perpetual inventory system**, inventory values and cost of sales are continuously updated to reflect purchases and sales. Under either system, the allocation of goods available for sale to cost of sales and ending inventory is the same if the inventory valuation method used is either specific identification or FIFO. This is not generally true for the weighted average cost method. Under a periodic inventory system, the amount of cost of goods available for sale allocated to cost of sales and ending inventory may be quite different using the FIFO method compared to the weighted average cost method. Under a perpetual inventory system, inventory values and cost of sales are continuously updated to reflect purchases and sales. As a result, the amount of cost of goods available for sale allocated to cost of sales and ending inventory is similar under the FIFO and weighted average cost methods. Because of lack of disclosure and the dominance of perpetual inventory systems, analysts typically do not make adjustments when comparing a company using the weighted average cost method with a company using the FIFO method.

Last-in, first-out (LIFO), which is allowed under US GAAP but not allowed under IFRS, assumes that the inventory items purchased or manufactured most recently are sold first. The items remaining in inventory are assumed to be the oldest items purchased or manufactured. In periods of rising prices, the costs assigned to the units in ending inventory are lower than the costs assigned to the units sold. Similarly, in periods of declining prices, the costs assigned to the units in ending inventory are higher than the costs assigned to the units sold. In periods of changing prices and using LIFO, cost of sales more closely reflects current costs than do ending inventory values.

Using the LIFO method, the periodic and perpetual inventory systems will generally result in different allocations to cost of sales and ending inventory. Under either a perpetual or periodic inventory system, the use of the LIFO method will generally result in significantly different allocations to cost of sales and ending inventory compared to other inventory valuation methods. When inventory costs are increasing and inventory unit levels are stable or increasing, using the LIFO method will result in higher cost of sales and lower inventory carrying amounts than using the FIFO method. The higher cost of sales under LIFO will result in lower gross profit, operating income, income before taxes, and net income. Income tax expense will be lower under LIFO, causing the company's net operating cash flow to be higher. On the balance sheet, the lower inventory carrying amount will result in lower reported current assets, working capital, and total assets. Analysts must carefully assess the financial statement implications of the choice of inventory valuation method when comparing companies that use the LIFO method with companies that use the FIFO method.

The choice of inventory valuation method would be largely irrelevant if inventory unit costs remained relatively constant over time. The allocation of cost of goods available for sale to items sold and inventory items would be very similar regardless of the choice of inventory valuation method. However, inventory unit costs typically

change over time and the choice of inventory valuation method does in fact result in potentially different allocations of cost of goods available for sale to inventory sold in the period and inventory on hand at the end of the period. The financial results of two essentially similar companies can look very different if the companies choose different inventory valuation methods. Cost of sales (cost of goods sold) on the income statement and inventory on the balance sheet will differ depending upon the inventory valuation method chosen.

An inventory valuation method that allocates more of the cost of goods available for sale to cost of sales and a corresponding lower amount to inventory will result in lower gross profit, net income, current assets, and total assets than an inventory method that allocates more of the cost of goods available for sale to inventory and a correspondingly lower amount to cost of sales. Therefore, the choice of inventory valuation method can have a direct impact on a company's financial statements and many of the financial ratios that are derived from them.

EXAMPLE 1

Impact of Inflation Using LIFO Compared to FIFO

Company L and Company F are identical in all respects except that Company L uses the LIFO method and Company F uses the FIFO method. Each company has been in business for five years and maintains a base inventory of 2,000 units each year. Each year, except the first year, the number of units purchased equaled the number of units sold. Over the five-year period, unit sales increased 10 percent each year and the unit purchase and selling prices increased at the beginning of each year to reflect inflation of 4 percent per year. In the first year, 20,000 units were sold at a price of \$15.00 per unit and the unit purchase price was \$8.00.

- 1 What was the end of year inventory, sales, cost of sales, and gross profit for each company for each of the five years?
- 2 Compare the inventory turnover ratios (based on ending inventory carrying amounts) and gross profit margins over the five-year period and between companies.

Solution to 1:

Company L using LIFO	Year 1	Year 2	Year 3	Year 4	Year 5
Ending inventory ^a	\$16,000	\$16,000	\$16,000	\$16,000	\$16,000
Sales ^b	\$300,000	\$343,200	\$392,621	\$449,158	\$513,837
Cost of sales ^c	160,000	183,040	209,398	239,551	274,046
Gross profit	<u>\$140,000</u>	<u>\$160,160</u>	<u>\$183,223</u>	<u>\$209,607</u>	<u>\$239,791</u>

^a Inventory is unchanged at \$16,000 each year (2,000 units × \$8). 2,000 of the units acquired in the first year are assumed to remain in inventory.

^b Sales Year X = (20,000 × \$15)(1.10)^{X-1}(1.04)^{X-1}. The quantity sold increases by 10 percent each year and the selling price increases by 4 percent each year.

^c Cost of sales Year X = $(20,000 \times \$8)(1.10)^{X-1}(1.04)^{X-1}$. In Year 1, 20,000 units are sold with a cost of \$8. In subsequent years, the number of units purchased equals the number of units sold and the units sold are assumed to be those purchased in the year. The quantity purchased increases by 10 percent each year and the purchase price increases by 4 percent each year.

Note that if the company sold more units than it purchased in a year, inventory would decrease. This is referred to as LIFO liquidation. The cost of sales of the units sold in excess of those purchased would reflect the inventory carrying amount. In this example, each unit sold in excess of those purchased would have a cost of sales of \$8 and a higher gross profit.

Company F using FIFO	Year 1	Year 2	Year 3	Year 4	Year 5
Ending inventory ^a	\$16,000	\$16,640	\$17,306	\$17,998	\$18,718
Sales ^b	\$300,000	\$343,200	\$392,621	\$449,158	\$513,837
Cost of sales ^c	160,000	182,400	208,732	238,859	273,326
Gross profit	\$140,000	\$160,800	\$183,889	\$210,299	\$240,511

^a Ending inventory Year X = 2,000 units × Cost in Year X = 2,000 units [$\$8 \times (1.04)^{X-1}$]. 2,000 units of the units acquired in Year X are assumed to remain in inventory.

^b Sales Year X = $(20,000 \times \$15)(1.10)^{X-1}(1.04)^{X-1}$

^c Cost of sales Year 1 = \$160,000 (= 20,000 units × \$8). There was no beginning inventory.

Cost of sales Year X (where $X \neq 1$) = Beginning inventory plus purchases less ending inventory

= (Inventory at Year X-1) + $[(20,000 \times \$8)(1.10)^{X-1}(1.04)^{X-1}]$ - (Inventory at Year X)

= $2,000(\$8)(1.04)^{X-2} + [(20,000 \times \$8)(1.10)^{X-1}(1.04)^{X-1}] - [2,000(\$8)(1.04)^{X-1}]$

For example, Cost of sales Year 2 = $2,000(\$8) + [(20,000 \times \$8)(1.10)(1.04)] - [2,000(\$8)(1.04)] = \$16,000 + 183,040 - 16,640 = \$182,400$

Solution to 2:

Year	Company L					Company F				
	1	2	3	4	5	1	2	3	4	5
Inventory turnover	10.0	11.4	13.1	15.0	17.1	10.0	11.0	12.1	13.3	14.6
Gross profit margin (%)	46.7	46.7	46.7	46.7	46.7	46.7	46.9	46.8	46.8	46.8

Inventory turnover ratio = Cost of sales ÷ Ending inventory. The inventory turnover ratio increased each year for both companies because the units sold increased, whereas the units in ending inventory remained unchanged. The increase in the inventory turnover ratio is higher for Company L because Company L's cost of sales is increasing for inflation, but the inventory carrying

amount is unaffected by inflation. It might appear that a company using the LIFO method manages its inventory more effectively, but this is deceptive. Both companies have identical quantities and prices of purchases and sales and only differ in the inventory valuation method used.

Gross profit margin = Gross profit ÷ Sales. The gross profit margin is stable under LIFO because both sales and cost of sales increase at the same rate of inflation. The gross profit margin is slightly higher under the FIFO method after the first year because a proportion of the cost of sales reflects an older purchase price.

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THE LIFO METHOD

In the United States, the LIFO method is widely used (approximately 36 percent of US companies use the LIFO method). The potential income tax savings are a benefit of using the LIFO method when inventory costs are increasing. The higher cash flows due to lower income taxes may make the company more valuable because the value of a company is based on the present value of its future cash flows. Under the “LIFO conformity rule,” the US tax code requires that companies using the LIFO method for tax purposes must also use the LIFO method for financial reporting. Under the LIFO method, ending inventory is assumed to consist of those units that have been held the longest. This generally results in ending inventories with carrying amounts lower than current replacement costs because inventory costs typically increase over time. Cost of sales will more closely reflect current replacement costs.

If the purchase prices (purchase costs) or production costs of inventory are increasing, the income statement consequences of using the LIFO method compared to other methods will include higher cost of sales, and lower gross profit, operating profit, income tax expense, and net income. The balance sheet consequences include lower ending inventory, working capital, total assets, retained earnings, and shareholders' equity. The lower income tax paid will result in higher net cash flow from operating activities. Some of the financial ratio effects are a lower current ratio, higher debt-to-equity ratios, and lower profitability ratios.

If the purchase prices or production costs of inventory are decreasing, it is unlikely that a company will use the LIFO method for tax purposes (and therefore for financial reporting purposes due to the LIFO conformity rule) because this will result in lower cost of sales, and higher taxable income and income taxes. However, if the company had elected to use the LIFO method and cannot justify changing the inventory valuation method for tax and financial reporting purposes when inventory costs begin to decrease, the income statement, balance sheet, and ratio effects will be opposite to the effects during a period of increasing costs.

The US Securities Exchange Commission (SEC) has proposed the full adoption of IFRS by all US reporting companies beginning in 2014. An important consequence of this proposal would be the complete elimination of the LIFO inventory method for financial reporting and, due to the LIFO conformity rule, tax reporting by US companies. As a consequence of the restatement of financial statements to the FIFO or weighted average cost method, significant immediate income tax liabilities may arise in the year of transition from the LIFO method to either the FIFO or weighted average cost method.

3.1 LIFO Reserve

For companies using the LIFO method, US GAAP requires disclosure, in the notes to the financial statements or on the balance sheet, of the amount of the LIFO reserve. The **LIFO reserve** is the difference between the reported LIFO inventory carrying amount and the inventory amount that would have been reported if the FIFO method had been used (in other words, the FIFO inventory value less the LIFO inventory value). The disclosure provides the information that analysts need to adjust a company's cost of sales (cost of goods sold) and ending inventory balance based on the LIFO method, to the FIFO method.

