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New evidence on the incremental information content of earnings reported using the LIFO inventory method

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ABSTRACT

This study extends prior research by comparing the relative information quality of LIFO earnings and non-LIFO earnings using updated data and methodology. Results suggest LIFO earnings are incrementally informative independent of tax reporting implications. In addition to shedding light on why the results of prior studies present conflicting evidence about the relative information content of LIFO, these findings are important in light of international accounting standards convergence efforts, under which LIFO is currently prohibited.

1. Introduction

The information content of earnings may be assessed according to the impact of its change on stock price, as validated by others in numerous contexts (e.g., Ball & Brown, 1968; Lev, 1989; Nichols, Craig, & Wahlen, 2004; Ohlson, 1995). Financial Accounting Concepts Statement No. 1 states that the objective of financial reporting is to provide decision-useful information to investors (FASB, 1978); hence, the choice of accounting policies for measuring inventory costs and how these choices affect the information content of earnings are important considerations. The Financial Accounting Standards Board (FASB) reports that an important qualitative objective of financial reports is that they should be relevant and timely (FASB, 1980). Since the last-in, first-out (LIFO) cost of goods sold (COGS) reflects more recent input prices, *ceteris paribus*, relative to non-LIFO cost flow assumptions, LIFO net income provides a more timely measure of firm performance.

Several prior studies have investigated this assumption by evaluating the relative earnings quality and information content of the LIFO method of accounting for inventories. Using LIFO note disclosures to recast LIFO into "as if" non-LIFO financial reports, Jennings, Simko, and Thompson (1996) document that LIFO income statements explain more of the cross-sectional variation in equity values than their "as if" non-LIFO counterparts. Carroll, Collins, and Johnson (1991) compare before and after earnings response coefficients (ERCs) for LIFO adopters and find evidence of post-adoption increases, in support of the suggestion that LIFO provides incremental information content. In contrast, Pincus and Wasley (1996) identify post-LIFO adoption decreases in ERCs. Neither of these studies attempt to control for taxes and other factors that have been demonstrated to affect the returns and earnings relation, perhaps contributing to these conflicting findings.

Biddle and Ricks (1988) and Hand (1995) investigate excess returns around earnings announcements dates of LIFO adopters. Biddle and Ricks (1988) document a positive bias in earnings forecasts and report negative two-day excess returns. In contrast, after considering the impact of pre-earnings disclosures, Hand (1995) finds returns are dependent upon where firms are listed and whether earnings forecasts are explicitly LIFO- or FIFO-based. Hand (1995) also reports positive ERCs around adopting firms' earnings announcement dates.

Lee (1988) documents that in spite of the income-reducing effects of LIFO, firms using LIFO tend to have higher earnings-to-price ratios than non-LIFO firms, a result that Dhaliwal, Trezevant, and Wilkins (2000) investigate and find is attributed largely to highly correlated omitted variables, expected growth and firm leverage.

In a follow-up study, Lee (1989) proposes a tax effect hypothesis to assert that in periods of rising prices tax savings under LIFO should have value enhancing consequences. He finds that during the inflationary 1970 to 1980 period, LIFO firms earn excess returns vis-à-vis FIFO firms. There is, however, no significant difference in returns during the low inflation years from 1962 to 1971.

This study contributes to these prior findings by investigating the relative information content of LIFO and non-LIFO earnings using updated data and methodology including additional controls for taxes. In addition to shedding light on why the results of prior studies may conflict, the study's findings are important in light of international accounting standards convergence efforts, under which LIFO is currently prohibited. In her February 2010 press release, Chairwoman Mary Schapiro reaffirmed the Securities and Exchange Commission's (SEC) commitment to the convergence of U.S. Generally Accepted Accounting Principles (GAAP) with International

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Financial Reporting Standards (IFRS-SEC, 2010). Implementation of IFRS could begin as early as 2015.[1]

Results of this study provide evidence that the impact of LIFO earnings changes on stock prices is greater than those for non-LIFO earnings changes. In particular, after controlling for tax benefits and other factors, we document an incremental increase in the slope of the earnings-returns coefficient for LIFO firms, suggesting that LIFO earnings may be incrementally informative. This suggests shareholders benefit from firms' use of LIFO, ergo the prohibition of LIFO under IFRS may be detrimental to shareholders.

This paper is organized as follows. The following section provides background and develops the study's hypotheses. The study's sample selection and methodology are described next, followed by a presentation of results, and a discussion of findings.

2. Background and hypotheses development

Relative to non-LIFO cost flow assumptions, LIFO net income (cost of goods sold — COGS) tends to be lower (higher) when inventory costs rise. Hence, incentives related to correspondingly lower taxes largely motivate firms' use of LIFO. To enhance comparability between LIFO and non-LIFO based financial reports, firms using LIFO must disclose in the notes what ending inventory (and by extension COGS) would have been if the company had used the first-in, first-out (FIFO) method. The difference between LIFO inventory reported on the face of the balance sheet and the "as if" FIFO inventory reported in the note disclosure is described as the "LIFO reserve." Since the difference between LIFO and FIFO inventory directly corresponds (inversely) with the difference between LIFO and FIFO COGS, the LIFO reserve represents the total amount that a firm's net income has been reduced since its adoption.

In juxtaposition with the current international movement towards a global unification of accounting standards, there has also been considerable domestic political debate regarding the potential repeal of LIFO. Arguments for its abolishment include that certain industries with little or no COGS are unable to avail themselves of the potentially favorable tax effects of LIFO; hence, non-LIFO firms are unfairly penalized. Further, by reducing the number of alternative accounting treatments available to firms, eliminating LIFO could enhance financial reporting comparability. The most recent 2012 Budget Proposal from the Obama administration includes the repeal of LIFO. Indeed, this provision has been included in all budgets submitted by the Obama Administration. Although Congress has yet to act on the proposed repeal of LIFO, pressure for its passage may be increasing. The administration projects eliminating LIFO would increase tax revenue by $59 billion over ten years.[2] Opponents assert that the tax effect on certain industries could be unprecedented. Although the arguments for and against LIFO's repeal are compelling on both sides from a tax reporting perspective, an additional consideration is the potential effect that its abolishment would have on the information quality of financial reporting earnings.

