Derivative financial instruments, tax aggressiveness and firm market value

Tao Zeng
Wilfrid Laurier University, Canada
tzeng@wlu.ca

The authors acknowledge that financial supports have been received from CA/Laurier Research Centre.

Abstract

Among the factors that affect a firm’s decision to use derivative financial instruments is the tax-timing option, which enables firms to defer gains but immediately realize losses, thereby reduce tax liability. This paper develops a theoretical model showing that firms can exploit the tax-timing option through the use of derivatives. It also develops a modified firm valuation model showing that the tax-timing option increases firm market value. The empirical tests using data from large Canadian public companies shows that a firm’s realized losses or unrealized gains from using derivatives are negatively associated with its effective tax rate; (2) a firm’s realized losses or unrealized gains from using derivatives are positively associated with its firm market value.

Key Words: tax-timing option, derivatives, tax aggressiveness, unrealized gains, realized losses, firm market value.
1. Introduction

The last two decades have witnessed a dramatic increase in the use of derivatives. Academic studies have identified several motives for firms to use derivatives: to hedge risks; to reduce financial distress costs, and other agency costs; to be used as a signal of manager quality; to reduce the volatility of pre-tax income and thereby reduce tax liability; (Aretz and Bartram 2010, Adam and Fernando 2006, Graham and Rogers 2002, Allayannis and Weston 2001, Fok et al. 1997, Geczy et al. 1997, Graham and Smith, Jr. 1996, Berkman and Bradbury 1996, Phillips 1995, Nance et al. 1993, Smith and Stulz 1985, Stulz 1984, to name a few). However, there are few studies examine the association between derivative and tax aggressiveness (Donohoe 2012). As argued by Donohoe (2012), derivatives are appealing means to avoid taxes since they can replicate economic situations, blur underlying economic substance, and introduce ambiguity and complex in tax reporting. This paper adds to the existing literature on derivatives by suggesting a reason not heretofore considered; that is, why using derivatives might be expected to enhance firm market value. The potential gain of using derivatives lies in a firm’s tax circumstances.

Constantinides (1983, 1984) and Constantinides and Ingersoll (1984) show that, given that capital gains and losses are taxed when realized, optimal tax-trading behaviour in an environment of fluctuating securities prices involves deferring the realization of capital gains indefinitely to avoid paying taxes thereon but realizing immediately all capital losses in order to take the associated tax deductions. The ability to implement such a strategy conveys to investors a valuable tax-timing option that can contribute significantly to the total value of an investment position in a
Lewellen and Mauer (1988) argue that the existence of the tax-timing option has provided an incentive for firms to have complex capital structures. Given two firms whose asset holdings and operating cash flows are identical, but one of which is levered and the other is not, fluctuations in the total market value of the unlevered firm will permit shareholders to exercise their timing option to take losses and defer gains. Corresponding fluctuations in the market value of the levered firm, however, will present investors in the aggregate with additional timing opportunities, as long as the prices of the firm’s constituent securities do not always change in the same direction. For that reason, the inclusion of debt as well as equity in a firm's capital structure should raise the total market value of the firm.

Recent evidence leads support to the argument that investors respond to this tax-timing option; for instance, Odean (1998) shows that investors are more likely to sell loss investments in December than in other months. Jin (2006) provides evidence that tax-sensitive investors defer selling stocks that have incurred large capital gains. Chay et al. (2006) examine a type of distribution that is taxed as capital gains, rather than as dividends. They find that the ex-day return behaviour reflects the value of tax-timing capital gains. Desai and Gentry (2003) examine how capital gains taxes affect a firm’s decision on realizing capital gains. Their time-series analysis of aggregated corporate realization behaviour demonstrates that capital gains taxes are negatively associated with realized capital gains. Their firm-level analysis of realization behaviour finds similar results.
This study incorporates these arguments and develops a framework to show how firms exploit tax-timing option value by using derivatives. It is the first study to conclude that one motive for firms using derivatives is to exploit the tax-timing option.

The remainder of this paper is organized as follows. In section two, I briefly summarize the relevant tax treatment of derivative financial instruments. In section three, a theoretical framework is derived, based on the Lewellen and Mauer (1988) analysis to show that firms use derivatives to exploit tax-timing option value. A firm valuation model is also developed showing that tax-timing option increases firm market value. Hypotheses are also developed in section three. In section four, I specify the empirical analysis. I design the regression models, define the variables and describe data collection. In section five, the testing results are presented. Finally, a summary and conclusion are provided in section six.

