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Journal of Small Business Finance

Provided in Cooperation with:
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Suggested Citation: Rhee, Thomas A. (1991) : Tax Effects on the Value of Incentive Stock Options (ISOs) and the Decision to Go Public, Journal of Small Business Finance, ISSN 1057-2287, JAI Press, Greenwich, CT, Vol. 1, Iss. 2, pp. 101-113

This Version is available at:
https://hdl.handle.net/10419/114630

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Tax Effects on the Value of Incentive Stock Options (ISOs) and the Decision to Go Public

Thomas A. Rhee

The incentive stock options (ISOs) are similar to the regular stock call options. However, when one considers various taxing laws regarding the ISO stocks, the ISOs have unique features differentiated from the regular stock call options. In general, no income from ISOs is realized, for tax purposes, either upon the grant or exercise of the ISOs, until the ISO stock is actually sold. This poses an interesting question to executives with ISOs about when the firm should go public. In fact, a significant wealth can accrue to executives with the ISO stocks, when the firm's stock becomes publicly traded. Therefore, any changes in the tax law may affect the financial value of ISOs and also the firm's decision to go public.

The present paper examines the valuation process of the ISOs and investigates the economic effects of tax law changes on "going public." The result suggests that the 1986 TRA may have delayed the firm's decision to go public, while the U.S. Administration's recent individual income tax hike to finance the government deficit may somewhat encourage the firm's activity to go public.

I. INTRODUCTION

There are several reasons why a firm may want to go public. The first and an obvious reason is that a firm can raise equity capital in the public market place. The firm being publicly traded, the existing shareholders now have an additional financial asset, which can be used as a means of payment and can be converted into cash. There are also other reasons why firms do go public. The search cost of finding a buyer of the firm's equity interest is saved as a public company. On the other hand, the firm's sudden ability to raise capital in the equity market as a public entity also helps increase the firm's borrowing capacity in the debt market as well. However, one of the most important reasons for firms going public is to retain and attract qualified professionals who often demand additional incentive stock options as a form of the company's deferred compensation.[1] Many professional managers

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The Journal of Small Business Finance, 1(2):101-113
ISSN: 1057-2287

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realize the full value of the incentive stock options (ISOs) once the firm is publicly traded.

The value of ISOs is often affected by changes in the tax law. To the extent that a reduced (or increased) value of ISOs affects the wealth of executives and consequently, their work performances, changes in the tax law may have profound impacts even on the firm value. This is a serious problem to consider in a corporate environment, where the principal-agent relationship exists.

The present paper analyzes the effects of various tax law changes on the value of ISOs. Furthermore, the paper investigates how ISOs differ from regular call options, and discusses how changes in the value of ISOs can either delay or facilitate the firm's decision to go public through the company's initial public offerings.

II. PROBLEMS TO ANALYZE

Similar to the regular stock call option, the executive ISOs grant the holder the rights to own a prespecified quantity of company stocks at an agreed-upon (or strike) price, in principle, at any time upon the ISO's issuance.[2] Therefore, at least on surface, the ISO is no different from the regular calls in that both options will have value, only if the underlying stock price exceeds the option's exercise price.

Certain tax rules, however, complicate the ISO's valuation unlike in the case of the regular stock options.[3] In general, no income from ISOs is realized, for tax purposes, either upon the grant or exercise of the ISOs, until the ISO stock is actually sold. This results in rather unusual circumstances for ISOs. For the particular tax law governing recognizing income from the ISO stock can make the valuation of ISOs rather unique.

III. SOME RECENT TAX LAW CHANGES

Prior to the Tax Reform Act (TRA) of 1986, the capital gains received preferential tax treatment, subject only to one half of the ordinary income tax rate. As a consequence, many executives realized income from the ISO stock in the form of capital gains. To qualify for the favorable tax treatment, however, the ISO stock was required to be held at least for two years from the date on which the option was first granted and at least for one year from the time of the exercise of the option.[4]

One of the sweeping changes in the 1986 TRA directly affecting the employee deferred compensation is to raise tax revenues by abolishing the special tax treatment on capital gains, on the one hand, and on the other hand, by revamping the Alternative Minimum Tax (AMT).[5] Specifically, the AMT rate rose. This affects the value of ISOs significantly.