To compare companies using LIFO with companies not using LIFO, inventory is adjusted by adding the disclosed LIFO reserve to the inventory balance that is reported on the balance sheet. The reported inventory balance, using LIFO, plus the LIFO reserve equals the inventory that would have been reported under FIFO. Cost of sales is adjusted by subtracting the increase in the LIFO reserve during the period from the cost of sales amount that is reported on the income statement. If the LIFO reserve has declined during the period,³ the decrease in the reserve is added to the cost of sales amount that is reported on the income statement. The LIFO reserve disclosure can be used to adjust the financial statements of a US company using the LIFO method to make them comparable with a similar company using the FIFO method.

EXAMPLE 2

Inventory Conversion from LIFO to FIFO

Caterpillar Inc. (NYSE: CAT), based in Peoria, Illinois, USA, is the largest maker of construction and mining equipment, diesel and natural gas engines, and industrial gas turbines in the world. Excerpts from CAT's consolidated financial statements are shown in Exhibits 1 and 2; notes pertaining to CAT's inventories are presented in Exhibit 3. Assume tax rates of 20 percent for 2008 and 30 percent for earlier years. The assumed tax rates are based on the provision for taxes as a percentage of consolidated profits before taxes rather than the US corporate statutory tax rate of 35 percent.

- 1 What inventory values would CAT report for 2008, 2007, and 2006 if it had used the FIFO method instead of the LIFO method?
- 2 What amount would CAT's cost of goods sold for 2008 and 2007 be if it had used the FIFO method instead of the LIFO method?
- 3 What net income (profit) would CAT report for 2008 and 2007 if it had used the FIFO method instead of the LIFO method?
- 4 By what amount would CAT's 2008 and 2007 net cash flow from operating activities decline if CAT used the FIFO method instead of the LIFO method?
- 5 What is the cumulative amount of income tax savings that CAT has generated through 2008 by using the LIFO method instead of the FIFO method?
- 6 What amount would be added to CAT's retained earnings (profit employed in the business) at 31 December 2008 if CAT had used the FIFO method instead of the LIFO method?

³ This typically results from a reduction in inventory units and is referred to as LIFO liquidation. LIFO liquidation is discussed in Section 3.2.

- 7 What would be the change in Cat's cash balance if CAT had used the FIFO method instead of the LIFO method?
- 8 Calculate and compare the following for 2008 under the LIFO method and the FIFO method: inventory turnover ratio, days of inventory on hand, gross profit margin, net profit margin, return on assets, current ratio, and total liabilities-to-equity ratio.

Exhibit 1 Caterpillar Inc. Consolidated Results of Operation (US\$ Millions)

For the Years Ended 31 December	2008	2007	2006
Sales and revenues:			
Sales of Machinery and Engines	48,044	41,962	38,869
Revenue of Financial Products	3,280	2,996	2,648
Total sales and revenues	51,324	44,958	41,517
Operating costs:			
Cost of goods sold	38,415	32,626	29,549
⋮	⋮	⋮	⋮
Interest expense of Financial Products	1,153	1,132	1,023
⋮	⋮	⋮	⋮
Total operating costs	46,876	40,037	36,596
Operating profit	4,448	4,921	4,921
Interest expense excluding Financial Products	274	288	274
Other income (expense)	299	320	214
Consolidated profit before taxes	4,473	4,953	4,861
Provision for income taxes	953	1,485	1,405
Profit of consolidated companies	3,520	3,468	3,456
Equity in profit of unconsolidated affiliated companies	37	73	81
Profit	3,557	3,541	3,537

Exhibit 2 Caterpillar Inc. Consolidated Financial Position (US\$ Millions)

31 December	2008	2007	2006
Assets			
Current assets:			
Cash and short-term investments	2,736	1,122	530
⋮	⋮	⋮	⋮
Inventories	8,781	7,204	6,351
Total current assets	31,633	25,477	23,663
⋮	⋮	⋮	⋮

Exhibit 2 (Continued)

31 December	2008	2007	2006
Total assets	<u>67,782</u>	<u>56,132</u>	<u>51,449</u>
Liabilities			
Total current liabilities	26,069	22,245	19,822
⋮	⋮	⋮	⋮
Total liabilities	<u>61,171</u>	<u>47,249</u>	<u>44,590</u>
Redeemable noncontrolling interest (Note 25)^a	524		
Stockholders' equity			
Common stock of \$1.00 par value:			
Authorized shares: 900,000,000			
Issued shares (2008, 2007 and 2006— 814,894,624) at paid-in amount	3,057	2,744	2,465
Treasury stock (2008—213,367,983 shares; 2007—190,908,490 shares and 2006— 169,086,448 shares) at cost	(11,217)	(9,451)	(7,352)
Profit employed in the business	19,826	17,398	14,593
Accumulated other comprehensive income	(5,579)	(1,808)	(2,847)
Total stockholders' equity	<u>6,087</u>	<u>8,883</u>	<u>6,859</u>
Total liabilities and stockholders' equity	<u>67,782</u>	<u>56,132</u>	<u>51,449</u>

^a US GAAP permitted the reporting of non-controlling interest as a liability or mezzanine account between liabilities and equity.

Exhibit 3 Caterpillar Inc. Selected Notes to Consolidated Financial Statements**Note 1. Operations and Summary of Significant Accounting Policies**
D. Inventories

Inventories are stated at the lower of cost or market. Cost is principally determined using the last-in, first-out (LIFO) method. The value of inventories on the LIFO basis represented about 70% of total inventories at December 31, 2008 and about 75% of total inventories at December 31, 2007 and 2006.

If the FIFO (first-in, first-out) method had been in use, inventories would have been \$3,183 million, \$2,617 million and \$2,403 million higher than reported at December 31, 2008, 2007 and 2006, respectively.

Note 9. Inventories

31 December (Millions of Dollars)	2008	2007	2006
Raw Materials	3,356	2,990	2,698
Work-in-process	1,107	863	591
Finished goods	4,022	3,066	2,785

(continued)

Exhibit 3 (Continued)

31 December (Millions of Dollars)	2008	2007	2006
Supplies	296	285	277
Total inventories	8,781	7,204	6,351

We had long-term material purchase obligations of approximately \$363 million at December 31, 2008.

Solution to 1:

31 December (Millions of Dollars)	2008	2007	2006
Total inventories (LIFO method)	8,781	7,204	6,351
From Note 1. D (LIFO reserve)	3,183	2,617	2,403
Total inventories (FIFO method)	11,964	9,821	8,754

Solution to 2:

31 December (Millions of Dollars)	2008	2007
Cost of goods sold (LIFO method)	38,415	32,626
Less: Increase in LIFO reserve*	–566	–214
Cost of goods sold (FIFO method)	37,849	32,412

*From Note 1. D, the increase in LIFO reserve for 2008 is 566 (3,183 – 2,617) and for 2007 is 214 (2,617 – 2,403).

Solution to 3:

31 December (Millions of Dollars)	2008	2007
Net income (LIFO method)	3,557	3,541
Reduction in cost of goods sold (increase in operating profit)	566	214
Taxes on increased operating profit*	–113	–64
Net income (FIFO method)	4,010	3,691

*The taxes on the increased operating profit are assumed to be 113 (566 × 20%) for 2008 and 64 (214 × 30%) for 2007.

Solution to 4:

The effect on a company's net cash flow from operating activities is limited to the impact of the change on income taxes paid; changes in allocating inventory costs to ending inventory and cost of goods sold does not change any cash flows except income taxes. Consequently, the effect of using FIFO on CAT's net operating cash flow from operating activities would be a decline of \$113 million in 2008 and a decline of \$64 million in 2007. These are the approximate incremental increases in income taxes that CAT would have incurred if the FIFO method were used instead of the LIFO method (see solution to 3 above).

Solution to 5:

Assuming tax rates of 20 percent for 2008 and 30 percent for earlier years, the cumulative amount of income tax savings that CAT has generated by using the LIFO method instead of FIFO is approximately \$898 million ($566 \times 20\% + 2,617 \times 30\%$). Note 1.D indicates a LIFO reserve of \$2,617 million at the end of 2007 and an increase in the LIFO reserve of \$566 million in 2008. Therefore, under the FIFO method, cumulative gross profits would have been \$2,617 million higher as of the end of 2007 and an additional \$566 million higher as of the end of 2008. The estimated tax savings would be higher (lower) if income tax rates were assumed to be higher (lower).

Solution to 6:

The amount that would be added to CAT's retained earnings is \$2,285 million ($3,183 - 898$) or ($566 \times 80\% + 2,617 \times 70\%$). This represents the cumulative increase in operating profit due to the decrease in cost of goods sold (LIFO reserve of \$3,183 million) less the assumed taxes on that profit (\$898 million, see solution to 5 above).

Solution to 7:

Under the FIFO method, an additional \$898 million is assumed to have been paid in taxes and cash would be reduced accordingly. If CAT switched to FIFO, it would have an additional tax liability of \$898 million as a consequence of the restatement of financial statements to the FIFO method. This illustrates the significant immediate income tax liabilities that may arise in the year of transition from the LIFO method to the FIFO method.

Solution to 8:

CAT's ratios for 2008 under the LIFO and FIFO methods are as follows:

	LIFO	FIFO
Inventory turnover	4.81	3.47
Days of inventory on hand	76.1 days	105.5 days
Gross profit margin	20.04%	21.22%
Net profit margin	6.93%	7.81%
Return on assets	5.74%	6.26%
Current ratio	1.21	1.30
Total liabilities-to-equity ratio	10.05	7.31

Inventory turnover ratio = cost of goods sold $\div$ Average inventory

$$\text{LIFO} = 4.81 = 38,415 \div [(8,781 + 7,204) \div 2]$$

$$\text{FIFO} = 3.47 = 37,849 \div [(11,964 + 9,821) \div 2]$$

The ratio is higher under LIFO because, given rising inventory costs, cost of goods sold will be higher and inventory carrying amounts will be lower under LIFO. If an analyst made no adjustment for the difference in inventory methods, it might appear that a company using the LIFO method manages its inventory more effectively.

Days of inventory on hand = Number of days in period $\div$ Inventory turnover ratio

$$\text{LIFO} = 76.1 \text{ days} = (366 \text{ days}^* \div 4.81)$$

$$\text{FIFO} = 105.5 \text{ days} = (366 \text{ days} \div 3.47)$$

*2008 was a leap year.

Without adjustment, a company using the LIFO method might appear to manage its inventory more effectively. This is primarily the result of the lower inventory carrying amounts under LIFO.

Gross profit margin = Gross profit ÷ Total revenue

$$\text{LIFO} = 20.04 \text{ percent} = [(48,044 - 38,415) \div 48,044]$$

$$\text{FIFO} = 21.22 \text{ percent} = [(48,044 - 37,849) \div 48,044]$$

Revenue of financial products is excluded from the calculation of gross profit. Gross profit is sales of machinery and engines less cost of goods sold. The gross profit margin is lower under LIFO because the cost of goods sold is higher given rising inventory costs.

