

LIFO and Accounting Distortion – The Case of the Oil Industry

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This study examines the use of LIFO (Last in First Out) inventory method in the oil industry. With the impending acceptance of IFRS (the International Financial Reporting Standards) by the SEC and the Obama administration's budget proposals (2010, 2011 and 2012) which contained a provision to eliminate LIFO for tax purposes, LIFO is expected to be repealed. LIFO, which is prohibited under IFRS, has been used by U.S. companies for its tax advantages as long as LIFO is also used for financial reporting purposes (the "conformity rule"). In a period of inflation, LIFO results in the highest amount of cost of goods sold and the lowest taxable income and thus highest tax savings compared to other inventory cost methods. The repeal of LIFO is expected to increase billions in tax revenue. Studies indicate that the oil industry would be the hardest hit from LIFO repeal. Oil industry has the highest LIFO reserve (difference between LIFO and non-LIFO inventories). This study examines the use of LIFO in the oil industry from 2008 (the start of recession) through 2012. The income distortions & liquidity measurements under LIFO will be the focus. Data will be obtained from Compustat/Research Insight. In light of the pressure to repeal LIFO and the energy price volatility in recent years, this study will provide transparency of LIFO accounting information in the oil industry.

INTRODUCTION

Businesses with inventory may determine the value of their inventory using a number of acceptable accounting methods. One such method is the LIFO method. Under LIFO, companies assume for accounting purposes that they sell the inventory most recently acquired or manufactured first. When inventory is experiencing increasing prices, LIFO assigns the most recent prices to cost of goods sold and oldest prices to remaining inventory, hence resulting in the highest amount of cost of goods sold and lowest taxable income for the company using LIFO. Therefore use of LIFO during increasing inventory prices results in highest tax savings for the company. Industries that often experience rising inventory costs typically use LIFO as the inventory accounting method since LIFO allows them to match current income with the current higher cost of that inventory. As a result, the LIFO method enables businesses to avoid phantom profits caused by inflation.

Under current tax law, Internal Revenue Code section 472 allows a company to use the LIFO for tax purposes only if it also uses LIFO for financial reporting purposes (the "conformity rule"). Therefore, LIFO has been used by a wide range of businesses including publicly-traded companies, manufacturers,

extractive industries, wholesalers, retailers, automobile and equipment dealers and numerous others. Many of them have been on LIFO for decades.

The impending acceptance of IFRS by the SEC and the Obama administration's budget proposals (2010, 2011, and 2012) will require US publicly traded companies that currently use LIFO inventory valuation method to change their inventory accounting method to first-in-first-out (FIFO) or average-cost as permitted under IFRS. The FIFO method assumes companies first sell inventory which they have held the longest. Therefore, use of FIFO during increasing inventory prices results in lowest amount of cost of goods sold, highest taxable income, and greatest tax liabilities for the company. Thus, FIFO is preferred by companies that sell in a flat or declining price market. The repeal of LIFO will cause these companies which previously use LIFO inventory valuation method to shift to FIFO and hence significantly increase their tax liabilities. The hardest hit industry by the repeal of LIFO is the oil industry which has seen steadily increasing oil prices in the past couple of years, according to Kostolansky (2009).

Our study examines the use of LIFO in the oil industry from 2008 (the start of recession) through 2012. Our focus is on accounting distortion due to the use of LIFO in oil companies by providing transparency of LIFO information on oil industry.

Our study is arranged as follows. In section 2, we present prior research. In section 3, we discuss data and methodology used in this paper. In section 4, we provide empirical results. We conclude the paper with a summary of evidence in section 5.

PRIOR RESEARCH

During a period of increasing inventory prices, LIFO inventory method assigns cost of goods sold using newer and hence higher prices, the remaining inventory is valued using older and hence lower prices. As a result, the accounting value of the inventory is lower than its market value. LIFO therefore grossly understates inventory values on the balance sheet. On the other hand, by distorting the balance sheet, LIFO creates an enhanced income statement. Starting from 1972, The SEC requires all publicly traded companies to report LIFO reserve, which is the excess of current cost or replacement cost of inventory over LIFO values stated on the balance sheet when the differences are material. In other words, the LIFO reserve represents the cumulative inventory value differential between LIFO and an alternative inventory valuation method. The LIFO reserve also reflects the cumulative income differential that a company could have reported over the time period while it is on LIFO.

Given LIFO reserve's importance, it has been extensively studied and reported in accounting researches in recent years. Accounting research has shown that during increasing inventory prices, LIFO reserve could be a substantial amount relative to the reported inventory. For example, Reeve and Stange (1987) document an LIFO reserve of about 38% of the reported LIFO inventory on 56 selected companies and find a positive relationship between the years a company has been using LIFO and the LIFO reserve.