2. Summary of tax rules on derivatives in Canada

The term, “derivatives,” is used to describe a wide range of products; such as interest and currency swaps; equity index and commodity swaps and forwards; options on government bonds (domestic and foreign), commodities, equity indices and other underlying interests; warrant products; caps, collars, floors, forward rate agreements; foreign exchange contracts, to name a few. Nonetheless, the tax treatments of very few derivatives (such as, employee stock options, options, etc.) are specifically provided for in the Income Tax Act. Tax treatment of remaining derivatives is, in the absence of specific rules, based on general tax rules and the administrative pronouncements
of the Canada Revenue Agency (Tennant 2005, Edgar 2000). These general tax rules involve two issues: (1) the type or character of gains or losses from the transactions (is it ordinary income, capital gains or losses, interest, dividends?); and, (2) the timing of the recognition of these amounts. In general, a derivative is treated as an independent transaction and it is characterized as business income if it is acquired by a financial institution as part of the business of trading or it is acquired for the purposes of producing a profit from speculation.

Characterization of other derivatives may also be linked to their underlying assets. For example, foreign exchange gains or losses will be characterized as either business income or capital gains or losses, based on the character of a related transaction. The gains or losses from forwards, futures and options on foreign currencies, shares, or share price indexes are generally characterized as capital gains or losses, when these derivative instruments are used to hedge price changes associated with foreign currencies or, with shares held as capital assets.

The timing of the recognition of the gains or losses on derivatives is based on the realization principle (Edgar 2000). The realization principle requires that the gains or losses be recognized when the derivatives mature, are disposed of, sold, or closed out. Gains or losses can only be recognized as they are actually realized. Accrued gains or losses are instead an unanticipated gains or losses that cannot be recognized until they are realized.

Tax treatment of derivatives differs substantially from their treatment under general accounting principles. According to the accounting policies, if a company uses derivative financial instruments to hedge its foreign currency, interest rate, and commodity price risk, (that is, all
hedging relationships, risk management objectives, hedging strategies are formally documented and periodically assessed to ensure those changes in the value of these derivatives are highly effective in offsetting changes in the fair values, net investment or cash flows of the hedged exposures), all gains and losses (realized and unrealized, as applicable) on such derivatives are recognized in the same manner as gains and losses on the underlying exposure being hedged (matching principle). There is, however, no such a matching approach for tax purposes.

Tennant (2005) argues that one purpose of entering into derivatives is to postpone tax by deferring gains to a subsequent year or realizing losses in an early year; in other words, to exploit the tax-timing option. Without specific tax rules, income needs not be recognized until the taxpayer disposes of, or sells, the derivatives. In the Supreme Court of Canada decision of The Queen v. Friedberg, the taxpayer took a “spread” position in his trading of gold futures. For each year, the taxpayer actually closed out his losing position and recognized losses immediately. He deferred closing out those positions showing profits and deferred recognizing gains until after his taxation year end. The Supreme Court agreed with the taxpayer and indicated that the mark-to-market accounting method, which would have required the taxpayer to recognize unrealized income in the same year as the realized losses, was not appropriate for tax purposes.

In the next section, I describe a theoretical model to show that the firms can exploit the tax-timing option by using derivatives.

3. Analytical framework and hypothesis development
3.1. Tax-timing option and tax aggressiveness

I examine a two-period case. To begin with, there are 3 assumptions: (1). Capital market is perfect with zero transaction costs, no information asymmetries, and zero bankruptcy costs. (2). $\tau$ is the uniform corporate income tax rate, where $0<\tau<1$. (3). Random end-of-period market value of the firm's asset $M$ is normally distributed, i.e. $M \sim N(\bar{M}, \sigma^2)$.

Given assumption (3), the beginning-of-period market value of the asset is simply $\bar{M}$. To exploit tax-timing option value, firms will realize losses immediately, i.e., when $M \leq \bar{M}$, the tax-timing option is $\tau(\bar{M} - M)$; but will defer gains, i.e., when $M > \bar{M}$, there is no trading, and thus the tax-timing option value is zero. The aggregate one-period tax-timing payoff function for firms, therefore, is equal to $\tau$ times that of a put option with exercise price $\bar{M}$ on random underlying asset value $M$. Accordingly, the total beginning-of-period firm market value is:

$$V = \bar{M} + E[\tau \max(\bar{M} - M, 0)]$$  \hspace{1cm} (1)

where $E[.]$ denotes expectation. By the assumption that market value is normally distributed, the firm market value can also be presented as

$$V = \bar{M} + (\tau) f^*(0) \sigma$$  \hspace{1cm} (2)

where $f^*(0) = 1/\sqrt{2\pi}$ and $\sigma$ is the standard deviation of $M$.