Net profit margin = Net income ÷ Total revenue

$$\text{LIFO} = 6.93 \text{ percent} = (3,557 \div 51,324)$$

$$\text{FIFO} = 7.81 \text{ percent} = (4,010 \div 51,324)$$

The net profit margin is lower under LIFO because the cost of goods sold is higher. The absolute percentage difference is less than that of the gross profit margin because of income taxes on the increased income reported under FIFO and because net income is divided by total revenue including sales of machinery and engines and revenue of financial products. The company appears to be less profitable under LIFO.

Return on assets = Net income ÷ Average total assets

$$\text{LIFO} = 5.74 \text{ percent} = 3,557 \div [(67,782 + 56,132) \div 2]$$

$$\text{FIFO} = 6.26 \text{ percent} = 4,010 \div [(67,782 + 3,183 - 898) + (56,132 + 2,617 - 785) \div 2]$$

The total assets under FIFO are the LIFO total assets increased by the LIFO reserve and decreased by the cash paid for the additional income taxes. The return on assets is lower under LIFO because the lower net income due to the higher cost of goods sold has a greater impact on the ratio than the lower total assets, which are the result of lower inventory carrying amounts. The company appears to be less profitable under LIFO.

Current ratio = Current assets ÷ Current liabilities

$$\text{LIFO} = 1.21 = (31,633 \div 26,069)$$

$$\text{FIFO} = 1.30 = [(31,633 + 3,183 - 898) \div 26,069]$$

The current ratio is lower under LIFO primarily because of lower inventory carrying amount. The company appears to be less liquid under LIFO.

Total liabilities-to-equity ratio = Total liabilities ÷ Total shareholder's equity

$$\text{LIFO} = 10.05 = (61,171 \div 6,087)$$

$$\text{FIFO} = 7.31 = [61,171 \div (6,087 + 2,285)]$$

The ratio is higher under LIFO because the addition to retained earnings under FIFO reduces the ratio. The company appears to be more highly leveraged under LIFO.

In summary, the company appears to be less profitable, less liquid, and more highly leveraged under LIFO. Yet, because a company's value is based on the present value of future cash flows, LIFO will increase the company's value because the cash flows are higher in earlier years due to lower taxes. LIFO is primarily used for the tax benefits it provides.

3.2 LIFO Liquidations

In periods of rising inventory unit costs, the carrying amount of inventory under FIFO will always exceed the carrying amount of inventory under LIFO. The LIFO reserve may increase over time as the result of the increasing difference between the older costs used to value inventory under LIFO and the more recent costs used to value inventory under FIFO. Also, when the number of inventory units manufactured or purchased exceeds the number of units sold, the LIFO reserve may increase as the result of the addition of new LIFO layers (the quantity of inventory units is increasing and each increase in quantity creates a new LIFO layer).

When the number of units sold exceeds the number of units purchased or manufactured, the number of units in ending inventory is lower than the number of units in beginning inventory and a company using LIFO will experience a LIFO liquidation (some of the older units held in inventory are assumed to have been sold). If inventory unit costs have been rising from period to period and LIFO liquidation occurs, this will produce an inventory-related increase in gross profits. The increase in gross profits occurs because of the lower inventory carrying amounts of the liquidated units. The lower inventory carrying amounts are used for cost of sales and the sales are at the current prices. The gross profit on these units is higher than the gross profit that would be recognised using more current costs. These inventory profits caused by a LIFO liquidation, however, are one-time events and are not sustainable.

LIFO liquidations can occur for a variety of reasons. The reduction in inventory levels may be outside of management's control; for example, labour strikes at a supplier may force a company to reduce inventory levels to meet customer demands. In periods of economic recession or when customer demand is declining, a company may choose to reduce existing inventory levels rather than invest in new inventory. Analysts should be aware that management can potentially manipulate and inflate their company's reported gross profits and net income at critical times by intentionally reducing inventory quantities and liquidating older layers of LIFO inventory (selling some units of beginning inventory). During economic downturns, LIFO liquidation may result in higher gross profit than would otherwise be realised. If LIFO layers of inventory are temporarily depleted and not replaced by fiscal year-end, LIFO liquidation will occur resulting in unsustainable higher gross profits. Therefore, it is imperative to review the LIFO reserve footnote disclosures to determine if LIFO liquidation has occurred. A decline in the LIFO reserve from the prior period may be indicative of LIFO liquidation.

EXAMPLE 3

LIFO Liquidation: Financial Statement Impact and Disclosure

The following excerpts are from the 2007 10-K of Sturm Ruger & Co., Inc. (NYSE:RGR):

Item 7 — Management's Discussion and Analysis of Financial Condition and Results of Operations

Reduction in inventory generated positive cash flow for the Company, partially offset by the tax impact of the consequent LIFO liquidation, which generated negative cash flow as it created taxable income, resulting in higher tax payments.

Balance Sheets

(In thousands, except per share data)

December 31	2007	2006
Assets		
Current Assets		
⋮	⋮	⋮
Gross inventories:	64,330	87,477
Less LIFO reserve	(46,890)	(57,555)
Less excess and obsolescence reserve	(4,143)	(5,516)
Net inventories	13,297	24,406
⋮	⋮	⋮
Total Current Assets	73,512	81,785
⋮	⋮	⋮
Total Assets	\$101,882	\$117,066

Statements of Income

(In thousands, except per share data)

Year ended December 31	2007	2006
⋮	⋮	⋮
Total net sales	156,485	167,620
Cost of products sold	117,186	139,610
Gross profit	39,299	28,010
Expenses:		
⋮	⋮	⋮
Total expenses	30,184	27,088
Operating income	9,115	922
⋮	⋮	⋮
Total other income, net	7,544	921
Income before income taxes	16,659	1,843
Income taxes	6,330	739
Net income	\$ 10,329	\$ 1,104
Basic and Diluted Earnings Per Share	\$ 0.46	\$ 0.04
Cash Dividends Per Share	\$ 0.00	\$ 0.00

Notes to Financial Statements

1. Significant Accounting Policies

⋮

Inventories

Inventories are stated at the lower of cost, principally determined by the last-in, first-out (LIFO) method, or market. If inventories had been valued using the first-in, first-out method, inventory values would have been higher by approximately \$46.9 million and \$57.6 million at December 31, 2007 and

2006, respectively. During 2007 and 2006, inventory quantities were reduced. This reduction resulted in a liquidation of LIFO inventory quantities carried at lower costs prevailing in prior years as compared with the current cost of purchases, the effect of which decreased costs of products sold by approximately \$12.1 million and \$7.1 million in 2007 and 2006, respectively. There was no LIFO liquidation in 2005.

- 1 What is the decrease in the LIFO reserve on the balance sheet? How much less was cost of products sold in 2007, due to LIFO liquidation, according to the note disclosure?
- 2 How did the decreased cost of products sold compare to operating income in 2007?
- 3 How did the LIFO liquidation affect cash flows?

Solution to 1:

The LIFO reserve decreased by \$10,665 thousand (57,555 – 46,890) in 2007. The LIFO liquidation decreased costs of products sold by approximately \$12.1 million in 2007. The decrease in the LIFO reserve is indicative of a LIFO liquidation but is not sufficient to determine the exact amount of the LIFO liquidation.

Solution to 2:

The decreased cost of products sold of approximately \$12.1 million exceeds the operating income of approximately \$9 million.

Solution to 3:

The LIFO liquidation (reduction in inventory) generated positive cash flow. The positive cash flow effect of the LIFO liquidation was reduced by its tax impact. The LIFO liquidation resulted in higher taxable income and higher tax payments.

EXAMPLE 4

LIFO Liquidation Illustration

Reliable Fans, Inc. (RF), a hypothetical company, sells high-quality fans and has been in business since 2006. Exhibit 4 provides relevant data and financial statement information about RF's inventory purchases and sales of fan inventory for the years 2006 through 2009. RF uses the LIFO method and a periodic inventory system. What amount of RF's 2009 gross profit is due to LIFO liquidation?

Exhibit 4 RF Financial Statement Information under LIFO

	2006	2007	2008	2009
Fans units purchased	12,000	12,000	12,000	12,000
Purchase cost per fan	\$100	\$105	\$110	\$115
Fans units sold	10,000	12,000	12,000	13,000
Sales price per fan	\$200	\$205	\$210	\$215
LIFO Method				
Beginning inventory	\$0	\$200,000	\$200,000	\$200,000
Purchases	1,200,000	1,260,000	1,320,000	1,380,000

(continued)

Exhibit 4 (Continued)

	2006	2007	2008	2009
Goods available for sale	1,200,000	1,460,000	1,520,000	1,580,000
Ending inventory*	(200,000)	(200,000)	(200,000)	(100,000)
Cost of goods sold	\$1,000,000	\$1,260,000	\$1,320,000	\$1,480,000
Income Statement				
Sales	\$2,000,000	\$2,460,000	\$2,520,000	\$2,795,000
Cost of goods sold	1,000,000	1,260,000	1,320,000	1,480,000
Gross profit	\$1,000,000	\$1,200,000	\$1,200,000	\$1,315,000
Balance Sheet				
Inventory	\$200,000	\$200,000	\$200,000	\$100,000

*Ending inventory 2006, 2007, and 2008 = (2,000 × \$100).

Ending inventory 2009 = (1,000 × \$100).

Solution:

RF's reported gross profit for 2009 is \$1,315,000. RF's 2009 gross profit due to LIFO liquidation is \$15,000. If RF had purchased 13,000 fans in 2009 rather than 12,000 fans, the cost of goods sold under the LIFO method would have been \$1,495,000 (13,000 fans sold at \$115.00 purchase cost per fan), and the reported gross profit would have been \$1,300,000 (\$2,795,000 less \$1,495,000). The gross profit due to LIFO liquidation is \$15,000 (\$1,315,000 reported gross profit less the \$1,300,000 gross profit that would have been reported without the LIFO liquidation). The gross profit due to LIFO liquidation may also be determined by multiplying the number of units liquidated times the difference between the replacement cost of the units liquidated and their historical purchase cost. For RF, 1,000 units times \$15 (\$115 replacement cost per fan less the \$100 historical cost per fan) equals the \$15,000 gross profit due to LIFO liquidation.

4**INVENTORY METHOD CHANGES**

Companies on rare occasion change inventory valuation methods. Under IFRS, a change in method is acceptable only if the change “results in the financial statements providing reliable and more relevant information about the effects of transactions, other events, or conditions on the business entity’s financial position, financial performance, or cash flows.”⁴ If the change is justifiable, then it is applied retrospectively.