Assuming that the ISO stock justifies exercise, it can be sold for immediate profits[6] or create tax preferences[7] by postponing the sale of his shares. In either case,

tax consequences facing executives differ, especially when the taxpayer will have to compute his taxes twice, once under the regular tax table and once under the AMT rule, whichever is greater. Obviously, from the taxpayer's standpoint, whether to realize his profits immediately or to create tax preferences, or to do some of both, became more important now than ever before with the enactment of the 1986 TRA.

To illustrate the problem, the highest individual tax rate prior to the tax reform was 50 percent and long-term capital gains were taxed at the rate of 20 percent, thereby establishing a spread of 30 percent. Thus, unless the tax preference item was large enough, figuring tax under AMT did not raise the tax liabilities. Under the 1986 TRA, however, the spread narrowed to seven percent effective 1988: the highest individual marginal tax rates were reduced to 28 percent and the tentative minimum income is now taxed at 21 percent.[8] As a result, an active use of AMT is almost mandatory to the majority of executives with ISO stocks, warranting an optimal tax strategy.

IV. ANALYSIS

A. Individual Income Taxes and the Valuation of ISOs

Imagine that a firm has already gone public through the initial public offerings of the firm's securities. An executive with cash needs of X dollars in any particular year seeks a lower AMT rate on his tax return under the present tax system.[9] Typical problems facing the executive is whether ISOs he holds should be exercised now or at a later date in the future. This would obviously depend on the executive's additional cash needs for this and future periods. Had the ISO stock not been exercised, there is no tax consequences, of course. However, if exercised in taxing year, should they be sold for gain in the same year or at a later date? Whether or how much to exercise and/or to sell has to be an economic decision, relative to the executive's inter-temporal consumption preferences. However, what is clear is that the value of ISOs is the executive's ability, within the present tax laws, to raise additional income for this or any other future periods.

Let q^0 = the amount of ISOs held by executives; q_s = the quantity of the exercised ISO stocks to be sold for an immediate gain; q_t = the quantity of the exercised ISO stocks to create tax preferences; and q_n = the amount of ISOs not exercised. Then, by using mnemonic symbols,

$$q^0 = q_s + q_t + q_n \tag{1}$$

Assume that the taxpayer has the current consumption requirement, Y_0, which exceeds his after-tax other regular income, i.e., $Y_0 > (1 - t_0)I_0$, where t_0 = the ordinary individual tax rate and I_0 = the present ordinary taxable income. Then, the taxpayer has to exercise his ISOs and sells stocks for immediate gain to meet his current

consumption, Y_0. In this circumstance his tax obligation is $t_0\{q_s(S_0-E)+I_0\}$, where S_0 represents the current stock price if the firm goes public today.[10] But by realizing income on the ISO stock, the taxpayer ends up.with a higher tax burden by the amount of $t_0q_s(S_0-E)$. If he creates tax preferences, his total taxable income, $\{q_s(S_0-E)+I_0\}$, is subject to a lower AMT rate, t_a. If each taxpayer minimizes his tax liability, he will choose values for q_s, q_t and q_n to meet his current consumption requirement, Y_0, in taxing year. Whether he will indeed be able to do so is a function of how many shares of ISO stocks he has and of what kind of tax liabilities he would face as a consequence. In all circumstance, his current tax obligation, T_0, under the present IRS code, is

$$T_0 = \text{Max}\ [t_a\{(q_s+q_t)(S_0-E)+I_0\},$$

$$t_0\{qs(S_0-E)+I_0\}] \tag{2}$$

where the amount of tax preference is $qt(S_0-E)$.

No rational taxpayer will create tax preferences to pay higher taxes than what he could have paid had he not sought tax preference. Therefore, there must exist a unique value of q_t exercised for each q_s exercised and immediately sold. In fact, the unique relationship between q_t and q_s can be found in equation (2). Equating the two alternative taxes in equation (2) and solving for q_s,

$$q_s = q_t[t_a/(t_0-t_a)] - I_0/(S_0-E) \tag{3}$$

Substituting equation (3) into the regular tax computation in equation (2) gives the executive's tax liabilities as

