Patterns of Stock Option Exercise in the United States

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Executive Compensation and Shareholder Value:

Theory and Evidence

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Benefits

- permit optionees to time the receipt of income to coincide with personal liquidity needs;
- serve as "golden handcuffs" that bind optionees to firms during the vesting period;
- provide optionees with incentives to increase the stock price of the firm;
- permit optionees to recognize income at times that coincide with favorable tax treatment; and
- may be treated as "off income statement compensation" by the employer for financial statement purposes.

Costs

- dilute existing shareholder's interest in the firm (but increase cash inflows to the firm);
- expose optionees to the risk of fluctuations in the employer's stock price; and,
- cause optionees to trade in their employers' stock and hence put them at risk of violating insider trading rules.

Employee behavior is essential to an understanding of both the benefits and costs of options.

- duration of incentive effects
- mix of compensation
- reported cost
  - FAS 123
  - SEC regulation S-K §229.402

3 perspectives

- valuation: ESOs $\neq$ TSOs
- description of behavior in general
- exercise and taxation

Valuation

- dilutive
- "American" with a vesting period
- non-transferable
  - usual arbitrage arguments to price options do not apply
  - cost to the employer depends on exercise policy of the employee
  - cost to employer ranges between zero and the market value of a comparable TSO

When do benefits outweigh the costs?

- tough question
- a benchmark
  - suppose stock price movements over time do not depend on employee actions
  - any increase in the cost of the option due to incentive effects is less than the concomitant expected increase in the value of the stock outstanding at the time the option is granted

Binomial model

- binomial model of Cox et al. (1979)
- trees and nodes
- each period the stock price moves up with probability p or down with probability $1 - p$
- on an uptick, the stock price increases by a factor of $s > 1$
- on a downtick, the stock price falls by a factor of $1/s$

Method

- Determine when exercise takes place along each path and compute the difference between the stock price on the exercise date and the strike price. The sum over every path of these discounted quantities, weighted by an appropriate probability, represents the expected present value of the option.

- Easy
  - expiration date,
  - vesting schedule,
  - strike price,
  - current stock price
- Harder
  - interest rates,
  - dividend yield,
  - stock volatility
- Hardest
  - employee exercise behavior

Reasons for exercise before expiration

- risk aversion
- liquidity needs
- separation from the employer
- tax planning
- dividend capture

Risk aversion example

- At time zero, employer grants an option to buy stock at a strike price of $X = 1$ at either time 1, time 2, or time 3
- $p = {}^{2}\!/_{3} \quad s = 2 \quad d = 1.5$
- risk-neutral $\rightarrow$ exercise only at expiration
- risk-aversion $\rightarrow$ earlier exercise

Implications

  - market value of an American TSO
  - market value of a European TSO
  - cost of a European ESO to the employer $108,879
  - cost of an American ESO to the employer $94,317
  - value of an American ESO to the employee $36,960
  - value of a European ESO to the employee $30,881

- These relationships hold more generally.

Evidence on exercise decisions

- 8 corporation
- nearly 60,000 employees
- 10 years
- employee-by-employee grant and exercise records

Companies B and H

- Company B
  - ten-year options that vest ratably at 25%
  - 24,126 employees per year
- Company H issued only five-year options that vest annually in increments of 10% to 40% over four years
  - 13,146 employees

Univariate analysis of exercise activity

Exercise and vesting

Exercise over time

Regression analysis

Regression

- exercise in response to recent stock price movements
  - rebounding from a fall
- increases in volatility increase exercise
- exercise concentrates in periods following vesting

High-level employees

- exercise is less sensitive to historical stock price varianc
- exercise is insensitive to recent vesting
- exercise is less sensitive to recent stock movements
- high-level employees are more sensitive to stock price levels
- explanatory power is lower for high-level employees

Taxation

- Exercise at opportune times may enhance the net-of-tax value of options to employees or reduce net-of-tax costs to the employer.
  - general framework
  - case study
  - empirical investigation

Planning opportunities

- tax rates vary over time or types of income
  - 28% to 50% in the US over the last fifteen years
- rules governing the deduction/inclusion of option compensation change over time

Effects of tax on exercise—simple case

- Employee marginal tax rates are about to change from t_1 to t_2
- Employer marginal tax rates are about to change from T_1 to T_2
- S_1 be the current stock
- X, the strike
- W_1^e, the pretax value the employee would accept today in exchange for surrendering the option.

Which is better?

- $(S_1 - X)(1 - t_1)$
- $W_1^e(1 - t_2)$

Intuition:

If the employee exercises a deep-in-the-money short maturity option before the tax rate increase, she captures a large fraction of the option's expected total value and benefits from having this value taxed at a low rate.

Case study

- After November 3, 1992, there was widespread expectation that personal income tax rates for high levels of income would increase in 1993.
- Lots of discussion in the business press.

Disney's Eisner and Wells

- Disney stock trading at $40 per share,
- 6,640,000 options expiring in 1994 with a strike of $3.59 per share.
- For every dollar of income triggered in 1992, 61.4¢ is left after tax, while for every dollar of income triggered in 1993 or later, only 53.8¢ (or 12 percent *less*) is left after tax
- The net benefit is greatest when the option is deep-in-the-money and the time to maturity is short.

Not every option

- Eisner and Wells also held, but did not exercise, options expiring in 1999 with strike prices of $17.14 and $19.64.

Employer preferences

- Exercise preserve a deduction for compensation expense that might otherwise be lost because of a legislative proposal to deny a deduction for compensation above $1 million paid to any one person.

Other cases

- Employer and employee preferences need not coincide
- Employer may find it worthwhile to pay the employee
  - to accelerate exercise or
  - to postpone exercise.

Exercise to benefit from capital gains rates

$$\tilde{S}_2 - (\tilde{S}_2 - S_1)g - [X + (S_1 - X)t](1 + r) >$$
$$(\tilde{S}_2 - X)(1 - t).$$
$$\frac{\tilde{R}}{r} > \frac{t + \frac{X}{S_1}(1 - t)}{t - g}$$

where $\tilde{R} = (\tilde{S}_2 - S_1)/S_1$.

Implications

- income tax rate is 40%
- capital gains tax rate is g is 20%
- anticipated pretax return on the stock must be at least twice the net-of-tax cost of borrowing for early exercise to be worthwhile.

Conclusions

- options are a complex, multifaceted component of compensation
- understanding exercise behavior is critical to measuring costs and benefits of options
- 3 perspectives
  - valuation
  - empirical behavior
  - taxation

Future research

- behavioral factors seem important
  - in employee's minds, what difference is there between vested and unvested options?
  - how often do employees check stock price?
  - reference points and price paths