

Enterprise Risk and Management Incentives

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ABSTRACT

This paper examines how incentives created by management structures and performance measurement systems affect a corporation's risk management decisions.

- Unique risks diversified by shareholders may impose high costs on a firm's managers.
- Systematic risks that shareholders avoid may not affect managers.

Enterprise risk management reflects a shift from traditional insurance products that transfer risk between firms to an emphasis on manager incentives and performance measurement systems to align shareholder interests with those of their agents (the firm's managers).

This paper adopts the Coase perspective (microeconomics): social efficiency depends on business incentives and the ability to mitigate losses, not on legal rights or risk transfer to another enterprise. The principal agent problem between shareholders and the firm's managers implies that social efficiency is maximized when manager's incentives are parallel to those of investors.

This paper uses a commercial automobile illustration to show how actuaries can adapt experience rating techniques to the division managers of a manufacturer to reduce both enterprise risk and insurance costs. A second illustration shows how internal reinsurance arrangements can be used to reduce reinsurance costs and raise shareholder value.

Experience rating and internal reinsurance are traditional techniques. The ERM innovation is the shift from risk transfer to manager incentives. Performance measurement systems must change so that managers risk decisions maximize the firm's value. If managers fear reprimands for non-systematic, speculative risks that cause unexpected losses, they make poor insurance decisions.

Enterprise risk management applies to business risks as well as speculative risks. This paper uses two illustrations to show how manager incentives prevent firms from effectively implementing business strategies.

- Independent agency systems are less efficient than exclusive agencies, and direct writers are gaining market share at the expense of traditional insurers. The transition from independent agency insurer to direct writer is not easy, and it is rendered more

difficult by performance measurement systems that cause managers to strengthen current agency relations and avoid the risks of agent boycotts of their products.

- The automobile and airline industries promised labor benefits they could not afford, and relied on government regulation and cartels to suppress competition and keep prices high. These strategies seem mistaken because they destroyed shareholder value. But they kept management jobs with high salaries through retirement and full pensions afterward. The problem was not a failure to forecast accurately; it was a failure to align managers' incentives with those of shareholders.

Actuaries and insurers are adapting to the revised risk management paradigm with new products and expertise.

- Insurers have modified traditional business policies to keep loss reduction incentives with the local manager but large financial costs with the enterprise or the insurer.
- The actuarial societies are developing ERM education separate from traditional insurance products and applicable to non-financial industries.

The ERM perspective should enable the actuarial profession to serve in a wider array of assignments, working to optimize risk management of both business and insurance risks.

INTRODUCTION

Paradigm shifts are hard to predict, but they offer great opportunities when correctly foreseen. Many financial professionals, including actuaries, are examining the risk of the enterprise. The focus on enterprise risk management has met a warm reception: corporate executives, boards of directors, regulators, and rating agencies support the new endeavor.

Enterprise risk management (ERM) has little effect on the personal insurance consumer, who will continue to buy auto and homeowners coverages. For corporate consumers, and even more for insurers and reinsurers, ERM may change the services bought and the products provided. The largest effect may be on the actuarial societies, for two reasons:

- Employers seeking professionals with expertise in enterprise risk management will look to educational organizations that grant degrees in ERM. Actuaries may be highly qualified for risk analysis, but the years spent on insurance studies may be seen as a distraction. By granting degrees in ERM, societies create reputations for themselves.
- A growing concern with financial risk has led to convergence among several societies. The CFA, SOA, CAS, and GARP societies define their members as risk specialists, not constrained to specific industries. Employers cannot judge the quality of professional education. If one society grants degrees in ERM, other societies must do so as well.

ONCE AND FUTURE PARADIGMS

Risk has always been a mainstay of financial analysis. Investment analysts assume they have solved the risk-return conundrum. The expected return on a portfolio depends on its systematic risk, which is the risk that is not diversifiable. Analysts differ on the exact attributes of systematic versus unique risk. But the link of return to systematic risk is based on strong arbitrage arguments. Risk can be measured, quantified and priced.

Some proponents of enterprise risk management have no quarrel with this perspective. ERM is financial risk analysis writ large:

- Investors analyze financial call and put options, ERM deals with real business options.
- Investors speak of efficient security frontiers, ERM speaks of efficient frontiers of business strategies.
- Investors optimize asset portfolios, ERM optimizes asset-liability portfolios.

Other proponents of ERM discard the investment perspective, which they perceive as too narrow. They use utility theory, risk aversion, and behavioral finance to link reward to risk. Actuarial science studies risk loads for insurance, which ERM extends to the general operations of a firm.

But ERM is neither modern portfolio theory writ large nor a replacement for portfolio theory. As the name implies, it extends risk from the investor to the enterprise.

Well-diversified investors are not troubled by diversifiable risk, because this risk (by definition) has been eliminated from their portfolios. Other investors follow the lead of a well-diversified one and deal only with systematic risk, because additional return for other risks provides arbitrage opportunities to well-diversified investors.

But the behavior of stock prices is not the behavior of the enterprise itself. The enterprise is run by managers, not by diversified investors. The enterprise itself cannot diversify. For the managers, enterprise risk management is critical.

We do not imply that the firm receives additional reward for other risks, which it passes on to its owners. The investors in any firm can diversify, and the investors do not receive additional return for diversifiable risk. But the firm's managers avoid risks that are inimical to their own interests even if they are of no concern to the investors. Avoiding these risks reduces their returns, but the lower return is not subtracted from shareholders. The shares of manager-run corporations are reduced for the expected lower returns, so the return to the shareholders reflects its systematic risk.

MANAGERS VERSUS INVESTORS

Financial economists speak of the principal agent problem: the different interest of principals and the agents whom they hire. It takes myriad forms, so it is hard to quantify. It affects corporate governance, manager compensation and performance measurement.

Managers avoid risks that shareholders are willing to assume, and they assume liabilities that shareholders would not.

- Shareholders avoid systematic risk that cannot be diversified unless they are compensated by higher returns. They willingly assume diversifiable risk, particularly if it is accompanied by high returns.
- Managers' most valuable asset is their jobs. Most senior managers would not find jobs at comparable pay if they lost their current positions and their foremost concern is to retain their jobs.

The principal agent problem is most evident in corporate efforts to diversify products and smooth earnings. Shareholders prefer managers to focus on their strengths. High earnings are desired even if they are volatile, as long as the volatility is not systematic risk.

The principal agent problem is most severe in decisions about the assumption of risk. A manager may be highly concerned about labor strife, even if shareholders are willing to assume the unique risks of possible work stoppages. Managers are too willing to assume large future costs for pensions and post-retirement health care that come due after the manager has retired, though these costs lower future earnings and current share prices.

ERM uses risk analysis to mitigate agent principal problems and raise returns. ERM focuses on principles of financial economics drawn from several disciplines that affect corporate behavior. It revises risk decisions so that

- Behavioral decisions are left with persons having the greatest incentive to reduce cost.
- Risk assumption is left to persons with incentive to reduce systematic risk, not unique risk.
- Performance measurement systems focus on expected profits, not unique risk.
- Unique risks are diversified at the lowest possible cost.

ERM applies to all industries; it is not specific to insurance. ERM extends risk control from insurance products to behavioral incentives. We illustrate many of its principles with insurance pricing, since readers are most familiar with this subject. But our success with ERM depends on shifting from an insurance paradigm to an incentives paradigm. As risk managers learn to transform business incentives to deal with risk and

uncertainty, ERM shifts from traditional (actuarial) solutions to more effective behavioral changes.

BEHAVIORAL DECISIONS

Traditional insurance products are helpful in some ways and detrimental in others. Actuaries quantify the financial effects, but may ignore the behavioral incentives.

Illustration: Seat belts prevent serious injuries, so drivers wearing seat belts are less fearful of potential accidents and more enticed by the benefits of speed. A driver wearing a seat belt has a lower risk of being seriously injured and a higher probability of injuring others.

- If no drivers wear seat belts, all drivers fear injuries and drive more slowly.
- If all drivers wear seat belts, they drive more rapidly and have more accidents.

Economists speak of this as a negative externality. Seat belts change consumers' behavior to adversely affect others. They cause more physical accidents, but it is unclear if they cause more or less bodily injury. Some economists say they raise the total injury costs.

Seat belts are a safety device meant to curb risk that changes drivers' incentives and increases risk. Applied to insurance coverage, underwriters speak of this as morale hazard.

Illustration: Flood, earthquake, and windstorm coverages—especially when provided at subsidized rates – remove disincentives from building in hazardous areas. People who might be reluctant to build homes along the Gulf Coast, river basins, or earthquake faults no longer have these disincentives. Governmental provision of subsidized flood insurance or emergency financial aid and rebuilding after hurricanes and earthquakes exacerbate the disincentives.

New Orleans is a city that should never have been built; having learned our lesson, we are rebuilding it. Consumers are rational and do not invest their own money in hazardous properties, so we use government funds instead. The increasing severity of natural catastrophes reflects the removal of disincentives to incur the risk of catastrophes.