Similarly, suppose that the firm invests in two assets A and B, with the time t+1 market values normally distributed, i.e., $M_A \sim N(\bar{M}_A, \sigma_A^2)$ and $M_B \sim N(\bar{M}_B, \sigma_B^2)$. Their aggregate market value at time t will be the sum of the values of its constituent assets, and (2) can be rewritten
as:

\[ V_{A+B} = M_A + M_B + \tau[f^*(0)](\sigma_A^2 + \sigma_B^2 + 2 \rho_{AB} \sigma_A \sigma_B)^{1/2} \]  \hspace{1cm} (3)

where \( \rho_{AB} \) is the coefficient of correlation between the values of the two assets.

If the firm can separately trade asset A and B with no concurrent change in the market value of either asset, the firm can exploit the tax-timing option value separately. With the separate trading available, thus the value of these assets to the firm, at time t, will be:

\[ V_A = M_A + \tau[f^*(0)] \sigma_A \]  \hspace{1cm} (4)

\[ V_B = M_B + \tau[f^*(0)] \sigma_B \]  \hspace{1cm} (5)

The tax-timing option value from the separate trading of the two assets can be measured by:

\[ V_A + V_B - V_{A+B} = \tau[f^*(0)](\sigma_A^2 + \sigma_B^2 - (\sigma_A^2 + \sigma_B^2 + 2 \rho_{AB} \sigma_A \sigma_B)^{1/2}) \]  \hspace{1cm} (6)

It is evident that the valuation gain is no less than zero, increasing in the tax rate \( \tau \), and decreasing in \( \rho_{AB} \). The more correlated are the end-of-period values of the two assets, the smaller the gain from investing in these two assets, and the less correlated are the end-of-period values of these two assets, the greater the gain. Extremely, when \( \rho_{AB} = -1 \), the tax-timing option value is maximized.

Derivatives, by their nature, are generally used to hedge the price risk of their underlying assets. The changes in their values are opposed to those of underlying assets. If a firm invests in an underlying asset and holds a derivative security, which hedges the price risk of the underlying asset, the coefficient of correlation between the value of derivative and the underlying asset will be
negative, and tax-timing option value is thus obtained. Hence, I specify the following conclusion.

**Conclusion:** *Firms will use derivative instruments to exploit tax-timing option value, when the coefficient of the value for the underlying asset and the derivatives, which hedge the price risk of the underlying asset, is negative, and thus save taxes.*

A firm’s tax aggressiveness or tax saving can be measured by its effective tax rate following the existing studies on tax aggressiveness.

Hence I generate the following hypothesis.

**Hypothesis one:** *A firm’s net unrealized gains or net realized losses from using derivatives are negatively associated with its effective tax rate.*

### 3.2. Tax-timing option and firm market value

The motive for firms’ using derivatives to exploit tax-timing option value fits Constantinides and Scholes (1980) and Bossaerts and Dammon (1994), and implies that this tax-timing option would increase firm market value. Hence firm market value could be expressed as the present value of future dividend payoff and tax saving from using derivatives to exploit the tax-timing option.

I separate the future cash flow on the stock of the firm into dividends and tax benefits resulting from optimal realization of capital losses and deferring capital gains. The firm market valuation function at date 0 could be expressed as

$$
P_0 = \sum_{j=t+1}^{\infty} E[m(j,t)] [d_j + \tau_t (RL_j + UG_j)]
$$

Where $m(j, t)$ denotes the marginal rate of substitution between consumption at date $j$ and data $t$. 

\[ (7) \]
For a risk neutral investor, the marginal rate of substitution of consumption is the inverse of riskless discount rate. Therefore, the firm market value is expressed as

\[ P_t = \sum_{j=t+1}^{\infty} R_p^{-j}E[d_j + \tau_c (RL_j + URG_j)] \] (8)

The formula is similar to the standard market valuation function (Bossaerts and Dammon 1994), except that it includes the tax-timing option of realizing capital losses immediately but deferring capital gains. Hence I generate the following hypothesis.

**Hypothesis two:** A firm’s net unrealized gains or net realized losses from using derivatives are positively associated with its market value.

