INVENTORY ACCOUNTING CHOICE AND BOND ISSUE PREMIUM: EVIDENCE FROM THE U.S. CORPORATE BOND MARKET

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ABSTRACT

US-based firms have one more option when accounting for inventory: LIFO (last-in-first-out). Though LIFO firms enjoy lower cost of equity than FIFO firms, it is not clear in the corporate bond market. Therefore, an empirical investigation is needed. We show that risk spreads for new bonds issued by LIFO firms are lower than non-LIFO firms after controlling firm characteristics, bond features, etc. We also show that the LIFO effect is more pronounced for short-maturity bonds (less than 5 years) as predicted by theoretical model. Our results extend the literature on inventory accounting choice, and contribute to the bond spread literature.

Key words: LIFO accounting, information risk, cost of debt, new bond issue

1. INTRODUCTION

The capital market impact of inventory accounting policy has been an attractive topic for both finance and accounting researchers for decades. Given the prominence of stock markets, most attention is directed to the equity side. Some scholars investigate through the tax-savings aspect of LIFO versus FIFO (Brown 1980, Biddle and Ricks, 1988, Kang 1993), while others explore the equity effect through the quality of accounting accruals (Krishnan et al. 2007). Both sides find that, compared with firms under other inventory accounting choices, LIFO firms are rewarded by the equity investors with lower cost of equity capital. This paper also aims at investigating inventory choices, but through the perspective of corporate bondholders in the debt market.

This study is important for two reasons. First, according to SIFMA (Securities Industry and Financial Market Association), corporate bond market is playing an increasingly important role in funding investment for U.S. companies. For example, in 2015, 166 firms filed IPO and raised $32.5 billion in equity capital. In contrast, 1,306 companies issued new corporate bonds and raised $1.5 trillion through the bond market (SIFMA 2016), 45 times higher than the amount of capital raised through equity. Second, conclusions in the equity market may or may not apply to the bond market for two reasons. On one hand, bond investors are usually large institutional investors well-known for powerful information-processing capability. They also have access to credit ratings from the Big 3 raters (Moody's, S&P's and Fitch) who already convert LIFO measures into comparable FIFO result in rating assessment (Kraft, 2015). In other words, corporate bond investors might assign a lower cost of debt to LIFO companies than non-LIFO companies, since they can see through those accounting window-dressing under different inventory flow assumptions. On the other hand, financial innovation could change bondholder's

risk attitude and pricing behavior. For example, since the late 1990s, bondholders can purchase credit default swaps (CDS) contract from insurers to hedge against credit loss. Martin and Roychowdhury (2015) and Shan et al. (2019) already documented a trend towards less monitoring effort by previous diligent debtholders. In addition, bondholder could be less sensitive to minor difference on balance sheet from different inventory accounting choices. Bond pricing model of Merton (1974) shows that cost of debt is mostly driven by risk-free rate, asset volatility, leverage, and time-to-maturity. LIFO choice directly impacts reported profit, thus is a critical driver for equity valuation and cost of equity, but its impact on cost of debt may not be economically or statistically significant.

To address the inconclusive question above, in this study, we will examine the association between LIFO choice and risk spread for newly issued corporate bonds by U.S. companies. This research contributes to two streams of literature. First, it contributes to the literature on the economic impact of accounting policy choice, or more specifically, the inventory accounting choice. We extend past research (Biddle and Ricks, 1988; Kang 1993; Krishnan et al. 2007) and shift the focus from equity market to corporate bond market. At the same time, accounting standard-setters could also find this study informative since it (together with all those historical equity studies) examines whether bond investors could identify the higher accounting quality imbedded in the financial statements under LIFO and price accordingly in funding contracting. Second, this paper also contributes to the bond pricing literature. We build upon a long stream of research on cost of bond debt (Kaplan and Urwitz 1979; Fung and Rudd 1986; Beaver et al. 2006) and add inventory choice (LIFO) as a new pricing factor to the bond pricing model.