This means that the change is applied to comparative information for prior periods as far back as is practicable. The cumulative amount of the adjustments relating to periods prior to those presented in the current financial statements is made to the opening balance of each affected component of equity (i.e., retained earnings or comprehensive income) of the earliest period presented. For example, if a company changes its inventory method in 2009 and it presents three years of comparative financial statements (2007, 2008, and 2009) in its annual report, it would retrospectively

⁴ IAS 8 [Accounting Policies, Changes in Accounting Estimates and Errors].

reflect this change as far back as possible. The change would be reflected in the three years of financial statements presented; the financial statements for 2007 and 2008 would be restated as if the new method had been used in these periods, and the cumulative effect of the change on periods prior to 2007 would be reflected in the 2007 opening balance of each affected component of equity. An exemption to the restatement applies when it is impracticable to determine either the period-specific effects or the cumulative effect of the change.

Under US GAAP, the conditions to make a change in accounting policy and the accounting for a change in inventory policy are similar to IFRS.⁵ US GAAP, however, requires companies to thoroughly explain why the newly adopted inventory accounting method is superior and preferable to the old method. If a company decides to change from LIFO to another inventory method, US GAAP requires a retrospective restatement as described above. However, if a company decides to change to the LIFO method, it must do so on a prospective basis and retrospective adjustments are not made to the financial statements. The carrying amount of inventory under the old method becomes the initial LIFO layer in the year of LIFO adoption.

Analysts should carefully evaluate changes in inventory valuation methods. Although the stated reason for the inventory change may be to better match inventory costs with sales revenue (or some other plausible business explanation), the real underlying (and unstated) purpose may be to reduce income tax expense (if changing to LIFO from FIFO or average cost), or to increase reported profits (if changing from LIFO to FIFO or average cost). As always, the choice of inventory valuation method can have a significant impact on financial statements and the financial ratios that are derived from them. As a consequence, analysts must carefully consider the impact of the change in inventory valuation methods and the differences in inventory valuation methods when comparing a company's performance with that of its industry or its competitors.

INVENTORY ADJUSTMENTS

5

Significant financial risk can result from the holding of inventory. The cost of inventory may not be recoverable due to spoilage, obsolescence, or declines in selling prices. IFRS state that inventories shall be measured (and carried on the balance sheet) at the lower of cost and net realisable value.⁶ **Net realisable value** is the estimated selling price in the ordinary course of business less the estimated costs necessary to make the sale and estimated costs to get the inventory in condition for sale. The assessment of net realisable value is typically done item by item or by groups of similar or related items. In the event that the value of inventory declines below the carrying amount on the balance sheet, the inventory carrying amount must be written down to its net realisable value⁷ and the loss (reduction in value) recognised as an expense on the income statement. This expense may be included as part of cost of sales or reported separately.

⁵ FASB ASC Topic 250 [Accounting Changes and Error Corrections].

⁶ IAS 2 paragraphs 28–33 [Inventories–Net realisable value].

⁷ Frequently, rather than writing inventory down directly, an inventory valuation allowance account is used. The allowance account is netted with the inventory accounts to arrive at the carrying amount that appears on the balance sheet.

In each subsequent period, a new assessment of net realisable value is made. Reversal (limited to the amount of the original write-down) is required for a subsequent increase in value of inventory previously written down. The reversal of any write-down of inventories is recognised as a reduction in cost of sales (reduction in the amount of inventories recognised as an expense).

US GAAP specify the lower of cost or market to value inventories.⁸ This is broadly consistent with IFRS with one major difference: US GAAP prohibit the reversal of write-downs. Market is defined as current replacement cost subject to upper and lower limits. Market cannot exceed net realisable value (selling price less reasonably estimated costs of completion and disposal). The lower limit of market is net realisable value less a normal profit margin. Any write-down reduces the value of the inventory, and the loss in value (expense) is generally reflected in the income statement in cost of goods sold.

An inventory write-down reduces both profit and the carrying amount of inventory on the balance sheet and thus has a negative effect on profitability, liquidity, and solvency ratios. However, activity ratios (for example, inventory turnover and total asset turnover) will be positively affected by a write-down because the asset base (denominator) is reduced. The negative impact on some key ratios, due to the decrease in profit, may result in the reluctance by some companies to record inventory write-downs unless there is strong evidence that the decline in the value of inventory is permanent. This is especially true under US GAAP where reversal of a write-down is prohibited.

Analysts should consider the possibility of an inventory write-down because the impact on a company's financial ratios may be substantial. The potential for inventory write-downs can be high for companies in industries where technological obsolescence of inventories is a significant risk. Analysts should carefully evaluate prospective inventory impairments (as well as other potential asset impairments) and their potential effects on the financial ratios when debt covenants include financial ratio requirements. The breaching of debt covenants can have a significant impact on a company.

Companies that use specific identification, weighted average cost, or FIFO methods are more likely to incur inventory write-downs than companies that use the LIFO method. Under the LIFO method, the *oldest* costs are reflected in the inventory carrying amount on the balance sheet. Given increasing inventory costs, the inventory carrying amounts under the LIFO method are already conservatively presented at the oldest and lowest costs. Thus, it is far less likely that inventory write-downs will occur under LIFO—and if a write-down does occur, it is likely to be of a lesser magnitude.

EXAMPLE 5

Effect of Inventory Write-downs on Financial Ratios

The Volvo Group (OMX Nordic Exchange: VOLV B), based in Göteborg, Sweden, is a leading supplier of commercial transport products such as construction equipment, trucks, busses, and drive systems for marine and industrial applications as well as aircraft engine components.⁹ Excerpts from Volvo's consolidated financial statements are shown in Exhibits 5 and 6. Notes pertaining to Volvo's inventories are presented in Exhibit 7.

- 1 What inventory values would Volvo have reported for 2008, 2007, and 2006 if it had no allowance for inventory obsolescence?

⁸ FASB ASC Section 330-10-35 [Inventory—Overall—Subsequent Measurement].

⁹ As of this writing, the Volvo line of automobiles is not under the control and management of the Volvo Group.

- 2 Assuming that any changes to the allowance for inventory obsolescence are reflected in the cost of sales, what amount would Volvo's cost of sales be for 2008 and 2007 if it had not recorded inventory write-downs in 2008 and 2007?
- 3 What amount would Volvo's profit (net income) be for 2008 and 2007 if it had not recorded inventory write-downs in 2008 and 2007? Assume tax rates of 28.5 percent for 2008 and 30 percent for 2007.
- 4 What would Volvo's 2008 profit (net income) have been if it had reversed all past inventory write-downs in 2008? This question is independent of 1, 2, and 3. Assume a tax rate of 28.5 percent for 2008.
- 5 Compare the following for 2008 based on the numbers as reported and those assuming no allowance for inventory obsolescence as in questions 1, 2, and 3: inventory turnover ratio, days of inventory on hand, gross profit margin, and net profit margin.
- 6 CAT (Example 2) has no disclosures indicative of either inventory write-downs or a cumulative allowance for inventory obsolescence in its 2008 financial statements. Provide a conceptual explanation as to why Volvo incurred inventory write-downs for 2008 but CAT did not.

Exhibit 5 Volvo Group Consolidated Income Statements
(Swedish Krona in Millions, except per Share Data)

For the years ended 31 December	2008	2007	2006
Net sales	303,667	285,405	258,835
Cost of sales	(237,578)	(219,600)	(199,054)
Gross income	66,089	65,805	59,781
⋮	⋮	⋮	⋮
Operating income	15,851	22,231	20,399
Interest income and similar credits	1,171	952	666
Income expenses and similar charges	(1,935)	(1,122)	(585)
Other financial income and expenses	(1,077)	(504)	(181)
Income after financial items	14,010	21,557	20,299
Income taxes	(3,994)	(6,529)	(3,981)
Income for the period	10,016	15,028	16,318
Attributable to:			
Equity holders of the parent company	9,942	14,932	16,268
Minority interests	74	96	50
Profit	10,016	15,028	16,318

Exhibit 6 Volvo Group Consolidated Balance Sheets
(Swedish Krona in Millions)

31 December	2008	2007	2006
Assets			
Total non-current assets	196,381	162,487	124,039

(continued)

Exhibit 6 (Continued)

31 December	2008	2007	2006
Current assets:			
Inventories	55,045	43,645	34,211
⋮	⋮	⋮	⋮
Cash and cash equivalents	17,712	14,544	10,757
Total current assets	176,038	159,160	134,388
Total assets	372,419	321,647	258,427
Shareholders' equity and liabilities			
Shareholders' equity:			
Share capital	2,554	2,554	2,554
Reserves	5,078	2,146	1,664
Retained earnings	66,436	62,570	66,418
Income for the period	9,942	14,932	16,268
Equity attributable to equity holders of the parent company	84,010	82,202	86,904
Minority interests	630	579	284
Total shareholders' equity	84,640	82,781	87,188
Total non-current provisions	29,031	26,202	19,864
Total non-current liabilities	92,608	71,729	45,457
Total current provisions	11,750	10,656	9,799
Total current liabilities	154,390	130,279	96,119
Total shareholders' equity and liabilities	372,419	321,647	258,427

Exhibit 7 Volvo Group Selected Notes to Consolidated Financial Statements**Note 1. Accounting Principles****Inventories**

Inventories are reported at the lower of cost, in accordance with the first-in, first-out method (FIFO), or net realisable value. The acquisition value is based on the standard cost method, including costs for all direct manufacturing expenses and the apportionable share of the capacity and other related manufacturing costs. The standard costs are tested regularly and adjustments are made based on current conditions. Costs for research and development, selling, administration and financial expenses are not included. Net realisable value is calculated as the selling price less costs attributable to the sale.

Note 2. Key Sources of estimation uncertainty**Inventory obsolescence**

Inventories are reported at the lower of cost, in accordance with the first-in, first-out method (FIFO), or net realisable value. The estimated net realisable value includes management consideration of out-dated articles, over-stocking, physical damages, inventory-lead-time, handling

Exhibit 7 (Continued)

and other selling costs. If the estimated net realisable value is lower than cost, a valuation allowance is established for inventory obsolescence. The total inventory value, net of inventory obsolescence allowance, is per 31 December 2008, SEK (in millions) 55,045.

Note 18. Inventories

31 December (Millions of Krona)	2008	2007	2006
Finished products	39,137	28,077	20,396
Production materials, etc.	15,908	15,568	13,815
Total	55,045	43,645	34,211

Increase (decrease) in allowance for inventory obsolescence

31 December (Millions of Krona)	2008	2007	2006
Balance sheet, 31 December, preceding year	2,837	2,015	2,401
Increase in allowance for inventory obsolescence charged to income	1,229	757	186
Scrapping	(325)	(239)	(169)
Translation differences	305	2	(130)
Reclassifications, etc	(524)	302	(273)
Balance sheet, 31 December	3,522	2,837	2,015

Solution to 1:

31 December (Swedish Krona in Millions)	2008	2007	2006
Total inventories, net	55,045	43,645	34,211
From Note 18. (Allowance for obsolescence)	3,522	2,837	2,015
Total inventories (without allowance)	58,567	46,482	36,226

Solution to 2:

31 December (Swedish Krona in Millions)	2008	2007
Cost of sales	237,578	219,600
Less: Increase in allowance for obsolescence*	<u>-685</u>	<u>-822</u>
Cost of sales (without allowance)	236,893	218,778

*From Note 18, the increase in allowance for obsolescence for 2008 is 685 (3,522 – 2,837) and for 2007 is 822 (2,837 – 2,015).

