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Much attention has been focused recently on enterprise risk management (ERM), not just in the insurance industry but in other industries as well. Across all industries, risk managers continue to seek better ways to identify, measure, and manage their risks. Many companies look to the leaders in their industries for insights into risk management techniques. This is certainly a valuable source of information and ensures that a company is at least keeping up with its peers. However, risk managers have been less likely to look outside their industries for leading-edge techniques. This is unfortunate because interesting and innovative approaches can be developed by adopting—and, in some cases, adapting—the tools and techniques used in other industries.

In this article, we consider three industries with mature risk management practices: insurance, banking, and manufacturing. Each industry possesses expertise around the management of certain types of risk. Insurance companies are experts in the business of exploiting insurance risks to generate profit. Banks are experts in the mitigation of financial risk, while manufacturers are experts in the mitigation of operational risk.

Each industry has its own specific risk management techniques, developed and refined to address that industry's key risks. Each industry can adapt the risk management techniques of other industries to produce innovative ways of approaching key risks, further enhancing its set of risk management tools. From this broader array of risk management tools, a company can select those that are most closely aligned with its culture, risk profile, and strategy. By taking off the blinders and achieving a more expansive view of risk management, companies can not only meet the requirements of regulators and rating agencies but also enhance their competitiveness and achieve maximum profits for shareholders.

A Survey of ERM Techniques

We concentrate on the key industries of insurance, banking, and manufacturing. In each case, we illustrate the type of insights that can be gained from a broader view of ERM techniques. Obviously,

it's not possible to cover every industry or even all of the techniques in use in each industry, but certain techniques are highlighted that are most likely to have applicability in other industries. It should also be noted that the techniques discussed here are selected because they focus on the practical management of risk with a view toward profit maximization, as opposed to those practices that are primarily used to determine minimum capital requirements (although some techniques may be suited to both purposes).

Manufacturing

Manufacturers focus on reducing the number of defects in production processes and defects in the finished product in order to reduce costs and compete more effectively, thereby increasing shareholder value. As a result of this focus, practices in the manufacturing industry tend to be operations focused and backward looking. In ERM, manufacturers tend to focus on operational risk by applying backward-looking tools.

In recent years, manufacturers have taken existing techniques developed to address production-line issues and have extended these to cover a range of operational risks to which they are exposed. For example, the defect tracking that companies have traditionally used to assess product quality has been adapted into risk tracking to capture adverse events across a number of specified operational categories. This information provides

Leveraging ERM Techniques



**If the banking industry
had followed
operational risk
management
practices that
are common in
life insurance
companies, would the subprime
meltdown have occurred?**

Across Industries

Case Study in Hybrid ERM Technique

AN EFFECTIVE EXAMPLE of a hybrid risk management technique is the integration of failure modes and effects analysis (FMEA) processes and stress testing.

One insurer has taken this approach by applying FMEA techniques to develop assumptions for stress-testing selected risks. The company began by selecting a short list of risks to test. It then identified the key business activities that would be affected by each risk event and drew up a list of key personnel with insights into each business activity. Through an iterative series of interviews, the impacts of the risk event were quantified, becoming more specific and detailed at each round of interviewing. These impacts were reflected in a cash flow model that consolidated the effects and produced a projection of cash flows and enterprise value. The impact of the risk is the difference from the base-case scenario.

The iterative nature of the FMEA process makes the quantification of risk impacts less overwhelming by providing personnel with a guided process for reaching specific quantification of risk impacts. Additionally, it results in improved communication of risk impacts across the organization so that inconsistencies in assumptions can be identified and addressed. And the results are credible to management.

management with a view as to where risk mitigation activities should be targeted. Additionally, management can use this approach to assess the effectiveness of those activities once they are implemented.

Other techniques are utilized to identify potential risk areas before risk events even occur. When used to address product defects, these approaches are most critical when even a single defect will result in a catastrophe, such as in launching the space shuttle. Similarly, they can be applied effectively to risk events that have a low probability but high impact. Failure Modes and Effects Analysis (FMEA) is a scenario-type, bottom-up tool used to prioritize potential process defects based on their severity, expected frequency, and likelihood of detection. A related approach, Fault-Tree Analysis, is designed to assess a system for weaknesses from the top down, identifying areas that are most subject to failure. More recently, Six Sigma has been developed as a system for process improvement through the identification and removal of defects, using a five-step “design, measure, analyze, improve, control” cycle. All of these techniques have been extended beyond their original application to product defects and used as tools for risk management.

In some manufacturing conglomerates, Six Sigma has been used very effectively as a risk management tool. As applied to product or process defects, Six Sigma processes are used to drive defects down to a specified threshold of 3.4 defective parts per million opportunities. The same processes that are used to achieve this threshold in product quality are also applied to reduce risk events below a specified level. Success is determined by tracking risk events over multiple periods and observing whether the number of risk events in a specified category has decreased. This technique fits very naturally in companies that already have a strong Six Sigma culture, as it leverages the same language and thought processes that are already familiar to company personnel.