One argument supporting the contention of higher LIFO earnings quality is that since COGS reflects recent input prices, LIFO earnings are a more temporally useful measure of firms' economic performance, a contention examined by prior research with conflicting results (e.g., Biddle & Ricks, 1988; Carroll et al., 1991; Dhaliwal, Lee, & Fargher, 1999; Hand, 1995; Lee, 1988; Pincus & Wasley, 1996). Another rationale regarding the choice between LIFO and non-LIFO relates to managers' private operational expectations in juxtaposition with their perceptions of investors' reactions to reported earnings. That is, managers' expectations about future economic performance in conjunction with their sensitivity to perceived investors' reactions to earnings surprises affects the choice between LIFO or non-LIFO. When managers' private operational expectations are low (high), the perceived need to forgo (realize) tax savings and increase (decrease) earnings with non-LIFO (LIFO) accounting is greater, therefore the general tendency to use non-LIFO increases (decreases) with the pessimistic (optimistic) expectations of the manager. In support of this expectation, Brown (1980) documents that companies changing to LIFO have better pre-adoption earnings than non-change companies. On the other hand, Pincus and Wasley (1996) show that while changes to non-LIFO are generally income-increasing, firms' report lower sales and income prior to the switch. They also find that non-LIFO adopters have higher (lower) debt to equity (interest coverage) ratios and argue that managers use non-LIFO accounting to mask poor performance. Of course, a firm's choice of LIFO may simply be intended to reflect the economic substance of its inventory cost flows; prior studies provide evidence that industry membership is associated with the use of LIFO (Hagerman & Senbet, 1976).

Since the use of non-LIFO is costly to the firm in the form of forgone tax benefits, *ceteris paribus*, its choice may connote a negative earnings quality signal.[3] In accordance with the above studies that suggest the motivation for using non-LIFO accounting may be inversely (positively) related to managers' performance expectations, we contend that using FIFO provides an opportunity for firms to manage earnings higher and changes in LIFO earnings may be perceived by the market as more credible than changes in non-LIFO earnings. We test this assertion with the following hypothesis:

H1. Relative to non-LIFO accounting, using LIFO increases the impact of earnings changes on stock returns.

Abdel-Khalik (1992) argues, "We continue to be relatively uninformed about these issues and know little about the real reasons that many firms do not switch to LIFO when it appears that they would benefit by the positive tax savings." Pincus (1997) shows positive abnormal returns for firms having the largest estimated tax benefits subsequent to the implementation of The Revenue Acts of 1938 and 1939. Fields, Lys, and Vincent (2001) state that prior to the 1990s, research regarding the effect of taxes on the choice between LIFO and FIFO was inconclusive. Dhaliwal et al. (2000) provide evidence of a negative relation between the amount of the tax-adjusted value of the LIFO reserve and market value of equity and explain that the LIFO reserve represents a future tax burden. Tax incentives are a potentially significant factor favoring the choice of LIFO, therefore an increase in the LIFO coefficient could merely be the result of built-in tax savings. Since taxes generally correspond with net income levels, the tax effect on the LIFO earnings coefficient should subside for net loss firms; hence, the information content of LIFO is asymmetric comparing income and loss firms. We hypothesize:

H2. For firms reporting net losses, LIFO accounting increases the impact of earnings changes on stock returns.

Generally the Internal Revenue Code permits corporations to carry losses back over either or both of the prior two years.[4] Accordingly, despite reporting current year losses, tax benefits could still exist as LIFO firms realize current period refunds for taxes paid in prior profitable years. Therefore, in addition to our primary test for loss firms we also evaluate the effect of the carry-back provision on our analysis by testing the following hypotheses:

H3. For firms reporting net losses in the current year but positive net income in either or both of the preceding two years, LIFO accounting increases the impact of earnings changes on stock returns.

[1] See http://www.sec.gov/spotlight/globalaccountingstandards/workplanprogress102910.pdf, accessed September 7, 2012.

[2] Available at: http://www.whitehouse.gov/omb/budget/, accessed September 7, 2012.

[3] Our assumption presumes potential non-tax related benefits associated with maintaining non-LIFO accounting vary randomly across firm observations and accordingly, do not impact the study's results.

[4] IRC section 172(b)(1)(A)(i).

Finally we complete our tests by also evaluating net income only firms:

H4. For firms reporting net income, LIFO accounting increases the impact of earnings changes on stock returns.

3. Sample and methodology

3.1. Data and models

Using the Compustat files of North American firms, we extract panel data over fiscal years 1990 to 2008 for companies reporting COGS. Stock returns data are acquired using the Center for Research in Stock Prices (CRSP). After deleting firms with data insufficient to estimate the study's equations, the total number of firm year observations is 44,597. To mitigate the potential influential effects of outliers on our estimates, we winsorize financial data at the top and bottom 1% of the observations.

The study's hypotheses seek to measure the cumulative impact of the use of LIFO accounting on changes in returns. In light of the permanency of accounting standards, methodologies that utilize long window time horizons are an especially appropriate approach for investigating their effectiveness and numerous, prior studies have studied the association between financial reports and firm value (Balsam et al., 2003; Biddle, Seow, & Siegel, 1995; Keener, 2011; Teoh & Wong, 1993; Warfield, Wild, & Wild, 1994). Using long window abnormal returns, we regress our dependent variable, end of fiscal year abnormal stock returns (*AR*), on variables of interest and control variables. Abnormal returns are estimated alternatively using the Capital Asset Pricing Model (CAPM) and Fama-French three factor (F-F), model (see Appendix A).