More recently, Kostolansky (2009) investigates the extensive use of LIFO among the largest 500 US companies. He provides evidence that across the Fortune 500 companies, 38 percent of the firms reporting inventory use LIFO. Chemicals, Industrial and Farm Equipment, Food and Drug Store, and Petroleum Refining are among the top four industries to utilize LIFO. He proves that LIFO causes significant differences in the reported value of inventory and net income for the Petroleum Refining industry.

Coffee, Roig, Lirely, and Little (2009) examine accounting distortions created by the use of LIFO inventory valuation method for 355 active publicly traded US companies with a positive LIFO reserve. They document significant balance sheet distortions in areas of inventory turnover, current ratio, and working capital across different company sizes and different industries such as Agricultural, Mining, Manufacturing, Transportation, and Wholesale/Retail industries.

But which industries benefit most from using LIFO inventory valuation method? Lirely, Coffee, Roig, Swanger (2010) provide us with a good picture. They focus on 22 energy companies, that represent slightly more than 5% of 406 energy US companies included in the Compustat North American database. While they show a limited overall use of LIFO in the energy industry, they do document a material LIFO

impact for some of the LIFO users. They provide evidence that LIFO inventory valuation method produces material accounting distortions for energy companies both in absolute dollar amounts and in amounts relative to other assets and liabilities. A greater distortion is observed in the energy industry than that in other industries.

DATA AND METHODOLOGY

We acquired data from Compustat/ Research Insight North American database. Since our study focus on how LIFO reserve affects the oil industry, our sample includes 14 major oil companies which are identified as LIFO users. Relevant data spanning from January 2008 to December 2012 are obtained for all the 14 oil companies.

To measure the accounting distortion, we compare inventory turnover, working capital, gross profit, and current ratio as reported in the financial statement with those adjusted with LIFO reserve. We define:

Year-end Adjusted Inventory = Year-end Reported Inventory + LIFO reserve

Beginning Adjusted inventory = Beginning Reported Inventory + LIFO reserve from previous year

Average Adjusted Inventory = (Year-end Adjusted Inventory + Beginning Adjusted inventory) / 2

Adjusted Inventory Turnover Ratio = (Cost of Goods sold – LIFO reserve) / Average adjusted inventory

Adjusted Gross Profit = Sales – Adjusted Cost of Goods Sold

Adjusted Working Capital = Reported Working Capital + LIFO reserve

Adjusted Current Ratio = (Reported Current Assets + LIFO Reserve) / Reported Current Liability

The accounting distortion in inventory turnover ratio is the percentage difference between the adjusted inventory turnover ratio and reported inventory turnover ratio, while the accounting distortion in gross profit is the percentage difference between the adjusted gross profit and the reported gross profit. Similarly, we measure the accounting distortion in working capital as the percentage difference between the adjusted working capital and reported working capital, while we measure the accounting distortion in current ratio as the percentage difference between adjusted current ratio and reported current ratio.

EMPIRICAL RESULTS

Since the LIFO method calculates cost of goods sold using the newer prices, a company's remaining inventory will be valued using older and typically lower prices. As a consequence, positive LIFO reserve is expected.

Table 1 presents the total dollars of LIFO reserve for each of the 14 oil companies. The Exxon Mobil has the greatest LIFO reserve in all the five years. Therefore it has the largest potential dollar amount accounting distortions in inventory. Arabian American Development has the lowest LIFO reserve in all the five years and hence the smallest dollar amount inventory accounting distortions. The average LIFO reserves are also provided for all the five years. An increasing LIFO reserve can be clearly observed from 2008 to 2011, while the LIFO reserve got lower in 2012. A closer examination reveals that out of the 14 oil companies, 12 of them have seen a LIFO reserve reduction in 2012, with ConocoPhillips having the greatest reduction in the LIFO reserve in 2012 to 200 million from 8,400 million in 2011. Part of this reduction can be attributed to a steadily decreasing oil price in 2012.