As a result of the long history of performance improvement and quality assurance systems that have been pioneered and refined in the manufacturing industry, it's clear that manufacturers are experts at mitigating operational risk. However, manufacturers have little or no expertise in the management of financial risk. Although this risk is of less significance to manufacturers, it still must be considered in the design of an ERM system. Additionally, manufacturing companies haven't been able to break free of their

backward-looking focus. For expertise in the area of managing financial risk through the application of forward-looking techniques, we next turn to banks.

Banking

The key objective of banks is to mitigate financial risks, such as market, credit, and liquidity risks. The relatively short-term nature of the bank's investment positions gives rise to the intraday and daily monitoring of risk positions as noted above. Thus, banks' leading practices for risk management must achieve a balance between complexity and speed in providing information about risk. Unlike manufacturers, banks must adopt a forward-looking approach to risk management that anticipates the impacts of changes in economic indicators and consumer behaviors.

Traditionally, the quantitative techniques used by banks have included duration and convexity calculations and asset liability matching. Banks also use stress-testing to assess their exposure to financial risks. More recently, banks have adopted stochastic techniques. Value at Risk (VaR) and Earnings at Risk (EaR) techniques are used on a daily, weekly, or monthly basis to assess the probability that the bank will lose a specified percentage of value or earnings over a specific (usually very short-term) time frame. This technique also requires the determination of underlying probability distributions for different variables in order to generate an appropriate range of potential outcomes. However, academics in the field of finance have spent significant time and effort on developing theories around appropriate probability distributions for use in modeling the movement of various financial assets and markets. While no one distribution is perfect, banks have the benefit of a number of generally accepted distributions for use in assessing market and other financial risks.

On the qualitative side, the tool kit available for risk management isn't significantly different from that used by insurers, with techniques falling into the broad categories of reports, limits, and policies. For example, credit ratings and reports and concentration reports are used to monitor credit risk in a portfolio. Many banks use a highly structured credit risk assessment process. Significant effort is invested in generating these reports in a timely manner so that risks can be monitored appropriately. Investment and trading limits are used to address exposure to market risk, al-

though as recent well-publicized failures have shown, these limits are not always effectively enforced.

For all of its emphasis on risk management techniques, the banking industry has had its share of high-profile failures in recent years. The subprime crisis is a clear example of a risk management failure. Key quantitative tools, such as models that might have predicted the liquidity crisis resulting from a housing market downturn, were either not used or weren't sophisticated enough to predict events or estimate their consequences. Perhaps more critically, certain qualitative tools weren't properly applied. Credit limits were ignored or were expanded to allow the concentration of too many high-risk loans. Policies regarding documents required for loan origination were modified. As a result, lenders significantly increased their risk without acknowledging the shift in their risk appetites.

Banks and other institutions in the field of finance have clearly led the way in developing techniques for the measurement and management of market risk. However, recent high-profile failures show that banks could clearly benefit by incorporating additional risk practices from outside their industry, particularly with respect to operational risk. Additionally, banks could find value in the more sophisticated tools in use in the insurance industry to predict macro-level longer-term trends in economic markets and

consumer behavior. In order to ensure the continued timeliness of risk management information, these more time-consuming analyses could be supplemented by existing risk management tools that produce less sophisticated results in a shorter time frame.

Insurance

The insurance industry possesses some of the most sophisticated tools of all industries for risk management. One of the reasons for this is that insurers are not just focused on risk mitigation, as are banks and manufacturers. Insurers are also keenly focused on the exploitation of risk, as they are in the business of taking on insurance risk for profit. The successful exploitation of risk requires sophisticated, forward-looking models that allow companies to price for uncertainty and sensitivity-test various strategies over a range of variables. These models are further complicated by the wide array of products offered by insurers today. For life insurers, the situation is further exacerbated by the built-in options, guarantees, and the long-term nature of the policy contracts. Fortunately, insurers have had access to actuarial skills and have a long history of asset-liability management and catastrophe modeling, techniques that continue to evolve to this day.

There are two general approaches that insurers take to the quantitative analysis of risk. First, stress testing is used to as-



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sess the impact of specific deterministic risk scenarios. Models are typically developed to accommodate a wide range of insurer and policyholder interactions that may take place over a significant length of time. Because of the deterministic nature of the projections, scenarios can be specified to a high degree of detail since model run time is not typically a constraint. However, this requires the insurer to develop a well-reasoned, highly specific point of view on the path that a particular risk may take, as the outputs from the process are only as valid as the inputs used to generate them. This approach results in a sophisticated view of specific key risks but doesn't provide any insight beyond the selected scenarios that the insurer wishes to consider.

A second approach is the use of stochastic economic capital or dynamic financial analysis (DFA) modeling. In this approach, scenarios based on underlying probability distributions assigned to key variables are generated stochastically. This approach has the advantage of considering a much wider range of potential outcomes than can be considered with a deterministic approach. However, companies still face the challenge of determining valid underlying probability distributions for use in the model. An additional disadvantage of this approach is that the technical sophistication of the modeling approach may serve to mask inaccuracies or oversimplification in the determination of the underlying probabilities.

