

IS THERE A TAX-INDUCED JANUARY EFFECT IN THE CANADIAN EQUITY OPTIONS MARKET ?

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Abstract

The Canadian tax code stipulates that the granting (short-sale) of an exchange traded equity option constitutes a taxable transaction. Under these peculiar regulations, a Canadian *investor* that writes a call/put option must declare the premium received as a capital gain in the year in which the option was granted. We show that this tax regulation induces investors to liquidate their short positions before the end of the tax-year regardless of whether there is an unrealized profit or loss on the option transaction. We test, and substantiate, this novel hypothesis by empirically examining the change in Open Interest on the Toronto Stock Exchange towards the beginning and end of the tax-year. In sharp contrast to Canada, the U.S. Internal Revenue Service does not tax equity option premia until the position is closed. Indeed, an empirical analysis of the open interest on the Chicago Board Options Exchange does not reveal the seasonal pattern exhibited in the Canadian market. We take this as further evidence for our proposition.

1 Introduction.

In an attempt, perhaps, to decrease the incidence of tax-arbitrage opportunities, the Canadian tax authorities have legislated that the granting (short-sale) of an exchange traded equity option constitutes a taxable transaction. Under these peculiar regulations, a Canadian investor (as opposed to trader or dealer) who writes a call/put option must declare the premium received as a capital gain in the year in which the option was granted. Subsequently, if and when the position is liquidated, the investor should report the funds used to close the transaction as a capital loss. If, on the other hand, the option is exercised, the original premium is added to the exercise proceeds in order to reduce the adjusted cost base of the underlying security.

We claim that these regulations create a situation whereby, regardless of whether there is an unrealized profit or loss on the option transaction, it is *never* optimal for a Canadian investor to maintain an open short position beyond tax-year boundaries. In other words, the tax code induces Canadian investors to liquidate their short positions at the end of the calendar-year. Subsequently, the investor can re-short the option at the beginning of the next calendar-year and experience an aggregate gain in all states of nature. This proposition will be demonstrated with the aide of a simple algebraic model.

We test, and substantiate, this novel hypothesis by empirically examining the change in Open Interest on the Toronto Stock Exchange towards the beginning and end of the calendar-year. In fact, there is a notable decrease in open interest towards the end of the calendar-year, likewise there is a significant increase in open interest at the beginning of the calendar-year. This phenomena is consistent with the supposition that Canadian investors will either close, or refrain from opening, short option positions towards the end of the calendar-year.

In sharp contrast to Canada, the U.S. Internal Revenue Code does not tax equity option premia until the position is terminated. Consequently, in the U.S. market, there is no motivation to liquidate open positions prior to the end of the year. Indeed, an empirical examination of the open interest on the Chicago Board Options Exchange does not reveal the seasonal pattern exhibited in the Canadian market. We take this as further evidence for our proposition. It therefore appears that this particular Canadian tax regulation distorts the capital markets to

the point at which any projected revenue augmentation is entirely eliminated.

The remainder of this paper is organized as follows. In section 2 we will present a brief literature review of the work that has been done regarding the effect of tax regulations on the options market. Then, in section 3, we will (attempt to) summarize the relevant tax regulations. In section 4 we create a rudimentary algebraic model in which we illustrate the sub-optimality of holding an open short option position at year end. The statistical evidence from the Canadian options market (T.S.E.) will be displayed in section 5 together with its counterpart in the U.S. (CBOE) options market. We conclude with a discussion and summary of our results in section 6, where we ultimately suggest directions for further research. (All statistical figures and tables that are referenced in the text, appear at the end of the paper.)

2 Literature Review:

Scholes [?] used quantitative reasoning similar to that used in the celebrated Black and Scholes formula, to derive the equilibrium price of a call option in a world with taxes. The resulting differential equation for the price of the call with taxes is identical to the differential equation derived for the price of a call option on a dividend yielding stock. However, in place of the dividend yield there is a constant, representing the marginal tax rate on capital gains multiplied by the risk free rate. His model demonstrated that, *ceteris paribus*, higher tax brackets would create lower option prices. Scholes mentioned that hedge ratios will be higher than they are in a no tax world because the tax authorities share in the risk of the option position by allowing losses to be tax deductible.