Markets value and assimilate earnings according to the perceived content of new information they convey. Since the value relevance of new information should generally correspond with the magnitude of earnings changes, we assume earnings follow a random walk and measure them as the change in current fiscal year and prior fiscal year net income before extraordinary items. Similar to Lustgarten (1982), Nichols et al., (2004), and Balakrishnan, Bartov, and Faurel (2009), we deflate earnings changes by beginning of the year total assets (*ERN*).[5]

We identify LIFO firm observations by assigning an indicator variable equal to one (*LIFO*) for all firms reporting a LIFO reserve and otherwise zero. Out of the total number of observations that comprise our sample, 7682 report a LIFO reserve. To test our prediction that LIFO increases the impact that earnings changes have on returns, we interact our earnings variable, *ERN* with the *LIFO* indicator variable. To mitigate the potential effects of other factors on our variables of interest and dependent variable, *AR*, we also include control variables. A significant positive coefficient on the interaction term, *ERN*LIFO*, provides support for the assertion that LIFO accounting enhances the information quality of earnings (H1).

High (low) market-to-book firms are associated with low (high) abnormal returns (e.g., Basu, 1997; Houmes & Skantz, 2010). Lee (1988) documents that firms using LIFO tend to have higher earnings-to-price ratios than firms using FIFO. Collins and Kothari (1989) provide evidence ERCs increase with growth opportunities. Prior research suggests these variables affect the slope of the ERC (Balsam et al., 2003; Teoh & Wong, 1993; Warfield et al., 1994). To account for this possibility, we interact the market-to-book ratio (*MB*), measured as the end of fiscal year market value of equity divided by the end of fiscal year stockholder's equity with *ERN*, (*ERN*MB*).

Hunt (1985) shows that LIFO adopters tend to have less debt than non-LIFO firms. They conjecture that the choice of FIFO may be related to income-related bond covenants. In addition, prior research documents that ERCs are lower for firms with high debt (Dhaliwal et al., 1999). To control for the effect that high debt levels may have on our earnings slope coefficient, we interact the end of fiscal year long term debt scaled by total assets (*LEV*) with earnings (*ERN*LEV*).

Hagerman and Zmijewski (1979) use a political cost hypothesis to explain results that show larger firms have a greater tendency to use LIFO. We control for size effects by including an interaction variable between earnings and the natural log of assets, *ERN*lnTA*.

Numerous prior studies provide evidence that audit quality is positively related to the size of the audit firm (e.g., Balsam et al., 2003; Teoh & Wong, 1993), and Teoh and Wong (1993) show that clients of the largest auditors have higher ERCs. Accordingly, we interact our earnings variable with an indicator variable equal to one, and otherwise zero, if the client firm's auditor is one of the Big 4, 5, or 6 (Big N) auditors (depending on the time period) (*ERN*BN*).

Factors unique to certain industries may affect choices of inventory cost flow assumptions. As previously mentioned, Hagerman and Senbet (1976) document industry membership affects the choice of LIFO. In particular, they provide evidence that those firms in industries with market share concentrations of greater than 50 percent are more likely to choose LIFO. We control for industry factors by assigning indicator variables equal to one for each two digit SIC industry group and interact them with earnings (*ERN*SIC*). Finally, year indicator variables (*YEAR*) are included to control for the potential impact of factors that occur over the years that our equations may not capture. Since the year dummies are not expected to be systematically related to changes in earnings, they are not interacted with our earnings variable. Our primary "all firms" equation used to test our first hypothesis is as follows:[6]

$$AR_{it} = \alpha_0 + \alpha_1 ERN_{it} + \alpha_2 ERN_{it} * MB_{it} + \alpha_3 ERN_{it} * LEV_{it} + \alpha_4 ERN_{it} * lnTA_{it} + \alpha_5 ERN_{it} * BN_{it} + \alpha_6 ERN_{it} * LIFO_{it} + \alpha_7 \Sigma ERN_{it} * SIC_{it} + \alpha_8 YEAR_{it} + \varepsilon_{it} \quad (1)$$

The subscripts *i* and *t* represent the firm and year, respectively (Table 1).

To examine the potential effect of taxes on results, we divide our sample observations into firms reporting net losses (n = 13,511) and firms reporting net income (n = 31,086). As discussed, tax provisions allow firms to carry losses back to the prior two years; hence, firms with net operating losses could realize current period refunds for taxes paid in prior profitable years. To control for this possibility in our sample of loss firms, we include separate interaction terms between earnings and dummy variables equal to 1 if firm *i* reports positive net income in years *t-1* and, or year *t-2*, (ERN_{it}*$POS1_{it-1}$ and ERN_{it}*$POS2_{it-2}$). Using net loss firms only, a significant positive coefficient on *ERN*LIFO* would provide support for our second and third hypotheses. For our net loss sample, we use the following equation with controls for loss-carry backs:

$$AR_{it} = \alpha_0 + \alpha_1 ERN_{it} + \alpha_2 ERN_{it} * MB_{it} + \alpha_3 ERN_{it} * LEV_{it} + \alpha_4 ERN_{it} * lnTA_{it} + \alpha_5 ERN_{it} * BN_{it} + \alpha_6 ERN_{it} * POS1_{it-1} + \alpha_7 ERN_{it} * POS2_{it-2} + \alpha_8 ERN_{it} * LIFO_{it} + \alpha_9 \Sigma ERN_{it} * SIC_{it} + \alpha_{10} YEAR_{it} + \varepsilon_{it} \quad (2)$$

[5] An alternative scalar to deflate earnings changes by is the firm's beginning of the year stock price (Teoh & Wong, 1993). As later discussed, results are generally unchanged when using this alternate methodology.

[6] The equation is largely derived from that used by Balsam, Krishnan, and Yang, (2003) to measure the impact of auditor industry specialization on cumulative abnormal returns.

Table 1
Variable definitions.