$$T_0 = t_0[q_t(S_0-E)\{t_a/(t_0-t_a)\}] \tag{4}$$

Noting that the executive's before-tax *realized* income available for consumption is $[I_0+q_s(S_0-E)-q_tE]$, the after-tax available income, Y_0, after exercise of his ISOs is

$$Y_0 = I_0 + q_s(S_0-E) - q_tE - T_0 \tag{5}$$

$$= (1-t_0)[q_t(S_0-E)\{t_a/(t_0-t_a)\}] - q_tE \tag{6}$$

The optimal values of q_s, q_t and q_n can be found by solving equations (1), (3) and (6) simultaneously. The results are

$$q_t^* = Y_0/[(1-t_0)(S_0-E)\theta - E] \tag{7}$$

$$q_s^* = Y_0\theta/[(1 - t_0)(S_0 - E)\theta - E] - I_0/(S_0 - E) \tag{8}$$

and

$$q_n^* = q_0 - q_s^* - q_t^* \tag{9}$$

where $\theta = t_a/(t_0 - t_a) > 0$.[11] It is assumed that both q_t^* and q_s^* are non-negative, i.e., $q_t^*, q_s^* \geq 0$, and hence, $(S_0 - E)/E \geq 1/\theta(1 - t_0)$. Obviously, if the executive had been granted sufficiently large amount of ISO stocks, the amount of after-tax income, Y_0, after his ISO's exercise *could* have equalled his optimal current consumption, C_0, if the taxpayer wished.

The effect of tax law changes on the demand for q_t^*, q_s^* and q_n^* can be seen by differentiating equations (7) through (9) with respect to various tax parameters. The result is

$$\delta q_s^*/\delta t_0 > 0;\ \delta q_s^*/\delta t_a < 0$$

$$\delta q_t^*/\delta t_0 > 0;\ \delta q_t^*/\delta t_a < 0$$

$$\delta q_n^*/\delta t_0 < 0;\ \delta q_n^*/\delta t_a > 0 \tag{10}$$

Since the 1986 TRA lowered t_0 while raising t_a, the above results would imply that the tax reform will effectively reduce q_s^* and q_t^* but increase q_n^*. That is, contrary to what the TRA may have intended, incentives to exercise ISO stocks, whether for immediate profit realization or to create tax preferences, declined. This means less tax yield to the government, at least not from high salaried executives. In fact, this also means that firms, run by professional managers with ISOs, will not go public any sooner to realize the gain from exercise of ISOs.

Note, however, that the preceding discussion will hold true for a given level of the executive's current after-tax income, Y_0. Clearly, any changes in tax laws will also affect the level of Y_0 and hence, something is missing in our analysis.

B. Intertemporal Consumption Decision

To complete the discussion, let's assume for simplicity that an individual is faced with an intertemporal decision only for today and tomorrow and that his after-tax income endowment in each period is given by $(1 - t_0)I_0$ and $(1 - t_0)I_1$, respectively. If tomorrow's income can be exchanged for income today at the reciprocal of (one plus) the market rate of interest, r, the executive with the ISO stock has the intertemporal consumption opportunity boundary:

$$C_0 - (1 - t_0)I_0 = (1 + r)^{-1}[(1 - t_0)I_1 - C_1] \tag{11}$$

The left hand side (LHS) of equation (11) is the amount of extra money which must be raised to satisfy the individual's current consumption. If LHS is borrowed, he will pay interests and thus, including the principal, he must pay $[(1 - t_0)I_1 - C_1]$ dollars in the future periods. As an alternative, the executive can exercise his ISO stocks to finance all or at least a part of LHS. Therefore, a rule to determine an optimal Y_0 is as follows.

First, in a two -period model,

$$\begin{aligned} Y_1 &= I_1 + (q_t^* + q_n^*)(S_1 - E) - T_1 \\ &= (1 - t_0)[I_1 + (q_t^* + q_n^*)(S_1 - E)] \end{aligned} \tag{12}$$

since

$$T_1 = t_0\{(q_t^* + q_n^*)(S_1 - E) + I_1\} \tag{13}$$

Next, note that the total interest costs on the borrowing of $(C_0 - Y_0)$ dollars after exercise of ISO stocks is $(1 + r)(C_0 - Y_0)$ dollars. Given the values of Y_1, as in equation (12), and C_1, however,

$$(C_0 - Y_0)(1 + r) \gtreqless (Y_1 - C_1) \tag{14}$$

Thus, if the RHS of equation (14) is greater than the LHS, the implicit cost of funds, τ, will be lower than the market rate of interest, r, and hence, exercise the ISOs as much as optimally possible, i.e., use the rule as outlined in equations (7) through (9) except that Y_0 will be replaced with C_0. Otherwise, borrow money in the capital market to finance his current consumption demands. Thus, given the definition of Y_1 in equation (12), the higher the S_1, i.e., the higher the stock price in the future, the greater the value of Y_1 will be for any given q_t^* and q_n^*.