TABLE 1
LIFO RESERVE (2008-2012) IN MILLIONS
IN RANKS OF 2012 AMOUNTS

Company	2008	2009	2010	2011	2012
EXXON MOBIL	10,000	17,100	21,300	25,600	21,300
CHEVRON CORP	9,368	5,491	6,975	9,025	9,292
VALERO ENERGY	686	4,500	6,100	6,800	6,700
IMPERIAL OIL	812	1,509	1,857	2,159	1,769
TESORO CORP	405	1,100	1,400	1,700	1,600
HESS CORP	500	815	995	1,276	1,123
MURPHY OIL	202	551	735	580	571
CONOCOPHILLIPS	1,959	5,627	6,794	8,400	200
WESTERN REFINING	26	126	174	214	148
HOLLYFRONTIER	33	207	284	378	134
UNITED REFINING	153	5	50	92	78
ALON USA ENERGY	4	100	115	93	58
CALUMET SPE. PROD.	28	30	56	88	38
ARABIAN AMER.DEVEL.	2	1	2	2	2
MEAN	1,727	2,655	3,346	4,029	3,072

Table 2 presents the LIFO reserve as a percentage of inventory, a measure of accounting inventory distortion, calculated by dividing the dollar amount of the LIFO reserve to the dollar amount of inventory. Again, Exxon Mobil tops the list with the greatest LIFO reserve to inventory percentage, while Arabian American Development gets the smallest number in this measure. We also calculate the average percentage for all the 14 oil companies. The average distortion in inventory was 74% in 2008, fast increased to 149% in 2011, and dropped back to 124% in 2012. The biggest jump happened in 2009, while a slight set back was observed in 2012.

TABLE 2
LIFO RESERVE AS A PERCENTAGE OF INVENTORY (2008- 2012)
IN RANKS OF 2012 LIFO RESERVE AMOUNTS

Company	2008 %	2009 %	2010 %	2011 %	2012 %
EXXON MOBIL	86	148	164	170	146
CHEVRON CORP	137	99	127	163	151
VALERO ENERGY	15	93	123	121	112
IMPERIAL OIL	148	280	353	288	213
TESORO CORP	51	177	111	96	101
HESS CORP	38	57	69	90	89
MURPHY OIL	34	75	96	87	76
CONOCOPHILLIPS	38	114	131	181	21
WESTERN REFINING	6	28	43	49	34
HOLLYFRONTIER	26	68	71	34	10
UNITED REFINING	162	2	24	54	50
ALON USA ENERGY	2	47	82	63	32
CALUMET SPE. PROD.	23	22	38	18	7
ARABIAN AMER.DEVEL.	73	22	38	24	22
MEAN	74	118	138	149	124

Table 3 reports LIFO reserve as a percentage of net sales, another measure of accounting distortion. We calculate the percentage as the dollar amount of the LIFO reserve to the dollar amount of net sales. Imperial Oil is shown to have the greatest percentage of LIFO reserve to net sales in most years. On average, LIFO reserve is about 2.1% of net sales in 2008, 5.0% in 2009, 5.1% in 2010, and 5.5% in 2011, and reduced to 4.2% in 2012. Again, a huge jump is identified in 2009, while a slight reduction is observed in 2012.

TABLE 3
LIFO RESERVE AS A PERCENTAGE OF NET SALES (2008- 2012)
IN RANKS OF 2012 LIFO RESERVE AMOUNTS

Company	2008 %	2009 %	2010 %	2011 %	2012 %
EXXON MOBIL	2.4	6.2	6.2	5.9	5.1
CHEVRON CORP	3.7	3.4	3.7	3.8	4.2
VALERO ENERGY	0.6	7.1	7.5	5.4	4.8
IMPERIAL OIL	3.3	7.9	7.9	7.5	5.9
TESORO CORP	1.4	6.6	6.9	5.7	4.9
HESS CORP	1.2	2.8	2.9	3.3	3.0
MURPHY OIL	0.7	2.9	3.6	2.1	2.0
CONOCOPHILLIPS	0.9	4.1	3.9	12.8	0.3
WESTERN REFINING	0.2	1.9	2.2	2.4	1.6
HOLLYFRONTIER	0.6	4.3	3.4	2.4	0.7
UNITED REFINING	4.8	0.2	1.9	2.9	2.1
ALON USA ENERGY	0.1	2.6	2.9	1.3	0.7
CALUMET SPE. PROD.	1.1	1.6	2.5	2.8	0.8
ARABIAN AMER.DEVEL.	1.2	0.9	1.6	1.1	1.0
MEAN	2.1	5.0	5.1	5.5	4.2

Tables 4 to 8 provide the main results of our research. Table 4 calculates the LIFO Inventory Distortion percentage. It measures balance sheet accounting distortion created by LIFO. We compare the inventory valued under LIFO with inventory valued using current costs. We find that LIFO has distorted inventory by 74.4% in 2008, 117.7% in 2009, 138.1% in 2011, and 149.2% in 2011, and reduced to 123.9% in 2012. United Refining has the greatest distortion in 2008, while the distortion has been significantly reduced in recently years. Imperial Oil has the greatest inventory distortion from 2009 through 2012.