STATE GUARANTEE FUNDS

State guarantee funds, which protect against insolvency of insurers, is ERM on an industry scale. Guarantee funds are hailed by regulators as a safety measure that arrived just in time. Insurance insolvencies multiplied after the advent of guarantee funds. We say that guarantee funds mitigate the pain to consumers from insurance failures. In fact, guarantee funds help fuel the insolvencies, not mitigate them.

- Before the advent of state guarantee funds, agents avoided high risk insurers, lest they be liable for procuring improper coverage and causing financial loss. An agent who issued policies from a risky insurer that failed to pay its claims might be sued by policyholders for negligence. Insurers sought to maintain strong balance sheets, lest agents not service their products. Insurance insolvencies were rare.
- Once state guarantee funds paid claims of insolvent insurers, agents sought the lowest cost carriers. Insurers had less incentive to maintain strong balance sheets. High risk insurers with little capital earned high returns, making them attractive to equityholders, and charged lower premiums, making them attractive to policyholders. Guarantee funds remove the obstacles to risky activity, ultimately harming society.¹

Illustration: Pension guarantee funds safeguard workers against investment risks, even as investment guarantee funds protect against insolvency risks. But pension guarantee funds simply shift the liability for investment losses and underfunded plans away from the party with the knowledge to manage the plans. They reduce the incentives to fully fund the plans, thereby increasing the eventual cost of plan failures. The premium for the guarantee fund does not reflect the risk, so financially distressed employers have incentives to underfund their plans and workers have little incentive to give up current pay for adequate pension funding.

ERM AND INCENTIVES

The traditional insurance paradigm presumes that behavior is fixed and risk is exogenous. Shifting the financial consequences of risk to an insurer pools the risk, spreads the risk and softens the pain of loss. But transferring the consequences of risk away from consumers, who have the incentive to avoid it or the ability to mitigate it, raises the incidence and costs of risk. Shifting financial responsibility has a minor effect on social welfare; raising the cost of risk has a great effect.

In competitive markets, the ultimate costs of risk are borne by consumers. By emphasizing the financial consequences but not the incentives, the traditional paradigm raises the social costs of risk. ERM focuses on the incentives to avoid risk and the ability to mitigate risk, lowering the ultimate costs to consumers.

Seat belts: People drive more carefully if they suffer the consequences of accidents. *Seat belts do not prevent accidents; they prevent injury from accidents.* They induce people to driver faster and more hazardously. People may drive so much faster that their own risk of injury increases back to the level as without seat belts. The risk of injury to others multiplies several-fold.

Guarantee funds for insurance, banking, and pensions remove the incentives to avoid risk, underfunding, and fraud. Firms in financial distress have particular incentive to assume high-risk projects since they do not bear the cost of losses. Guarantee funds

increase fraud, as managers of distressed firms have incentives to abscond with assets and leave the liabilities to the funds.

Experience rating restores the disincentives to risky activity if the manager responsible for the risk incurs the experience rating debit. When this is not true, experience rating has little effect on behavior.

Illustration: An uninsured firm eliminates work hazards that can cause employee accidents. Insurance eliminates the incentives, and plant managers are less concerned with hazards. Experience rating restores the financial disincentives to hazardous activity. In some large firms, the operations manager can best control the hazards, but the experience rating debit is incurred by the corporation.

PERFORMANCE MEASUREMENT AND MANAGER INCENTIVES

Economists, underwriters, and actuaries have long understood the effects of incentives. But the traditional solutions often erred by assuming firms were monolithic. In truth, firms are interlocking webs of managers, each with different interests. Sophisticated financial planning may shift disincentives from managers who could best *avoid* the risk to risk managers who *budget* for these risks.

Performance measurement systems exacerbate the problem. An uninsured non-systematic risk provides incentives for risk control, and it is ideal for diversified shareholders. But it is viewed as an avoidable risk and charged back to the operations manager.

Insurance premiums reduce the incentives for risk control. They are budget entries charged to the firm, not to the manager who can control the risks. Shifting the financial consequences of loss may increase the cost of loss and reduce the value of the firm, but ensure good reviews for the manager.

Illustration: Catastrophe planning is hailed as a savior when a catastrophe occurs. But catastrophe planning does not lessen the probability of catastrophes. It might even reduce the financial incentives to avoid catastrophes and move the consequences from managers best suited to control the losses to managers who are assigned to plan for risks.

- If the catastrophes are unforeseeable and uncontrollable, catastrophe planning helps.
- If catastrophe planning reduces the incentives to avoid hazardous activity, the incidence of catastrophes and their costs may increase.

MANAGEMENT COMPETENCE AND INCENTIVES

Blanket statements about risk control and behavioral incentives are rarely valid. ERM examines the behavioral incentives specific to each scenario to determine the optimal allocation of risk. ERM differs from other economic analyses by combining the theory of the firm with the theory of risk. It is not enough to assign the costs of risk to the firm responsible for them. We must assign the cost of risk to the managers most capable of reducing them and provide them the performance measurement incentives to reduce the cost to the firm.

We sometimes presume that operations managers are most competent to oversee operations and risk managers are most competent to reduce risks. But risk managers may be experts in financial risk transfer, not risk reduction. The risk manager's *raison d'être* is to control the costs of risk; his value is evident only if the risk remains but is *managed*.

The ideal solution is to eliminate the risk. The risk manager may have a poor sense of the operations contributing to the risk, no authority to change operations, and no incentive to eliminate the risk. The upshot is an increase in risk and financial loss, combined with a self-congratulatory feeling of having *managed* the risks.

ERM expands the purview of risk management to include both risk control and risk transfer, along with the effects of separation of responsibilities and performance measurement systems on risk avoidance.

LINE RESPONSIBILITIES, BUSINESS RISKS AND MANAGERIAL INCENTIVES

As managerial responsibilities are separated, the incentives to control risk decline. Large firms separate production operations, financing, human resources, sales, advertising, labor relations, and various other responsibilities.

- Exogenous risks, such as fires and catastrophes, do not change much.
- Endogenous risks multiply as one manager assumes risks that affect other managers.

Illustration: Employers who are both owners and managers of a firm are unlikely to promise post-retirement health care to employees. These promises help managers who seek good relations with workers but will not around when the cost come due. They hurt owners whose firm value declines when the cost of the promises becomes known.

Unfunded employee benefit obligations are a major cause of bankruptcy, just as public health care systems threaten to bankrupt entire countries. The ills caused by poor manager incentives are analogous to the ills of centrally planned systems. Job banks at General Motors are like workers at state run industries. Free markets are the antithesis

of central planning; large, centralized firms with separate incentives for different managers may imitate central planning.

Government bureaucracies may supply services less efficiently than private firms. The postal services of many countries inhibit innovations that threaten their monopolies and often seek to prevent private firms from providing the services that they do not provide.

We conceive of private firms as profit-maximizing entities. But as firms grow, they take on the characteristics of bureaucracies and planned economies. Inefficient operations continue because they satisfy the interests of entrenched managers, not those of the firm.

Risk management is particularly susceptible to inefficiencies when responsibility for risk is separated from operations. ERM measures the costs and benefits of different modes of handling business decisions related to risk. Employee benefits, distribution systems, and catastrophe planning have benefits and drawbacks that are best analyzed by ERM.

RETROSPECTIVE RATING

Background: Large employers may wish to retain financial responsibility for their group health insurance plans and workers' compensation programs but have an insurer or a third party administrator (TPA) service the plans. The employer has the incentive to reduce costs, and the insurer or TPA has the expertise to service the plan efficiently. Indemnity payments are made by the insurer or TPA and reimbursed by the employer.

Loss adjustment expenses (LAE) may be handled two ways. The optimal treatment may differ for (i) investigation and legal defense of dubious claims versus (ii) overhead fees.

Z. included with losses and reimbursed by the employer.

AA. included as a flat loading that is paid by the employer.

Illustration: Suppose average loss adjustment expenses are 10 percent of indemnity benefits. If an employer incurs \$20 million of indemnity benefits and \$2.5 million of loss adjustment expenses, it reimburses \$22.5 million under option A and \$22 million under option B.

Employers ultimately pay for loss adjustment expenses just as for other insurance costs.ⁱⁱ

Coase Theorem: Flowers, Fumes and Loss Adjustment Expenses

The insurance perspective focuses on legal exposures and property rights. It assumes economic efficiency and social welfare are optimized by shifting financial risks to the parties (insurers) whose cost of bearing them is lower, either because

- the insurer is less risk averse than the consumers, or
- the insurer spreads (diversifies) the risks over many shareholders or policyholders.

But economic efficiency and social welfare are distinct from legal rights. The *Coase Theorem* says that efficiency and social welfare are optimized when the responsibility of economic actors are aligned with their costs and incentives, not with their legal rights. We explain the Coase Theorem with a flowers and fumes example and then apply it to ERM.ⁱⁱⁱ

Part 1: A grocery store owns a small flower garden at the outskirts of a town near the exit of an interstate highway, where it grows flowers for occasional sale. The land is not ideal for gardening—the soil is poor and it is too far from the grocery store for the owner to tend to it—but it was the least expensive land available.

