



Professor David G. Carmichael has been leading research into real options analysis.



Ariel M. Hersh and his co-authors aim to transform real options analysis into a tool for investment analysis.



Praneeth Parasu is co-author of "Real Options Estimate Using Probabilistic Present Worth Analysis."

been designed to update parameter estimates in a recursive manner so that new information is incorporated quickly.

This work extends the scope of the conventional run-to-run algorithms, such as the exponentially weighted moving average and double exponentially weighted moving average controllers, and has broad applications in many manufacturing processes. Optimal settings for controllable factors in the next run are generated at the end of the previous run whenever a new categorical observation becomes available.

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The most recent issue of The Engineering Economist (Volume 56, Number 4) is extremely diverse. Two authors argue in a letter to the editor that tabulator factors no longer should be used in the teaching of engineering economy. They make the case for financial calculators and spreadsheets. A number of authors and educators voice their support for eliminating the use of tabulated factors. Another article presents a case study concerning the replacement of transport carriers. In the following summaries, we highlight the two remaining research articles. The first concerns an alternate method for computing real option values, while the second describes how to defend against the threat of

terrorist activity and the stockpiling of weapons.

Real option values

Real options analysis has developed over the past two decades as an alternate approach to analyzing investments under risk and uncertainty. The analysis computes an option value for an investment that attempts to capture the "value" or worth of uncertainty (measured by volatility) in the investment. The presumption is that a manager can take advantage of the positive volatility in the investment and avoid the negative volatility by discontinuing the investment. Thus, the true value of an investment is its traditional net present value plus the value of the option.

While research on this topic has been growing significantly over time, research has shown that the application of real options has not followed. Reasons for this are widespread, including the difficulty of computing the real option value, as it is derived from the pricing of financial stock options.

A number of research articles have been published recently (many in *The Engineering Economist*) to improve the applicability of real options. "Real Options Estimate Using Probabilistic Present Worth Analysis" was written in this same vein by professor David G. Carmichael, honors student Ariel M. Hersh and First Class Honors graduate Praneeth Parasu, all of

the University of New South Wales.

The paper presents a method for estimating the value of a real option using probabilistic present worth analysis, as opposed to using the Black-Scholes approach, which is common to financial options analysis. The presented method is shown to capture the upside value of a real option equivalently, and give similar results, to the Black-Scholes method.

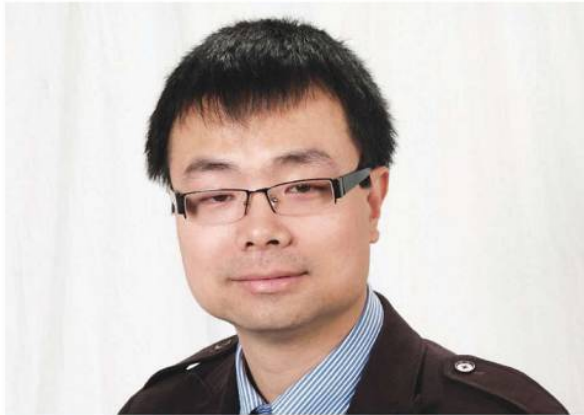
Clearly, this is welcome news, as using probabilistic present worth analysis is more intuitive than Black-Scholes to typical practitioners. Furthermore, the Black-Scholes method requires an estimate of volatility (and significant controversy exists on its estimate) while the proposed method does not. The paper presents a comparison with the Black-Scholes method both structurally and numerically. Thus, this paper presents another step toward bringing real options analysis into the traditional tool set for investment analysis.

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Defending against a terrorist

Unfortunately, terrorism is a realism of our time. The success of terrorism as well

research



Jun Zhuang and his colleague used game theory to examine how terrorists and the governments that defend against them act and react.



Kjell Hausken is co-author of "Defending Against a Stockpiling Terrorist."

as the success of defending against terrorism require resources. Often, one party reacts to the other by allocating resources to attack or defend. This game of "cat and mouse" often can be analyzed with game theory, as in the paper "Defending Against a Stockpiling Terrorist" by Jun Zhuang, an assistant professor of industrial and systems engineering at the University at Buffalo, State University of New York, and Kjell Hausken, a professor of social sciences at the University of Stavanger. Their paper examines how a terrorist acts and how a government defending against the terrorist reacts.

Specifically, the paper assumes that terrorists have resources that they can allocate in each period over a number of periods. For example, the terrorists may choose to attack early, or they may choose to hold their assets (stockpile) to attack in later periods. This strategy also defines the number of attacks that occur over time. It is assumed that the terrorists are attacking a specific asset.

The government defends the asset and may attack the terrorists' resources in order to hurt their ability to attack later. The terrorists may expend resources to defend their assets in addition to attacking the government.

Through the ensuing analysis, the authors find four equilibrium solu-

tions (outcomes that are expected to occur between the two entities): The government attacks only, deterring the terrorist; both players defend and attack; the government defends but does not attack, and the terrorist attacks only; and the terrorist attacks a passive government.

The solution that is arrived at depends on the parameters of the problem. For example, if the terrorists' resources are small, the government can deter them in each period. If the terrorists' resources are extremely large, they allocate their resources equally over time, while the government prefers a single attack. If the terrorists' resources are moderate, the terrorists are deterred in each period if they allocated their resources equally across time. It is clear that studying this situation closely will help defenders better allocate their resources.

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About the journals

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