The reminder of the paper is organized as follows. Section 2 reviews the relevant

literature and introduce hypotheses. Section 3 discusses the data, sample, measures, and methodology, and results. Section 4 present concluding remarks.

2. HYPOTHESES DEVELOPMENT AND RESEARCH DESIGN

The first hypothesis concerns the relation between cost of debt (bond spread) and inventory accounting choice, and the test is based on new bond issues from Mergent. Krishnan et al. (2008) find that LIFO firms tend to have higher reporting quality and lower information risk as perceived by the equity investors, and information risk is common risk factor to both equity investors and debt investors. On one hand, we can conjecture that LIFO inventory accounting choice shall be associated with lower bond spread. On the other hand, Merton (1974) model shows that the major bond spread (risk premium) drivers are asset volatility, risk-free interest rate, leverage ratio based on the current value of firm, and time-to-maturity. Since equity investors enjoy unlimited upside reward, but limited downside risk as protected by limited liability corporate laws, while debt investors could not join to share upside reward, but have to shoulder most of the downside risk, these two groups have different payoffs, thus could have different reaction to the same factor, LIFO accounting choice. For example, equity investors focus on profitability and prefer leverage for higher return (Jensen and Meckling, 1976), while debt investors dislike leverage and pay marginal attention to profitability. In addition, Frankel and Trezevant (2002) also show that LIFO inventory choice could induce firms to make large year-end inventory purchases for short-term tax benefits, but at the expense of inefficient inventory management. This sub-optimal behavior is unique for LIFO firms, but not for non-LIFO ones. Therefore, debt investors might naturally fret upon LIFO-induced management inefficiency. In sum, we state our first hypothesis in the null form.

Hypothesis 1: All else equal, new bond issues from LIFO firms have the same risk premium (bond spread) as new bond issues from non-LIFO firms.

The second hypothesis focuses on the moderating effect of bond maturity on the relation between bond risk spread and inventory accounting choice. Merton (1974) model implicitly assumes that the total assets of a firm are reported with accuracy and certainty, while in reality, performance incentives and outside constraints could easily distort reported historical earnings and thus resulted in bloated and unreliable asset values (Barton and Simko, 2002). Theoretical model by Duffie and Lando (2001) incorporates such inaccuracy in reported assets as well as accounting information quality into credit risk spread model. Their simulation results predict that risk spread tends to react more significantly for short-term bonds in time of inaccurately reported total assets, but less for long-term bonds. When a firm chooses to report under the non-LIFO choices (especially FIFO), it can be perceived as an intentional decision to overstate its current assets and total assets while LIFO values, the more prudent valuation bases, are used as the benchmark for comparison. We conjecture that, everything being equal, new bond issues with long-maturity (more than 5 years) by LIFO firms shall have a smaller risk spread decrease than new issues with short-maturity from exactly the *same* LIFO firms.

Hypothesis 2: All else equal, the LIFO effect shall be less significant for new bond issues with the long-maturity (5 years or more) than those with short-maturity (less than 5 years) of the same firms.

3. EMPIRICAL ANALYSIS AND RESULTS

3.1. The sample

Corporate bond new issue data are from the Mergent FISD database. Though the database promises coverage goes back to 1960s, we find most new bond issues started from 1985. Our new issues range from 1985 to 2016. The FISD database covers issuer name, firm ID as such CUSIP, bond-level ID, issue size, risk spread, offering date, maturity, and other embedded bond options, such as put option, redeem option, etc. We obtain all accounting data from Compustat Capital IQ – North America Annual files. We require all observations in the final sample have all required accounting information so that we can calculate various accounting ratios as the control variables. All accounting ratios are winsorized at the top 1% and the bottom 1% to eliminate the impact of extreme observations. We merge Compustat dataset with the FISD dataset and match new bond issue with its most recent annual accounting numbers in the previous fiscal year. Our final sample consists of 8,768 bond issues in 1985-2016.