Scholes realized that due to the multitude and unknown distribution of tax brackets inhabiting the marketplace, it would be impossible to determine the exact price at which options would sell. He rationalized the seemingly illogical heavy volume in the options market as being a direct result of the tax benefits.

Heaton [?] calculated the average tax-adjusted risk free interest rate implicit in call option prices in order to locate the marginal investor who would be indifferent between transacting in the options market, as opposed to the leveraged underlying security. His empirical results confirm that option prices reflect the marginal tax bracket at the highest

end of tax system.

Scholes did not address the issue of liquidating positions in order to avoid a tax liability, probably, because he was not aware of the particulars of the Canadian tax code. In fact, continuing Scholes line of thought, *ceteris paribus*, higher capital gains taxes will most likely induce *more* investors to liquidate their short option positions before year end.

A subsequent article by Constantinides and Scholes [?], continued the theme of tax-arbitrage in the options market. They observed the institutional features of the exchange traded options market and recognized that a losing option position can be closed without a symmetric gain recognition by the individual on the other side of the transaction. A contract buyer is not matched with a contract seller, but rather, the clearinghouse is the counterpart to both transactions. This results in a net tax gain at the expense of the government; quite different from a transaction between two taxpayers where one's tax loss is the other's tax gain. Constantinides and Scholes [?] focused on the ability to defer paying any capital gains by building a portfolio of equity options that establishes a loss with an equal but opposite gain. The option loss would be realized in one tax year (to offset different capital gains), while the option gain could be realized in the next tax year. Continuing with this (pyramid) scheme, one could defer all capital gains until death. The current applicability of this option strategy is questionable in light of the stringent *wash sale* and *offsetting position* rules that the U.S. tax authorities apply to such transactions. In the U.S., the above mentioned unrealized loss would not be deductible due to the offsetting gain in the profitable position.¹ Such strategies may be one of the reasons that the Canadian authorities tax the option premium in the year in which it is received.

Constantinides [?] continued with the theme of capital gains deferral, however he concentrated on the tax-timing option that is embedded in the American tax code. Capital gains (for financial assets other than Section 1256 contracts) are taxed upon realization. Furthermore, at the time he wrote the paper (early 1980's in the U.S.), short-term capital

¹Excluding equity options and legitimate business hedges, current tax rules in the U.S. require that all options, as well as commodity futures, (referred to as: Section 1256 contracts), be marked to market at the end of the tax year. Both losses and gains are forcefully realized, rendering the Constantinides and Scholes strategy obsolete. See [?] for details.

gains were taxed higher than long-term capital gains.² Therefore, a taxpayer has the valuable option to realize capital losses immediately and defer capital gains. Constantinides further proved a counter-intuitive result, using an intertemporal equilibrium model, that it is sometimes optimal to realize a long-term capital gain and then repurchase the asset. This so as to re-establish its short-term basis and then, if the price declines, use the loss at the higher short-term rate.

Dammon, Dunn and Spatt [?] empirically examine the value of tax trading in the above scenario and find that the cost of realizing capital gains each year outweighs the advantage from re-starting the short term holding period. Hence they question the magnitude of Constantinides [?] tax-sale savings. Nevertheless, we will show that for a Canadian investor in the equity option market, it is always optimal to liquidate and re-establish the basis of the position, regardless of whether there is an unrealized gain or loss.

Constantinides and Ingersoll [?] investigated the American tax system and its effect on the optimal trading of bonds. They built a model that incorporates capital loss realization, capital gains deferment, the distinction between short-term and long-term capital gains, transaction costs and the amortization of premiums. The theoretical value of a bond, assuming that investors utilize this optimal trading policy, differs substantially from the value obtained assuming that there are no *buy and hold* arbitrage opportunities. We believe (but leave for further research) that by adopting the Constantinides and Ingersoll [?] methodology, we will find that the value of a (Canadian) call option, in tax induced equilibrium, will differ from what standard option pricing theory implies.