AR_{it} are year t returns for firm i measured alternatively using
$CAPM_{it}$: abnormal returns using the capital asset pricing model
$F\text{–}F_{it}$: abnormal returns using the Fama-French three factor model
ERN_{it} is firm i's year t change in earnings scaled by year t assets.
MB_{it} is firm i's year t market value of equity divided by stockholder's equity.
LEV_{it} is firm i's year t long term debt divided by end of year t assets.
$lnTA_{it}$ is the natural log of firm i's year t total assets.
BN_{it} is an indicator variable equal to one if firm i uses a Big 4, 5 or 6 auditor in year t, and zero otherwise.
TAX_{it} is the natural log of firm i's year t taxes paid.
$LIFO_{it}$ is a dummy variable equal to 1 if firm i reports a LIFO reserve in year t and zero otherwise.
$POS1_{it-1}$ is an indicator variable equal to 1 if firm i reports net income in the year t-1 and zero otherwise.
$POS2_{it-2}$ is an indicator variable equal to 1 if firm i reports net income in the year t-2 and zero otherwise.
$ERN_{it}{}^{*}MB_{it}$ is the interaction between ERN_{it} and MB_{it}.
$ERN_{it}{}^{*}LEV_{it}$ is the interaction between ERN_{it} and LEV_{it}.
$ERN_{it}{}^{*}lnTA_{it}$ is the interaction between ERN_{it} and $lnTA_{it}$.
$ERN_{it}{}^{*}BN_{it}$ is the interaction between ERN_{it} and BN_{it}.
$ERN_{it}{}^{*}TAX_{it}$ is the interaction between ERN_{it} and TAX_{it}.
$ERN_{it}{}^{*}POS1_{it-1}$ is the interaction between ERN_{it} and $POS1_{it-1}$.
$ERN_{it}{}^{*}POS2_{it-2}$ is the interaction between ERN_{it} and POS_{it-2}.
$ERN_{it}{}^{*}LIFO_{it}$ is the interaction between ERN_{it} and $LIFO_{it}$.
SIC_{it} is an indicator variable equal to 1 for each two digit SIC code and zero otherwise.
$ERN_{it}{}^{*}SIC_{it}$ is an interaction term between ERN_{it} and SIC_{it}.
$YEAR_{it}$ is an indicator variable equal to 1 for each year and zero otherwise.
MVE_{it} is firm i's year t market value of equity.
NI_{it} is firm i's year t income before extraordinary items.
SE_{it} is firm i's year t common stockholder's equity.
For ease of intepretation, results for $ERN_{it}{}^{*}$SIC and $YEAR_{it}$ are omitted.

For our net income sample (H4) we include the variable *ERN*TAX* and measure it as the product of our earnings variable and the natural log of income taxes (income taxes total) as follows:

$$AR_{it} = \alpha_0 + \alpha_1 ERN_{it} + \alpha_2 ERN_{it} * MB_{it} + \alpha_3 ERN_{it} * LEV_{it} + \alpha_4 ERN_{it} * lnTA_{it} + \alpha_5 ERN_{it} * BN_{it} + \alpha_6 ERN_{it} * TAX_{it} + \alpha_7 ERN_{it} * LIFO_{it} + \alpha_8 \Sigma ERN_{it} * SIC_{it} + \alpha_9 YEAR_{it} + \varepsilon_{it} \quad (3)$$

3.2. Descriptive statistics

Table 2 reports descriptive statistics for the variables used in the regression equations. The mean (median) market-to-book ratio is 2.667 (1.877). The mean (median) long term debt as a percentage of assets is 17 (12.3) percent. Eighty-five percent of our sample firms are audited by Big N auditors, and 17.2% report a LIFO reserve. Table 3 provides univariate correlations between variables used in the study's equations. As expected, larger firms earn lower abnormal returns, and changes in earnings are positively correlated with abnormal returns. In addition, there is an inverse relation between firms' reported earnings in prior years (*t-1* and *t-2*) and current year (*t*) changes in earnings. Hence, firms with current year decreases in earnings are more likely to report net income in the prior two years.

Panels A and Panel B of Table 4 show differences in variable means for LIFO and non-LIFO net income and net loss firms. Consistent with results of prior studies, LIFO firms are larger, earn lower abnormal returns, have lower market-to-book ratios and carry more long-term debt. Relative to non-LIFO companies, a higher percentage of LIFO firms use Big N auditors. In addition, net loss LIFO companies are more likely to report net income in prior years (*t-1* and *t-2*). For all variables, differences in means are generally consistent between both earnings groups.

Table 2
Descriptive statistics.
n = 44,597.

Variables	Maximum	Minimum	Mean	Median	Standard Deviation
$CAPM_{it}$	2.009	−1.249	.102	.068	.545
$F\text{–}F_{it}$	1.991	−1.435	.067	.039	.553
ERN_{it}	.635	−.502	.008	.008	.140
MB_{it}	22.98	−1.761	2.667	1.877	3.685
LEV_{it}	.855	.000	.170	.123	.182
$lnTA_{it}$	10.86	1.200	5.588	5.482	2.173
BN_{it}	1	0	.85	1	.362
$LIFO_{it}$	1	0	.172	.000	.376

Variable definitions.
$CAPM_{it}$: abnormal returns using the capital asset pricing model
$F\text{–}F_{it}$: abnormal returns using the Fama-French three factor model
ERN_{it} is firm i's year t change in earnings scaled by year t assets.
MB_{it} is firm i's year t market value of equity divided by stockholder's equity.
LEV_{it} is firm i's year t long term debt divided by end of year t assets.
$lnTA_{it}$ is the natural log of firm i's year t total assets.
BN_{it} is an indicator variable equal to one if firm i uses a Big 4, 5 or 6 auditor in year t, and zero otherwise.
$LIFO_{it}$ is a dummy variable equal to 1 if firm i reports a LIFO reserve in year t and zero otherwise.