4. Empirical Analysis

4.1 Hypotheses and Regression model

To test the first hypothesis on the association of the tax-timing option from using derivatives and tax aggressiveness, I design the following regression model.

\[ ETR_{it} = \gamma_0 + \gamma_1 RL & UG_{it} + \sum_k \mu_k CONTROL_{ik} + (Industry dummies) + \epsilon_{it} \] (9)

Where

- \( ETR_{it} \): annual effective tax rate for firm \( i \) in year \( t \)
- \( RL & UG_{it} \): dummy variable, equal to 1 if there are net realized losses (i.e., realized losses
net of realized gains), or net unrealized gains (i.e., unrealized gains minus unrealized losses) from derivatives, and 0 otherwise

\[ CONTROL_{it} \]: a set of control variables

Annual ETR, defined as annual cash tax paid divided by pre-tax income, is generally used to be a proxy for tax aggressiveness, according to prior studies (Dyreng et al. 2007). The denominator is the pre-tax income shown on the firm’s income statement instead of the taxable income calculated based on tax law. Taxable income is the taxpayer’s tax base, on which income tax is taxed. Ideally, the measurement is calculated based on taxable income. However, taxable income is confidential and this study, as did other studies, uses accounting income. The numerator is cash tax paid shown on firms’ statements of change in cash flow. To have ETR within \([0,1]\), I set ETR to be zero when cash tax paid is negative (i.e., tax recovery) and ETR to be one when it is higher than one. Under a sensitivity test, I delete all the observations with ETR outside \([0,1]\). The results do not change qualitatively.

Following previous relevant studies on effective tax rates (ETR) (Stickney and McGee 1982, Gupta and Newberry 1997, Adhikari et al. 2006, Dyreng et al. 2007, to name a few), I choose six control variables that are known to influence ETRs; firm size \((\text{SIZE})\), measured as log of total assets; leverage \((\text{LEV})\), measured as the sum of short and long term debts over total assets; capital intensity \((\text{FIX})\), the ratio of fixed assets to total assets; inventory intensity \((\text{INV})\), the ratio of inventory to total assets; return on assets \((\text{ROA})\), measured as profit over total assets; and market to book ratio \((\text{MB})\), measured as shareholders’ equity over market value. Market value is equal to
year-end share price multiplied by number of shares outstanding at the end of the year. Industry
dummies are included to control for potential industry fixed effects. Hypothesis one predicts
\( \gamma_i < 0 \).

The second hypothesis is on the association of the tax-timing option from using derivatives
and firm market value. Based on Ohlson’s (1995) residual model, firm market value including the
present value of future dividends, can be expressed as firm book value and earnings. Therefore, I
design the following regression model.

\[
VAL_{it} = \beta_0 + \beta_1 RL & UG_{it} + \beta_2 BOOK_{it} + \beta_3 ROA_{it} + \epsilon_{it}
\] (10)

Where

\( VAL_{it} \): share price at the end of the year

\( RL & UG_{it} \): dummy variable, equal to 1 if there are net realized losses (i.e., realized losses
are more than realized gains), or net unrealized gains (i.e., unrealized gains minus
unrealized losses is positive) from derivatives, and 0 otherwise

\( BOOK_{it} \): shareholders’ equity, deflated by total assets

\( ROA_{it} \): net income over total assets (return on assets)

Hypothesis two predicts \( \beta_1 > 0 \).

4.2 Data Collection and Variable Definition

The data is obtained from the System for Electronic Document Analysis and Retrieval
Firms in the sample meet the following 2 conditions: (1) Canadian non-financial public companies (also not income trusts or other types of organizations) on TSX60; (2) available audited annual financial statements for any year from 2007 to 2011 on SEDAR. There are 233 firm-year observations from 3 industries. When I test hypothesis one under regression model 10, I further delete 10 observations with negative pre-tax income, since the measurement of effective tax rate is not meaningful for negative pre-tax income (see Table 1 for sample selection).

The first condition allows this study to concentrate on large firms, which are more likely to use derivatives. Nelson et al. (2005) find that, from 1995 to 1999, 21.6% of publicly traded companies used derivatives instruments, and, that the use of derivatives was concentrated in larger companies. The second condition is necessary for computing net unrealized gains and realized losses from derivatives, tax paid, total assets, earnings, shareholders’ equity, and other relevant accounting data.

The use of derivatives and the associated realized/unrealized gains/losses are disclosed in the footnotes of the company’s financial statements. The footnote of financial instruments shows details of a firm’s use of derivatives. The derivatives normally used by a firm can be classified into three broader classes: (1) foreign currency exchange derivatives (such as, foreign exchange forwards and options); (2) interest rate derivatives (such as, interest rate swaps); and, (3) commodity derivatives (such as, commodity contracts and futures). The footnote generally

---

1SEDAR is the system used for electronically filing most securities-related information with the Canadian securities regulatory authorities. Filing with SEDAR started January 1, 1997, and is now mandatory for most reporting issues in Canada. The SEDAR system allows users to access public company and mutual fund securities-related information.
discloses the notional value, fair value, and carrying value of each derivative used by a firm. It also discloses the unrealized gains/losses from the change of the market value (fair value) of the derivatives. In addition, the footnote disclosed the realized gains or losses when the derivatives are mature, expired, or settled. I further check the footnotes of significant accounting policies, risk management, commitments and contingencies and so on for additional information of a firm’s use of derivatives.