Figure 1 shows how the value of ISOs is derived in the most simplistic settings of a two-period model. The over-time endowed income in the absence of ISOs is denoted by the coordinate, I. Given the capital market line, the executive maximizes his intertemporal utility function at C^0, where his indifference curve U_0U_0 is tangent to the budget line A_0A_1. For a consumption combination at C_0, however, the executive must borrow an amount equal to I_0C_0, on which he pays I_1C_1 in the next period. With the exercise of a part of his ISO stocks, however, he can increase his current income by Y_0I_0, and hence, all he has to do is borrow C_0Y_0 in this period. Again, given the market interest rate of r, which is represented by the budget line A_0A_1, he pays $Y'C_1$ in the next period. However, with the unexercised and/or unsold

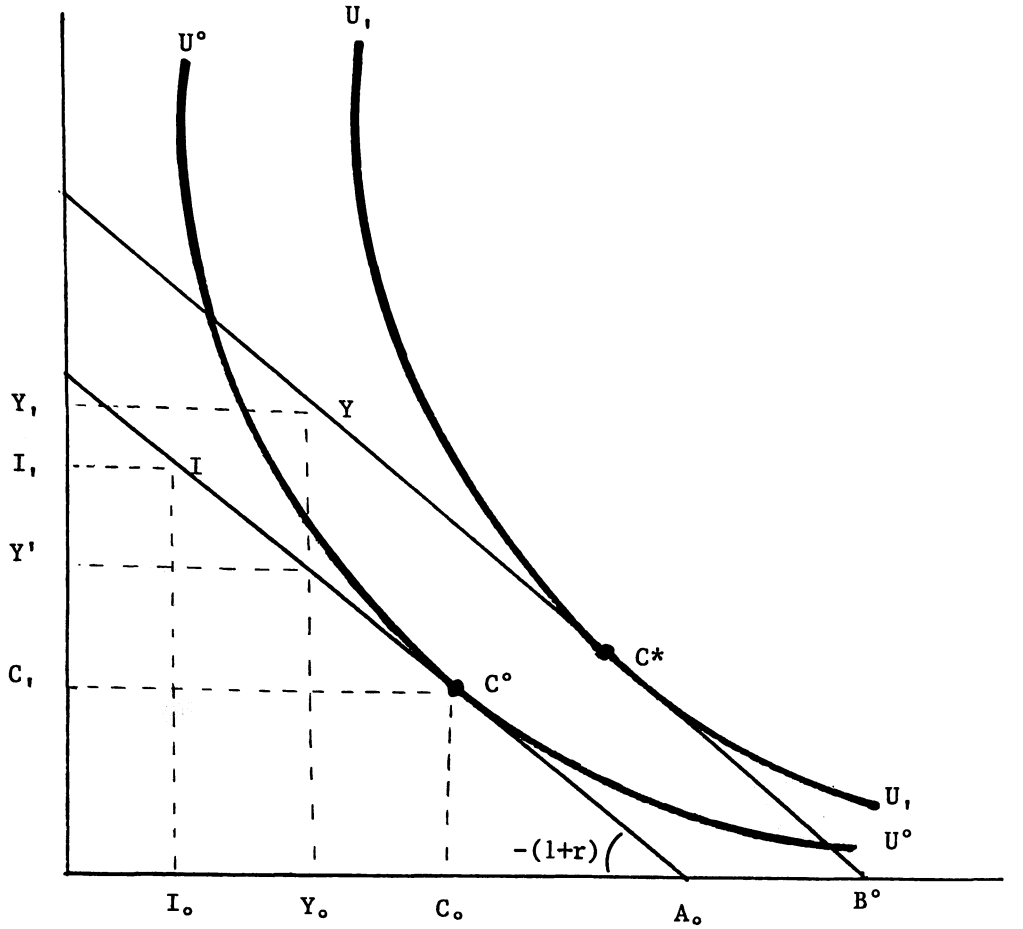

Figure 1: Intertemporal Consumption Decision

ISO stocks, the executive has an additional income equal to Y_1Y' in the next period. The present value of this additional income is the segment A_0B_0. With this additional wealth accruing to the executive, his new consumption pair is now at C^*, where his utility is higher. Symbolically, $PV(Y_1 - Y') = PV(Y_1) - PV(Y') = PV(Y_1) - A_0 + Y_0 = PV(Y_1) - [I_0 + PV(I_1)] + Y_0 = PV(Y_1 - I_1) + (Y_0 - I_0)$. Using equations (4), (5) and (12), the value, V, of ISOs can be derived as follows:

$$V = PV[(1 - t_0)(q_t^* + q_n^*)(S_0 - E)]$$

$$+ [q_s^*(S_0 - E) - q_t^*E - T_0] \qquad (15)$$

It says that the value of the ISO stocks accrues to executives in two ways. First, the amount of q_s and q_t not only minimizes the current tax liabilities but also provides additional income in this period without having to go into the debt market. (See the expression in the second bracket). Second, the amount of the ISO stocks

unexercised and/or exercised but not yet sold in this period may also enhance the future income streams. And this has to be discounted to compute the present value of such opportunity. (See the expression in the first bracket).

V. THE COST OF THE ISO STOCKS

To analyze the effect of ISOs on going public, the above discussions to value ISOs will have to be generalized to a much more realistic multi-period case. Furthermore, since going public is not costless, the cost associated with corporations gaining a public status will also have to be made explicit.

