

LIFO to FIFO conversion with Blended Tax Rate

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“The change in the balance of the LIFO reserve during the current year multiplied by the income tax rate reveals the difference in the income tax for the year. (The balance in the LIFO reserve times the income tax rate reveals the difference in income tax since LIFO was adopted.)”

We use another notation to simplify the symbols. Note that inventory is always measured at the year end.

$$COGS_t^{FIFO} = Inventory_{t-1}^{FIFO} + Purchase_t - Inventory_t^{FIFO}$$

and

$$COGS_t^{LIFO} = Inventory_{t-1}^{LIFO} + Purchase_t - Inventory_t^{LIFO}$$

Suppose Company A's inception date is in year 0 and has been using LIFO reporting method since then. We want to derive the tax difference in year t had Company A used FIFO since its inception.

In year t, in the income statement, the NI is given by

$$NI_t = (Sale_t - COGS_t - SG\&A_t - Depre_t - Int_t) \cdot (1 - T_t)$$

where T_t is the marginal tax rate for Company A in year t and the tax paid in year t is given by

$$Tax_t = (Sale_t - COGS_t - SG\&A_t - Depre_t - Int_t) \cdot T_t$$

Bear in mind that we have FIFO and LIFO version of taxable income EBT and tax paid to the government.

$$Tax_t^{FIFO} = (Sale_t - COGS_t^{FIFO} - SG\&A_t - Depre_t - Int_t) \cdot T_t$$

and

$$Tax_t^{LIFO} = (Sale_t - COGS_t^{LIFO} - SG\&A_t - Depre_t - Int_t) \cdot T_t$$

For LIFO version, substitute COGS into the tax payment equation, we can get

$$Tax_t^{LIFO} = (Sale_t - Inventory_{t-1}^{LIFO} - Purchase_t + Inventory_t^{LIFO} - SG\&A_t - Depre_t - Int_t) \cdot T_t$$

Similarly,

$$Tax_t^{FIFO} = (Sale_t - Inventory_{t-1}^{FIFO} - Purchase_t + Inventory_t^{FIFO} - SG\&A_t - Depre_t - Int_t) \cdot T_t$$

We need to get the difference equation of the tax payment between two cost flows.

$$\begin{aligned} Tax_t^{FIFO} - Tax_t^{LIFO} &= \left(Inventory_t^{FIFO} - Inventory_t^{LIFO} \right. \\ &\quad \left. - (Inventory_{t-1}^{FIFO} - Inventory_{t-1}^{LIFO}) \right) \cdot T_t \\ &= (LIFO_reserve_t - LIFO_reserve_{t-1}) \cdot T_t \end{aligned}$$

See the solution provided by Schweser Notes.

If 20X7 and before, tax rate is %20, in 20X8, tax rate is %30, then their solution is indeed

$$\text{LIFO_reserve change in 20X8} \cdot 30\% + \text{LIFO_reserve in 20X7} \cdot 20\% = 21$$

Corresponds to

$$\text{Tax}_t^{\text{FIFO}} - \text{Tax}_t^{\text{LIFO}} + \text{LIFO_reserve}_{t-1} \cdot T_{t-1}$$

Note that if $T_{t-1} = T_t$,

$$\begin{aligned} & \text{Tax}_t^{\text{FIFO}} - \text{Tax}_t^{\text{LIFO}} + \text{LIFO_reserve}_{t-1} \cdot T_{t-1} \\ &= (\text{LIFO_reserve}_t - \text{LIFO_reserve}_{t-1}) \cdot T_t + \text{LIFO_reserve}_{t-1} \cdot T_t \\ &= \text{LIFO_reserve}_t \cdot T_t \end{aligned}$$

If we sum over the entire lifetime of Company A, we get

$$\begin{aligned} & \sum_{i=1}^t \text{Tax}_i^{\text{FIFO}} - \text{Tax}_i^{\text{LIFO}} \\ &= \sum_{i=1}^t (\text{LIFO_reserve}_i - \text{LIFO_reserve}_{i-1}) \cdot T_i \end{aligned}$$

We see that

$$\text{LIFO_reserve}_0 = 0$$

So above really means

$$\sum_{i=2}^t (\text{LIFO_reserve}_i - \text{LIFO_reserve}_{i-1}) \cdot T_i + \text{LIFO_reserve}_1 \cdot T_1$$

From the first time when $T_j = T_{j-1} = \dots T_1$

$$\begin{aligned} & \sum_{i=2}^t (\text{LIFO_reserve}_i - \text{LIFO_reserve}_{i-1}) \cdot T_i + \text{LIFO_reserve}_1 \cdot T_1 \\ &= \sum_{i=j+1}^t (\text{LIFO_reserve}_i - \text{LIFO_reserve}_{i-1}) \cdot T_i + \text{LIFO_reserve}_j \cdot T_j \end{aligned}$$

We have to bear in mind that **cash** on the balance sheet is an **accrue** term so if we switch from LIFO to FIFO accounting method, we need to account for the accumulated tax overpayment since inception as the reduced cash amount for the reporting year t.