A chemical firm builds a factory near the highway exit, so that fumes from the factory do not drift into residential areas and it can easily ship raw materials and finished products. The fumes from the factory pass over the flower garden and harm the flowers, and the proprietor of the grocery store sues to have the chemical factory relocated elsewhere. The court agrees that the chemical factor is at fault for the trespassing fumes.

The present location is ideal for the factory: it is at the outskirts of the town so the fumes do not disturb residential areas and it is next to the major highway for easy transportation of goods. Moving the factory to another location is inefficient. The chemical factory would offer to buy land elsewhere and relocate the flower garden.

Whether the flower garden or the chemical factory is relocated should depend on efficiency issues, not legal merits. The court should decide who pays the moving costs and the cost of new land. Economic efficiency requires that the flower garden be relocated; the legal merits make the chemical firm responsible for the relocation costs.

Part 2: The city expands, and an apartment complex is built next to the chemical factory. The fumes from the chemical factory waft through the apartment complex, creating a foul smell, lowering demand and rental value. The owner of the apartment complex sues the chemical factory for damages caused by the fumes.

The owners of the chemical factory tell the landlord to install air fresheners to mitigate the smell. The landlord says it would be cheaper for the chemical factory to install filters on its exhaust pipes to stop the fumes. The court decides that the chemical factory was situated on its property before the apartment complex was built, and its fumes are not in violation of any law.

It is more efficient for the chemical factory to install filters. Whether filters or air fresheners are the solution is an economic issue, not a legal one. The court should decide who must pay to install the filters; in this case, the landlord should pay to install the filters.

COASE AND RISK MANAGEMENT

ERM examines the *benefits, costs, expertise* and *incentives* of each manager to best allocate the firm's risks.

Risk transfer exchanges a large but uncertain loss for its expected value plus the insurer's expenses and profit. The consumer gains if the reduction in risk through diversification outweighs the expenses plus any hidden costs of lower incentive to manage risk.

The changing demand for insurance implies that traditional insurance products may not be the optimal techniques.

Illustration: Before 1990, most commercial insurance was first-dollar coverage. Many firms now prefer large dollar deductible (LDD) policies. The original incentive for LDD policies was the reduction in the assessments for state residual markets. Consumers' demand for LDD policies has risen steadily, as the benefits of greater risk control are realized.

ERM expands risk analysis two ways:

- The managers who buy traditional insurance products act in their own interests, which are not always aligned with those of shareholders.
- The primary concerns of shareholders and senior management are business risks, which are not covered by traditional insurance products.

LOSS ADJUSTMENT EXPENSE

If insurers spent their own money for investigation and legal defense and were reimbursed a flat fee by employers, they might not investigate claims or defend them adequately. The insurer has a financial incentive *not* to contest claims, since it pays the defense costs but is reimbursed for indemnity benefits. The ultimate costs to the employer rises, so employers prefer to reimburse defense costs in addition to benefits.^{iv}

In contrast, if the employer reimbursed claims department overhead costs, the insurer might pay high salaries and incur unnecessary expenses. It is more efficient for the insurance company to pay these costs and collect a flat fee from the employer.

Some insurance contracts misallocate these costs. In traditional workers' compensation retrospective rating, all loss adjustment expenses are a flat loading on losses.^v Similarly inefficient is the reimbursement of all loss adjustment expenses as part of the servicing carrier fee in workers' compensation involuntary market pools. The servicing carriers have a disincentive to contest dubious claims, because they pay the investigation costs and all insurers in the state share the benefits. The disincentive to investigate

involuntary market claims spurs workers of employers in the pools to file dubious claims. The higher claim costs from this unintended loss cycle justify the placement of these employers in the pools.

ERM analysis focuses on the incentives and ability to control costs. Improper risk management is as prevalent in the insurance industry as in other industries, even in fields dominated by actuaries, such as retrospective rating and involuntary markets.^{vi}

CATASTROPHE EXPOSURES

Catastrophe risks for property insurers are particularly suited to ERM, since they are diversifiable for shareholders but affect managers' behavior. Suppose *investing* in property insurance has average *systematic risk*, with an expected return of 12 percent per annum.

A homeowners insurer should return 12 percent to its investors. An insurer writing in Florida, Louisiana, Texas, and other Gulf Coast states faces non-systematic risks from hurricanes.

The insurer can avoid the non-systematic risk by buying a catastrophe reinsurance cover.^{vii} But reinsurance is expensive. The reinsurer pays

- brokerage, underwriting and general expenses
- double taxation and other costs of holding capital
- retrocession costs for its own risk transfer

We assume the total cost is 5 percent of invested capital. Pricing actuaries calculate a risk load for hurricane coverage to cover the 5 percent cost of reinsurance.^{viii} The insurer can

- Add the risk load and buy the reinsurance cover, earning a 12 percent return for its investors.
- Write windstorm coverage, collect the risk load, but not buy reinsurance coverage, earning a 17 percent return for its investors.

The investors may not want the reinsurance. They are content if the insurer takes the risk of hurricanes, earns a 17 percent return, and every so often suffers a large loss.^{ix} They should instruct their managers to retain the non-systematic risk.

But insurers buy cat covers, and actuaries load the premiums for the cost of reinsurance.

Shareholders can not compel their managers to forego reinsurance. If managers can not buy reinsurance, they avoid catastrophe risks and do not collect the risk load.

Shareholders must pay managers to assume the unique risk of hurricanes. Managers may agree to assume the catastrophe risk for an additional 20 percent of salary, which compensates them for the risk that their firms may become insolvent. If the 20 percent of salary is less than the 5 percent of invested capital, it seems that shareholders and managers both gain.

But shareholders are not able to monitor underwriters' behavior. Managers would collect the additional 20 percent of salary but avoid coastal properties without admitting to doing so. Managers would gain handsomely, and shareholders would lose.

The insurers buy the catastrophe reinsurance covers not to protect their shareholders but to protect their managers. Financial economics has no place for catastrophe risk loads that are easily diversified by shareholders. But managers avoid these risks or eliminate them. The risk load reflects the costs of ERM, not of financial risk management.

ERM AND INVESTMENT ANALYSIS

If reinsurance were sold in perfectly efficient markets with immaterial transaction costs, managers would eliminate the diversifiable risk of natural catastrophes with reinsurance, and the returns for all insurers would be 12 percent.

The market for shares of insurance companies is efficient, so investment analysts ignore non-systematic risks. Insurance product markets are competitive but not perfectly efficient. Enterprise risk management examines the risks and returns for the enterprise, whether an insurer or another firm, and the effects of risk on management behavior.

ERM raises the value of the firm and its returns to investors by total risk management. If all firms equally practice ERM, returns to investors remain the same, firms become more efficient, consumers gain, and social welfare increases.

Financial analysts take several views of enterprise risk. Some deny its existence, saying that managers serve the interests of their investors. This is a normative statement, not an empirical one. In the United States, we say that managers *ought* to serve the interest of their investors. In other countries, even this norm is suspect. Managers are said to serve the interests of employees, consumers, or other stakeholders.^x

In fact, managers serve their own interests, whether in the United States or other countries. Enterprise risk management analyzes the benefits, costs, and incentives that govern their behavior and affect the firm's actions. By mitigating and re-allocating risks or incentives, ERM may enhance investor returns. It is too early to predict whether ERM can do so, but it is better to err and be prepared for change than to err and be left behind.

Illustration: Oil companies have large swings in profits, caused by fluctuating demand (weather, development of third-world countries), environmental concerns that constrain other energy sources (nuclear, coal), and political issues that affect the supply of oil in the Middle East, Russia, and Latin America (wars, cartels, embargoes). Some oil company managers tend to avoid risky projects, lest they lose their jobs, and hoard cash during profitable periods and incur double taxation instead of paying higher stockholder dividends. The goal of ERM is to rationalize the assessment of risk by managers to ensure that risky projects are undertaken and cash is not hoarded. The focus is on non-systematic risk, but the major beneficiaries are the shareholders.

COMPETITION

Some financial analysts say that competition eliminates the return for non-systematic risk. If managers did not serve the interests of their investors, competition in the product markets would eliminate their firms and competition in the capital markets (takeovers) would replace them with better managers.

Competition eventually lets more efficient firms prosper and inefficient firms decay. But eventually is long, and managers are happy to prosper in a short run that lasts beyond their retirement. Sometimes entire industries protect their turf and oppose competition, erecting barriers to entry. They shift the welfare losses to consumers and governments.^{xi}

Illustration: U.S. airlines vigorously fought competition since deregulation of their industry. They erected barriers to entry by denying airport access to new airlines, keeping air fares high and efficiency low. Instead of making airlines more efficient, deregulation initially made airlines more protective of their turf and more determined to suppress entrants.