Let's assume that when ISOs were granted earlier as a tax-free deferred compensation, their fair market values were E dollars. If the stock value is expected to decline, the ISOs would not have any value and hence, the taxpayer would have exploited the full current value of the options. However, if the stock price is expected to rise, the dollar value of ISOs were not being exercised can be considered a form of investment. For this is an additional income which could have been realized but has been foregone. Clearly, this type of investment costs $q_n{}^*(S_0 - E)$ dollars. The value of the investment does not only include the regular option values[12] but also, perhaps more importantly, the value of tax preferences the executive can create in the future. As it were, there is in general a positive value of "waiting" to exercise later.[13]

On the other hand, although the ISO stocks exercised to commence tax preferences now will not have this type of "waiting" value, the executive would have ended up holding regular stock investments in the company at the cost of E dollars less tax savings from the option's exercise. This type of stock investment can be valued in terms of the value of other regular options by using the put-call parity relation.[14] That is, commencing tax preferences through the exercise of ISOs is equivalent to buying a call, writing a put and lending at the risk-free rate of interest. Since the cost of investment is $q_t{}^*E$, the net present value of this type of investment equals the present value of the future dividends less E dollars, i.e., $q_t{}^*(S_0 - E)$.

In the meantime, the cost of going public can be seen in terms of the negative signals that the executive sends to the investor when the ISO stocks are exercised and sold.[15] When information asymmetry exists between company insiders and the outside investor, the sale of stocks can signal negative prospects for the company. Thus, it is argued that the cost of going public is a possible decline in stock prices as the amount of the sale of ISO stocks increases. This cost will be represented as the symbol, C_t, below.

VI. OPTIMAL TIMING TO GO PUBLIC

Since both benefits and costs generated by exercise of ISOs are spread over time, the profitability of going public is measured by its net present value, NPV_0.