4. Results

4.1. Main tests

Tables 5 and 6 show the results of our main tests. Table 5 includes results for all firms without taxes, and net income firms with $ERN_{it}{}^{*}TAX_{it}$ to control for taxes. As anticipated, earnings are positively associated with abnormal returns. The control variable, $ERN_{it}{}^{*}MB_{it}$, is significant and positive for all firms, but only marginally significant for the net income only sample. Leverage, $ERN_{it}{}^{*}LEV_{it}$, is positively related to abnormal returns for net income firms, but insignificant for our all firms sample. Hence, for firms reporting net income, greater debt magnifies the effect of earnings changes on returns. In accordance with prior studies, results also show that Big N audits enhance the effect of earnings changes on returns. For all firms, $ERN_{it}{}^{*}lnTA_{it}$ and $ERN_{it}{}^{*}TAX_{it}$ are generally positively related to abnormal returns. Importantly, as hypothesized (H1 and H4), the coefficient on the interaction term, $ERN_{it}{}^{*}LIFO_{it}$, is significantly positive across all samples and abnormal returns; the slope of the earnings coefficient increases with the use of LIFO accounting.

Table 6 provides results for net loss firms with and without controls for loss carry backs. Regarding our carry back controls, we report results with net income indicator variables separately and for both years *t-1*, *t-2*. Findings are similar to those of the net income firms and are confirmatory of H2 and H3 using F-F-derived *AR* ($p<0.01$), and are moderately confirmatory using CAPM-derived *AR* ($p<0.10$).

4.2. Sensitivity tests[7]

Prior studies advocate adjusting for size when using long-window stock returns. Although our equations include controls for size, in the spirit of Lyon, Barber, and Tsai (1999), we rerun the study's equations using size-adjusted returns as the dependent variable. In particular, we stratify firms into size deciles based upon market value of equity. For each size decile portfolio, we estimate abnormal returns as the difference between each firm's actual fiscal year end return and the mean return for each decile. For each equation evaluating all, net income, and net loss firms, results of estimates for our main variable of interest, $ERN_{it}{}^{*}LIFO_{it}$, are confirmatory of the study's main findings (p-values<0.001, <0.01, and <0.10, respectively).

As previously discussed, Dhaliwal et al. (2000) find a negative relation between the amount of the tax-adjusted value of the LIFO reserve and market value of equity and explain that the LIFO reserve

Table 3
Correlations (p-values, two-tailed) of dependent and independent variables. n = 44,597.

Variables	*CAPM*	*FF*	*ERN*	*MB*	*LEV*	*lnTA*	$POS1_{it-1}$	$POS2_{it-2}$	*LIFO*
$CAPM_{it}$	1	.925	.096	.019	−.040	−.036	−.025	−.038	−.024
		(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
$F–F_{it}$		1	.092	.020	−.048	−.044	−.023	−.036	−.030
			(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
ERN_{it}			1	.000	−.007	−.017	−.094	−.043	−.007
				(.841)	(.113)	(.000)	(.000)	(.000)	(.122)
MB_{it}				1	.002	−.003	−.002	−.018	−.005
					(.697)	(.532)	(.718)	(.000)	(.236)
LEV_{it}					1	.160	−.056	−.051	.038
						(.000)	(.000)	(.000)	(.000)
$lnTA_{it}$						1	.314	.301	.250
							(.000)	(.000)	(.000)
POS_{it-1}							1	.517	.167
								(.000)	(.000)
$POS2_{it-2}$								1	.164
									(.000)
$LIFO_{it}$									1

Variable definitions
$CAPM_{it}$: abnormal returns using the capital asset pricing model
FF_{it}: abnormal returns using the Fama–French three factor model
ERN_{it} is firm *i*'s year *t* change in earnings scaled by year *t* assets.
MB_{it} is firm *i*'s year *t* market value of equity divided by stockholder's equity.
LEV_{it} is firm *i*'s year *t* long term debt divided by end of year *t* assets.
$lnTA_{it}$ is the natural log of firm *i*'s year *t* total assets.
$POS1_{it-1}$ is an indicator variable equal to 1 if the firm reports net income in the year *t-1* and zero otherwise.
$POS2_{it-2}$ is an indicator variable equal to 1 if the firm reports net income in the year *t-2* and zero otherwise.
$LIFO_{it}$ is a dummy variable equal to 1 if firm *i* reports a LIFO reserve in year *t* and zero otherwise.

represents a future tax burden. To assess this potential deferred tax impact on LIFO ERCs, we multiply the LIFO reserve by a 35% effective tax rate and interact the product with our earnings variable. Results continue to indicate a significant, positive coefficient on our variable of interest, $ERN_{it}{}^{*}LIFO_{it}$.

To further assess whether results are merely reflective of the tax benefits derived from the use of LIFO, we include an independent variable in the study's equations, the change in the tax benefit of LIFO accounting, measured as changes in the LIFO reserve, multiplied by a 35% effective tax rate, and scaled by year *t-1* total assets. As with our other control variables, we then interact this variable with ERN_{it}. The significance of the coefficient on change in tax benefits variable is significant ($p<0.05$), and the coefficient of our variable of interest, $ERN_{it}{}^{*}LIFO_{it}$ continues to be significantly positive ($p<0.05$). We also include this tax benefit variable without interaction and obtain similar results.

Although LIFO reserves are generally inventory-deceasing and COGS-increasing, when inventory costs decrease, LIFO inventory (COGS) can be greater (less) than under FIFO, resulting in a negative LIFO reserve. For our sample, 201 of the 7682 LIFO-firm year observations report negative LIFO reserves. To determine the impact, if any, of these observations on our results, we re-estimate the study's equations including an indicator variable equal to one for firms reporting negative LIFO reserves, and zero otherwise. We also rerun our analyses excluding these 201 observations. Results are confirmatory of our main tests.