The airlines might have succeeded were it not for the decline in demand from September 2001, advances in telecommunications that eliminated the need for much business travel, and the rise in oil prices in the mid 2000's. Incumbent carriers fought competition from low-cost start-up firms by monopolizing airport facilities, not by greater efficiency. Between 1980 and 2000, 29 of 30 new entrants went bankrupt; only South-West Airlines prospered. The high costs of the legacy airlines eventually forced many of them into bankruptcy, with taxpayers picking up the tab unfunded pension costs.

We differentiate between returns to investors versus the managers. Even as airlines drifted into bankruptcy with unfunded pensions, some senior managers earned high salaries and kept their post-retirement benefits. We do not judge these managers; high salaries are needed to keep competent managers in a troubled industry. But each group within the industry – executives, pilots, mechanics, managers—sought its own gains. Each group prospered; consumers and shareholders lost.

ERM examines how the risks of an enterprise, including bankruptcy risks, can be re-allocated or controlled to reduce their cost and increase the returns to investors or managers.^{xii}

Illustration: For 25 years (1980-2005), the U.S. auto industry suffered under high labor costs, inefficient work rules, and non-competitive pricing, steadily losing ground to foreign rivals. Their solution has been to strengthen oligopolistic pricing by tariffs (quotas) on foreign automakers and domestic content rules.

But passing costs onto consumers or governments aggravates competitive weakness, and U.S. auto makers never developed efficient production practices. Even as costs increased, they continued to provide high wages and post-retirement benefits. To ensure labor peace, the automakers promised benefits that they could not provide.

We do not have better management skills than the executives of the airline and automobile industries. Their business successes of some executives that kept their firms intact for decades despite high labor costs and over-capacity are impressive. In general, the managers of firms in these industries have prospered even as their firms floundered.

These illustrations show that competition in the product markets does not force firms to act efficiently, even in industries as fiercely competitive as airlines and automobiles. If the incentives of managers diverge from those of investors, inefficient firms may continue for decades, reducing the returns of investors. Proper ERM analysis re-aligns incentives. Our hope is that proper ERM analysis 25 years ago may have saved these industries.

REINSURANCE

Hindsight is no substitute for forward vision. It is as easy to find fault with economic strategy after the fact as to predict an election after the people have voted or football strategy after the ball is fumbled. Hindsight gives a warm feeling, but no one pays for actuaries with good hindsight.

We use a reinsurance illustration to explain the value of enterprise risk management, showing how an integrated vision of risk, incentives, and performance measurement affects corporate strategy and increases returns.^{xiii} We then examine how ERM deals with business risks, such as changing distribution systems.

A large multiple-line insurer sells a widely diversified portfolio of insurance products. Non-systematic insurance risks, except for catastrophes, are eliminated by diversification, just as investors eliminate non-systematic risks with diversified portfolios.

The reinsurance cost is 10 percent to 20 percent of the reinsurance premium, depending on the phase of the underwriting cycle. This illustration assumes a cost of 15 percent of the premium.

The insurer has 500 reinsurance contracts, ranging from catastrophe covers to facultative placements. Except for a few large treaties, the reinsurance covers unique risks that are diversified (and eliminated) within the insurer's own portfolio. The insurer is larger than most of its reinsurers; it is not transferring the risks to larger enterprises.

The insurer cedes \$2 billion of premium a year, at a cost of \$300 million, including underwriting, brokerage, and profit. The insurer pays \$400 million of premium a year, at a cost of \$60 million, for reinsurance that it deems essential, such as catastrophe covers.^{xiv}

Financial economists often view a firm as a monolithic entity. The firm's action reflects the interests of its owners or senior management. In this illustration, the firm spends \$300 million a year on reinsurance that neither its owners nor its management require.

Underwriters buy reinsurance for their own protection. An underwriter may write a \$120 million shopping mall at a 5 percent rate, for a \$6 million premium. The mall has good risk prevention and loss engineering programs, and most losses are small. The insurer expects losses of \$3 million and expenses of \$2 million a year, for a \$1 million profit. Losses exceeding \$10 million are rare.

The 16.7 percent return on premium may be a 25 percent return on capital. The policy is profitable for investors, who require a return on 12 percent on capital. It is similarly profitable for the firm's senior management, since even a total loss has little effect on their jobs or bonuses.

The underwriter has authority to write up to \$10 million on a single risk. He buys a 25 percent quota share placement, a two line surplus share with a retained line of \$30 million, and a \$20 million excess of \$10 million excess-of-loss treaty. The net profit after all reinsurance is \$250,000. The required capital is lower, and the net profit gives a 12 percent return on capital.

The underwriter is satisfied with the coverage for several reasons:

- The retained profit is small, but it is satisfactory for the retained risk.
- By ceding a good risk, the underwriter earns the goodwill of the reinsurers and is able to place also more complex risks with a greater likelihood of loss.
- The insurer may allow higher limits as it gains experience with the shopping mall.

But the insurer has dissipated \$750,000 of profit. The underwriter may be satisfied, but the investors and the executives are not. To avoid this loss, we consider several proposals:

Proposal 1: Eliminate unneeded reinsurance

The executives identify the reinsurance contracts that provide the needed catastrophe cover and prohibit underwriters from purchasing other reinsurance.

We examine the long-term effects of this change. If the insurer offers only \$10 million of coverage, the mall buys other insurance. If the insurer prohibits its underwriters from using facultative placements, it must give them underwriting authority to write the full risk.

We assume the underwriter has authority to write the full coverage. But the problem is the performance measurement system, not underwriting authority. Managers expect

- Good results are rewarded and raise the bar for the coming year.
- Poor results demonstrate poor judgment.
- Very poor results are evidence of inability to run an underwriting function.

It is hard to distinguish good underwriting judgment combined with bad luck from poor judgment. In hindsight, losses seem evidence of poor judgment.

Illustration: Suppose the insurer targets a 5 percent return on premium, after investment income.

- A return of 5 percent each year is evidence of good underwriting judgment.
- A return of 15 percent one year may be good judgment or good luck.
- A loss of 10 percent one year is a sign of poor underwriting judgment.
- A loss of 20 percent one year signals an inability to manage an underwriting function.

The underwriter prefers a return of 5 percent each year to a return of 10 percent four years out of five and a loss of 15 percent the fifth year, though both give a 25 percent return over the five years. A manager who gets a return of 20 percent each year for four years and a loss of 50 percent the fifth year is viewed as an unsteady performer, whose high returns some years are attributed to luck and whose one poor return shows poor judgment. The 30 percent overall return surpasses the 25 percent in the other scenarios, but the overall benefits (in bonus and promotions) are lower.

Reinsurance lets the underwriter sleep at night. The insurer's investors are concerned with share prices, not with book earnings. High expected returns raise the stock price; a large, non-recurring loss has less effect on reducing the stock price.

Underwriters give up high expected returns with high variability in favor of steady returns that meet performance expectations, even if they are lower. The means to

accomplish this is reinsurance, even if it is expensive and is not in the interests of shareholders.

Proposal 2: Change the management bonus plan

Bonus plans and performance measurement system emphasize stability. The insurer must ensure that performance measures long-term results, not year-to-year stability.

This is impossible to achieve, for several reasons.

Four years of 20 percent profit and one year of a 50 percent loss might be acceptable if the profit years come first. One might budget for the loss by saving the excess profits of the good years. But the loss may precede the good years. No underwriter risks a large loss the first year.

Perceptions force an emphasis on stability. If other underwriters achieve returns of 5 percent:

- A steady 6 percent return is outstanding performance.
- A return of 20 percent for four years and a loss of 50 percent the fifth year shows an undependable underwriter. Good years bring envy and bad years bring rebuke.

Managers gear their performance to their expected bonuses, not the desires of executives. In contrast, investors want managers to take non-systematic risks that raise their returns.

Investors may set performance backed compensation for the CEO, not middle managers. These have little effect on the insurer's purchase of its reinsurance contracts:

- The CEO agrees that the insurer buys too much reinsurance. The issue is how to prevent this. The CEO's compensation is raised by risky but profitable underwriting.
- The chief underwriting officer may not buy facultative reinsurance because he is judged on the insurer's overall underwriting results, which are smoothed over the large book of business. Facultative placements reduce average results; only corporate treaties (catastrophe covers) are needed for the exceptionally bad years. But middle managers—heads of line underwriting divisions—use reinsurance to protect their bonuses.

We have treated investors and the insurer's executives as though they are not concerned with specific risk. But even investors may seek scapegoats for bad performance. A bad underwriting year is attributed to poor judgment by one underwriter who wrote a policy with a \$60 million loss, even if the expected profit was positive and the risk was not systematic.

Proposal 3: Accounting Reinsurance

Insurers use internal reinsurance to spread exceptional losses from individual divisions to a corporate group. Internal reinsurance can work well, but it is difficult to implement.

The simplest internal reinsurance is a pure accounting process. Each underwriting division is assigned a retention. Losses above the retention are paid by a corporate fund. The losses of the corporate fund are reimbursed by each underwriting division as a percentage of cover above its retention.