Assuming that the stock price at the time of the ISO's exercise is S_t, and that the stock price grows at some constant rate, g, the stock price, S_μ, at some future point in time, μ, is $S_\mu = S_t e^{g\mu}$ where $S_t = S_0 e^{gt}$. Assuming also that the negative signalling cost of the sale of ISO stocks is C_t, the NPV^0 of ISOs will be given by:

$$\begin{aligned} \mathrm{NPV}_0 = \int_t^\infty & (1-t_0)(q_t^* + q_n^*)(S_s e^{-(r-g)\mu} - E)d\mu \\ & + [q_s^*(S_t - E) - q_t^* E - \mathrm{T}_t]e^{-rt} \\ & - [q_n^*(S_t - E) + q_t^* E + C_t]e^{-rt} \end{aligned} \tag{16}$$

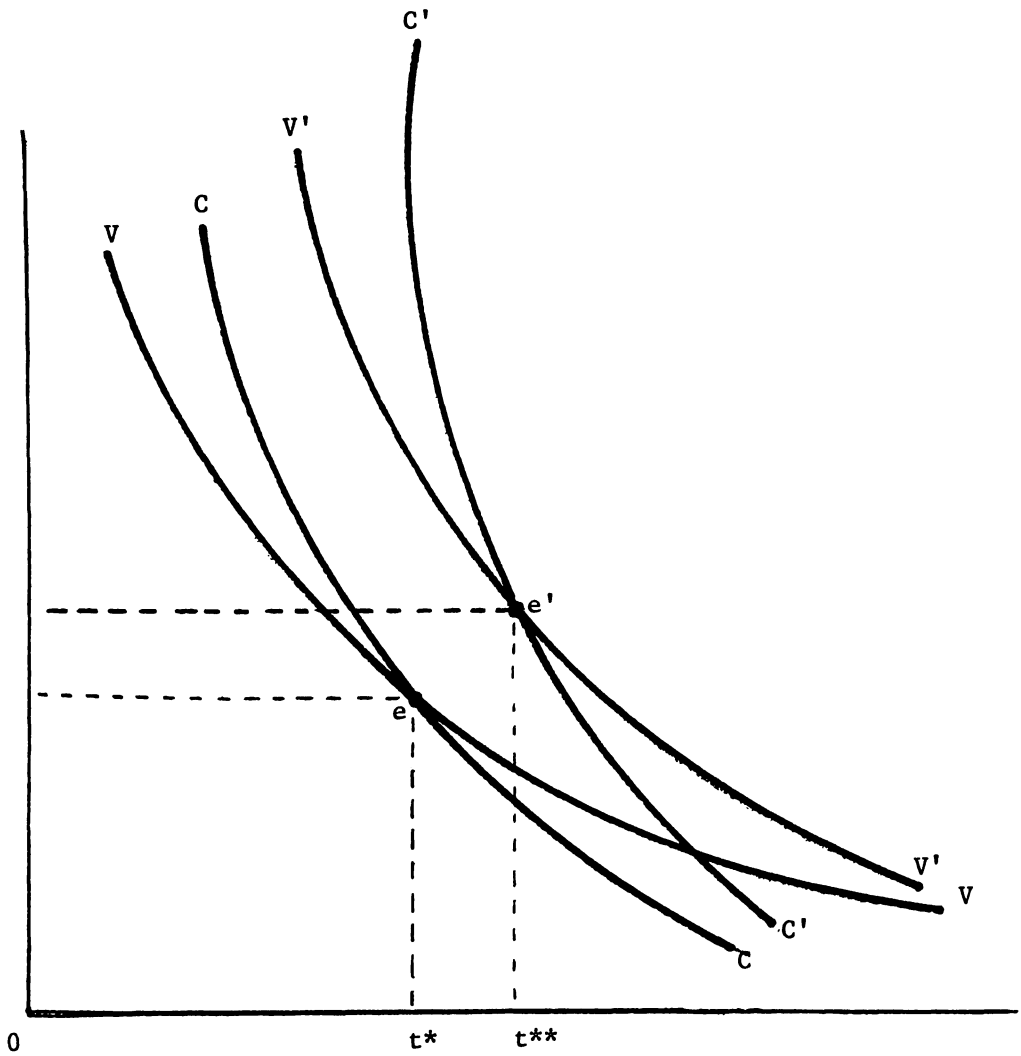

Figure 2: Optimal Timing to go Public

The first two terms in equation (16) are the multi-period version of the present value of ISOs as shown in equation (15). The last term in equation (16) is the opportunity cost of ISOs described at the beginning of the present section of this paper. For $r > g$, equation (16) can then be evaluated as

$$\mathrm{NPV}_0 = (1 - t_0)(q_0 - q_s^*)\left[\frac{S_t e^{-(r-g)t}}{r-g} - Et + \text{Constant}\right]$$