3.2. Methodology and variable measures

To test for H1, we control for various determinants of risk premiums for new bond issues (Fund and Rudd, 1986; Kaplan and Urwitz, 1979; Beaver et al. 2006).

$$\begin{aligned}\text{RiskPrem}_{i,t+1} = {} & \alpha_1 + \alpha_2 \textbf{LIFO}_{i,t} + \alpha_3 \text{lnoffering\_amt}_{i,t+1} + \alpha_4 \text{Convert}_{i,t+1} + \alpha_5 \text{Shelf}_{i,t+1} \\ & + \alpha_6 \text{Putable}_{i,t+1} + \alpha_7 \text{LogMaturity}_{i,t+1} + \alpha_8 \text{Redeemable}_{i,t+1} + \alpha_9 \text{Senior}_{i,t+1} \\ & + \alpha_{10} \text{Secure}_{i,t+1} + \alpha_{11} \text{Private}_{i,t+1} + \alpha_{12} \text{Fungible}_{i,t+1} \\ & + \alpha_{13} \text{DE}_{i,t} + \alpha_{14} \text{ROS}_{i,t} + \alpha_{15} \text{ROA}_{i,t} + \alpha_{16} \text{InterestCov}_{i,t} + \alpha_{17} \text{Current}_{i,t} \\ & + \alpha_{18} \text{LogAsset}_{i,t} + \alpha_{19} \text{PPE\_Tangible}_{i,t} + \alpha_{20} \text{LOSS}_{i,t} + \varepsilon \end{aligned} \quad \textbf{(1)}$$

The definitions of the variables in Equation (1) are summarized in the Appendix 1. The variable of interest here is "LIFO", whose value is 1 if a new corporate bond is issued by a firm

under LIFO inventory accounting method and 0 if not under LIFO. The coefficient estimate of LIFO reflects the incremental bond pricing effect of LIFO.

To test for H2, we control for various determinants of risk premiums for new bond issues and add one more interaction term to capture incremental difference for bonds with different maturities (Fund and Rudd, 1986; Kaplan and Urwitz, 1979; Beaver et al. 2006).

$$\begin{aligned}\text{RiskPrem}_{i,t+1} = {} & \alpha_1 + \alpha_2 \text{LIFO}_{i,t} + \alpha_3 \text{LongMaturity}_{i,t+1} + \boldsymbol{\alpha_4 \text{LIFO x LongMaturity}_{i,t+1}} \\ & + \alpha_5 \text{lnoffering\_amt}_{i,t+1} + \alpha_6 \text{Convert}_{i,t+1} + \alpha_7 \text{Shelf}_{i,t+1} \\ & + \alpha_8 \text{Putable}_{i,t+1} + \alpha_9 \text{LogMaturity}_{i,t+1} + \alpha_{10} \text{Redeemable}_{i,t+1} + \alpha_{11} \text{Senior}_{i,t+1} \\ & + \alpha_{12} \text{Secure}_{i,t+1} + \alpha_{13} \text{Private}_{i,t+1} + \alpha_{14} \text{Fungible}_{i,t+1} \\ & + \alpha_{15} \text{DE}_{i,t} + \alpha_{16} \text{ROS}_{i,t} + \alpha_{17} \text{ROA}_{i,t} + \alpha_{18} \text{InterestCov}_{i,t} + \alpha_{19} \text{Current}_{i,t} \\ & + \alpha_{20} \text{LogAsset}_{i,t} + \alpha_{21} \text{PPE\_Tangible}_{i,t} + \alpha_{22} \text{LOSS}_{i,t} + \varepsilon \end{aligned} \quad \textbf{(2)}$$

The definitions of the variables in Equation (1) are still in the Appendix 1. LongMaturity is a dummy variable for firm i in year t+1. It is 1 if a newly issued bond has maturity more than 5 years, and 0 if not. If α_4 is positive and significant, then H2 is supported: LIFO impact on new bond issues is more pronounced for short-term maturity bonds, but less for long-term bonds.

