

Valuing Employee Stock Options

Valuing employee stock options is a lot more difficult than it sounds.

It helps to remember that employee options and market-traded options are quite different. The difference between them makes valuing employee options

more complicated, but it also offers a lesson about how the employer's cost for a given piece of the total rewards package may not be the same as its value to a given employee. Organizations too often miss this and, as a result, can find themselves leaving money on the table.

Market-Traded Options

A stock option is the right to buy a share of stock at a specific price (called the strike or exercise price) at some point in the future. A market-traded option can be bought and sold in open markets (just like actual stock or commodities). To put a dollar value on an option bought and sold in the financial markets, one only need know six pieces of information: strike price; current stock price; volatility of the stock; time until expiration; risk-free rate of interest; and dividend rate. Four decades ago, pioneering work by Fisher Black and Myron Scholes ("The Pricing of Options and Corporate Liabilities," *Journal of Political Economy*, May-June, 1973) and Robert C. Merton ("The Theory of Rational Option Pricing," *Bell Journal of Economics and Management Science*, 4, Spring 1973) set off an extraordinary industry in options and other derivative trading. Merton and Scholes won the Nobel Prize in economics in 1997 for their research on derivatives pricing, and the Black-Scholes equation is ubiquitous when discussing stock options.

The tricky part is that the employee options are not market traded and may not fit all the technical assumptions underpinning the Black-Scholes equation. These



Cornell University
ILR School
Institute for Compensation Studies

Kevin F. Hallock, Ph.D.

Donald C. Opatrny '74 Chair,
Department of Economics
Cornell University

Joseph R. Rich '80 Professor,
Departments of Economics and HR Studies
Cornell University

Director,
Institute for Compensation Studies,
Cornell University

Member,
2012 WorldatWork Society
of Certified Professionals Board

assumptions range from straightforward (the individual can buy and sell at will) to more technical assumptions. The important thing is that the Black-Scholes equation wasn't created to put a dollar value on employee options within the total rewards package. Valuing employee options needs to be done, but trying to do so carefully introduces new complications.

Employee Stock Options Are Different

For some time, researchers have understood that pricing employee options is different from pricing market-traded options. In market-traded options, traders are risk-neutral, meaning they neither seek thrill in taking investment risks (think skydiver) nor fear risk, and their portfolios are diversified. But employees who hold options are neither risk-neutral nor diversified with regard to their options, and these facts and others make the valuation of employee options more difficult.

This is an issue that economists have been working on for some time. Some researchers, including Richard A. Lambert, David F. Larcker and Robert E. Verecchia ("Portfolio Considerations in Valuing Executive Compensation," *Journal of Accounting Research*, 29, 1991), recognized that employees making decisions about the value of their stock options probably shouldn't be thought of as risk-neutral, diversified investors. Think about those who have a large fraction of their wealth tied to the company and are, therefore, not diversified in any real sense. Brian J. Hall and Kevin J. Murphy ("Stock Options for Undiversified Executives," *Journal of Accounting and Economics*, 33, 2002), tried to estimate the value employees place on options by making some technical assumptions about how employees value money in hand versus income in the future and what economists call "utility" (think, for example, of the different bundles of goods that would make a person or group equally well off). Hall and Murphy found that the executives they studied valued employee options at less than the Black-Scholes value. This seems a reasonable result because employees (who hold employee stock options) are risk-averse and undiversified while the Black-Scholes equation is designed for risk-neutral and diversified investors.

A Lesson for Other Types of Pay

It turns out that market-traded options are never exercised until just before expiration. Therefore, if one wants money from a market-traded option, he/she must sell it to someone else (and it would be foolish to exercise it

because there is still time left on the option). On the other hand, an employee is barred from selling his/her options. To get money from employee options, he/she must exercise them. This marks an additional difference between market-traded and employee options. The former can be sold and are never exercised (except at the last moment) and the latter can't be sold and are frequently exercised long before they expire.

In a recent paper I wrote with Craig A. Olson ("New Data for Answering Old Questions Regarding Employee Stock Options," *Labor and The New Economy*, Katharine G. Abraham, James R. Spletzer and Michael Harper, editors, National Bureau of Economic Research, 2010), we tried to use this information and an additional fact to estimate the value employees place on options in a specific company. We reasoned that on any given day an employee option is not exercised, the employee must value the option by more than the intrinsic value (the difference between the stock price and the strike price). Say the strike price is \$20 and the current stock price is \$27. If an employee held the option that day, she must value the option at more than the \$7 intrinsic value. If she valued it less, she would have exercised the option and taken the \$7. We use this idea and "use statistical analysis to follow" a few thousand employees each day over many years and estimate that the employees in that company at that time valued options at a level quite a bit above the outcome of the Black-Scholes valuation. So in this company, the employer cost (which turns out is the Black-Scholes value) is less than the value to the employee. So they should give more options in lieu of cash. This may not be true at other companies and these have to be tested one at a time.

This example is illustrative of a larger point. Many organizations don't think carefully enough about the value employees place on different forms of compensation. Here we have a completely nonintrusive way to get a handle on the value employees place on compensation. It is easy to compute employer cost, but it takes different thinking to elicit employee value. **WFS**



The Institute for Compensation Studies (ICS) at Cornell University analyzes, teaches and communicates about monetary and nonmonetary rewards from work, and how rewards influence individuals, companies, industries and economies. ICS research and leading-edge insight address compensation issues challenging employers and employees in today's dynamic global marketplace. www.ilr.cornell.edu/ics

Send topic suggestions to ics-ilr@cornell.edu.