$$- [(q_n^* - q_s^*)(S_t - E) + T_t + Y_t]e^{-rt} \tag{17}$$

The value of t, t^*, which maximizes the NPV_0 of the ISOs, can be found by differentiating equation (17) with respect to t and setting it equal to zero. The result is

$$\sigma_1[S_t^* e^{-(r-g)t^*} + E] = \sigma_2 r e^{-rt^*} \tag{18}$$

where

$$\sigma_1 = (1 - t_0)(q_0 - q_s^*) \text{ and } \sigma_2 = [(q_n^* - q_s^*)(S_t - E) + T_t + C_t]$$

Figure 2 illustrates the optimal timing problem for going public as the executive seeks to maximize the NPV_0 of his ISO stock holdings under the present tax law. The LHS of equation (18) is represented by *VV* curve reflecting the "marginal" present value of the ISO's future benefits with respect to time t. On the other hand, the RHS of equation (18) represents the "marginal" cost of the ISO's exercise with respect to time t, and is depicted by *CC* curve. *VV* curve falls much more slowly than *CC* curve with respect to time, t. Assuming that the value of σ_2 is positive, an interior solution exists at the point e.

Since changes in t_0 and t_a will shift *VV* and *CC* curves, the comparative static results will depend on the partial derivatives of equation (18) as follows:

$$\frac{\delta \mathrm{LHS}}{\delta t_0} \equiv [S_{t^*} e^{-(r-g)t^*} + E]\frac{\delta \sigma_1}{\delta t_0}; \quad \frac{\delta \mathrm{RHS}}{\delta t_0} \equiv r e^{-rt^*}\frac{\delta \sigma_2}{\delta t_0}$$

$$\frac{\delta \mathrm{LHS}}{\delta t_a} \equiv [S_{t^*} e^{-(r-g)t^*} + E]\frac{\delta \sigma_1}{\delta t_a}; \quad \frac{\delta \mathrm{RHS}}{\delta t_a} \equiv r e^{-rt^*}\frac{\delta \sigma_2}{\delta t_a}$$

Clearly, the partial derivatives of σ_1 and σ_2 will depend upon the partials of q_n^*, q_s^* and T_t with respect to the tax rates, t_a and t_0. That is,

$$\frac{\delta\sigma_1}{\delta t_0} \approx (-1)\left[(q^0 - q_{s*}) + (1 - t_0)\frac{\delta q_{s*}}{\delta t_0}\right] < 0 \tag{19.1}$$

$$\frac{\delta\sigma_2}{\delta t_0} \approx -(S - E)\left[\frac{\delta q_{s*}}{\delta t_0} + \frac{\delta q_t}{\delta t_0} + \frac{\delta T_t}{\delta t_0}\right] < 0 \tag{19.2}$$

$$\frac{\delta\sigma_1}{\delta t_a} \approx -(1 - t_0)\frac{\delta q_{s*}}{\delta t_a} > 0; \text{ and} \tag{19.3}$$

$$\frac{\delta\sigma_2}{\delta t_a} \approx -(S - E)\left[\frac{\delta q_{s*}}{\delta t_a} + \frac{\delta q_t}{\delta t_a} + \frac{\delta T_t}{\delta t_a}\right] > 0^{16} \tag{19.4}$$

Therefore, the results in equations (19) suggest that if t_0 falls and t_a rises, both *VV* and *CC* curves shift upward. It seems, however, that upon careful investigation of the above equations (19), *CC* curve will rise more than *VV* curve. This means that an optimal timing of the ISO's exercise should occur much later than the original equilibrium at t^*.

That is, exercising the ISO stock by the firm's going public has both its benefits and costs. Assuming that the company's stock value is expected to continue to rise, the model presented seems to suggest that if t_0 decreases and t_a increases, an increase in the cost of the ISO's exercise outweighs an increase in the ISO's benefits. In the end, the majority of firms may wish to remain private. On the other hand, if our analysis were correct, the recent Bush Administration's measure to raise the ordinary income tax rates to finance the government deficits may shorten the optimal timing for firms to go public.

VII. SUMMARY AND CONCLUSIONS

The ISOs are similar to the regular stock call options. However, when one considers various taxing laws regarding the ISO stocks, the ISOs have unique features which can be differentiated from the regular stock call options.