3.3. Descriptive statistics and correlation table

Variable definition is in Appendix 1. Table 2 reports the descriptive statistics on our regression variables. The mean value of LIFO dummy is 0.291, indicating that 29.1% bonds are issued by firms with LIFO inventory accounting. The mean value of LOSS dummy, 0.158, implies that 15.8% of bonds come from firms that experience loss in the fiscal year just before the new bond issuance.

[INSERT TABLE 1 HERE]

3.4. Empirical results (H1)

Table 2 presents the results for our main regression. The variable of interest is the "LIFO" dummy. It is negative with a value of -20.183 and significant at less than 0.0001 level. The result implies that, everything being equal, a bond issued by a LIFO U.S. firm can enjoy about 20.183 basis points in discount than a non-LIFO U.S. firm. Therefore, the null form of Hypothesis 1 is rejected and we can conclude that LIFO firm also enjoy lower cost of debt in the corporate bond market.

[INSERT TABLE 2 HERE]

3.5. Empirical results (H2)

Table 3 presents the results for our second hypothesis. The main variable of interest is the "LIFO_Maturity5y" dummy. Its coefficient is positive at 30.127 and significant at 5% level (p=0.032). The LIFO dummy still has a negative coefficient of -48.897. In sum, ceteris paribus, a new bond issue by LIFO firm can still enjoy risk premium discount, but if this bond is a long-term bond, the risk premium discount will fall to to 18.77 basis points (-48.897+30.127). This result lends further support to the theoretical work of Duffie and Lando (2001) and supports our hypothesis 2.

[INSERT TABLE 3 HERE]

4. CONCLUSIONS

U.S. corporations have two major ways to account for inventory cost flows: Last-In-First-Out (LIFO) cost flow assumption and First-In-First-Out (FIFO) cost flow assumption. Two other options, such as weighted average and individual identification, are allowed, but much less frequently adopted by companies. Previous studies show that firms under LIFO are often perceived to have lower information risk and enjoy a lower cost of equity (Brown 1980; Krishnan et al. 2007). We are curious to know that whether the same conclusion could be extended into the corporate bond market in time of new bond issues.

In this study, we try to address this question. We find that the risk spread for new bonds issued by LIFO firms are lower than non-LIFO firms after controlling firm characteristics, bond features, and other relevant control variables. We also show that the bond spread effect is moderated by the maturity of bonds: It is weaker for bonds with a maturity higher than 5 years, as predicted by theoretical models. Our results extend the literature on inventory accounting choice, and also contribute to the bond spread literature.

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APPENDIX 1. DEFINITION OF VARIABLES IN EQUATION 1, 2 and 3

RiskPrem	The risk premium required for a newly issued bond for firm i in year t+1 after the accounting data have been published for year t. This variable is measured in basis point, and equal to the new bond yield to maturity minus the yield on a U.S. Treasury note of comparable maturity on the issuance date.
LIFO	The #1 variable of interest. As a dummy variable, it value is 1 if a new corporate bond is issued by a firm i under LIFO inventory accounting method in year t and 0 if not under LIFO.
Lnoffering_amt	The natural log of the face value of the bond initially issued. We usually expect that large bond issue could enjoy lower financing cost, but Jorion, Wang, and Zhang (2006) show that bond issue size is positively associated with bond risk premium (spread) in a large cross-sectional sample. Therefore, there is no prediction for the sign of this control variable.
Convert	A dummy variable indicating whether a bond is issued with a conversion option or not. It is 1 if the bond is a convertible bond and 0 if not. It is expected that convertible bonds will incur less borrowing costs than straight bonds issued by the same firm (Mayers, 1998).
Shelf	A dummy variable indicating whether a bond is issued under a shelf registration. It is 1 if a bond is under a shelf registration or 0 if not. American corporations are required to file with the SEC when they issue new stocks or bonds. To minimize paper work and delay, SEC Rule 415 allows issuers to pre-register a certain amount of securities for up to two