In addition, industry dummy variables (there are mainly three industries, energy, materials, and consumer discretionary and staples) are added to control for differences across industries and for other omitted variables.

5. Empirical results

5.1 Testing results

The main results are presented in Tables 2 - 5. Table 2 presents the descriptive statistics of the dependent and independent variables. It shows the mean, first quartile, median, third quartile, standard deviation, minimum and maximum value. For example, the mean of $RL&UG$ is 0.5157, which implies that a bit more than half of the firms have net realized losses or unrealized gains or both from using derivatives. The mean of $ETR$ is 0.2226. It implies that the average effective tax rate is about 22%, which is less than the statutory tax rate of 30%.

Table 3 presents the Pearson correlation matrix of dependent and independent variables.
The maximum absolute value of the correlation is 0.7978, between \textit{BOOK} and \textit{LEV}. The minimum absolute value of the correlation is 0.0098, between \textit{VAL} and \textit{INV}. The correlation between \textit{ETR} and \textit{RL\&UG} is -0.172, which provides a preliminary support of Hypothesis one. The correlation between \textit{VAL} and \textit{RL\&UG} is 0.1536, which provides a preliminary support of Hypothesis two.

Table 4 presents the results from regression model 9 on the association between \textit{ETR} and \textit{RL\&UG}. The coefficient on the realized losses or unrealized gains (\textit{RL\&UG}) from the use of derivatives is negative and significant at 0.01 level, which supports Hypothesis one to the extent that a firm’s tax-timing option (i.e., realizing losses but deferring gains) is negatively associated with its effective tax rate.

Some control variables are also relevant. For example, Table 4 shows that \textit{LEV} is negative and significant, suggesting that tax deduction of interest expenses from debt financing reduce tax liability (Stickney and McGee 1982, Porcano 1986, Zeng 2010, Zeng 2011 etc.). The coefficient in \textit{ROA} is negative, which is consistent with Dyreng et al. (2007), Zeng 2010, and Zeng 2011.

Table 5 presents the results from regression model 10 on the association between \textit{VAL} and \textit{RL\&UG}. The coefficient on the realized losses or unrealized gains (\textit{RL\&UG}) from the use of derivatives is positive and significant at 0.01 level, which supports Hypothesis two to the extent that a firm’s tax-timing option (i.e., realizing losses but deferring gains) is positively associated with its market value.

5.2 Robust tests

First, I measure effective tax rate as tax payable over pre-tax income, which is called
GAAP measurement. Tax payable includes both current and future tax payable, and can be collected on income statement. The results do not change qualitatively.

Second, I measure realized losses and unrealized gains as the sum of the actual amount of realized losses (absolute value) and the unrealized gains, deflated by revenue (to control for size effect). The results do not change qualitatively.

Third, I delete 17 observations with ETR outside [0,1]. The results do not change qualitatively.

Finally, I add year dummy to the market valuation model to control for potential year effects since global economy slowed down in 2008 due to the U.S. financial crisis. The results do not change qualitatively.

5.3 Supplementary tests

To further investigate either realized losses or unrealized gains or both contribute to tax savings and firm market value, I separate $RL\&UG$ into two variables $RL$ and $UG$ in regression models 9 and 10. The results are presented in Tables 6 and 7. It is shown that unrealized gains significantly contribute to tax saving and the increase of firm market value. On the other hand, realized losses also save tax and increase firm market value. However, the results are not statistically significant. One reason why realized losses are not significant is due to the fact that some firms do not provide data about realized losses from derivatives. Those firms generally combine realized losses with other expenses; for example, some firms combine losses from interest rate swaps with interest expenses.
6. Summary and conclusion

While it is well known that firms use derivative financial instruments to manage risk, reduce agency costs and other transaction costs, this study shows that firms also use these financial instruments for saving taxes and hence enhancing market value.

When the tax rules are based on realization, realizing losses immediately but deferring gains indefinitely (i.e., tax-timing option) is one of many tax-trading strategies for firms to save taxes.

In this paper develops, an analytical framework is developed to show that firms can exploit the tax-timing option through the use of derivatives. It also develops a modified firm valuation model showing that the tax-timing option increases firm market value.

In addition, this paper provides empirical tests, which generally support the theoretical conclusion. The empirical tests using data from large Canadian public companies shows that a firm’s realized losses or unrealized gains from using derivatives are negatively associated with its effective tax rate. It also shows that a firm’s realized losses or unrealized gains from using derivatives are positively associated with its market value.