In our illustration, the retention for commercial property risks may be \$10 million. The underwriter accepts the full \$120 million risk, but losses above \$10 million are assigned to a corporate fund. At the end of the year, the total losses above the retention are allocated to the underwriting units.

This internal reinsurance creates more problems than it solves. Underwriting high layers of loss requires expertise, and accounting reinsurance removes the incentive to collect enough premium from policyholders. An underwriter who needs a higher policy limit to retain an account but who does not pay for the higher losses is unlikely to charge enough.

Proposal 4: Underwritten Reinsurance

The insurer generally has expertise in pricing high layers of loss. It may have its own assumed reinsurance department, or it may have an umbrella liability unit. Experienced home office underwriters may set internal reinsurance rates for each property. The reinsurance premiums and recoverables are notional (accounting) entries, not actual cash flows. They affect the bonuses and performance ratings of line underwriters, but they avoid the commissions, brokerage fees, expenses, and profits of outside reinsurers.

This method is superior to the other proposals, but it still has drawbacks. In particular, it may cause discord among underwriters. Suppose a branch underwriter (BU) writes the ground-up policy, and a home office underwriter (HU) sets the reinsurance premium.

- If the home office underwriter is not responsible for the reinsured losses, the branch underwriters will seek low reinsurance rates. Understating the premium has no cost for the home office underwriter but raises the profit that affects the branch underwriter's bonus and performance evaluation.
- A home office underwriter who is responsible for the reinsured losses will set high reinsurance rates, particularly if the branch underwriter must take the reinsurance.

Manufacturers speak of the transfer pricing dilemma. Requiring one department to buy parts from a second department may impair efficiency.

One can make the internal reinsurance optional: the branch underwriter can take either the internal reinsurance or outside reinsurance. But outside reinsurers are unlikely to bid on the business, since they write the cover only if their premium is lower than that of the primary insurer, who has better knowledge of the risk.

The illustration shows that even insurers, who understand the costs of risk and potential benefits of risk transfer, are subject to the incentives controlling manager activities.

THE TRADITIONAL PARADIGM: RISK TRANSFER AND POOLING

The traditional insurance paradigm uses insurance products to re-allocate risks between consumers and insurers. By pooling homogeneous, independent exposures, insurance is presumed to diversify the risk and increase social welfare. We speak of risk pooling, the law of large numbers, and the credibility of homogeneous risk classes. We say that a thousand consumers with a single exposure each has high risk. An insurer with a thousand homogeneous exposures has low risk.^{xv}

Illustration: A firm with annual income of \$500 million and commercial auto exposures of \$5 million a year transfers the risk to an insurer with annual income of \$500 million and commercial auto exposures of \$500 million a year. We say that the commercial automobile risk has been pooled with similar exposures and reduced by a factor of $\sqrt{100} = 10$.

The opposite is true. The \$5 million of auto exposures are independent of the other risks of the firm. The auto exposure is a unique risk, which is eliminated by diversification in the original firm. By pooling the risk with similar exposures, the insurer diversifies the process risk but not the parameter risk among these exposures.

A single driver faces a large risk exposure, since a single auto accident may cost several hundred thousand dollars. If 100 drivers transferred their exposures *to a single individual*, that person has $\sqrt{100} = 10$ times the standard deviation of loss and 10 times the risk, assuming all accidents are independent. Since the risks are not completely independent, the combined risk is 15 or 20 times the individual risk. If the risk is 10 percent parameter risk and 90 percent process risk, the pooled risk is $10 \text{ percent} \times 100 + 90 \text{ percent} \times 10 = 19$ times as great.

RISK SPREADING

Spreading (diversification) reduces risk; pooling increases risk. Pooling of homogeneous risks is needed for pricing, not for risk reduction.

An insurer with 1,000 homogeneous risk can estimate the expected losses and derive the proper premium. If the risks are heterogeneous, the average cost is too high for some and too low for others. To avoid adverse selection, the insurer may not accept

risks unless it can find enough homogeneous exposures to *price* the coverage accurately.

Once the insurer has priced the risk, it spreads the risks to diversify and eliminate it. The insurer is a corporation of perhaps 10,000 shareholders, not a single individual. Each risk transferred from the individual driver to the insurer is spread over 10,000 persons. A loss of \$100,000 to the driver is a loss of \$10 to the shareholder. The risk is diversified among the other assets of the shareholder and is eliminated.

If the insured is also a corporation of 10,000 shareholders, the transfer of financial loss to the insurer does not reduce risk. But the transfer of financial loss affects social welfare by changing incentives.

BENEFITS OF INSURANCE

For personal consumers unable to sustain a significant loss, risk spreading raises net welfare. But the primary benefit of insurance is for others, not the consumer. For instance:

- Auto insurance is supported by financial responsibility and compulsory insurance laws to help accident victims. A young unmarried male driver with no appreciable assets has no financial reason to spend several thousand dollars on insurance. A compulsory insurance law helps the victims of his hazardous driving.
- Life insurance is supported by the exemption of the *inside build-up* from federal income taxes. The intent of the exemption was to help destitute widows and orphans. Now it gives insurance products an advantage over other investments.
- Workers' compensation is required to aid injured workers, not their employers. The original intent of the state statutes was to make the *blood of the workers* part of the product price paid by consumers. But statutory attempts to soften the hardships of free markets rarely work as intended. Workers' compensation, like all employee benefits, reduce monetary wages and may eliminate low-skilled jobs.

Many exogenous risks covered by commercial insurance products can be diversified by investors. Insurance coverage adds underwriting and acquisition costs, reduces managers' incentives to control risk, and raises morale hazard if consumers become less careful.

Corporate consumers examine risk management options other than insurance. Managers' incentives are critical if the firm's operations are independent of its ownership. Insurers can retain commercial business only if they gear their services to their consumers' needs.^{xvi}

As other firms compete to meet consumers' risk management needs, insurance services change. Actuaries adopt ERM to tailor the new services to consumer needs.

- ERM measures the value of insurance versus other risk management techniques. The actuary who recognizes the limits of conventional insurance and the potential solutions offered by ERM can compete effectively with other ERM specialists.
- The *managers* buying insurance policies gain from these products, not necessarily their firms. The ERM specialist serves the *senior management* of the firm, whose interests are more closely aligned with those of investors. Investors want risks to be managed by those who have the most expertise and the greatest incentive to control them.
- Managers buy insurance to protect their own interests. Managers further the goals of investors only if their interests are aligned with those of investors.
- Identifying the optimal risk management solutions for investors does not address the misaligned incentives that prevent the solution from being implemented. A solution that maximizes shareholder value may not be the optimal ERM solution.
- ERM focuses on performance measurement and manager incentives. The optimal risk management solution is practical only if managers implement it. ERM requires expertise with performance measurement systems and behavioral incentives.
- Endogenous risks are more affected by behavioral incentives. Risks of outmoded business strategies, inefficient distribution systems, long-term promises to employees, and changing consumer tastes are of greater concern than fires and auto accidents, and their ERM solutions also focus on incentives and performance measurement. Actuaries need expertise in business risks to cope with the full range of ERM problems.

INSURANCE AND SOCIAL WELFARE

We examine the benefits of ERM by first examining the effect of insurance on social welfare. Insurance *increases* social welfare two ways:

- by spreading risk over a large number of shareholders
- by removing disincentives to economic activity

Insurance may *reduce* social welfare two ways, even if consumers gain:

- by imposing additional costs of risk^{xvii}
- by weakening incentives to reduce risk^{xviii}

Even without financial responsibility or compulsory insurance laws, a risk-averse driver might buy auto insurance to spread the risk among the shareholders of the insurer.^{xix} The underwriting and acquisition costs of insurance are offset by risk diversification.

For shareholders, the commercial automobile premium is about twice the present value of the losses, since the risk is diversifiable and insurance raises morale hazard and reduces incentives to avoid loss. But the auto driver or business unit manager needs insurance:

- The driver of a delivery truck fears an accident will incur his manager's indignation. Drivers want the firm to have insurance, lest an accident cause loss of a job.
- The manager does not have a budget for accidents. A \$100,000 uninsured accident is an unexpected cost that imperils his performance review. The insurance premium is a hidden cost; it is part of the budget over which he is not judged.

Auto insurance is a budgeted cost like home office rent. The manager is not judged on the cost of insurance, unless it results from poor risk control. An uninsured accident is the manager's fault: hiring an irresponsible driver or failing to maintain proper vehicle safety.

Illustration: Suppose the annual insurance premium is \$60,000. One manager buys insurance; a second manager absorbs the uninsured losses and incurs a \$150,000 loss one year out of five.

- The insurance premium is a budgeted cost and does not affect the manager's performance rating.
- The uninsured loss is an unexpected cost. The second manager gets no gain in years without a large accident and suffers a loss in years with a large accident.