Inflation exacerbates the differences in LIFO and non-LIFO COGS and by extension net income, therefore we replace our year indicator variables with yearly changes in the consumer price index. Further, to capture the effect of firm size that may be unrelated to the magnitude of a firm's physical assets, we replace our $ERN_{it}{}^{*}lnTA_{it}$ interaction term with the log of the market value of equity. We also separately estimate the regression equations using data limited to the most recent five-year period of the sample, as representative of a period with low inflation. Results of tests with these additional controls and for different periods are consistent with our main findings.

To avoid characteristics that may be uniquely associated with high and low earnings-to-price firms, our primary tests use total assets to scale our dependent variable, changes in earnings. Others studies use price as the scalar (e.g., Collins & Kothari, 1989), accordingly, we modify the study's equations using price as the scaling factor. Results are consistent with our main findings.[8]

In a recent study, Petersen (2009) reports that 42% of studies using panel data do not adjust standard errors, potentially inflating t-statistics. Of the remaining studies, 34% estimate coefficients using the Fama–MacBeth procedure, and 23% report clustered standard errors. Although our analyses include year indicator variables, to mitigate the potential effect of within-cluster correlations on the study's estimates we alternatively run the study's equations using the Fama–MacBeth procedure (Fama & MacBeth, 1973) and clustered robust standard errors (Liang & Zegler, 1986) with 5105 firm clusters. Under both methodologies, the coefficient on the $ERN_{it}{}^{*}LIFO_{it}$ variable of interest remains significantly positive across all equations.

The study's equations interact earnings (ERN_{it}) with each of our independent variables to control for their potential effects on the earnings slope coefficient. As depicted in Table 4, LIFO and non-LIFO firms differ along many different economic and financial dimensions. An alternative analysis to consider the impact of these differences is to instead interact each independent variable with our LIFO indicator variable (*LIFO*). Doing so, the coefficient on the $ERN_{it}{}^{*}LIFO_{it}$ variable of interest remains significantly positive; however, as would be expected, the significance of the coefficients on the independent variables differ from those reported in Tables 5 and 6.

The study's equations follow those of previous ERC studies which include earnings (*ERN*) followed by interactions with ERC control variables and variables of interest (Balsam et al., 2003; Park & Pincus, 2003). An alternative specification is to include *LIFO* as a separate independent variable. We test this alternative specification and find results are substantially unchanged.

Some studies use analysts' forecast errors to measure the impact of earnings changes on abnormal returns (e.g., Balsam et al., 2003). Although numerous studies document that analysts forecasts tend

[8] Due to the asymmetric timeliness of loss recognition, for this test we did not separately evaluate loss firms.

Table 4
LIFO vs. non-LIFO difference in means.

Panel A. LIFO versus non-LIFO difference in means (net income firms)
n = 31,086

Variables	LIFO (n = 6576)	Non-LIFO (n = 24,510)	Difference	T (sig.)
$CAPM_{it}$	.010	.185	−.175	−17.071 (.000)
$F–F_{it}$	.067	.159	−.092	−18.079 (.000)
ERN_{it}	.013	.044	−.031	−20.349 (.000)
MB_{it}	2.610	3.196	−.586	−1.644 (.100)
LEV_{it}	.185	.156	.029	14.706 (.000)
BN_{it}	.954	.847	.107	24.507 (.000)
$\ln TA_{it}$	6.776	5.680	1.096	42.961 (.000)
TAX_{it}	3.178	2.000	1.178	40.637 (.000)

Panel B. LIFO versus non-LIFO difference in means (net loss firms)
n = 13,511

Variables	LIFO (n = 1106)	Non-LIFO (n = 12,405)	Difference	T (sig., two-tailed)
$CAPM_{it}$	−.112	−.033	−.079	−5.317 (.000)
$F–F_{it}$	−.168	−.058	−.110	−7.356 (.000)
ERN_{it}	−.048	−.051	.003	.384 (.701)
MB_{it}	1.125	3.245	−2.120	−3.585 (.000)
LEV_{it}	.254	.192	.062	9.818 (.000)
$\ln TA_{it}$	6.067	4.344	1.723	28.772 (.000)
BN_{it}	.930	.770	.160	12.815 (.000)
POS_{it-1}	.570	.320	.250	15.340 (.000)
$POS2_{it-2}$	.680	.420	.260	15.679 (.000)

Variable definitions
$CAPM_{it}$: abnormal returns using the capital asset pricing model.
$F–F_{it}$: abnormal returns using the Fama-French three factor model.
ERN_{it} is firm *i*'s year *t* change in earnings scaled by year *t-1* assets.
MB_{it} is firm *i*'s year *t* market value of equity divided by stockholder's equity.
LEV_{it} is firm *i*'s year *t* long term debt divided by end of year *t* assets.
$lnTA_{it}$ is the natural log of firm *i*'s year *t* total assets.
BN_{it} is an indicator variable equal to one if firm I uses a Big 4, 5 or 6 auditor in year t, and zero otherwise.
$POS1_{it-1}$ is an indicator variable equal to 1 if the firm reports net income in the year *t-1* and zero otherwise.
$POS2_{it-2}$ is an indicator variable equal to 1 if the firm reports net income in the year *t-2* and zero otherwise.

to be biased (e.g., Francis & Philbrick, 1993; Ke & Yong, 2006; Richardson, Teoh, & Wysocki, 2004), we test the sensitivity of the study's results by replacing *ERN* with the difference between actual earnings and mean and median analysts' forecasts, deflated by beginning of year stock price (*AFE*), for a subset of observations for which IBES data is available (n = 21,445). Since returns are measured at each fiscal year end, and earnings announcements generally follow fiscal year end reporting dates, we use a twelve month estimation period ending with the quarter prior to the fiscal year. Results are confirmatory of the study's primary findings. The coefficient on $AFE_{it}{}^{*}LIFO_{it}$ is significant for the all firms and net income firms models ($p = 0.001$); but is not significant examining net loss firms. As the net loss firms sample size includes only 3523 observations, this finding may be the result of a loss of statistical power.