However, this study simplifies the model by separating the intrinsic firm market value from the tax-timing option value. In a more general framework, the tax-timing option value should be subsumed in the firm market value and the firm market value will be determined endogenously.
Table 1. Sample selection

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSX60</td>
<td>310</td>
</tr>
<tr>
<td>Less: Financial firms</td>
<td>(50)</td>
</tr>
<tr>
<td>Less: Income trusts</td>
<td>(25)</td>
</tr>
<tr>
<td>Less: Audited financial statements not available on SEDAR</td>
<td>(2)</td>
</tr>
<tr>
<td></td>
<td>233</td>
</tr>
<tr>
<td>Less: negative pre-tax income</td>
<td>(10)</td>
</tr>
<tr>
<td>Sample observations</td>
<td>223</td>
</tr>
</tbody>
</table>
Table 2. Descriptive statistics of dependent and independent variables

The sample contains 223 observations for the years of 2007 to 2011. Table 2 entries include the mean, median, 1st quartile, 3rd quartile, standard deviation, maximum, and minimum values.

<table>
<thead>
<tr>
<th></th>
<th>MEAN</th>
<th>1ST QU</th>
<th>MEDIAN</th>
<th>3RD QU</th>
<th>STDEV</th>
<th>MAX</th>
<th>MIN</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ETR</strong></td>
<td>0.2226</td>
<td>0.1045</td>
<td>0.2044</td>
<td>0.2982</td>
<td>0.1853</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td><strong>RL&amp;UG</strong></td>
<td>0.5157</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0.5009</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td><strong>SIZE</strong></td>
<td>4.0169</td>
<td>3.7271</td>
<td>4.1260</td>
<td>4.3592</td>
<td>0.4755</td>
<td>4.8738</td>
<td>2.2014</td>
</tr>
<tr>
<td><strong>LEV</strong></td>
<td>0.2023</td>
<td>0.0784</td>
<td>0.1919</td>
<td>0.3123</td>
<td>0.1423</td>
<td>0.5465</td>
<td>0</td>
</tr>
<tr>
<td><strong>INV</strong></td>
<td>0.0629</td>
<td>0.0105</td>
<td>0.0356</td>
<td>0.0817</td>
<td>0.0782</td>
<td>0.3449</td>
<td>0</td>
</tr>
<tr>
<td><strong>FIX</strong></td>
<td>0.4767</td>
<td>0.2752</td>
<td>0.4895</td>
<td>0.7250</td>
<td>0.2795</td>
<td>0.9388</td>
<td>0</td>
</tr>
<tr>
<td><strong>ROA</strong></td>
<td>0.0751</td>
<td>0.0383</td>
<td>0.0604</td>
<td>0.0893</td>
<td>0.0541</td>
<td>0.3410</td>
<td>-0.0047</td>
</tr>
<tr>
<td><strong>MB</strong></td>
<td>2.6287</td>
<td>1.4761</td>
<td>2.1026</td>
<td>3.0835</td>
<td>2.2263</td>
<td>25.285</td>
<td>0.2637</td>
</tr>
<tr>
<td><strong>BOOK</strong></td>
<td>0.5017</td>
<td>0.3657</td>
<td>0.4883</td>
<td>0.6436</td>
<td>0.1839</td>
<td>0.9241</td>
<td>0.02812</td>
</tr>
<tr>
<td><strong>VAL</strong></td>
<td>35.86</td>
<td>21.33</td>
<td>34.6</td>
<td>45.1</td>
<td>19.02</td>
<td>112.6</td>
<td>3.52</td>
</tr>
</tbody>
</table>

**ETR**: effective tax rate, measures as cash tax paid over pre-tax income

**RL&UG**: dummy variable, equal to 1 if there are net realized losses (i.e., realized losses net of realized gains), or net unrealized gains (i.e., unrealized gains minus unrealized losses) from derivatives, and 0 otherwise

**SIZE**: firm size, measured as log of total assets

**LEV**: leverage, measured as the sum of short and long term debts over total assets

**FIX**: capital intensity, the ratio of fixed assets to total assets

**INV**: inventory intensity, the ratio of inventory to total assets

**ROA**: return on assets, measured as profit over total assets

**MB**: market to book ratio, measured as shareholders’ equity over market value. Market value is equal to year-end share price multiplied by number of shares outstanding at the end of the year

**BOOK**: book value, measured as shareholders’ equity deflated by total assets

**VAL**: share price at the fiscal year end
Table 3. Pearson correlation matrix of dependent and independent variables

The sample contains 223 observations for the years of 2007 to 2011. Table 2 shows the Pearson correlations of the dependent and independent variables.