We have attempted to survey the assorted strands of literature pertaining to the financial market implications of equity option taxation. We will now present a brief summary of the relevant Canadian regulations.

3 The Tax Environment:

Within the context of personal income taxation of financial securities, the Canadian Income Tax Act differentiates between *traders* and *investors* for the purpose of determining the classification of remuneration

²In Canada there is no distinction between short and long-term capital gains.

earned. A *trader*, as interpreted by Revenue Canada³, is an individual whose whole *course of conduct* indicates the carrying on of a business or an *adventure or concern in the nature of trade*. Factors that are considered when trying to ascertain *course of conduct* include, but are not limited to, frequency of transaction turnover, knowledge of securities markets, time spent studying the securities markets, sophistication of trading methodology, financing procedures and other operating similarities to professional dealers in securities. Therefore, an individual that exhibits the characteristics of a professional trader will be classified as a generic *trader* and will be taxed accordingly. On the other hand, an individual whose behaviour does not exhibit the mannerisms of a professional trader, will be classified as an *investor*.

The theoretical distinction between *trader* and *investor* exists under the American Internal Revenue Code. The I.R.S. classification of *investor* is wider than the Canadian classification of *investor*. Revenue Canada's *trader*, can include full-time doctors, lawyers and engineers provided that their trading activities are sophisticated enough to indicate an *adventure or concern in the nature of trade*. Hence it is conceivable, that tax payers that are classified as *investors* in the U.S., would be classified as *traders* in Canada.

This paper is concerned with the tax regulations pertaining to an *investor*. As a general rule, a Canadian *investor* will have all proceeds (net of allowable expenses), from the disposition of financial assets, taxed as capital gains/capital losses, at the time of disposition.⁴ Currently in Canada, only 75% of capital gains (or losses) will be taxed. Thus, for example, an investor in the 35% federal marginal tax bracket, will pay $\$100 \times (.75) \times (.35) = \26.25 for every \$100 in capital gains.

The Canadian tax authorities view the writing (granting) of an exchange-traded equity option by an *investor* as the sale of an asset whose *adjusted cost base, immediately before the grant, is nil*.⁵ This means that the writer undergoes an immediate capital gains tax liability corresponding to the premium received for the granting of the option. The net tax liability will be a function of the writer's tax bracket as well as the proportion of net capital gains that is taxable. Subsequently, if the option expires worthless, the writer undergoes no further tax liabil-

³See Revenue Canada Interpretation Bulletin IT-479R.

⁴Special rules apply to discount debt instruments which must be amortized on a yearly basis.

⁵Canadian Income Tax Act, Section 49(1).

| Position: | Tax Liability (at end of:) | |
|------------------|--|---|
| | Initial Year | Subsequent Year |
| Closed | <i>Capital Gains Netting Profit/Loss</i> | <i>New Premium Capital Loss</i> |
| Exercised | <i>Strike Price with Premium Considered Sale Proceeds (C.G.)</i> | <i>Premium (Retroactive) and Strike Price as Sale Proceeds (C.G.)</i> |
| Expired | <i>Capital Gains</i> | <i>None</i> |
| Held | <i>(Temporary) Capital Gains</i> | <i>None</i> |

Figure 1: Canadian Investor – Short Call

ity. If the writer decides to close the position with the purchase of an identical option, the price paid for closing the position will be considered a deductible expenditure and treated as a capital loss.

If, on the other hand, a call option is exercised and the grantor is forced to deliver the underlying stock, then the grantor must include the original premium received for the option together with the strike price as part of the sale proceeds, when calculating the profit/loss from the disposition of the stock. In the case of a put, the grantor is forced to buy the underlying security, and will include the original premium plus the strike price in the adjusted cost base of the security.

The grantor (seller) can then go back and amend his/her tax return for the year in which the option was granted and remove the option premium from capital gains proceeds.⁶ If an amended return is filed, the option writer is entitled to the principal and interest corresponding to the sum that was retroactively eliminated from the earlier tax return.

⁶Canadian Income Tax Act, Section 49(4). Interpretation Bulletin No. IT-479R paragraph 29.

⁷ Of course, if the writing and the subsequent exercise, expiry or sale take place in the same tax year, there will be no need for an amended return.

