THE RHA REVIEW

ROUTE TO:

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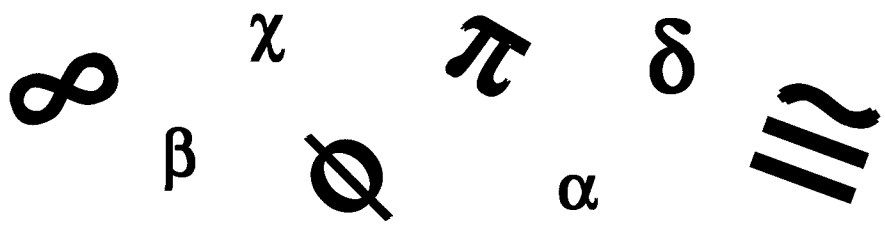
Value-Added with Quantitative Analysis



By Amy v. Puelz, Ph.D.

Starting with my receipt of a mathematics degree in the '80s, I have pursued the career path of a "quant," which I define as one who applies a variety of mathematical models to complex problems to structure, understand and possibly provide solutions. Over these past 20 years I can count on one hand the number of times a person, when finding out I consult, teach and research in statistics, mathematical modeling and simulation, does not respond with something to the effect of "I hate that stuff," "that was absolutely my worst class in college" or a more general "yuk." In defense of my chosen "quant" career path, I must attribute these visceral reactions to some memory trigger in the respondents' past, such as dropping a stack of computer punch cards on a windy day, memorizing statistical formulas with more Greek symbols than seen on campus during rush week, or some even-more-traumatizing numerical event. What I'd like to achieve in this column and several future columns is to convince you of the value of and relative ease with which quantitative analysis can be applied in risk- and insurance-related decision-making. In this column I'll focus on a firm's risk manager, and in future columns I'll explore the potential for quantitative analysis in insurance-related litigation support and insurance company operations.

> ***"The single-most-important reason for the growth in the application of quantitative analysis to risk- and insurance-related decision-making is the migration of analysis tools from the mainframe computers in the basement to executives' desks."***

The single-most-important reason for the growth in the application of quantitative analysis to risk- and insurance-related decision-making is the migration of analysis tools from the mainframe computers in the basement to executives' desks. Tools and techniques that were considered rocket science 20 years ago, from advanced statistical analysis to data mining, are now available in menu-driven, user-friendly packages on laptop computers. How can risk managers use these tools in decision-making? Two broad categories for potential application are the measure and quantification of risk, and the integration of the risk-management function.

Measuring a firm's risk has received a lot of attention in recent years with the acceptance and implementation of Value at Risk (VaR) as the standard for reporting risk. VaR can be thought of as identifying the worst-case cost of risk. The academic and practitioner literature is now filled with tips, techniques and problems associated with the derivation and validity of a portfolio's VaR. At the very basic level, deriving VaR can be accomplished by using a simple computer spreadsheet package and

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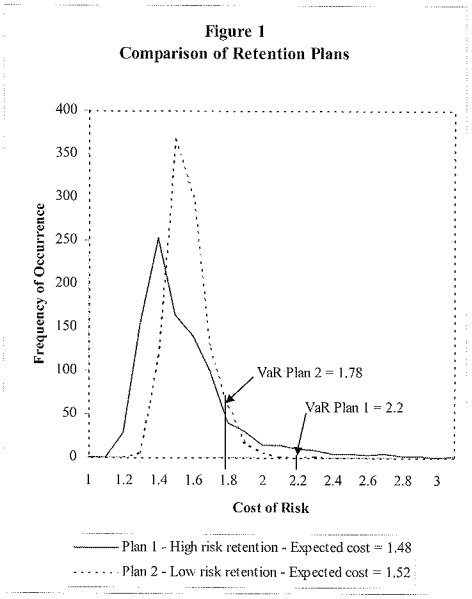
generating random cost of risk outcomes, also called scenarios. These scenarios can be presented in a probability-distribution format similar to that in Figure 1, in which two risk-retention plans are compared — Plan 1 with high-risk retention (less insurance) and Plan 2 with low-risk retention (more insurance). Labeled for each plan is the VaR. In this case the VaR, or the worst-case cost of risk, is defined as the 95th percentile of risk costs. Plan 1, in which more risk is retained, has a higher VaR of 2.2 (compared with 1.78 for Plan 2) but has a lower expected cost of risk of 1.48 (compared with 1.52 for Plan 2). In other words, Plan 1, in which less



insurance is purchased, is riskier but lower in cost. This worst-case or VaR analysis, in addition to the visual inspection of the probability distribution, can provide risk managers with valuable information when they are deciding how much and what type of insurance to purchase.

This process of comparing risk-retention plans becomes necessarily more complex when multiple risk and cash-flow streams are integrated into the analysis. This integrated view of a firm's risk is called enterprise risk management. A firm represents a complex arrangement of activities that are managed by functional and operational areas. Historically, the risk manager has focused attention on those events which hold the prospect of disrupting a firm's productivity without considering how loss events interact with profit-making events — in essence, the consideration of risk management and financial management within the same firm. The enterprise view of the firm is an approach that requires the identification of all the firm's important cash flows, not only those related to risk costs. All cash flows are then analyzed to determine how they change relative to other cash flows. Statistical techniques for measuring how a firm's risk and core business cash flows interact, such as correlation analysis, are available in standard spreadsheet packages; and others, such as principal component analysis, are available as add-ins for spreadsheets or operate in a standalone environment.