To see the benefit of insurance, suppose the firm's owners prohibit managers from buying insurance. They want the firm to cover losses from its assets, and they expect managers to become more careful about hiring drivers and monitoring vehicle safety.

But managers seek to maintain their own jobs, bonuses, and performance ratings. A manager who can not buy insurance may out-source the job, hiring another firm to deliver packages. The firm loses more by hiring another distributor than by buying commercial insurance. But the manager gains in job security.

Illustration: Unless hiring another distributor reduces labor costs or adds other efficiencies, it increases the costs of the firm. If insurance costs \$60,000 a year, hiring an outside distributor who buys insurance at the same price costs more than internal costs.

Insurers are tempted to continue traditional products as long as consumers buy them. But if consumers turn to other ERM specialists to provide risk management solutions, insurers lose. The prescient actuary provides services that best serve consumer needs, retaining their markets.

INSURANCE RISK TRANSFER VS ECONOMIC RISK MANAGEMENT (COASE THEOREM)

Insurers and economists differ on the optimal allocation of risk.

- *Insurers* presume risk should reside with the party that is least risk averse or best able to diversify the risk. This perspective justifies risk transfer from consumers to insurers.
- *Economists (Coase theorem)* presume risk should reside with the party having the greatest incentives or ability to reduce it, unless the value of risk diversification is great.

The insurer's perspective increases social welfare if consumers are sufficiently risk averse, as is true for personal lines coverages. The economist's perspective maximizes the value of the firm. Investors diversify non-systematic risk, and they may not need insurance.

But firms buy insurance. Enterprise risk management is a paradigm shift that focuses on managerial incentives and performance measurement systems *to understand why firms buy insurance*. The revised paradigm enables the ERM specialist

- To re-allocate risks and change performance measurement systems so that managers keep incentives to control risks, firms minimize risk transfer costs, investors receive higher returns, and social welfare is maximized.
- To apply the same techniques to endogenous risks that escape the traditional insurance paradigm but affect investor returns and social welfare.

The property owner can better protect a building against fire or windstorm than the insurer.

- Property insurance reduces risk control incentives (morale hazard).
- Insurance on property whose value has dropped may lead to arson.

For risk averse small firms or private owners, whose property is a major portion of their wealth, spreading risk by insurance raises social welfare. Large firms need protection against catastrophic risks, but first dollar coverage has a negative net present value.

Workers' compensation insurers provide loss engineering expertise that reduces hazards, particularly for medium size employers. But underwriters and agents focus on profitable sales, incurring their own expenses plus additional friction costs, such as taxes and returns to investors. Loss engineering is a minor component of most lines of business.

In the ERM paradigm, the actuary works with performance metrics to re-allocate risk among business units and to revise the performance measurement system to maximize risk control. The enterprise risk is reduced, shifted, or insured (if necessary). Most risk remains with the property or exposure, so that incentives to reduce loss are strong.

Insurance markets are competitive, and insurers must provide optimal risk management solutions to succeed. Actuaries with ERM expertise modify their employers' products to better serve their consumers.

EXPERIENCE RATING

We have come full circle. Auto accidents are not systematic risk, so investors prefer that firms retain the risk, saving on insurance expenses, avoiding morale risk, and keeping incentives to hire responsible drivers and maintain vehicle safety. Managers are measured by performance, and auto accidents reduce their bonuses or advancement. If managers can not buy insurance, they change their operations or out-source the job, which is more expensive (wasteful) than the insurance. Changing the performance measurement system is difficult, since supervisors correctly see auto accidents as a sign of poor management.

We want to retain the risk but shift it to a corporate account. But to maintain the incentives to avoid loss, the costs must be shifted back to the manager.

The actuary plays a pivotal role. The loss costs, which depends primarily on fluctuations in *loss severity*, are shifted to a corporate account, relieving the manager from buying insurance or out-sourcing the job. The cost of risk that is shifted back to the manager is the predictors of loss, not the loss itself. By focusing on the predictors of loss, the manager (who is best able to minimize the loss) has a leverage incentive to reduce the cost of risk.

The actuary bases the cost of risk on class analysis and experience rating. Suppose FedEx seeks insurance for its drivers, vehicles, airplanes. A commercial auto policy would be experience rated. The firm retains the overall losses, but charges each unit by driver characteristics, vehicle safety, and accident record. The accident record is based on claim frequency, not claim severity.

The firm would allow managers to opt for greater experience rating, encouraging them to adopt better safety procedures. The costs to the manager is controllable cost, not a fixed budget.

The actuary setting up the internal insurance system must have the respect of the managers, who defer to his cost allocation.

Illustration: A manager has ten delivery trucks and twelve drivers. Actual losses are assigned to an internal corporate fund, avoiding the underwriting and acquisition costs of the insurer. The cost allocated to the manager depends on the characteristics of the drivers and trucks. This maintains the incentives to reduce risk. The allocated costs are adjusted by experience rating, whereby higher claim frequency increases the allocation. To encourage managers to adopt better cost control, managers may opt for higher leverage in the experience rating plan. For instance, an auto accident may normally be given a cost allocation of \$2,000. The manager may opt for a cost allocation of \$5,000 and an offsetting reduction in other cost allocation.

Illustration: The manager expects two accidents a year and \$30,000 of losses. Most losses are random, and an experience rating plan would assign \$2,000 to each accident and \$26,000 in other allocated costs. The more leveraged plan would assign \$5,000 to each accident and \$20,000 in other allocated costs.

In theory, the manager pays the same costs in the long run. But the manager has greater incentive to avoid accidents, which can often be prevented by inexpensive safety controls. Reducing the number of accidents is an efficient way to minimize the cost of accidents, since claim frequency is an excellent predictor of total loss costs.

Too leveraged a plan provides incentives to out-source the job. If the plan assigned \$50,000 to each accident, and the manager could not control most accidents, the manager might out-source the package delivery function; otherwise a few accidents would eliminate the manager's bonus. But if the plan assigns \$10,000 to each accident, the costs even in an adverse scenario would be less than the cost of out-sourcing.

For a commercial experience rating plan, this does not work. If the assigned cost is greater than the predictive value, a manager with a debit modification seeks coverage elsewhere. This is because the experience rating plan is for next year's premium. But the internal program assigns the cost for the past year's program, so there is no incentive to change one's activities because one year's costs are high.

THE RISK SPECIALIST VS THE AGENT/UNDERWRITER

For personal coverages required by statute, insurance products are an efficient means of risk management. For large firms, ERM services are doubly useful: they eliminate unneeded insurance expenses and maintain the incentives to control risk with the managers capable of doing so.

Actuaries who adapt to the ERM paradigm should be most successful. A large corporation that transfers financial risk to a subsidiary or a corporate unit but allocates the costs of risk to operations managers seeks an actuary with ERM expertise. The commercial lines agent or underwriter who focuses on sales is superfluous. An ERM specialist focusing on manager incentives becomes essential.

RISKS VERSUS INSURANCE PRODUCTS

The airline and automobile industries show the disparity between the risks facing large firms and the insurance products available. Insurance products are best for independent and exogenous risks, such as workers' compensation, liability, and property exposures. Losses of even \$2 or \$3 million are diversifiable for the firm; smaller claims are best handled by non-insurance risk management techniques.

The two industries failed because of risks that insurers and other financial intermediaries do not cover. Managers and consultants identify problems that they can

solve without changing business strategy. The goal of enterprise risk management is to identify problems that call for changes in business strategy.

The most common cause of business failure is a reluctance to abandon failed strategies. The auto industry shows this most clearly. High gas using vehicles lose consumer demand when oil prices rise. The auto industry has known this for decades, but managers producing high gas using vehicles are no interest in abandoning their projects. But oil is not eternal, and it is quickly running out. The price of oil fluctuates from year to year, but the denouement is the same: vehicles which use less gas will ultimately do better.

The role of the risk manager is a mix of the easy and difficult. The easy part is to trace the future scenarios that affect the firm. The increasing demand, diminishing supply, and rising price of oil is not debated. The exact figures depend on economic growth in the emerging countries and reserves still buried underground, but the end is the same.

The implication for the auto industry is that vehicles that consume less gas will be more successful. We don't need actuaries trained in ERM to relay this message to the auto executive.

The second cause of the auto industry's demise is the high labor costs, both for union contracts and post-retirement benefits.

The task of ERM is to identify why managers do not adapt and how their incentives can be modified. Managers tend to avoid conflict and short term losses.

Attempts to wall themselves off from foreign competition either failed legislatively or produced perverse results. Faced with domestic-content laws, Japanese and European firms built large plants in the United States with nonunion work forces. That has left the Big Three and their spinoffs, like Delphi, with redundant work forces and huge legacy costs in the form of generous pensions and open-ended retiree health benefits.

Union-driven legacy costs have already forced many steel companies and airlines into bankruptcy, with pension obligations fobbed off on the Pension Benefit Guaranty Corp. The Big Three auto companies might as well do the same. At least there aren't that many big unionized private industries left to fall. Besides, taxpayers and politicians angry at costs imposed by unions—particularly in the public sector—can always change the rules and reduce unions' bargaining leverage. Just as the economic marketplace eventually reduced the power of the old industrial unions, the political marketplace could, in time, reduce the power of the "post-industrial" unions.