	years, thus issuers can time the issue in more favorable market condition and enjoy lower financing costs.
Putable	A dummy variable indicating whether a bond is issued with a put option or not. It is 1 if one bond has an embedded put option, and 0 if none. Put option gives bondholders the right to sell back bonds to issuers at pre-set prices. It is a bond-level variable that's expected to be negatively associated with bond risk premium on new issues.
LogMaturity	The natural log of maturity (in years). Unlike bank loans whose life is never more than 5 years in the modern finance world, corporate bonds have all kinds of maturities, ranging from 1 year to 30 years. Log transformation ensures that this control variable has a distribution closer to normal distribution. Long-term new issues are perceived to be more risky than short-term issues, so the natural log of maturity is expected to positively associated with bond risk premium.
Redeemable	A dummy variable indicating whether a bond is issued with a redemption option or not. It is 1 if the bond is a redeemable bond and 0 if not. It is expected that firms have to pay higher borrowing costs, thus higher risk premium, in order to enjoy this pre-maturity redemption right.
Senior	A dummy variable that is 1 if a loan is a "senior" bond as compared to other corporate debts, and 0 otherwise. A senor bond enjoys lower risk spread.
Secure	A dummy variable that is 1 if a bond is a secured by certain corporate assets, and 0 otherwise. A secured bond enjoys lower risk spread.

Private	A dummy variable that is 1 if a bond is sold via private placement. With less biddings, those bonds tend to be small and pay higher risk spread.
Fungible	A dummy variable that is 1 if a firm has the right to sell more bonds than planned quantity.
Maturity5y	A dummy variable that is 1 if a new bond has maturity over 5 years, and 0 if the maturity is less than 5 years.
LIFO_Maturity5y	An interaction term of two dummy variables, LIFO and Maturity5y.
DE	Leverage ratio (total debt divided by total assets). "Total debt" is the sum of long-term debt and current portion of long-term debt. This variable is derived from Compustat [**(DLTT+DLC)/AT**]. It is expected to be positively associated with new issue risk premium.
ROS	Profitability ratio (a ratio of operating income to sales). It is derived from Compustat [OIADP/REVT]. It is expected to be negatively associated with risk premium.
ROS	Asset-based profitability ratio (a ratio of operating income to total assets). It is derived from Compustat [OIADP/AT]. It is expected to be negatively associated with risk premium.
InterestCov	Interest coverage ratio (operating income divided by interest expense). It is derived from Compustat [OIADP/XINT]. It is expected to be negatively associated with new issue risk premium.
Current	Current ratio, a ratio between current assets and current liability.
LogAsset	The natural logarithm of total assets. It is derived from Compustat [**log(AT**)]. This variable controls for firm size. New bond issued by large

	firms are often perceived to be less risky than those from small firms, therefore it is expected to be negatively associated with new issue risk premium.
PPE_tangible	Net book value of PPE/total asset.
Loss	A dummy variable on profitability. It is 1 if an issuer(firm) has negative earnings, and 0 otherwise. “Earnings” is defined as income before extraordinary items and derived from Compustat with the variable as “IB”.

