

*Designing Ways to  
Account for Foreseeable  
Financial Risk*

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In order to attract and retain top executive talent, many firms develop sophisticated compensation arrangements that include employee stock options (ESOs) and securities. In fact, almost half the compensation for corporate CEOs is usually in the form of stock options.

But what's the true value of these ESOs? It's difficult to determine because value is dependent upon fluctuations in the stock market and when an ESO owner exercises the option to cash in those compensation vehicles. Because timing is variable, valuation of ESOs can be somewhat random. Without a viable model for ESO valuation, the actual and true costs of these compensation vehicles cannot be correctly reflected in any company's financial bottom line. This puts a burden on other shareholders, the company, and the economy.

Tightening the gaps in accepted practice of valuation for compensation vehicles like ESOs can have direct impact on businesses as well as the stabilization of the economy. Key to accomplishing that is the application of mathematical acumen and practical financial knowledge—components of financial engineering.

Financial engineering is both the art and science of evaluating, structuring, and pricing financial instruments and designing strategies to reduce risk and maximize opportunities. Through innovative, analytical procedures, financial engineers help individual and institutional investors as well as regulators understand and manage financial risk.

Tim Siu-Tang Leung uses financial theory, engineering methodology, and mathematics to build reliable models that account for foreseeable financial risks. His research interests are in financial engineering, especially in the valuation of ESOs and credit derivatives. The National Science Foundation is underwriting his research in stochastic modeling of risk aversion and its implications for derivative pricing and risk management.

He has made significant contributions to the field with a revised ESO valuation model that takes into account the complex contractual features and the realistic behaviors of ESO holders (i.e., due to their heightened risk perceptions—fear of market crash or job termination—ESO holders usually exercise options to cash in early). He has also developed strategies to help employees hedge some of the risk involved with owning ESOs. His research has led to interesting mathematics including analytical and numerical studies of several combined stochastic control and optimal stopping problems. The mathematical tools from his research are also being applied to tackle other financial engineering challenges.

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