The attempt to protect workers from all risk has turned out to be very risky indeed, since in a dynamic economy large corporations are subject to competition from firms with lower costs. In the auto industry the result is significant pain for those who relied on the

Big Three and the UAW; but the result is also a vastly faster growing economy and many more opportunities than provided by the European welfare states.

DISTRIBUTION SYSTEMS

Inefficient distribution systems are the bane of producers, especially if distributors have contractual or legal control over access to consumers. We illustrate with property-casualty insurance; the same trade-offs and self-interest of managers occur in other industries.

Property-casualty insurers distribute their products through independent agents, who own their agencies, or exclusive agents, who are employees of the insurer. The independent agency system is doubly inefficient: it adds about 7 or 8 points to the insurer's acquisition costs and leaves the insurer with little control over marketing strategy.

Direct writers have replaced independent agency companies in personal auto and property coverages, and they will presumably do the same in the commercial lines as well, such as workers' compensation, commercial auto, and reinsurance.^{xx} Long-term strategy leaves little choice except for an exclusive agency system.

The immediate costs of restructuring a distribution system are high, perhaps overwhelming, and may stretch over five to ten years. By the National Fire decision of 1905, independent agents own the renewals to their business. Insurers fear their existing agents will shun their policies and move their renewals elsewhere if they hire exclusive agents.

Continuing the current agency relations serves the goals of both agents and managers:

If insurance managers are measured on quarterly production and sales goals, they buy peace by working through existing agents. Underwriting managers add new independent agents to meet their performance targets. The long-term effects are detrimental to the insurer and lower shareholder value.

Illustration: An insurer sells workers' compensation through independent agents who have worked with the firm for decades. The distribution system is inefficient, adding eight points to the combined ratio and inhibiting an effective marketing strategy.

Developing an exclusive agency system imperils the current book of business. Managers strengthen current agency relations to eliminate duplication and to streamline processing. The insurer spends millions integrating its underwriting and data systems with the agency system, locking itself even more firmly into an inefficient distribution system. Its managers achieve their short term goals, but the insurer's long-term profits are reduced.

Outsiders may presume that inefficient distributors do not persist in competitive industries, since distributors should prefer to merge with producers to ensure long-term success. But independent agents with established books of business have no reason to abandon their agencies. The agent receives the full commission on each policy, whether new or renewal, so the franchise value of the existing book is high. Consumers tend not to switch insurers, and the agent's renewal book of business decreases slowly, if at all. An independent agent owns the renewals to the entire book plus potential profits from new business.

Insurers do not offer to buy out the agent for the full present value of the renewal business. An insurer may argue that the long-term value of new business as an exclusive agent exceeds the agent's franchise value on the current book. But these expectations are uncertain; an agent's franchise value is not subject to others' whims. Insurers long-term promises often lapse with the first signs of poor earnings. Promises of financial security by an insurer are no stronger than the insurance manager's current intentions, subject to change of managers and periodic revision of the insurer's goals.

Most agents prize their independence: owning their own firms outweighs subservience to a corporate manager who can hire and fire at whim. Independent agents enjoy the support of their communities, trade organizations, regulators, and even professional societies like the CPCU. The camaraderie among agents is powerful, protecting each agent much as labor unions protect individual workers. Giving up one's agency means abandoning a strong fellowship of agents.

MANAGEMENT BY FIAT

Changing the distribution system is difficult, risky, and painful, but it is essential for the long-term success of the insurer. The insurer's dilemma is that its own managers have incentives to strengthen the current system, not to reform it. Executives who want change must battle their own managers.

Executives win overt battles and lose covert ones. An executive who demands a change in the distribution system but does not change the performance measurement system receives the passive acquiescence of his staff and their covert refusal to promote the change.

- The executive may demand that all new agency contracts be for exclusive agents.
- If managers are measured by annual premium, they focus on retaining existing agency contracts, even if they are not profitable. They add new agents only if they do not threaten existing relations.

An insurer may say it has tried to change its distribution system but has failed. Most often, it has tried by fiat and been defeated by its own performance measurement system.

Executives and senior managers may presume their directives are obeyed. They have a command perspective: they formulate strategy which others implement. They reason that their power to fire and promote ensures obedience. But managers follow their incentives.

Toward the end of the Soviet system in the late 1980s, wages were sometimes delayed for weeks or months. A joke circulating in Moscow was “They pretend to pay us and we pretend to work.” Manager relations in U.S. insurers are similar:

- Executives direct managers to seek other distribution systems, but they base pay on premium targets.
- Managers say they are seeking other distribution systems, but they focus efforts on existing agency contracts.

The executive correctly perceives that the insurer gains from an exclusive agency system but fails to induce managers to achieve this goal.

ERM AND DISTRIBUTION SYSTEMS

The goal of ERM is to identify the cost to managers of switching distribution systems and to change the performance measurement system that enforces these costs.

Switching distribution systems is an expected gain but a large risk. The likelihood may be

- 80 percent that the insurer succeeds and doubles its market value in the long-run.
- 20 percent that the insurer fails and becomes insolvent within five years.

Regardless of the ultimate outcome, the insurer expects a short-term loss of market share and lower profitability.

Shareholders wish the insurer to accept the risk, and they provide performance incentives to the CEO, such as stock options along with protection of pension rights in insolvency, to encourage the insurer to accept the risk. But the insurer acts through its managers, whose incentives are to avoid the risk.

Providing stock options to middle managers is not effective, since one manager's actions have little effect on the stock price. The manager's action is influenced by the performance measurement system. Unless performance reviews measure the objectives desired by shareholders, the objectives remain unfulfilled.

Performance measurement systems are hard to change. Premium volume is a clear measure of success. Hiring exclusive agents is an ambiguous metric:

- A good manager may hire two exclusive agents and keep good relations with existing agents.
- A poor manager may hire ten exclusive agents who provide little profit for the firm but antagonize existing agency relations.

The ERM task has several components:

- Quantify the risks and their likelihood in changing distribution systems.
- Identify the incentives of managers and the impediments to revising the distribution system.
- Re-structure the performance measurement system so that actions furthering the new objectives are rewarded.
- Cushion key managers against the risks so that fear of failure does not derail the new strategy.

OTHER INDUSTRIES

We use property-casualty insurance as our illustration because readers are familiar with it. Other industries face similar dilemmas. ERM expertise expands the actuary's purview beyond insurance. Insurers who lack an ERM perspective may find other professionals encroaching on their markets.

Auto manufacturers sell through car dealers, who take a middleman's fee. Consumers now compare auto models on the internet, and the car dealer has become a distribution cost instead of a benefit. Switching distribution systems is as perilous as replacing independent agents by exclusive ones. Managers measured by annual production work through the existing system, even at the long-run cost to the firm.

Soft-drink manufacturers sell to retail outlets through bottlers, incurring extra distribution costs. As retailers better manage their inventory, middlemen become inefficient costs.

The auto market is as competitive as insurance. Inefficient suppliers are replaced by new firms, who do not suffer from inefficient distribution costs. An actuary who leads an insurer to a better distribution system will find demand in a dozen other industries to do the same.

Rapid changes to meet consumer needs are evident in workers' compensation, sometimes perceived as a traditional line of business.

Illustration: Until the late 1980s, workers' compensation was a first dollar coverage. Large employers used experience and retrospective rating plans, which gave more credibility to their own experience, but acquisition, underwriting, and general expenses were based on first dollar premiums. By the late 1980s, the traditional perspective was changing.

- Large residual markets placed high costs on first dollar coverage. A \$2 million premium might include \$500,000 for expenses and \$200,000 for the residual market.
- The increasing competition in the workers' compensation market made employers more aware of alternative insurance products.
- Rising workers' compensation costs, despite low workplace hazards, lead employers to focus more on accident prevention than financial risk transfer.

Large dollar deductible policies shifted loss control incentives from insurers to employers. Automation, worker training, loss engineering, and speedy rehabilitation of disabled workers reduce workers' compensation costs, particularly when combined with excess coverage or large dollar deductible policies. Knowledge of the potential costs and methods of controlling them is essential.

Other exposures require equal risk expertise, and can also be mitigated. Most large firms have property, automobile and general liability exposures. In the traditional paradigm, the firm's financial officer or risk manager seeks insurance products to transfer these risks. The financial officer can identify the risk covered by the insurance products, but may not be qualified to price them or to fit them into the general risk structure of the firm. He or she may not understand how to change managers' incentives from elimination of financial risks by insurance transactions to re-alignment of the risks based on manager incentives.

Large dollar deductible policies have gained much of the large risk workers' compensation market. ERM expertise may enable innovative insurers to gain large segments of other large risk markets.