Because of the complexity and, for life insurers, the long-term nature of the risks being considered, quantitative approaches in the insurance industry are typically applied on a quarterly or even annual time-interval basis. While this frequency of analysis may be acceptable for the majority of risks that an insurer faces, which may take longer to develop, it may not be sufficient for those risks that can develop over a much shorter time, such as catastrophic events or sudden market movements. From a qualitative standpoint, insurers typically use many of the same techniques used in other industries, such as limits (e.g., underwriting limits, investment guidelines), reports, and policies.

One leading insurer has made ERM the basis for its strategic decision-making by implementing an efficient frontier framework to track risk and reward. The company implemented a robust economic capital model initially for the purpose of understanding its risk appetite and the optimum level of capital in each business unit. However, it has expanded its use of the economic capital model to assess the risk of proposed strategic projects. By assessing the risk of the project in this manner, the company can plot each project on a risk-reward curve. This allows it to assess the desirability of each individual project but also to plot an overall efficient frontier for the insurer. The company can then push out the efficient frontier by identifying projects that generate higher returns for a specified level of risk. This allows it to improve its competitive position against others in the industry.

While insurers are undisputed experts in the field of insurance risk, many insurers could benefit from innovative techniques to deal with other risks, such as operational risk. Additionally, the increasing pace of business in general and the greater use of financial market guarantees in life insurance and annuity products

will require insurers to find more nimble ways of measuring risk in order to move toward the intraday or daily monitoring of risk used in the banking industry.

Leveraging ERM Practices

In each of the industries above, significant investment has been made over many years to develop leading practices for the management of its key risks. When taken together, the result is a broad range of risk management techniques that carry the benefit of the best thought leadership from experts in each industry. Given this wealth of risk management expertise, companies looking to create the most effective ERM program for their specific culture and risks would clearly benefit from reviewing practices from other industries and aligning those techniques with their culture and risks as appropriate.

There are two ways in which companies may consider doing this. The first, and more straightforward, is to adopt appropriate techniques wholesale from other industries for application to the same types of risks for which those techniques were developed. Some of this activity is already occurring. Clearly, insurance companies have utilized many of the techniques developed in the banking industry for the management of market and other financial risks of their asset portfolios. Banks and insurance companies could also leverage some practices from manufacturing to address operational risks. Six Sigma and lean processing techniques could be applied to improve the quality of repetitive processes, such as underwriting, contract administration, transaction processing, etc.

There is a second, and much more transformative, way that companies can leverage practices from other industries to their benefit. By borrowing concepts of other industries' risk management techniques and redesigning these to address risks for which they weren't originally intended, companies can develop truly innovative ways to manage risk and strengthen their ERM programs. Some examples of this are as follows:

▶ Insurers can continue to leverage leading practices from the banking industry by using short-term market risk techniques to assess and manage their portfolio of embedded options and market-related guarantees on an intraday or daily basis, thereby applying consistent processes on both the asset and liability sides of the balance sheet.

▶ Insurers and banks can apply operational risk techniques such as FMEAs to identify risks and produce more robust assumptions and parameters for the stress testing of all risks, whether insurance related, financial, or operational. The FMEA technique uses expert elicitation to brainstorm key risks and detailed descriptions of their outcomes, a practice that's particularly useful for low-probability, high-impact events for which historical data on effects are limited or nonexistent.

▶ Banks can institute more rigorous enterprise-level models of the type typically used by life insurance companies. By using approaches similar to those employed by insurers, banks could model more specifically the interactions and responses of banks and consumers to various economic indicators over a longer time

horizon. This technique would help banks to identify earlier those risk events that take a longer time to reach critical levels, such as the recent subprime mortgage crisis. These models could also be used to aggregate over several different types of risk, such as market, credit, and liquidity, which are more commonly managed in individual silos.

➤ Manufacturers can implement stress testing to quantify the impact of operational risks. The data collected in risk-event databases can be particularly useful for establishing assumptions and parameters for deterministic stress-testing scenarios. Manufacturers should also consider extending stochastic modeling to their operational and other risks in order to assess the benefits of risk transfer and other key strategic decisions.

A detailed review of risk management techniques from other industries would provide risk managers with even more insights into innovative improvements for their existing processes.

A Broad View of ERM

No one industry has the market cornered on effective ERM practices. The divergence of practices across sectors is enlightening and provides food for thought for risk managers in all industries. By utilizing a variety of risk management practices, not only can

companies more effectively manage all the risks within the enterprise; they can also further innovate in their management of risks for which they are already perceived to be experts. Bringing together a number of varying risk management techniques does create additional challenges in the aggregation of risks into a single enterprisewide measure. However, the additional insights into risk that are provided by these leading practice techniques will help insurers and other companies to maintain the health of their companies while competing effectively.

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