"This process of comparing risk-retention plans becomes necessarily more complex when multiple risk and cash-flow streams are integrated into the analysis."

Once the relationships between the cash flows are established, random outcomes for all cash flows or scenarios are generated using simulation analysis. This process is similar to that described earlier in the VaR derivation, except that multiple cash flows representing important business risks and profit-making ventures are all generated for each scenario, capturing the interaction between all business functions and allowing for the development of an integrated firm-level decision methodology.

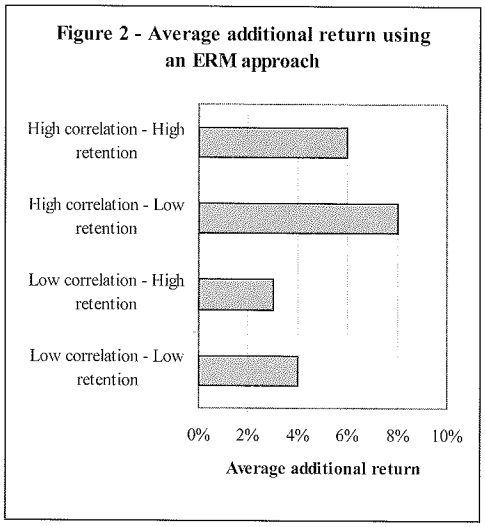


Figure 2 illustrates the savings realized using an ERM approach relative to a non-ERM approach. In this example a risk-related cash outflow and a profit-making cash inflow

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FROM NEAR AND FAR

Paris, France — According to *Business Insurance*, La Reunion Aerianne, the lead liability insurer for the Air France Concorde that crashed last July, is confident that almost all of the claimants will accept a settlement offer. The amount of the settlement offer has not been disclosed.

Chicago — *Business Insurance* announced its Risk Manager of the Year in its April 30 issue. The winner was Dan Hartman, chief risk officer for the state of Oregon. RHA's own Bob Hughes was one of the distinguished panel of judges that selected Mr. Hartman.

London — According to *Catflash*, Wellington Underwriting Agency's newsletter, the total claim for the sinking of the Petrobras P-36 oil platform could amount to $700 million. If, in fact, it does amount to that, it would almost equal the total worldwide premium volume for offshore energy business.

New York — The property-casualty insurance industry faces a shortfall of $33 billion in reserves set aside to pay asbestos-related claims, *The Wall Street Journal* reported in its online edition on Monday, May 7. Citing a study by A.M. Best, the paper said insurers, who have paid $21.6 billion in asbestos claims so far, may wind up paying another $43.4 billion during the next 20 years, for a total of $65 billion. The report says the industry has $10.3 billion set aside to pay additional claims.

Dallas — Strong storms blew through Dallas on the evening of May 6, leaving the owners of a row of unfinished townhouses picking through the wreckage. Six of the structures that were severely damaged will probably be demolished. Estimated cost of the storm damage is somewhere between $1.5 million and $2 million, according to one of the investors. None of the townhouses was occupied, and no one was injured.

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are generated, assuming either a high or low correlation between their movements. The ERM approach incorporates this interaction between cash flows in decision analysis, whereas the non-ERM approach views the cash flows in isolation, ignoring any interaction between them. The analysis was conducted assuming either a firm with a relatively high-risk retention in the form of a high per-loss deductible or one with a relatively low-risk retention. In this example, scenarios were generated for both the ERM and non-ERM assumptions, and an optimization decision model was executed on the PC to derive the optimal decision, given the possible set of cash-flow outcomes. The average additional return the firm realized using an integrated ERM approach is presented in Figure 2.

"Quantitative analysis is no longer a report that comes from a black box in the basement but a dynamic, adaptable tool for managers to use in exploring alternatives for effective risk management."

Both the VaR and ERM examples presented in this column used PC-based tools to provide managers with quantitative analysis to use in making better decisions regarding the management of a firm's risk. Careful development and use of models similar to these can be valuable for any risk manager. Quantitative analysis is no longer a report that comes from a black box in the basement but a dynamic, adaptable tool for managers to use in exploring alternatives for effective risk management. RHA

Amy v. Puelz is an associate with Robert Hughes Associates, Inc., and consults, teaches and researches in the area of financial risk analysis and management.

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PUELZ REFOCUSES

The author of this issue's article, Amy Puelz, has been associated with Robert Hughes Associates for quite some time. The relationship has been low key for the most part because Amy has focused most of her energy on her teaching career at Southern Methodist University. Amy has now decided to redirect some of her energy to her consulting practice. This is great news for us because we can really begin to utilize her unique talents.

Her areas of expertise include but are not limited to statistical analysis, enterprise risk management, financial modeling, financial risk, coverage allocation and quantitative risk analysis. She has taught a wide variety of courses, including; statistics, quantitative analysis, management science, quantitative modeling and various programming courses. She has a high level of expertise in financial risk-management statistical decision-modeling and has consulted, published papers and made various conference presentations on the subject.

Amy received her bachelor's degree in mathematics from The Colorado College and her Ph.D. from the University of Nebraska. She has taught at the University of Nebraska, Emory University, the University of Memphis and Southern Methodist University in Dallas, where she was assistant professor of Information Technologies and Operations Management. She has also recently consulted on projects involving statistical analysis and enterprise risk management and is about to publish a new paper on enterprise risk management. She is a member of the Decision Sciences Institute and the Institute for Operations Research and Management Sciences. RHA

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