TABLE 4
LIFO INVENTORY DISTORTION PERCENTAGE (2008- 2012)

Company	2008 %	2009 %	2010 %	2011 %	2012 %
ALON USA ENERGY	1.7	46.7	81.6	63.4	31.7
ARABIAN AMER.DEVEL.	73.0	21.7	38.4	24.1	22.4
CALUMET SPE. PROD.	23.2	22.2	38.0	17.6	6.9
CHEVRON CORP	136.7	99.3	127.0	162.8	51.2
CONOCOPHILLIPS	38.4	113.9	130.7	181.4	20.7
EXXON MOBIL	85.9	148.0	164.1	170.4	146.5
HESS CORP	38.2	56.7	68.5	89.7	89.2
HOLLYFRONTIER	26.2	68.2	70.9	33.9	10.2
IMPERIAL OIL	147.7	280.0	352.8	288.2	213.0
MURPHY OIL	33.5	75.1	96.4	87.0	75.9
TESORO CORP	51.5	176.8	111.4	96.4	101.4
UNITED REFINING	161.9	2.2	24.3	53.6	49.8
VALERO ENERGY	14.8	92.5	123.3	120.9	112.2
WESTERN REFINING	112.2	27.7	42.8	49.4	33.9
MEAN	74.4	117.7	138.1	149.2	123.9

Table 5 demonstrates how the use of the LIFO method distorts inventory turnover ratio in the 14 oil companies. Imperial Oil has been shown to have the greatest distortion in inventory turnover ratio for the five year period. The average inventory turnover distortions are -46.8%, -42.1%, -48.9%, -49.8%, and -46% from 2008 through 2012. We find the inventory turnover distortion is quite stable in the range of 42.1% to 49.8%.

TABLE 5
INVENTORY TURNOVER DISTORTION PERCENTAGE(2008- 2012)

Company	2008 %	2009 %	2010 %	2011 %	2012 %
ALON USA ENERGY	-21.0	-21.1	-39.6	-42.8	-31.9
ARABIAN AMER.DEVEL.	-41.4	-28.6	-24.9	-23.9	-19.8
CALUMET SPE. PROD.	-38.2	-20.0	-25.5	-20.8	-11.5
CHEVRON CORP	-59.3	-56.5	-55.3	-61.2	-63.2
CONOCOPHILLIPS	-48.6	-45.8	-57.1	-68.8	-60.8
EXXON MOBIL	-62.1	-57.5	-64.1	-65.4	-63.8
HESS CORP	-38.4	-34.8	-40.9	-46.6	-49.3
HOLLYFRONTIER	-46.9	-38.8	-43.2	-32.4	-18.0
IMPERIAL OIL	-72.5	-71.2	-78.3	-78.2	-73.5
MURPHY OIL	-43.1	-38.2	-48.5	-49.2	-46.1
TESORO CORP	-48.4	-55.0	-60.2	-53.6	-52.4
UNITED REFINING	-48.1	-32.5	-12.9	-29.6	-35.7
VALERO ENERGY	-44.2	-40.0	-55.7	-57.5	-56.1
WESTERN REFINING	-20.9	-15.9	-27.5	-33.4	-30.6
MEAN	-46.8	-42.1	-48.9	-49.8	-46.0

Table 6 reports gross profit distortion. United Refining has the greatest gross profit distortion in 2008, Valero Energy has the greatest gross profit distortion in 2009, 2011, and 2012, while Tesoro Corp has the greatest gross profit distortion in 2010. The average gross profit distortion about 11/2% in 2008, jumps to 29.5% in 2009, and slows to 28.4% in 2010, 28.3% in 2011, and then reduced to 22.1%. We find the 13 of the 14 companies except Chevron Corp are shown to have less gross profit distortion in 2012.

TABLE 6
GROSS PROFIT DISTORTION PERCENTAGE (2008- 2012)

Company	2008	2009	2010	2011	2012
	%	%	%	%	%
ALON USA ENERGY	1.9	68.2	148.7	22.5	9.9
ARABIAN AMER.DEVE L	-54.2	4.5	11.7	7.9	6.5
CALUMET SPE. PROD.	8.8	12.8	21.6	26.0	6.3
CHEVRON CORP	18.2	17.0	15.7	15.8	16.9
CONOCOPHILLIPS	4.9	26.7	25.9	33.6	0.9
EXXON MOBIL	10.4	31.1	29.7	29.5	26.1
HESS CORP	5.3	12.2	12.0	13.9	11.4
HOLLYFRONTIER	10.3	86.5	62.9	18.8	4.1
IMPERIAL OIL	14.5	38.1	38.5	35.5	26.0
MURPHY OIL	5.0	20.3	23.0	15.4	15.1
TESORO CORP	32.7	165.7	178.3	96.4	69.9
UNITED REFINING	140.8	2.0	53.2	34.9	13.8
VALERO ENERGY	9.6	201.1	159.9	117.5	97.3
WESTERN REFINING	6.1	34.3	50.8	19.9	16.1
MEAN	11.2	29.5	28.4	28.3	22.1