On the other hand, in the U.S., the granting of an exchange-traded equity option by an *investor*, induces no immediate tax liability. The writer of the option should carry the premium in a deferred account until the writer's obligation is terminated. Only when position is closed, the option is exercised or the option expires, can the taxpayer determine whether indeed there are any tax consequences to the transaction.⁸

If the option expires worthless, in the U.S., the premium becomes a short-term capital gain: it is short-term, and taxes are due at the time of expiration, regardless of the amount of time that has elapsed since the original granting of the option. If the writer decides to close the position with the purchase of an identical option, the price paid for closing the position will be deducted from the original premium received in order to obtain a net gain/loss that will be taxed as short-term capital gains/loss. If the equity option is exercised and the grantor (seller) is forced, in the case of a call, to deliver the underlying stock at the strike price, then the grantor must include the original premium received for the option as part of the sale proceeds of the stock and the corresponding gain/loss on the disposition of the stock will be long/short-term depending on the holding period of the stock.⁹ In the case of a put, the grantor is forced to purchase the stock at the strike price and must deduct the premium received in computing the adjusted cost basis of the stock. The holding period for the stock starts on the date of exercise.¹⁰

4 Model of the Tax System:

In this section we will discuss the optimality of closing *all* short call/put option positions before year end.

Let y_0 denote the price of the option at $t = 0$. It is the amount of money that the option writer receives at time zero for granting the option. Likewise, let y_1 denote the price of the option at $t = 1$, an instant

⁷There is no time limit to this reassessment period. Interpretation Bulletin No. IT-384R.

⁸U.S. Revenue Ruling 58-234, 1958-1 Cumulative Bulletin page 283.

⁹The holding period of the delivered stock will depend on whether the option was a *qualified covered call*.

¹⁰U.S. Internal Revenue Code, Section 1234(b)(1).

before the end of the tax-year. (Closing price on December 31st.) For the sake of the argument and without any loss of generality let's assume that the price of the option at time $t = 1$ can either be higher or lower than the price at which it was originally sold for.¹¹ Thus, let y_1^u denote the market price of the option, at the end of the year, when it has gone up in price. (The short position is exhibiting a loss.) Also, let y_1^d denote the market price of the option, at the end of the year, when it has gone down in price. (The short position is exhibiting a gain.) Finally, let τ_g denote the Canadian investors marginal tax bracket on capital gains. (See Table 1 for details.)

At the end of the year, if the position is left open, the investor will undergo a tax liability of $y_0\tau_g$, regardless of the options price. This corresponds with the tax on the premium.

However, when the option position is closed right before the end of the year, the tax situation will be as follows. If the market price of the option is y_1^d , there will be a net gain of $y_0 - y_1^d$ on the position, which induces a tax liability of $(y_0 - y_1^d)\tau_g$, this will always be less than the corresponding tax liability if the position were left open. If, on the other hand, the market price of the option is y_1^u , there will be a net loss of $y_1^u - y_0$ on the position which is deductible against other capital losses and implicitly results in a tax refund of $(y_1^u - y_0)\tau_g$.

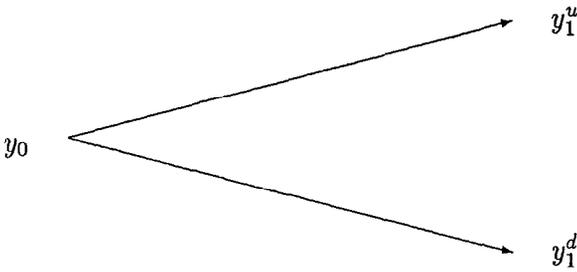
Thus, we see that regardless of which state of nature occurs, it is always optimal for the Canadian investor to liquidate their short option position prior to the end of the tax-year.¹² (See table 1.)

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¹¹For the sake of accuracy, we could include a third state of nature in which the price of the option at time $t = 1$ is exactly equal to y_0 . However, this would not change the results at all, as is evident from the ensuing argument.

¹²Unless, of course, $y_1^d = 0$, in which case the investor is indifferent.