<table>
<thead>
<tr>
<th></th>
<th>ETR</th>
<th>RL&amp;UG</th>
<th>SIZE</th>
<th>LEV</th>
<th>INV</th>
<th>FIX</th>
<th>ROA</th>
<th>MB</th>
<th>BOOK</th>
<th>VAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>ETR</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RL&amp;UG</td>
<td>-0.172</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SIZE</td>
<td>-0.014</td>
<td>0.262</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LEV</td>
<td>-0.202</td>
<td>0.1866</td>
<td>0.4426</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INV</td>
<td>0.0847</td>
<td>0.0516</td>
<td>-0.2241</td>
<td>-0.2089</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FIX</td>
<td>-0.0346</td>
<td>0.1438</td>
<td>0.3630</td>
<td>0.1398</td>
<td>-0.3157</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ROA</td>
<td>-0.0808</td>
<td>-0.0498</td>
<td>-0.2719</td>
<td>-0.3624</td>
<td>0.1187</td>
<td>-0.0539</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MB</td>
<td>-0.0286</td>
<td>-0.0381</td>
<td>-0.2367</td>
<td>-0.1706</td>
<td>0.1664</td>
<td>-0.1337</td>
<td>0.3694</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BOOK</td>
<td>0.0828</td>
<td>-0.1009</td>
<td>-0.5302</td>
<td>-0.7978</td>
<td>0.0167</td>
<td>-0.1158</td>
<td>0.3702</td>
<td>0.0672</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>VAL</td>
<td>-0.022</td>
<td>0.1536</td>
<td>0.1645</td>
<td>0.0701</td>
<td>0.0098</td>
<td>0.0813</td>
<td>0.1693</td>
<td>0.2676</td>
<td>-0.021</td>
<td>1</td>
</tr>
</tbody>
</table>

**ETR**: effective tax rate, measures as cash tax paid over pre-tax income  
**RL&UG**: dummy variable, equal to 1 if there are net realized losses (i.e., realized losses net of realized gains), or net unrealized gains (i.e., unrealized gains minus unrealized losses) from derivatives, and 0 otherwise  
**SIZE**: firm size, measured as log of total assets  
**LEV**: leverage, measured as the sum of short and long term debts over total assets  
**FIX**: capital intensity, the ratio of fixed assets to total assets  
**INV**: inventory intensity, the ratio of inventory to total assets  
**ROA**: return on assets, measured as profit over total assets  
**MB**: market to book ratio, measured as shareholders’ equity over market value. Market value is equal to year-end share price multiplied by number of shares outstanding at the end of the year  
**BOOK**: book value, measured as shareholders’ equity deflated by total assets  
**VAL**: share price at the fiscal year end
Table 4. Results from regression on the association between tax-timing option and tax aggressiveness

Regression model:

\[ ETR_n = \gamma_0 + \gamma_{RL\&UG} + \sum k \mu_k CONTROL_n + (Industry \text{ dummies}) + \varepsilon_n \]

| Parameter   | Est value | St dev  | t student | Prob(>|t|) |
|-------------|-----------|---------|-----------|------------|
| Intercept   | 0.14125   | 0.132547| 1.06566   | 0.28779    |
| RL&UG       | -0.0714   | 0.025977| -2.74857*** | 0.006502   |
| SIZE        | 0.042444  | 0.033673| 1.260465  | 0.208887   |
| LEV         | -0.28867  | 0.110232| -2.61871*** | 0.009463   |
| INV         | 0.064492  | 0.183932| 0.350627  | 0.726217   |
| FIX         | -0.0203   | 0.053085| -0.3825   | 0.702477   |
| ROA         | -0.54545  | 0.25125 | -2.17095** | 0.031045   |
| MB          | 0.001275  | 0.005885| 0.216679  | 0.828667   |

Residual St dev 0.175974
R2 0.139064
R2(adj) 0.098454
F 3.424364
Obs 223

*** significant at 0.01 level; ** significant at 0.05 level and * significant at 0.1 level based on two-tailed t-test

RL&UG: dummy variable, equal to 1 if there are net realized losses (i.e., realized losses net of realized gains), or net unrealized gains (i.e., unrealized gains minus unrealized losses) from derivatives, and 0 otherwise
SIZE: firm size, measured as log of total assets
LEV: leverage, measured as the sum of short and long term debts over total assets
FIX: capital intensity, the ratio of fixed assets to total assets
INV: inventory intensity, the ratio of inventory to total assets
ROA: return on assets, measured as profit over total assets
MB: market to book ratio, measured as shareholders’ equity over market value. Market value is equal to year-end share price multiplied by number of shares outstanding at the end of the year
Table 5. Results from regression on the association between tax-timing option and Firm market value