Table 7 provides the data for the working capital distortion. Chevron Corp has the greatest working capital distortion in 2008, while Exxon Mobile has the greatest distortion in 2009. Alon USA Energy has an extremely high working capital distortion in 2010, while Hess Corp has a similar situation in 2011 & 2012. The average working capital distortion is about 75.3% in 2008, jumped to 203.6% in 2009, declined to 155.2% in 2010, climbed back up to 228.4% in 2011, and eventually dropped to 114.1% in 2012.

TABLE 7
WORKING CAPITAL DISTORTION PERCENTAGE (2008- 2012)

Company	2008 %	2009 %	2010 %	2011 %	2012 %
ALON USA ENERGY	1.6	119.3	11,623.5	93.9	66.7
ARABIAN AMER.DEVEL.	20.4	6.0	12.0	7.7	7.5
CALUMET SPE. PROD.	16.4	19.0	85.4	22.5	10.7
CHEVRON CORP	210.7	49.9	35.2	46.0	43.2
CONOCOPHILLIPS	-209.1	-222.6	93.8	390.7	3.1
EXXON MOBIL	43.2	538.8	-583.7	-563.6	6,635.5
HESS CORP	-125.6	71.7	85.3	533.9	22,460.0
HOLLYFRONTIER	48.2	80.3	90.6	18.6	4.8
IMPERIAL OIL	201.2	-600.4	-178.9	-253.6	-97.2
MURPHY OIL	21.1	46.2	118.6	93.2	81.7
TESORO CORP	197.6	329.3	324.1	188.5	91.2
UNITED REFINING	74.1	2.3	30.6	49.3	24.7
VALERO ENERGY	21.2	144.0	128.9	208.3	147.9
WESTERN REFINING	8.1	40.6	63.6	39.2	26.5
MEAN	75.3	203.6	155.2	228.4	114.1

Table 8 presents the current ratio distortion. United Refining is shown to have the greatest current ratio distortion in 2008, while Tesoro takes the first place in 2009 and 2010. Imperial Oil tops others in current ratio distortion in 2011 and 2012. The average current ratio distortion is 15.9% in 2008, 17.6% in 2009, reached its peak at 22.3% in 2011, dropped to 19.9% in 2011, and further declined to 15.0% in 2012. Compared to other distortion measures, current ratio is least distorted.

TABLE 8
CURRENT RATIO DISTORTION PERCENTAGE (2008- 2012)

Company	2008 %	2009 %	2010 %	2011 %	2012 %
ALON USA ENERGY	0.6	23.1	29.2	15.3	11.4
ARABIAN AMER.DEVEL.	5.7	4.2	8.6	5.4	5.3
CALUMET SPE. PROD.	9.0	10.2	18.1	11.3	4.6
CHEVRON CORP	25.7	14.8	14.3	17.0	16.7
CONOCOPHILLIPS	9.4	26.6	19.6	27.8	0.8
EXXON MOBIL	13.8	31.0	36.1	35.1	33.0
HESS CORP	6.8	10.2	11.3	15.3	13.4
HOLLYFRONTIER	6.2	16.1	16.7	8.1	3.0
IMPERIAL OIL	21.4	45.0	52.5	43.2	43.0
MURPHY OIL	7.1	16.3	20.7	16.8	13.9
TESORO CORP	24.6	49.5	47.8	41.0	34.5
UNITED REFINING	49.7	1.4	14.1	25.7	17.9
VALERO ENERGY	7.3	41.2	45.1	42.6	40.7
WESTERN REFINING	3.1	13.4	21.0	17.7	11.5
MEAN	15.9	17.6	22.3	19.9	15.0

CONCLUSIONS

Our study provides evidence that the use of the LIFO inventory accounting method by oil companies results in significant accounting information distortions in inventory turnover, gross profit, working capital, and current ratio. We find that the greatest accounting distortion resulting from using LIFO is in working capital. The inventory turnover ratio is also greatly distorted by using LIFO. The gross profit is less distorted compared to other measures; while the current ratio is the least distorted by LIFO with a range of 15% to 22%. The repeal of LIFO is expected to result in greater transparency in financial reporting in the oil industry and reasonably expected in other industries that use LIFO.

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