¹³Of course, in a world with discrete trading, there is a certain amount of risk involved in closing the position and then re-opening it. The risk is that the price of the option will decline (between the two periods) and thus the option writer will receive a diminished premium. However, via simulations we realized that the magnitude of this risk is very small compared to the tax liability. Indeed, in a binomial world, the movement of the price of the option over one period is minimal. An additional point that must be considered is the transaction cost of closing and then opening the position. However, today it is not uncommon for option traders to pay a flat annual fee regardless of the volume of trading.



| Position: | Tax Liability/Refund Cash Flow at Year End: | |
|-----------|---|----------------------------|
| | Up State | Down State |
| Closed | $(y_1^u - y_0)\tau_g$ | $-y_0\tau_g + y_1^d\tau_g$ |
| Held | $-y_0\tau_g$ | $-y_0\tau_g$ |

Table 1: Tax Matrix.

5 Statistical Evidence:

If, indeed, it is always optimal for Canadian investors to close their short equity option positions before year end, then logic would dictate that there should be evidence of this behaviour in the actual market place. We postulate that the aggregate open interest in the options market is the natural place to look for such activity. As the year comes to an end, the open interest in the options market should display a noticeable decrease as previously open positions are closed in anticipation of the tax consequences. Also, investors will defer from writing options until the beginning of next year in order to save on the time value of money emanating from any tax liability. An investor (especially in a high tax

bracket) contemplating the short-sale of an option in the month of December, is much better-off postponing such an activity until January. Therefore, we also believe that at the beginning of the tax year we will observe a significant increase in open interest, stemming from those investors who either closed, or deferred, their short option positions towards the end of the previous tax-year.

Table 2 exhibits the end of month open interest and percentage change in open interest for equity options traded on the Toronto Stock Exchange and cleared through Trans Canada Options Inc.¹⁴ Data from the T.S.E. was chosen as a proxy for the Canadian market as a whole because it represents the majority of equity options traded on Canadian exchanges. Figure 2 is a graphical representation of the data in Table 2. A visual inspection of Figure 2 will confirm the strong growth in open interest (and implicit volume) during the period spanning 1976 to 1980. At the start of 1981 open interest stabilized in the 200 to 300 thousand region and remains there (approximately) to this date. We therefore decided to initiate our *statistical* analysis from the year 1981 and onward. Thus, the data would not be contaminated by the exceptional development in the options market during its first few years.

Figure 3 is a graphical representation of the average monthly change in Open Interest from 1981 to 1994. Indeed, it appears that open interest tends to decrease (on average) towards the end of the year and then increase (on average) at the beginning of the year. In particular, November and December undergo the largest decrease in open interest throughout the whole year, likewise, January and March experience the largest monthly increase in open interest.

Table 3 displays a statistical summary and hypothesis test of the change in monthly open interest during the period 1981 to 1994. The Null Hypothesis that the average monthly change in open interest is zero, must be rejected (at the ten percent alpha level) for the months of January, March, November and December. Figure 4 is a graphical display of the P-values for the above mentioned null hypothesis. An additional hypothesis (equality of means) test was conducted which assumed, for the null, that the average population change in open interest in the first three months of the year, is identical to the average population change in open interest for the last three months of the year. This

¹⁴Source: The T.S.E. Review 1976-1994, includes standard equity options as well as TSE35 index options and LEAPS.

null hypothesis was rejected at the five percent alpha level.¹⁵

This perceptible phenomena is consistent with our proposition that Canadian investors close, or refrain from opening, short equity option positions towards year end. Also, the above serves as evidence that *ceteris paribus* Canadian investors prefer to open their equity option positions at the beginning of the year in order to avoid paying tax on the premium.¹⁶

As a means for comparison, we inspected the open interest on the Chicago Board Options Exchange. Table 4 exhibits the end of month open interest and percentage change in open interest for equity options traded on the CBOE and cleared through the Option Clearing Corporation.¹⁷ Figure 5 is a graphical representation of the data in Table 4. Figure 6 displays the average monthly change in CBOE open interest during the entire period 1978 to 1993. In the year 1985, the CBOE changed the structure of expiration cycles. Up to that year, all equity options were on a strict quarterly system in which options on any particular stock were traded with four monthly maturities during the year. After 1985, the current and next month were added to each options series. Thus, we include Figure 7, which only displays the change in open interest from the year 1985 to 1993, for the sake of thoroughness.¹⁸

In sharp contrast to the data from the T.S.E., open interest does not decline in the month of December nor does it increase in the month of January. This is consistent with the fact that there are no *tax advantages* to closing out option positions prior to the end of the tax year.¹⁹

¹⁵Note: These hypothesis tests were all built on the underlying parametric assumption of Gaussian error terms.