Regression model:

\[ VAL_{it} = \beta_0 + \beta_1 RL & UG_{it} + \beta_2 BOOK_{it} + \beta_3 ROA_{it} + \epsilon_{it} \]

| Parameter  | Est value | St dev  | t student | Prob(>|t|) |
|------------|-----------|---------|-----------|------------|
| Intercept  | 31.59492  | 4.006608| 7.885703 | 1.47E-13   |
| RL&UG      | 5.913362  | 2.500451| 2.364918**| 0.018908   |
| BOOK       | -8.48067  | 7.322859|-1.15811  | 0.248081   |
| ROA        | 72.93868  | 24.79946| 2.94114***| 0.003621   |
| Residual St dev | 18.56367 |         |           |            |
| R2         | 0.060731  |         |           |            |
| R2(adj)    | 0.047864  |         |           |            |
| F          | 4.719994  |         |           |            |
| Prob(>F)   | 0.003263  |         |           |            |

*** significant at 0.01 level; ** significant at 0.05 level and * significant at 0.1 level based on two-tailed t-test

RL&UG: dummy variable, equal to 1 if there are net realized losses (i.e., realized losses net of realized gains), or net unrealized gains (i.e., unrealized gains minus unrealized losses) from derivatives, and 0 otherwise

BOOK: book value, measured as shareholders’ equity deflated by total assets

ROA: return on assets, measured as profit over total assets
Table 6. Results from regression on the association between tax-timing option and tax aggressiveness

| Parameter | Est value | St dev  | t student | Prob(>|t|) |
|-----------|-----------|---------|-----------|-----------|
| Intercept | 0.152824  | 0.133355| 1.145992  | 0.253096  |
| RL        | -0.01782  | 0.028219| -0.6316   | 0.528331  |
| UG        | -0.05905  | 0.027071| -2.18141**| 0.030258  |
| SIZE      | 0.038611  | 0.033862| 1.140248  | 0.255476  |
| LEV       | -0.29688  | 0.110986| -2.67493***| 0.00806  |
| INV       | 0.000387  | 0.18693 | 0.002068  | 0.998352  |
| FIX       | -0.02199  | 0.053708| -0.40939  | 0.682667  |
| ROA       | -0.5471   | 0.253038| -2.16215**| 0.031732  |
| MB        | 0.001104  | 0.005934| 0.18606   | 0.852577  |

Residual St dev 0.177154
R2 0.131593
R2(adj) 0.086321
F 2.906701
Obs 223

*** significant at 0.01 level; ** significant at 0.05 level and * significant at 0.1 level based on two-tailed t-test

RL: dummy variable, equal to 1 if there are net realized losses (i.e., realized losses net of realized gains) from derivatives, and 0 otherwise
UG: dummy variable, equal to 1 if there are net unrealized gains (i.e., unrealized gains minus unrealized losses) from derivatives, and 0 otherwise
SIZE: firm size, measured as log of total assets
LEV: leverage, measured as the sum of short and long term debts over total assets
FIX: capital intensity, the ratio of fixed assets to total assets
INV: inventory intensity, the ratio of inventory to total assets
ROA: return on assets, measured as profit over total assets
MB: market to book ratio, measured as shareholders’ equity over market value. Market value is equal to year-end share price multiplied by number of shares outstanding at the end of the year
Table 7. Results from regression on the association between tax-timing option and Firm market value

| Parameter | Est value | St dev | t student | Prob(>|t|) |
|-----------|-----------|--------|-----------|-----------|
| Intercept | 31.14705  | 3.949118 | 7.887091 | 1.48E-13 |
| BOOK      | -8.63886  | 7.308665 | -1.182   | 0.238492 |
| ROA       | 75.13018  | 24.69036 | -3.042895*** | 0.002631|
| RL        | 3.596161  | 2.828529 | 1.271389 | 0.204945 |
| UG        | 6.329103  | 2.586598 | 2.446883** | 0.015201|
| Residual St dev | 18.46853 |    |          |           |
| R2        | 0.074579  |        |          |           |
| R2(adj)   | 0.057598  |        |          |           |
| F         | 4.392094  |        |          |           |
| Obs       | 223       |        |          |           |

*** significant at 0.01 level; ** significant at 0.05 level and * significant at 0.1 level based on two-tailed t-test

RL&UG: dummy variable, equal to 1 if there are net realized losses (i.e., realized losses net of realized gains), or net unrealized gains (i.e., unrealized gains minus unrealized losses) from derivatives, and 0 otherwise

BOOK: book value, measured as shareholders’ equity deflated by total assets

ROA: return on assets, measured as profit over total assets
Reference


Zeng, T., Ownership Concentration, State Ownership and Effective Tax Rates: Evidence from