Solution to 3:

31 December (Swedish Krona in Millions)	2008	2007
Profit (Net income)	10,016	15,028
Reduction in cost of sales (increase in operating profit)	685	822
Taxes on increased operating profit*	<u>-195</u>	<u>-247</u>
Profit (without allowance)	10,506	15,603

*Taxes on the increased operating profit are assumed to be 195 (685 × 28.5%) for 2008 and 247 (822 × 30%) for 2007.

Solution to 4:

31 December (Swedish Krona in Millions)	2008
Profit (Net income)	10,016
Reduction in cost of sales (increase in operating profit)	3,522
Taxes on increased operating profit*	<u>-1,004</u>
Profit (after recovery of previous write-downs)	12,534

*Taxes on the increased operating profit are assumed to be 1,004 (3,522 × 28.5%) for 2008.

Solution to 5:

The Volvo Group's financial ratios for 2008 with the allowance for inventory obsolescence and without the allowance for inventory obsolescence are as follows:

	With Allowance (As Reported)	Without Allowance (Adjusted)
Inventory turnover ratio	4.81	4.51
Days of inventory on hand	76.1	81.2
Gross profit margin	21.76%	21.99%
Net profit margin	3.30%	3.46%

Inventory turnover ratio = Cost of sales ÷ Average inventory

With allowance (as reported) = 4.81 = 237,578 ÷ [(55,045 + 43,645) ÷ 2]

Without allowance (adjusted) = 4.51 = 236,893 ÷ [(58,567 + 46,482) ÷ 2]

Inventory turnover is higher based on the numbers as reported because cost of sales will be higher (assuming inventory write-downs are reported as part of cost of sales) and inventory carrying amounts will be lower with an allowance for inventory obsolescence. The company appears to manage its inventory more efficiently when it has inventory write-downs.

Days of inventory on hand = Number of days in period ÷ Inventory turnover ratio

With allowance (as reported) = 76.1 days = (366 days* ÷ 4.81)

Without allowance (adjusted) = 81.2 days = (366 days ÷ 4.51)

*2008 was a leap year.

Days of inventory on hand are lower based on the numbers as reported because the inventory turnover is higher. A company with inventory write-downs might appear to manage its inventory more effectively. This is primarily the result of the lower inventory carrying amounts.

Gross profit margin = Gross income ÷ Net sales

With allowance (as reported) = 21.76 percent = [66,089 ÷ 303,667]

Without allowance (adjusted) = 21.99 percent = [(66,089 + 685) ÷ 303,667]

The gross profit margin is lower with inventory write-downs because the cost of sales is higher. This assumes that inventory write-downs are reported as part of cost of sales.

Net profit margin = Profit ÷ Net sales

With allowance (as reported) = 3.30 percent = (10,016 ÷ 303,667)

Without allowance (adjusted) = 3.46 percent = (10,506 ÷ 303,667)

The net profit margin is lower with inventory write-downs because the cost of sales is higher (assuming the inventory write-downs are reported as part of cost of sales). The absolute percentage difference is less than that of the gross profit margin because of income taxes on the increased income without write-downs.

The profitability ratios (gross profit margin and net profit margin) for Volvo Group would have been slightly better (higher) for 2008 if the company had not recorded inventory write-downs. The activity ratio (inventory turnover ratio) would appear less attractive without the write-downs. The inventory turnover ratio is slightly better (higher) with inventory write-downs because inventory write-downs increase cost of sales (numerator) and decrease the average inventory (denominator), making inventory management appear more efficient with write-downs.

Solution to 6:

CAT uses the LIFO method whereas Volvo uses the FIFO method. Given increasing inventory costs, companies that use the FIFO inventory method are far more likely to incur inventory write-downs than those companies that use the LIFO method. This is because under the LIFO method, the inventory carrying amounts reflect the *oldest* costs and therefore the *lowest* costs given increasing inventory costs. Because inventory carrying amounts under the LIFO method are already conservatively presented, it is less likely that inventory write-downs will occur.

IAS 2 [Inventories] does not apply to the inventories of producers of agricultural and forest products and minerals and mineral products, nor to commodity broker-traders. These inventories may be measured at net realisable value (fair value less

costs to sell and complete) according to well-established industry practices. If an active market exists for these products, the quoted market price in that market is the appropriate basis for determining the fair value of that asset. If an active market does not exist, a company may use market determined prices or values (such as the most recent market transaction price) when available for determining fair value. Changes in the value of inventory (increase or decrease) are recognised in profit or loss in the period of the change. US GAAP is similar to IFRS in its treatment of inventories of agricultural and forest products and mineral ores. Mark-to-market inventory accounting is allowed for bullion.

6

FINANCIAL STATEMENT ANALYSIS ISSUES

IFRS and US GAAP require companies to disclose, either on the balance sheet or in the notes to the financial statements, the carrying amounts of inventories in classifications suitable to the company. For manufacturing companies, these classifications might include production supplies, raw materials, work in progress, and finished goods. For a retailer, these classifications might include significant categories of merchandise or the grouping of inventories with similar attributes. These disclosures may provide signals about a company's future sales and profits.

For example, a significant increase (attributable to increases in unit volume rather than increases in unit cost) in raw materials and/or work-in-progress inventories may signal that the company expects an increase in demand for its products. This suggests an anticipated increase in sales and profit. However, a substantial increase in finished goods inventories while raw materials and work-in-progress inventories are declining may signal a decrease in demand for the company's products and hence lower future sales and profit. This may also signal a potential future write-down of finished goods inventory. Irrespective of the signal, an analyst should thoroughly investigate the underlying reasons for any significant changes in a company's raw materials, work-in-progress, and finished goods inventories.

Analysts also should compare the growth rate of a company's sales to the growth rate of its finished goods inventories, because this could also provide a signal about future sales and profits. For example, if the growth of inventories is greater than the growth of sales, this could indicate a decline in demand and a decrease in future earnings. The company may have to lower (mark down) the selling price of its products to reduce its inventory balances, or it may have to write down the value of its inventory because of obsolescence, both of which would negatively affect profits. Besides the potential for mark-downs or write-downs, having too much inventory on hand or the wrong type of inventory can have a negative financial effect on a company because it increases inventory-related expenses such as insurance, storage costs, and taxes. In addition, it means that the company has less cash and working capital available to use for other purposes.

Inventory write-downs may have a substantial impact on a company's activity, profitability, liquidity, and solvency ratios. It is critical for the analyst to be aware of industry trends toward product obsolescence and to analyze the financial ratios for their sensitivity to potential inventory impairment. Companies can minimise the impact of inventory write-downs by better matching their inventory composition and growth with prospective customer demand. To obtain additional information about a company's inventory and its future sales, a variety of sources of information are available. Analysts should consider the Management Discussion and Analysis (MD&A) or similar sections of the company's financial reports, industry-related news and publications, and industry economic data.

When conducting comparisons, differences in the choice of inventory valuation method can significantly affect the comparability of financial ratios between companies. A restatement from the LIFO method to the FIFO method is critical to make a valid comparison with companies using a method other than the LIFO method such as those companies reporting under IFRS.

EXAMPLE 6

Comparative Illustration

- 1 Using CAT's LIFO numbers as reported and FIFO adjusted numbers (Example 2) and Volvo's numbers as reported (Example 5), compare the following for 2008: inventory turnover ratio, days of inventory on hand, gross profit margin, net profit margin, return on assets, current ratio, total liabilities-to-equity ratio, and return on equity. For the current ratio, include current provisions as part of current liabilities. For the total liabilities-to-equity ratio, include provisions in total liabilities.
- 2 How much do inventories represent as a component of total assets for CAT using LIFO numbers as reported and FIFO adjusted numbers, and for Volvo using reported numbers in 2007 and 2008? Discuss any changes that would concern an analyst.
- 3 Using the reported numbers, compare the 2007 and 2008 growth rates of CAT and Volvo for sales, finished goods inventory, and inventories other than finished goods.

Solution to 1:

The comparisons between Caterpillar and Volvo for 2008 are as follows:

	CAT(LIFO)	CAT(FIFO)	Volvo
Inventory turnover ratio	4.81	3.47	4.81
Days of inventory on hand	76.1 days	105.5 days	76.1 days
Gross profit margin	20.04%	21.22%	21.76%
Net profit margin	6.93%	7.81%	3.30%
Return on assets ^a	5.74%	6.26%	2.89%
Current ratio ^b	1.21	1.30	1.06
Total liabilities-to-equity ratio ^c	10.05	7.31	3.40
Return on equity ^d	47.5%	42.0%	12.0%

Note: Calculations for ratios previously calculated (see Examples 2 and 5) are not shown again.

^a Return on assets = Net income ÷ Average total assets

Volvo = 2.89 percent = $10,016 \div [(372,419 + 321,647) \div 2]$

^b Current ratio = Current assets ÷ Current liabilities

Volvo = 1.06 = $[176,038 \div (11,750 + 154,390)]$

The question indicates to include current provisions in current liabilities.

^c Total liabilities-to-equity ratio = Total liabilities ÷ Total shareholders' equity

Volvo = 3.40 = $[(29,031 + 92,608 + 11,750 + 154,390) \div 84,640]$

The question indicates to include provisions in total liabilities.

^d Return on equity = Net income ÷ Average shareholders' equity

CAT (LIFO) = 47.5 percent = $3,557 \div [(6,087 + 8,883) \div 2]$

(continued)

$$\text{CAT (FIFO)} = 42.0 \text{ percent} = 4,010 \div \{[(6,087 + 3,183 - 898) + (8,883 + 2,617 - 785)] \div 2\}$$

$$\text{Volvo} = 12.0 \text{ percent} = 10,016 \div [(84,640 + 82,781) \div 2]$$

Comparing CAT (FIFO) and Volvo, it appears that Volvo manages its inventory more effectively. It has higher inventory turnover and less days of inventory on hand. CAT appears to have superior profitability based on net profit margins. CAT did report some losses as other comprehensive income in the balance sheet (see Exhibit 2) as indicated by the absolute increase in the negative accumulated other comprehensive income. The absolute increase in the negative accumulated other comprehensive income results in a reduction of shareholders' equity which makes CAT's return on equity higher. The higher leverage of CAT also increases the return on equity. The sources of CAT's higher return on equity (reporting losses through other comprehensive income and higher leverage) should be of concern to an analyst. An analyst should investigate further, rather than reaching a conclusion based on ratios alone (in other words, try to identify the underlying causes of changes or differences in ratios).