¹⁶An alternative rationalization of the systematic changes in open interest might be the natural cycle for option expiration. However, there is no *a priori* reason to believe that options are more likely to expire in December than they are in January. In fact, if anything, the exact opposite is true. Options are more likely to expire in January. Also, why should that impact open interest? When one series is terminated another one is initiated.

¹⁷Source: The CBOE 1978-1993. Monthly data was not available for years prior to 1978. Data from the CBOE was chosen as a proxy for the U.S. market.

¹⁸It is quite possible that the CBOE data prior to the year 1985 will not be indicative of any tax-induced phenomena. Exxon, IBM and Kodak are among the (large volume) options that have January maturity cycles and hence could have influenced the pre-1985 results.

¹⁹In fact, in the U.S. there is a clear *tax disadvantage* to closing out an equity option position during the month of December, because it induces a tax liability on realized gains. Rather, it is optimal to defer closing the position until the month of January

From a statistical point of view (as in Canada), an hypothesis (equality of means) test was conducted which assumed, for the null, that the average population change in open interest in the first three months of the year, is identical to the average population change in open interest for the last three months of the year. This null hypothesis could not be rejected at *any* reasonable confidence level. Hence we conclude that U.S. investors do not prefer to liquidate their short option positions at year end. (Indeed there is no reason too.)²⁰

6 Discussion and Conclusion:

We have argued and empirically demonstrated that the Canadian Income Tax Act forces investors to liquidate their short equity option positions prior to the end of the tax year. This holds true regardless of whether the position exhibits an unrealized gain or loss.

If so, we are now confronted with the paradox of why the open interest in the Canadian options market does not go to *zero* in December. Who would hold an open short option position at year-end when they could be better off by liquidating?

We have a few possible answers to this question. First, as we mentioned at the beginning of this paper, from a tax point of view there is another participant in the options market, namely the Canadian *trader*. The Canadian trader does not have to pay taxes on the option premium until the position is closed, hence, the trader has no incentive to close the position prematurely. Thus, assuming rationality of all economic participants, we are tempted to conclude that Canadian investors close their short positions prior to year end, while Canadian traders, being indifferent to the tax implications, leave them open. However, due to the large proportion of retail investors that are believed to be playing the options market, we must stop short of proclaiming that the aggregate change in open interest can serve as a proxy (by computing the ratio of closed positions) for the marginal agent in the Canadian equity options market.

so as to delay the tax liability for an additional year.

²⁰There does, however, appear to be high variability in changes in open interest during the year, on the CBOE. This variability may be attributable to the expiration of certain option series (triple witching hour), or other unexplained reasons. In fact, from a strict statistical view point, we must reject the null hypothesis that the average population change in open interest is zero, for eight out of twelve months of the year.

A more controversial and perhaps qualitative rationalization was gleaned by talking to market participants and tax practitioners. We offer as anecdotal evidence that apparently very few investors are (consciously) aware of the tax regulations pertaining to equity option premia. Canadian income tax returns offer no specific line in which to report open option positions. In addition, Canadian brokerage firms do not report any open positions (as opposed to realized profits and losses) to the provincial and federal authorities. Also, since there is no distinction between short and long term capital gains in the Canadian Income Tax Act, the tax authorities have never developed a bureaucratic awareness for holding periods, therefore, we believe that they have no way of verifying when an option position was opened.

The effect of tax regulations on the equilibrium market price of an equity option, remains an open question in light of these and other distinctive attributes of the Canadian Income Tax Act. We leave this for further research.

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