Table 5
LIFO vs. non-LIFO all and net income firms.
(OLS).

$$AR_{it} = \alpha_0 + \alpha_1 ERN_{it} + \alpha_2 ERN_{it} * MB_{it} + \alpha_3 ERN_{it} * LEV_{it} + \alpha_4 ERN_{it} * lnTA_{it} + \alpha_5 ERN_{it} * BN_{it} + \alpha_6 ERN_{it} * TAX_{it} + \alpha_7 ERN_{it} * LIFO_{it} + \alpha_8 \Sigma ERN_{it} * SIC_{it} + \alpha_9 YEAR_{it} + \varepsilon_{it}$$

Variables	CAPM		F-F	
	All n = 44,597	Pos. NI n = 31,086	All n = 44,597	Pos. NI n = 31,086
ERN_{it}	.273 (.000)	1.529 (.000)	.277 (.000)	1.579 (.000)
$ERN_{it}{}^{*}MB_{it}$	.00001 (.001)	.001 (.049)	.00001 (.004)	.001 (.108)
$ERN_{it}{}^{*}LEV_{it}$	−.008 (.822)	.227 (.079)	−.018 (.625)	.252 (.059)
$ERN_{it}{}^{*}lnTA_{it}$	.046 (.000)	−.193 (.000)	.043 (.000)	−.197 (.000)
$ERN_{it}{}^{*}BN_{it}$	.070 (.014)	.390 (.000)	.080 (.006)	.410 (.000)
$ERN_{it}{}^{*}TAX_{it}$		.144 (.000)		.143 (.000)
$ERN_{it}{}^{*}LIFO_{it}$	.698 (.000)	.740 (.000)	.806 (.000)	.745 (.000)
$ERN_{it}{}^{*}SIC_{it}$	Not reported	Not reported	Not reported	Not reported
$YEAR_{it}$	Not reported	Not reported	Not reported	Not reported
Adj. R^2	.082	.139	.048	.101

Significance (p, two-tailed) is shown in parentheses under coefficients.
Variable definitions (control variables are defined in Table 1, variables definitions)
$CAPM_{it}$: abnormal returns using the capital asset pricing model.
$F–F_{it}$: abnormal returns using the Fama–French three factor model.
ERN_{it} is firm *i*'s year *t* change in earnings scaled by year *t-1* assets.
$ERN_{it}{}^{*}LIFO_{it}$ is the interaction between ERN_{it} and $LIFO_{it}$.

5. Discussion

Although others have examined differences in ERCs of LIFO and non-LIFO firms (Carroll et al., 1991; Pincus & Wasley, 1996) differences in excess returns around earnings announcement dates (Biddle & Ricks, 1988; Hand, 1995), and differences in pre- and post-change to LIFO reported earnings, ours is the first study to directly examine differences in the impact of earnings changes on stock returns comparing LIFO and non-LIFO firms including additional controls for taxes. Our results provide evidence that, LIFO earnings are incrementally informative. We rationalize these findings as suggesting LIFO provides a more temporally useful match of current costs and revenues, and relative to non-LIFO users reflect at least in part and in conjunction with an intent to save taxes a more optimistic operating performance expectation by management. This finding is important in light of the movement toward convergence of GAAP and IFRS, and the proposed prohibition of LIFO under IFRS. It is also important in terms of the potential detrimental impact on shareholders of LIFO firms in terms of information quality. However, the news is not all bad. As documented in Table 4, non-LIFO firms tend to have greater abnormal returns than their LIFO counterparts. We estimate CAPM (F–F) abnormal returns would be higher by approximately 1.46 (2.15) percent if our LIFO firms were to use FIFO.[9] Others have attributed the negative relation between LIFO and measures of valuation to the effects of past inflation and the market's expectations of the effects of future inflation (Guenther & Trombley, 1994), and/or to abnormal inventory levels (Bernard & Noel, 1991). As many studies of the effects of LIFO were conducted during highly-inflationary periods, which may have influenced researchers' conclusions, further examination is warranted.

The IFRS prohibition of LIFO exemplifies one of many differences in financial reporting between the U.S. and other countries (Sepheri

[9] We do this by first omitting the variable, $ERN_{it}{}^{*}LIFO_{it}$, then re-estimating Eq. (1) using only FIFO firms to obtain estimates of the independent variable coefficients. These FIFO coefficients are next fit to the LIFO firms, and *AR* estimates are compared to actual.

Table 6
LIFO vs. non-LIFO net loss firms with and without loss carry-back.
(OLS).

$$AR_{it} = \alpha_0 + \alpha_1 ERN_{it} + \alpha_2 ERN_{it} * MB_{it} + \alpha_3 ERN_{it} * LEV_{it} + \alpha_4 ERN_{it} * lnTA_{it} + \alpha_5 ERN_{it} * BN_{it} + \alpha_6 ERN_{it} * LIFO_{it} + \alpha_7 \Sigma ERN_{it} * SIC_{it} + \alpha_8 YEAR_{it} + \varepsilon_{it}$$

$$AR_{it} = \alpha_0 + \alpha_1 ERN_{it} + \alpha_2 ERN_{it} * MB_{it} + \alpha_3 ERN_{it} * LEV_{it} + \alpha_4 ERN_{it} * lnTA_{it} + \alpha_5 ERN_{it} * BN_{it} + \alpha_6 ERN_{it} * POS1_{it-1} + \alpha_7 ERN_{it} * POS2_{it-2} + \alpha_8 ERN_{it} * LIFO_{it} + \alpha_9 \Sigma ERN_{it} * SIC_{it} + \alpha_{10} YEAR_{it} + \varepsilon_{it}$$