Solution to 2:

The 2008 and 2007 inventory to total assets ratios for CAT using LIFO and adjusted to FIFO and for Volvo as reported, are as follows:

	CAT (LIFO)	CAT (FIFO)	Volvo
2008	12.95%	17.08%	14.78%
2007	12.83%	16.94%	13.57%

Inventory to total assets

$$\text{CAT (LIFO) 2008} = 12.95 \text{ percent} = 8,781 \div 67,782$$

$$\text{CAT (LIFO) 2007} = 12.83 \text{ percent} = 7,204 \div 56,132$$

$$\text{CAT (FIFO) 2008} = 17.08 \text{ percent} = 11,964 \div (67,782 + 3,183 - 898)$$

$$\text{CAT (FIFO) 2007} = 16.94 \text{ percent} = 9,821 \div (56,132 + 2,617 - 785)$$

$$\text{Volvo 2008} = 14.78 \text{ percent} = 55,045 \div 372,419$$

$$\text{Volvo 2007} = 13.57 \text{ percent} = 43,645 \div 321,647$$

Based on the numbers as reported, CAT appears to have a lower percentage of assets tied up in inventory than Volvo. However, when CAT's inventory is adjusted to FIFO, it has a higher percentage of its assets tied up in inventory than Volvo.

The increase in Volvo's inventory as a percentage of total assets is cause for some concern. Higher inventory typically results in higher maintenance costs (for example, storage and financing costs). In addition, Volvo may be building up slow moving or obsolete inventories that may result in future inventory write-downs for 2009. In Volvo's Note 18, the breakdown by inventory classification shows a small increase in the inventory of production materials. It appears that Volvo is planning on reducing production until it reduces its finished goods inventory. Looking at CAT's Note 9, all classifications of inventory seem to be increasing, and because these are valued using the LIFO method, there is some cause for concern. The company must be increasing inventory quantities and adding LIFO layers.

Solution to 3:

CAT's and Volvo's 2008 and 2007 growth rates for sales (for CAT use Sales of machinery and engines and for Volvo use Net sales), finished goods, and inventories other than finished goods are as follows:

2008	CAT (%)	Volvo (%)
Sales	14.5	6.4
Finished goods	31.2	39.4
Inventories other than finished goods	15.0	2.2
2007		
Sales	8.0	10.3
Finished goods	10.1	37.7
Inventories other than finished goods	16.0	12.7

Growth rate = (Value for year – Value for previous year)/Value for previous year

2008 CAT

Sales = 14.5 percent = $(48,044 - 41,962) \div 41,962$

Finished goods = 31.2 percent = $(4,022 - 3,066) \div 3,066$

Inventories other than finished goods = 15.0 percent = $[(3,356 + 1,107 + 296) - (2,990 + 863 + 285)] \div (2,990 + 863 + 285)$

2008 Volvo

Sales = 6.4 percent = $(303,667 - 285,405) \div 285,405$

Finished products = 39.4 percent = $(39,137 - 28,077) \div 28,077$

Inventories other than finished products = 2.2 percent = $(15,908 - 15,568) \div 15,568$

2007 CAT

Sales = 8.0 percent = $(41,962 - 38,869) \div 38,869$

Finished goods = 10.1 percent = $(3,066 - 2,785) \div 2,785$

Inventories other than finished goods = 16.0 percent = $[(2,990 + 863 + 285) - (2,698 + 591 + 277)] \div (2,698 + 591 + 277)$

2007 Volvo

Sales = 10.3 percent = $(285,405 - 258,835) \div 258,835$

Finished products = 37.7 percent = $(28,077 - 20,396) \div 20,396$

Inventories other than finished products = 12.7 percent = $(15,568 - 13,815) \div 13,815$

For both companies, the growth rates in finished goods inventory exceeds the growth rate in sales; this could be indicative of accumulating excess inventory. Volvo's growth rate in finished goods compared to its growth rate in sales is significantly higher but the lower growth rates in finished goods inventory for CAT is potentially a result of using the LIFO method versus the FIFO method. It appears Volvo is aware that an issue exists and is planning on cutting back production given the relatively small increase in inventories other than finished products. Regardless, an analyst should do further investigation before reaching any conclusion about a company's future prospects for sales and profit.

EXAMPLE 7**Management Discussion and Analysis**

The following excerpts commenting on inventory management are from the Volvo Group Annual Report, 2008:

From the CEO Comment: In a declining economy, it is extremely important to act quickly to reduce the Group's cost level and ensure we do not build inventories, since large inventories generally lead to pressure on prices. ... During the second half of the year, we implemented sharp production cutbacks to lower inventories of new trucks and construction equipment as part of efforts to maintain our product prices, which represent one of the most important factors in securing favorable profitability in the future. We have been successful in these efforts. During the fourth quarter, inventories of new trucks declined 13% and of new construction equipment by 19%. During the beginning of 2009, we have continued to work diligently and focused to reduce inventories to the new, lower levels of demand that prevail in most of our markets, and for most of our products.

From the Board of Directors' Report 2008: Inventory reduction contributed to positive operating cash flow of SEK 1.8 billion in Industrial Operations. ... The value of inventories increased during 2008 by SEK 11.4 billion. Adjusted for currency changes, the increase amounted to SEK 5.8 billion. The increase is mainly related to the truck operations and to construction equipment and is an effect of the rapidly weakening demand during the second half of the year. ... In order to reduce the capital tied-up in inventory, a number of shutdown days in production were carried out during the end of year. Measures aimed at selling primarily trucks and construction equipment in inventory were prioritized. These measures have continued during the beginning of 2009 ... Overcapacity within the industry can occur if there is a lack of demand, potentially leading to increased price pressure.

From Business Areas 2008 (Ambitions 2009): Execute on cost reduction and adjust production to ensure inventory levels in line with demand.

Assume inventory write-downs are reported as part of cost of sales. Based on the excerpts above, discuss the anticipated direction of the following for 2009 compared to 2008:

- 1 Inventory carrying amounts
- 2 Inventory turnover ratio
- 3 Sales
- 4 Gross profit margin
- 5 Return on assets
- 6 Current ratio

Solution to 1:

Inventory carrying amounts are expected to decrease as the company cuts back on inventory levels and pressures are exerted on costs and prices.

Solution to 2:

Inventory turnover ratio is expected to increase. Any potential change in cost of sales will be more than offset by the decline in inventory carrying amounts. The company is expecting to reduce both inventories and sales, but sales and cost of sales are expected to decline by a lesser percentage than inventory.

Solution to 3:

Unit sales and sales revenues are expected to decline due to decrease in demand and pressure on prices.

Solution to 4:

Gross profit margin is difficult to predict. Sales revenues are expected to decline but cost of sales as a percentage of sales revenue may decline if cost controls are effective, stay the same if cost controls are offset by increased inventory write-downs, or increase if inventory write-downs more than offset cost controls. In this case, an analyst might use 2008's gross profit margin of 21.8 percent as a reasonable prediction. It is less than the 2006 and 2007 gross profit margin of 23.1 percent and may already reflect cost controls, price pressures, and inventory write-downs.

Solution to 5:

Return on assets is expected to decline. The positive effects of cost controls and reduction in assets is likely to be offset by decreased net income due to the declining sales revenues.

Solution to 6:

The direction of change in the current ratio is difficult to predict. Current assets are expected to be reduced but current liabilities are also expected to be reduced as costs are controlled and purchases are reduced resulting in lower accounts payable.

Analysts should seek out as much information as feasible when analyzing the performance of companies.

SUMMARY

Inventories and cost of sales (cost of goods sold) are significant items in the financial statements of many companies. Comparing the performance of these companies is challenging due to the allowable choices for valuing inventories; differences in the choice of inventory valuation method can result in significantly different amounts being assigned to inventory and the cost of sales. To evaluate a company's performance over time and relative to industry peers, analysts must clearly understand the various inventory valuation methods that companies use and the related impact on financial statements and financial ratios.

Key concepts in this reading are as follows:

- The allowable inventory valuation methods implicitly involve different assumptions about cost flows. The choice of inventory valuation method determines how the cost of goods available for sale during the period is allocated between inventory and cost of sales.
- Under IFRS, the cost of inventories is typically assigned by using either the first-in, first-out (FIFO) or weighted average cost formula. The specific identification method is required for inventories of items that are not ordinarily interchangeable and for goods or services produced and segregated for specific projects.
- Under US GAAP, in addition to specific identification, FIFO and weighted average cost, last-in first-out (LIFO) is an accepted inventory valuation method. The LIFO method is widely used in the United States for both tax and financial reporting purposes because of potential income tax savings.
- The choice of inventory method affects the financial statements and any financial ratios that are based on them. As a consequence, the analyst must carefully consider inventory valuation method differences when evaluating a company's performance over time or in comparison to industry data or industry competitors.
- Under US GAAP, companies that use the LIFO method must disclose in their financial notes the amount of the LIFO reserve or the amount that would have been reported in inventory if the FIFO method had been used. This information can be used to adjust reported LIFO inventory and cost of goods sold balances to the FIFO method for comparison purposes.
- LIFO liquidation occurs when the number of units in ending inventory declines from the number of units that were present at the beginning of the year. If inventory unit costs have generally risen from year to year, this will produce an inventory-related increase in gross profits.
- Consistency of inventory costing is required under both IFRS and US GAAP. If a company changes an accounting policy, the change must be justifiable and applied retrospectively to the financial statements. An exception to the retrospective restatement is when a company reporting under US GAAP changes to the LIFO method.
- Inventories are measured at the lower of cost and net realisable value under IFRS and the lower of cost and market under US GAAP. Any write-down of inventory to net realisable value or market reduces the carrying amount of inventory on the balance sheet and profit on the income statement.
- Reversals of inventory write-downs may occur under IFRS but are not allowed under US GAAP.
- Changes in the carrying amounts within inventory classifications (such as raw materials, work-in-process, and finished goods) may provide signals about a company's future sales and profits. Relevant information with respect to inventory management and future sales may be found in the Management Discussion and Analysis or similar items within the annual or quarterly reports, industry news and publications, and industry economic data.
- Inventory management may have a substantial impact on a company's activity, profitability, liquidity, and solvency ratios. It is critical for the analyst to be aware of industry trends and management's intentions.

PRACTICE PROBLEMS

The following information relates to Questions 1–6

John Martinson, CFA, is an equity analyst with a large pension fund. His supervisor, Linda Packard, asks him to write a report on Karp Inc. Karp prepares its financial statements in accordance with US GAAP. Packard is particularly interested in the effects of the company's use of the LIFO method to account for its inventory. For this purpose, Martinson collects the financial data presented in Exhibits 1 and 2.