TABLE 1. DESCRIPTIVE STATISTICS

Variable	Mean	Std Dev	25th Pctl	Median	75th Pctl
RiskPrem (Risk Spread)	157.619	194.893	0	95	225
LIFO Dummy	0.291	0.454	0	0	1
Maturity Dummy(>5 years)	0.931	0.253	1	1	1
LIFO_Maturity5y	0.273	0.446	0	0	1
LnOffering_amt	11.770	1.730	11.513	12.206	12.835
Convertible	0.163	0.370	0	0	0
Shelf Registration Dummy	0.409	0.492	0	0	1
Putable	0.055	0.228	0	0	0
LogMaturityYears	2.358	0.632	1.950	2.305	2.864
Redeemible Dummy	0.734	0.442	0	1	1
Senior Dummy	0.842	0.365	1	1	1
Secured Bond Dummy	0.196	0.397	0	0	0
Private Placement Dummy	0.276	0.447	0	0	1
Fungible Dummy	0.202	0.402	0	0	0
DE-Leverage	0.310	0.203	0.174	0.279	0.405
ROS (Return on Sales)	0.058	0.577	0.057	0.096	0.152
ROA (Return on Assets)	0.088	0.100	0.059	0.093	0.132
Interest Coverage Ratio	10.077	27.764	2.111	4.433	9.486
Current Ratio	1.725	1.173	1.040	1.446	2.072
Total Assets (natural log-adjusted)	7.847	1.629	6.754	8.092	9.118
PPE-Net Book Value/TA	0.414	0.255	0.191	0.380	0.620
LOSS Dummy	0.158	0.365	0	0	0

Note: Variable Definition is available in Appendix 1.

TABLE 2. THE IMPACT OF LIFO ON NEW BOND ISSUE RISK PREMIUM (RISK SPREAD)

Variable	Coeff. Estimate	t Value	Pr > |t|
Intercept	0.191	0.01	0.992
LIFO	**-20.183**	**-5.27**	**<.0001**
LnOffering_amt	28.841	17.72	<.0001
convert	-51.451	-6.47	<.0001
shelf	65.123	14.25	<.0001
put	-27.525	-2.2	0.028
LogMaturityYears	-14.713	-5.47	<.0001
redeem	23.316	5.32	<.0001
senior	-95.296	-13.37	<.0001
secure	-28.332	-5.29	<.0001
pp_exempt	295.737	58.65	<.0001
fung	90.643	18.33	<.0001
DE	73.302	7.76	<.0001
ROS	-7.366	-0.61	0.5387
ROA	-164.047	-5.4	<.0001
InterestCov	-0.078	-1.14	0.2536
Current	-1.141	-0.55	0.5789
LogAsset	-20.904	-14.24	<.0001
tangible	-43.245	-4.79	<.0001
LOSS	49.509	8.91	<.0001
Industry-fixed effects	Yes		
Adj R-Sq	0.598		
N	8,768		

Note: All variable definition is summarized in Appendix 1.

TABLE 3. LIFO EEFFECT ON NEW BOND ISUE RISK PREMIUM (RISK SPREAD): MATURITY-MODERATING EFFECT

Variable	Coeff.	t Value	Pr > |t|
Intercept	-9.599	-0.49	0.623
LIFO	-48.897	-3.53	0.000
Maturity5y	32.306	3.58	0.000
LIFO_Maturity5y	**30.127**	**2.15**	**0.032**
LnOffering_amt	28.428	17.44	<.0001
convert	-49.021	-6.17	<.0001
shelf	63.891	13.99	<.0001
put	-25.997	-2.08	0.038
LogMaturityYears	-23.228	-7.47	<.0001
redeem	22.497	5.14	<.0001
senior	-94.352	-13.26	<.0001
secure	-29.086	-5.44	<.0001
pp_exempt	292.834	57.9	<.0001
fung	88.936	18	<.0001
DE	71.325	7.55	<.0001
ROS	-8.303	-0.69	0.487
ROA	-161.621	-5.33	<.0001
InterestCov	-0.077	-1.12	0.261
Current	-1.167	-0.57	0.570
LogAsset	-20.228	-13.75	<.0001
tangible	-42.400	-4.71	<.0001
LOSS	49.367	8.91	<.0001
Industry-fixed effects	Yes		
Adj R-Sq	0.598		
N	8,768		

Note: All variable definition is summarized in Appendix 1.