Variables	CAPM n = 13,511				F-F n = 13,511			
ERN_{it}	.064	.056	.200	.206	.060	.052	.204	.210
	(.333)	(.395)	(.014)	(.011)	(.376)	(.445)	(.016)	(.012)
$ERN_{it}*MB_{it}$	−.0001	−.0001	−.0001	−.0001	−.0001	−.0001	−.0001	−.0001
	(.005)	(.005)	(.326)	(.327)	(.016)	(.016)	(.345)	(.346)
$ERN_{it}*LEV_{it}$	.054	.053	.205	.207	.039	.039	.223	.226
	(.280)	(.284)	(.008)	(.007)	(.444)	(.449)	(.005)	(.004)
$ERN_{it}*lnTA_{it}$	.004	.009	.022	.018	.001	.005	.019	.014
	(.686)	(.363)	(.068)	(.128)	(.961)	(.593)	(.140)	(.244)
$ERN_{it}*BN_{it}$	.068	.072	−.075	−.078	.074	.078	−.064	−.086
	(.123)	(.104)	(.179)	(.163)	(.106)	(.089)	(.272)	(.251)
$ERN_{it}*POS_{it-1}$	.062		−.094		.065		−.096	
	(.256)		(.168)		(.245)		(.175)	
$ERN_{it}*POS2_{it-2}$			.214	.172			.190	.148
			(.001)	(.003)			(.005)	(.013)
$ERN_{it}*LIFO_{it}$	.403	.413	.415	.394	.656	.667	.714	.693
	(.065)	(.058)	(.079)	(.095)	(.004)	(.003)	(.003)	(.004)
$ERN_{it}*SIC_{it}$	Not reported	Not reported	Not reported	Not reported	Not reported	Not reported	Not reported	Not reported
$YEAR_{it}$	Not reported	Not reported	Not reported	Not reported	Not reported	Not reported	Not reported	Not reported
Adj. R^2	.072	.072	.076	.076	.036	.036	.040	.040

Significance (p, two-tailed) is shown in parentheses under coefficients.
Variable definitions (other control variables are defined in Table 1, variables definitions).
$CAPM_{it}$: abnormal returns using the capital asset pricing model.
$F\text{–}F_{it}$: abnormal returns using the Fama–French three factor model.
ERN_{it} is firm *i*'s year *t* change in earnings scaled by year *t-1* assets.
$LIFO_{it}$ is a dummy variable equal to one if firm *i* reports a LIFO reserve in year *t*, and zero otherwise.
$POS1_{it-1}$ is an indicator variable equal to one if firm *i* reports net income in the year *t-1*, and zero otherwise.
$POS2_{it-2}$ is an indicator variable equal to one if firm *i* reports net income in the year *t-2*, and zero otherwise.
ERN_{it} *$POS1_{it-1}$ is the interaction between ERN_{it} and $POS1_{it-1}$ and zero otherwise.
ERN_{it} *$POS2_{it-2}$ is the interaction between ERN_{it} and $POS1_{it-2}$ and zero otherwise.
ERN_{it} *$LIFO_{it}$ is the interaction between ERN_{it} and $LIFO_{it}$.
For ease of interpretation, results for ERN_{it}*SIC and $YEAR_{it}$ are omitted.

& Houmes, 2011). In another example, Black and White (2003) document that book value of equity is more value relevant in Germany and Japan than in the U.S. and U.S. positive earnings are more relevant than book value. They contend that conservative, credit oriented institutional structures that rely on bank financing in countries abroad induce the need for more value relevant balance sheets. Consistent with these results and our findings we conjecture that since financing is more equity driven in the U.S., the income statement is more temporally relevant. The attention analysts give to U.S. earnings forecasts and trends supports this contention. Indeed, much of the extant capital markets research reflects this notion. What impact the looming internationalization of accounting standards will have on this income statement emphasis remains to be seen.

Most countries now either require or permit IFRS reporting (Dickins & Cooper, 2010). Additional insight might be gained by examining whether the favorable impact of LIFO on earnings hold when examining non-U.S. firms in jurisdictions permitting both LIFO and IFRS, or comparing across jurisdictions in countries where IFRS has been implemented and LIFO is prohibited.

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Appendix A. Abnormal returns

For all models, abnormal returns (AR_{it}) are the differences between each firm's end of fiscal year *t* actual return (R_{it}) and the estimated return (ER_{it}) predicted by the following models.

That is:

$$AR_{it} = R_{it} - ER_{it} \tag{4}$$

Capital Asset Pricing Model (CAPM):

$$ER_{it} = R_{ft} + \beta_{it}\left(R_{mt} - R_{ft}\right) \tag{5}$$

where, ER_{it} is firm *i*'s expected end of fiscal year *t* return; R_{ft} is the one month treasury bill rate; and β_{it} is the end of fiscal year *t* market model *Beta* calculated over the prior year with daily closing prices. R_{mt} is the value-weighted return from the NYSE, AMEX, and NASDAQ (from CRSP).

Fama — French three factor model (F–F):

$$ER_{it} = R_{ft} + \beta_{it}\left(R_{mt} - R_{ft}\right) + \beta_{sit}\left(S_{acpt} - L_{acpt}\right) + \beta_{vit}\left(H_{pbt} - L_{pbt}\right) \tag{6}$$

where, β_{it} $(R_{mt} - R_{ft})$ are as defined above and the additional two Fama–French factors are obtained using six value-weighted portfolios formed on size and market-to-book. $S_{acpt} - L_{acpt}$ is the average return on the three smallest (small value, small neutral, and small growth) portfolios less the average return on the three large (large value,

large neutral, and large growth) portfolios, both formed according to their market value of equity. $H_{pbt} - L_{pbt}$ is the difference between returns earned on two value (small value and large value) portfolios and two growth portfolios (small growth and large growth), both formed according to market-to-book ratios. See Fama and French (1993) for a detailed explanation of portfolio breakpoints and their rationale for formation.

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