Exhibit 1 Balance Sheet Information (US\$ Millions)

As of 31 December	2009	2008
Cash and cash equivalents	172	157
Accounts receivable	626	458
Inventories	620	539
Other current assets	125	65
Total current assets	1,543	1,219
Property and equipment, net	3,035	2,972
Total assets	4,578	4,191
Total current liabilities	1,495	1,395
Long-term debt	644	604
Total liabilities	2,139	1,999
Common stock and paid in capital	1,652	1,652
Retained earnings	787	540
Total shareholders' equity	2,439	2,192
Total liabilities and shareholders' equity	4,578	4,191

Exhibit 2 Income Statement Information (US\$ Millions)

For the Year Ended 31 December	2009	2008
Sales	4,346	4,161
Cost of goods sold	2,211	2,147
Depreciation and amortisation expense	139	119
Selling, general, and administrative expense	1,656	1,637
Interest expense	31	18
Income tax expense	62	48
Net income	247	192

Martinson finds the following information in the notes to the financial statements:

- The LIFO reserves as of 31 December 2009 and 2008 are \$155 million and \$117 million respectively, and
 - The effective income tax rate applicable to Karp for 2009 and earlier periods is 20 percent.
- 1 If Karp had used FIFO instead of LIFO, the amount of inventory reported as of 31 December 2009 would have been *closest* to:
 - A \$465 million.
 - B \$658 million.
 - C \$775 million.
 - 2 If Karp had used FIFO instead of LIFO, the amount of cost of goods sold reported by Karp for the year ended 31 December 2009 would have been *closest* to:
 - A \$2,056 million.
 - B \$2,173 million.
 - C \$2,249 million.
 - 3 If Karp had used FIFO instead of LIFO, its reported net income for the year ended 31 December 2009 would have been higher by an amount *closest* to:
 - A \$30 million.
 - B \$38 million.
 - C \$155 million.
 - 4 If Karp had used FIFO instead of LIFO, Karp's retained earnings as of 31 December 2009 would have been higher by an amount *closest* to:
 - A \$117 million.
 - B \$124 million.
 - C \$155 million.
 - 5 If Karp had used FIFO instead of LIFO, which of the following ratios computed as of 31 December 2009 would *most likely* have been lower?
 - A Cash ratio.
 - B Current ratio.
 - C Gross profit margin.
 - 6 If Karp had used FIFO instead of LIFO, its debt to equity ratio computed as of 31 December 2009 would have:
 - A increased.
 - B decreased.
 - C remained unchanged.
-

The following information relates to Questions 7–12

Robert Groff, an equity analyst, is preparing a report on Crux Corp. As part of his report, Groff makes a comparative financial analysis between Crux and its two main competitors, Rolby Corp. and Mikko Inc. Crux and Mikko report under US GAAP and Rolby reports under IFRS.

Groff gathers information on Crux, Rolby, and Mikko. The relevant financial information he compiles is in Exhibit 1. Some information on the industry is in Exhibit 2.

Exhibit 1 Selected Financial Information (US\$ Millions)

	Crux	Rolby	Mikko
Inventory valuation method	LIFO	FIFO	LIFO
From the Balance Sheets			
As of 31 December 2009			
Inventory, gross	480	620	510
Valuation allowance	20	25	14
Inventory, net	460	595	496
Total debt	1,122	850	732
Total shareholders' equity	2,543	2,403	2,091
As of 31 December 2008			
Inventory, gross	465	602	401
Valuation allowance	23	15	12
Inventory, net	442	587	389
From the Income Statements			
Year Ended 31 December 2009			
Revenues	4,609	5,442	3,503
Cost of goods sold ^a	3,120	3,782	2,550
Net income	229	327	205
^a Charges included in cost of goods sold for inventory write-downs*	13	15	15
*This does not match the change in the inventory valuation allowance because the valuation allowance is reduced to reflect the valuation allowance attached to items sold and increased for additional necessary write-downs.			
LIFO Reserve			
As of 31 December 2009	55	0	77
As of 31 December 2008	72	0	50
As of 31 December 2007	96	0	43
Tax Rate			
Effective tax rate	30%	30%	30%

Exhibit 2 Industry Information

	2009	2008	2007
Raw materials price index	112	105	100
Finished goods price index	114	106	100

To compare the financial performance of the three companies, Groff decides to convert LIFO figures into FIFO figures, and adjust figures to assume no valuation allowance is recognized by any company.

After reading Groff's draft report, his supervisor, Rachel Borghi, asks him the following questions:

- Question 1 Which company's gross profit margin would best reflect current costs of the industry?
- Question 2 Would Rolby's valuation method show a higher gross profit margin than Crux's under an inflationary, a deflationary, or a stable price scenario?
- Question 3 Which group of ratios usually appears more favorable with an inventory write-down?
- 7 Crux's inventory turnover ratio computed as of 31 December 2009, after the adjustments suggested by Groff, is *closest* to:
- A 5.67.
B 5.83.
C 6.13.
- 8 Rolby's net profit margin for the year ended 31 December 2009, after the adjustments suggested by Groff, is *closest* to:
- A 6.01%.
B 6.20%.
C 6.28%.
- 9 Compared with its unadjusted debt-to-equity ratio, Mikko's debt-to-equity ratio as of 31 December 2009, after the adjustments suggested by Groff, is:
- A lower.
B higher.
C the same.
- 10 The *best* answer to Borghi's Question 1 is:
- A Crux's.
B Rolby's.
C Mikko's.
- 11 The *best* answer to Borghi's Question 2 is:
- A Stable.
B Inflationary.
C Deflationary.
- 12 The *best* answer to Borghi's Question 3 is:
- A Activity ratios.

- B Solvency ratios.
C Profitability ratios.

The following information relates to Questions 13–20

ZP Corporation is a (hypothetical) multinational corporation headquartered in Japan that trades on numerous stock exchanges. ZP prepares its consolidated financial statements in accordance with US GAAP. Excerpts from ZP's 2009 annual report are shown in Exhibits 1–3.

Exhibit 1 Consolidated Balance Sheets (¥ Millions)

31 December	2008	2009
Current Assets		
Cash and cash equivalents	¥542,849	¥814,760
⋮	⋮	⋮
Inventories	608,572	486,465
⋮	⋮	⋮
Total current assets	4,028,742	3,766,309
⋮	⋮	⋮
Total assets	¥10,819,440	¥9,687,346
⋮	⋮	⋮
Total current liabilities	¥3,980,247	¥3,529,765
⋮	⋮	⋮
Total long-term liabilities	2,663,795	2,624,002
Minority interest in consolidated subsidiaries	218,889	179,843
Total shareholders' equity	3,956,509	3,353,736
Total liabilities and shareholders' equity	¥10,819,440	¥9,687,346

Exhibit 2 Consolidated Statements of Income (¥ Millions)

For the years ended 31 December	2007	2008	2009
Net revenues			
Sales of products	¥7,556,699	¥8,273,503	¥6,391,240
Financing operations	425,998	489,577	451,950
	7,982,697	8,763,080	6,843,190
Cost and expenses			
Cost of products sold	6,118,742	6,817,446	5,822,805
Cost of financing operations	290,713	356,005	329,128

(continued)

Exhibit 2 (Continued)

For the years ended 31 December	2007	2008	2009
Selling, general and administrative	827,005	832,837	844,927
⋮	⋮	⋮	⋮
Operating income (loss)	746,237	756,792	−153,670
⋮	⋮	⋮	⋮
Net income	¥548,011	¥572,626	−¥145,646

Exhibit 3 Selected Disclosures in the 2009 Annual Report**Management's Discussion and Analysis of Financial Condition and Results of Operations**

Cost reduction efforts were offset by increased prices of raw materials, other production materials and parts ... Inventories decreased during fiscal 2009 by ¥122.1 billion, or 20.1%, to ¥486.5 billion. This reflects the impacts of decreased sales volumes and fluctuations in foreign currency translation rates.

Management & Corporate Information**Risk Factors**Industry and Business Risks

The worldwide market for our products is highly competitive. ZP faces intense competition from other manufacturers in the respective markets in which it operates. Competition has intensified due to the worldwide deterioration in economic conditions. In addition, competition is likely to further intensify because of continuing globalization, possibly resulting in industry reorganization. Factors affecting competition include product quality and features, the amount of time required for innovation and development, pricing, reliability, safety, economy in use, customer service and financing terms. Increased competition may lead to lower unit sales and excess production capacity and excess inventory. This may result in a further downward price pressure.

ZP's ability to adequately respond to the recent rapid changes in the industry and to maintain its competitiveness will be fundamental to its future success in maintaining and expanding its market share in existing and new markets.

Notes to Consolidated Financial Statements**2. Summary of significant accounting policies:**

Inventories. Inventories are valued at cost, not in excess of market. Cost is determined on the "average-cost" basis, except for the cost of finished products carried by certain subsidiary companies which is determined "last-in, first-out" ("LIFO") basis. Inventories valued

Exhibit 3 (Continued)

on the LIFO basis totaled ¥94,578 million and ¥50,037 million at December 31, 2008 and 2009, respectively. Had the “first-in, first-out” basis been used for those companies using the LIFO basis, inventories would have been ¥10,120 million and ¥19,660 million higher than reported at December 31, 2008 and 2009, respectively.

9. Inventories:

Inventories consist of the following:

31 December (¥ Millions)	2008	2009
Finished goods	¥ 403,856	¥ 291,977
Raw materials	99,869	85,966
Work in process	79,979	83,890
Supplies and other	24,868	24,632
	¥ 608,572	¥ 486,465

- 13 The MD&A indicated that the prices of raw material, other production materials, and parts increased. Based on the inventory valuation methods described in Note 2, which inventory classification would *least accurately* reflect current prices?
- A Raw materials.
B Finished goods.
C Work in process.
- 14 The 2008 inventory value as reported on the 2009 Annual Report if the company had used the FIFO inventory valuation method instead of the LIFO inventory valuation method for a portion of its inventory would be *closest* to:
- A ¥104,698 million.
B ¥506,125 million.
C ¥618,692 million.
- 15 What is the *least likely* reason why ZP may need to change its accounting policies regarding inventory at some point after 2009?
- A The US SEC is likely to require companies to use the same inventory valuation method for all inventories.
B The US SEC is likely to prohibit the use of one of the methods ZP currently uses for inventory valuation.
C One of the inventory valuation methods used for US tax purposes may be repealed as an acceptable method.
- 16 If ZP had prepared its financial statement in accordance with IFRS, the inventory turnover ratio (using average inventory) for 2009 would be:
- A lower.
B higher.
C the same.
- 17 Inventory levels decreased from 2008 to 2009 for all of the following reasons *except*:

- A LIFO liquidation.
 - B decreased sales volume.
 - C fluctuations in foreign currency translation rates.
- 18 Which observation is *most likely* a result of looking only at the information reported in Note 9?
- A Increased competition has led to lower unit sales.
 - B There have been significant price increases in supplies.
 - C Management expects a further downturn in sales during 2010.
- 19 Note 2 indicates that, “Inventories valued on the LIFO basis totaled ¥94,578 million and ¥50,037 million at December 31, 2008 and 2009, respectively.” Based on this, the LIFO reserve should *most likely*:
- A increase.
 - B decrease.
 - C remain the same.
- 20 The Industry and Business Risk excerpt states that, “Increased competition may lead to lower unit sales and excess production capacity and excess inventory. This may result in a further downward price pressure.” The downward price pressure could lead to inventory that is valued above current market prices or net realisable value. Any write-downs of inventory are *least likely* to have a significant effect on the inventory valued using:
- A weighted average cost.
 - B first-in, first-out (FIFO).
 - C last-in, first-out (LIFO).
-

SOLUTIONS

- 1 C is correct. Karp's inventory under FIFO equals Karp's inventory under LIFO plus the LIFO reserve. Therefore, as of 31 December 2009, Karp's inventory under FIFO equals:

$$\begin{aligned}\text{Inventory (FIFO method)} &= \text{Inventory (LIFO method)} + \text{LIFO} \\ &\quad \text{reserve} \\ &= \$620 \text{ million} + 155 \text{ million} \\ &= \$775 \text{ million}\end{aligned}$$

- 2 B is correct. Karp's cost of goods sold (COGS) under FIFO equals Karp's cost of goods sold under LIFO minus the increase in the LIFO reserve. Therefore, for the year ended 31 December 2009, Karp's cost of goods sold under FIFO equals:

$$\begin{aligned}\text{COGS (FIFO method)} &= \text{COGS (LIFO method)} - \text{Increase in LIFO} \\ &\quad \text{reserve} \\ &= \$2,211 \text{ million} - (155 \text{ million} - 117 \text{ million}) \\ &= \$2,173 \text{ million}\end{aligned}$$

- 3 A is correct. Karp's net income (NI) under FIFO equals Karp's net income under LIFO plus the after-tax increase in the LIFO reserve. For the year ended 31 December 2009, Karp's net income under FIFO equals:

$$\begin{aligned}\text{NI (FIFO method)} &= \text{NI (LIFO method)} + \text{Increase in LIFO reserve} \times \\ &\quad (1 - \text{Tax rate}) \\ &= \$247 \text{ million} + 38 \text{ million} \times (1 - 20\%) \\ &= \$277.4 \text{ million}\end{aligned}$$

Therefore, the increase in net income is:

$$\begin{aligned}\text{Increase in NI} &= \text{NI (FIFO method)} - \text{NI (LIFO method)} \\ &= \$277 \text{ million} - 247 \text{ million} \\ &= \$30.4 \text{ million}\end{aligned}$$

- 4 B is correct. Karp's retained earnings (RE) under FIFO equals Karp's retained earnings under LIFO plus the after-tax LIFO reserve. Therefore, for the year ended 31 December 2009, Karp's retained earnings under FIFO equals:

$$\begin{aligned}\text{RE (FIFO method)} &= \text{RE (LIFO method)} + \text{LIFO reserve} \times (1 - \text{Tax} \\ &\quad \text{rate}) \\ &= \$787 \text{ million} + 155 \text{ million} \times (1 - 20\%) \\ &= \$911 \text{ million}\end{aligned}$$

Therefore, the increase in retained earnings is:

$$\begin{aligned}\text{Increase in RE} &= \text{RE (FIFO method)} - \text{RE (LIFO method)} \\ &= \$911 \text{ million} - 787 \text{ million} \\ &= \$124 \text{ million}\end{aligned}$$

- 5 A is correct. The cash ratio (cash and cash equivalents ÷ current liabilities) would be lower because cash would have been less under FIFO. Karp's income before taxes would have been higher under FIFO, and consequently taxes paid by Karp would have also been higher and cash would have been lower. There

is no impact on current liabilities. Both Karp's current ratio and gross profit margin would have been higher if FIFO had been used. The current ratio would have been higher because inventory under FIFO increases by a larger amount than the cash decreases for taxes paid. Because the cost of goods sold under FIFO is lower than under LIFO, the gross profit margin would have been higher.

- 6 B is correct. If Karp had used FIFO instead of LIFO, the debt-to-equity ratio would have decreased. No change in debt would have occurred, but shareholders' equity would have increased as a result of higher retained earnings.
- 7 B is correct. Crux's adjusted inventory turnover ratio must be computed using cost of goods sold (COGS) under FIFO and excluding charges for increases in valuation allowances.

$$\begin{aligned}
 \text{COGS (adjusted)} &= \text{COGS (LIFO method)} - \text{Charges included in} \\
 &\quad \text{cost of goods sold for inventory write-downs} - \text{Change} \\
 &\quad \text{in LIFO reserve} \\
 &= \$3,120 \text{ million} - 13 \text{ million} - (55 \text{ million} - 72 \text{ million}) \\
 &= \$3,124 \text{ million}
 \end{aligned}$$

Note: Minus the change in LIFO reserve is equivalent to plus the decrease in LIFO reserve. The adjusted inventory turnover ratio is computed using average inventory under FIFO.

$$\text{Ending inventory (FIFO)} = \text{Ending inventory (LIFO)} + \text{LIFO reserve}$$

$$\text{Ending inventory 2009 (FIFO)} = \$480 + 55 = \$535$$

$$\text{Ending inventory 2008 (FIFO)} = \$465 + 72 = \$537$$

$$\text{Average inventory} = (\$535 + \$537)/2 = \$536$$

Therefore, adjusted inventory turnover ratio equals:

$$\text{Inventory turnover ratio} = \text{COGS/Average inventory} = \$3,124/\$536 = 5.83$$

- 8 B is correct. Rolby's adjusted net profit margin must be computed using net income (NI) under FIFO and excluding charges for increases in valuation allowances.

$$\begin{aligned}
 \text{NI (adjusted)} &= \text{NI (FIFO method)} + \text{Charges, included in cost of goods} \\
 &\quad \text{sold for inventory write-downs, after tax} \\
 &= \$327 \text{ million} + 15 \text{ million} \times (1 - 30\%) \\
 &= \$337.5 \text{ million}
 \end{aligned}$$

Therefore, adjusted net profit margin equals:

$$\text{Net profit margin} = \text{NI/Revenues} = \$337.5/\$5,442 = 6.20\%$$

- 9 A is correct. Mikko's adjusted debt-to-equity ratio is lower because the debt (numerator) is unchanged and the adjusted shareholders' equity (denominator) is higher. The adjusted shareholders' equity corresponds to shareholders' equity under FIFO, excluding charges for increases in valuation allowances. Therefore, adjusted shareholders' equity is higher than reported (unadjusted) shareholders' equity.
- 10 C is correct. Mikko's and Crux's gross margin ratios would better reflect the current gross margin of the industry than Rolby because both use LIFO. LIFO recognizes as cost of goods sold the cost of the most recently purchased units, therefore, it better reflects replacement cost. However, Mikko's gross margin

ratio best reflects the current gross margin of the industry because Crux's LIFO reserve is decreasing. This could reflect a LIFO liquidation by Crux which would distort gross profit margin.

- 11 B is correct. The FIFO method shows a higher gross profit margin than the LIFO method in an inflationary scenario, because FIFO allocates to cost of goods sold the cost of the oldest units available for sale. In an inflationary environment, these units are the ones with the lowest cost.
- 12 A is correct. An inventory write-down increases cost of sales and reduces profit and reduces the carrying value of inventory and assets. This has a negative effect on profitability and solvency ratios. However, activity ratios appear positively affected by a write-down because the asset base, whether total assets or inventory (denominator), is reduced. The numerator, sales, in total asset turnover is unchanged, and the numerator, cost of sales, in inventory turnover is increased. Thus, turnover ratios are higher and appear more favorable as the result of the write-down.
- 13 B is correct. Finished goods least accurately reflect current prices because some of the finished goods are valued under the "last-in, first-out" ("LIFO") basis. The costs of the newest units available for sale are allocated to cost of goods sold, leaving the oldest units (at lower costs) in inventory. ZP values raw materials and work in process using the weighted average cost method. While not fully reflecting current prices, some inflationary effect will be included in the inventory values.
- 14 C is correct. FIFO inventory = Reported inventory + LIFO reserve = ¥608,572 + 10,120 = ¥618,692. The LIFO reserve is disclosed in Note 2 of the notes to consolidated financial statements.
- 15 A is correct. The SEC does not require companies to use the same inventory valuation method for all inventories, so this is the *least likely* reason to change accounting policies regarding inventory. The SEC is currently evaluating whether all US companies should be required to adopt IFRS. If the SEC requires companies to adopt IFRS, the LIFO method of inventory valuation would no longer be allowed.
- 16 A is correct. The inventory turnover ratio would be lower. The average inventory would be higher under FIFO and cost of products sold would be lower by the increase in LIFO reserve. LIFO is not permitted under IFRS.

Inventory turnover ratio = Cost of products sold ÷ Average inventory

2009 inventory turnover ratio as reported = 10.63 = ¥5,822,805 / [(608,572 + 486,465) / 2].

2009 inventory turnover ratio adjusted to FIFO as necessary = 10.34 = [¥5,822,805 - (19,660 - 10,120)] / [(608,572 + 10,120 + 486,465 + 19,660) / 2].

- 17 A is correct. No LIFO liquidation occurred during 2009; the LIFO reserve increased from ¥10,120 million in 2008 to ¥19,660 million in 2009. Management stated in the MD&A that the decrease in inventories reflected the impacts of decreased sales volumes and fluctuations in foreign currency translation rates.
- 18 C is correct. Finished goods and raw materials inventories are lower in 2009 when compared to 2008. Reduced levels of inventory typically indicate an anticipated business contraction.
- 19 B is correct. The decrease in LIFO inventory in 2009 would typically indicate that more inventory units were sold than produced or purchased. Accordingly, one would expect a liquidation of some of the older LIFO layers and the LIFO reserve to decrease. In actuality, the LIFO reserve *increased* from

¥10,120 million in 2008 to ¥19,660 million in 2009. This is not to be expected and is likely caused by the increase in prices of raw materials, other production materials, and parts of foreign currencies as noted in the MD&A. An analyst should seek to confirm this explanation.

- 20** B is correct. If prices have been decreasing, write-downs under FIFO are least likely to have a significant effect because the inventory is valued at closer to the new, lower prices. Typically, inventories valued using LIFO are less likely to incur inventory write-downs than inventories valued using weighted average cost or FIFO. Under LIFO, the *oldest* costs are reflected in the inventory carrying value on the balance sheet. Given increasing inventory costs, the inventory carrying values under the LIFO method are already conservatively presented at the oldest and lowest costs. Thus, it is far less likely that inventory write-downs will occur under LIFO; and if a write-down does occur, it is likely to be of a lesser magnitude.