In particular, a significant wealth can accrue to executives with the ISO stocks. And the wealth can be realized when the firm goes public and when the company's stock becomes publicly traded. Therefore, any changes in the tax law which may affect the financial value of ISOs can either delay or hasten the firm's decision to go public.

The present paper examined the valuation process of the ISOs and investigated the economic effects of tax law changes on "going public." The result suggests that

in fact, the 1986 TRA may have delayed the firm's decision to go public, while the U.S. Administration's recent individual income tax hike to finance the government deficit may encourage the firm's activity to go public. In essence, the 1986 tax law change may have ended up penalizing executives with ISOs, thereby reducing the incentives to go public. If going public is a vehicle to realize the employee deferred compensation for executives and if such a vehicle becomes expensive, the structure of executive compensation contracts may also change.

Acknowledgment: An earlier version of this paper was first presented at the Second Annual Small Firm Financial Research Symposium, California State University, Fresno, California, April 26–27, 1990.

NOTES

1. It is well known that the incentive conflict almost always exists between the stockholders, i.e., the principal and managers, i.e., agents. This conflict is at least partially controlled by incentive provisions of executive compensation contracts which formally tie the manager's compensation to some measure of firm performance. The frequently stated objective of these widely used provisions is to encourage managers to maximize the value of the firm. For a general overview of these incentive provisions which are typically found in the employee compensation contracts, see Smith and Watts (1983).
2. Internal Revenue Code of 1986, Section 422A(b) spells out various requirements for the company's ISO plan.
3. Miller and Scholes (1982) first presented the model of the ISOs in the context of various taxes.
4. Lavelle and Welsh (1988) argue, however, that although the 1986 TRA does seem to have diminished the attractiveness of ISOs by abolishing the special tax treatment on capital gains, such preferential tax treatment is not necessary to fully utilize the ISO provisions to reap low-taxed benefits.
5. Ibid.
6. Since there is not special tax treatment on capital gains, delaying the profits till a later date is of no relevance.
7. The Internal Revenue Code imposes a one-year holding period requirement for ISOs to be qualified for the status of tax preferences under the AMT rule.
8. The Bush Administration has recently taken measures to raise the effective individual income tax rates to finance the government deficit. This may negate the effect of the 1986 TRA somewhat.
9. It is assumed that a two-year statutory time limitation for ISO exercise is now up and the current stock price exceeds the striking price.
10. It shall be assumed that $S_0 > E$.
11. Consider the following numerical example. Let's assume that an executive earned in 1989 $100,000 before tax and yet has after-tax cash liquidity requirement of $110,000. He has 10,000 shares of ISOs which were valued at $5 at the time of grant. Two years have passed since then. Today the stock price is $20 a share. Under the IRS tax code, his marginal

individual rate is 28 percent. The AMT rate is 21 percent after the 1986 TRA. In this case, substituting the appropriate values for S_0, E, Y_0, I_0 and tax rates for t_0 and t_a, we find that $q_s^* = 5{,}377$ shares, $q_t^* = 4{,}015$ shares and $q_n^* = 608$ shares. That is, when 5,377 shares of ISO stocks were exercised and sold, his total income realized, including his other income of $100,000, is $180,655. But he also created the tax preference of $20,075, when he exercised additional 4,015 shares. After deducting his tax obligation of $50,589 under the AMT rule, the executive ends up having a disposal income of $110,000, as was to be proved.

12. Clearly, the exercise price of the option is E dollars.
13. The value of "waiting" will be henceforth referred to as the symbol, W.
14. See, for example, Black and Scholes (1973).
15. Myers and Majluf (1984) recently argued that the value of the firm may fall when new equity issues are announced. Earlier, Leland and Pyle (1977) also argued that the value of the firm is a negative function of the amount of equity held by the owner-managers of the firm.
16. The result in equation (10) holds C_0 constant. If the stock price is expected to rise sufficiently in the future, the taxpayer would use ISO stocks to meet his current consumption requirements in lieu of personal borrowing. Thus, Y_0 in equations (7) through (9) will be replaced with Y_0. Thus, the partial derivatives of q_s^* and q_t^* with respect to t_0 and t_a will be the same as in equation (10).

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