LABOR STRIFE AND JOB SECURITY

The traditional insurance paradigm focuses on exogenous risks, like fires and accidents, for which managers' incentives are less critical. ERM expands our purview to endogenous risks, like declining demand and high labor costs, for which incentives are central.

ERM has many terms: financial economists speak of principal agent problems and MBAs speak of performance incentives. Globalization has broken the traditional constraints of protected markets. The professionals who can best deal with endogenous risks will garner the new markets for risk management.

Illustration: A firm faces greater competition and potential declining demand for its product. Its labor union wants job security and threatens labor strife otherwise. This scenario is prevalent in numerous European nations (Germany, France, Italy), and it has contributed to the decline of some U.S. industries (airlines, steel, autos) as well.

The firm's response shows the risk management dilemma. The plant manager can promise job security, with a high risk of large loss if demand is low and no loss if

demand is high. The loss from job security with low demand occurs over many future years. The loss is borne not by the plant manager but by his successors and the firm's shareholders.

Labor strife is an immediate loss for the plant manager, who is seen as unable to manage labor relations. The mantra of human resources departments is that smooth labor relations are critical to the firm. Poor labor relations upset employees and raise production costs.

The opposite is often true: excessive costs to buy labor peace lower shareholder value and have crippled major industries. The HR department sees only half the costs and rarely quantifies them; the task of ERM is to identify and measure all the costs. By separating the risks of labor strife from the long-term costs of labor benefits, and by imposing only the risks of labor strife on the plant manager, the firm assures inefficient business decisions.

A forecast of low demand for a plant's products implies that the manager is not effective. Managers overstate the expected demand for their products to expand their responsibilities and domains. They have incentive *not* to accurately forecast demand.

The manager has incentives to underestimate the costs of low demand and job security and overestimate the costs of labor strife.^{xxi} The ERM solution is to (i) re-estimate the costs of job security and (ii) allocate their expected costs to the operations of the plant.

Illustration: The manager may estimate the expected cost of labor strife as \$10 million and of job security as \$4 million. The ERM specialist may re-estimate the expected costs as \$6 million for labor strife and \$8 million for job security.

- Assigning the costs of labor strife but not of job security to the plant manager creates an incentive to promise future benefits and avoid short term risks.
- Assigning the expected costs of all risks to the plant's current operations creates disincentives to risky but profitable economic activity.

The ERM solution assigns enough risk to the manager to assure proper incentives, and enough risk to the firm to assure proper business decisions. Trust, focus, modeling and incentives are critical:

93. *Trust:* The ERM specialist must be trusted by both managers and shareholders, so that managers accept the expected costs of job security and shareholders accept the expected costs of labor strife.
94. The *focus* shifts from financial risks to business risks. Financial analysts quantify the risks of interest rate movements and stock price declines. The ERM specialist must quantify even business risks like labor strife and competition.
95. *Models:* We say that business risks can not be modeled, when we mean that *we do not have the tools or training for the modeling.*

96. *Incentives*: The ERM specialist must redesign the performance measurement system and the allocation of costs through the firm.

CONCLUSION

The traditional insurance paradigm focuses on transferring and spreading exogenous risks, such as liability exposures and property damage. ERM changes the focus

- from financial risk transfer to performance measurement systems
- from risk diversification (spreading) to changing the incentives of managers
- from traditional insurance products to consumer needs.^{xxii}

ERM compares the long-run costs of risk and the benefits of mitigating risks. Changing incentives involves re-aligning performance measurement systems, but this re-alignment is expensive. Some managers prefer to rule by fiat instead of by incentives.

Actuaries adapt as the environment changes. Actuaries who do not anticipate consumers' needs must meet them anyway when traditional products are rejected. But adaptation is insufficient in a fiercely competitive profession.

The misalignment between managers and shareholders takes two forms.

- Managers avoid some risks that shareholders would assume. ERM changes managers' incentives so these risks are assumed and controlled, not transferred.
- Some long-term risks that threaten the firm are assumed by managers to avoid short term costs.

The actuarial societies have the personnel and educational structures to endow their memberships with expertise in ERM: incentives, risks, and performance measurement systems. Others see similar opportunities: business schools and financial economists believe they are more knowledgeable than actuaries in non-traditional risks. Our success in developing ERM expertise may shape the careers of the coming generation of actuaries.

ⁱ Economists advocate risk-based guarantee fund premiums, though these have proved impractical.

ⁱⁱ The ultimate incidence of insurance costs falls on workers, who receive less in wages to compensate for the benefits. These plans often have a negative value for workers; their prevalence reflects:

- Tax advantages that favor employer provided health insurance.
- State statutes that mandate workers' compensation coverage.
- Benefits provided by managers seeking labor peace over long-term costs to the workers.

ⁱⁱⁱ See R. Coase (1988) *The Firm, the Market, and the Law*. The Coase Theorem assumes an efficient market with no transaction costs, such as the costs of performance measurement systems.

^{iv} This argument should not be taken to extremes. Even if the insurer paid the ALAE costs, it would not pay claims indiscriminately, lest the employer choose a less expensive carrier at renewal.

^v Workers' compensation is considered a no-fault coverage; the ALAE was once a minor expense on rare claims. For the liability lines of business (general liability, employer's liability, private passenger automobile, commercial automobile, products liability, and medical malpractice), ALAE is included with losses both for class ratemaking and for experience rating.

^{vi} The Americans with Disability Act (ADA) is another oft-cited illustration of legislative mismanagement of risk that have increased costs to citizens and decreased social welfare.

^{vii} For this illustration, we assume that all insurers are monoline Homeowners writers serving only in the Gulf Coast states. Diversification by line of business and state reduces the catastrophe risks.

^{viii} Some actuaries speak of risk loads in terms of equity among insureds: consumers receive greater risk transfer benefits from hurricane coverage and should pay more. But equity is a subjective concept that has no relation to prices in a competitive market. Some actuaries relate risk loads to the variance of returns. But financial economists say that non-systematic variance has no effect on expected returns. The risk load depends on the product market. If all insurers buy cat covers, the 5 percent of capital cost becomes part of the cost of coverage, no less than other loss or expense costs. If most insurers are large multi-line insurers with little hurricane exposure, the product market does not allow an additional charge for a monoline insurer. For simplicity, we assume all insurers are identical monoline Homeowners writers.

^{ix} If the costs of bankruptcy were high, risk loads might be needed. But the costs of bankruptcy are low for insurers, whose assets are easily sold and do not lose value in bankruptcy. Investment analysis has no catastrophe risk load, just as it has no load for other non-systematic risks, like labor strife or terror attacks.

^x ERM proponents sometimes use the same terms, speaking of stakeholders in the firm. Actuaries should avoid ill-defined terms, and specify the incentives, benefits, and costs that affect managers' behavior.

^{xi} We often quote Adam Smith about the benefits of competitive markets, forgetting his warning that firms continually seek to suppress competition.

^{xii} ERM is more socially beneficial than classic investment risk theory. Shareholders may maximize value even if consumers or employees lose.

^{xiii} The reinsurance illustration for an insurer is like an insurance illustration for a manufacturer.

^{xiv} A financial economist might argue that investors wish no reinsurance coverage at all, since insurance risks are not systematic. In practice, investors may desire cat covers, which reduce the costs of bankruptcy. An insurer that loses much of its statutory surplus and must shed other business to meet risk-based capital requirements or rating agency capital targets imposes a cost on investors, who suffer reduced returns.

Cat covers are surely valuable to the insurer's senior management, since they protect the insurer's solvency and the jobs of senior officers. The text focuses on the reinsurance that senior management does not want.

^{xv} Risk pooling, the law of large numbers, and the credibility of homogeneous risk classes are on the CPCU and actuarial exam syllabi, in both the mistaken and correct formats explained in the text of this paper.

^{xvi} Insurers adapt their products to consumers' systems, such as policy effective dates of January 1 to

conform with consumers' fiscal years or monthly billing for workers' compensation policies.

^{xvii} The initial costs of risk are the harm to accident victims. Insurance may impose costs of risk transfer and increase the harm to accident victims. (i) About 40 percent of the insurance premium is spent on acquisition, underwriting, and other expenses, including the return on capital, federal income taxes, and state premium taxes. (ii) Another 10 percent of the premium is lost on higher morale and moral hazards. Consumers with insurance are less careful about safeguarding their property against loss and more likely to exaggerate claims, leading to wasteful litigation.

^{xviii} Suppose a firm hires drivers for its delivery trucks. If the firm has no insurance, it would hire only adult drivers, carefully monitor drivers for poor safety habits, and keep its vehicles in good working condition. With insurance, the firm hires young males drivers and is less careful about safety. Buying insurance weakens the manager's incentive to hire responsible drivers and to ensure proper vehicle safety.

^{xix} Policyholders of a mutual insurance company spread the risk amongst themselves.

^{xx} The large personal lines insurers are direct writers (State Farm, Allstate, GEICO, Farmers, as are the largest U.S. reinsurer (General Reinsurance) and workers' compensation carrier (Liberty Mutual).

^{xxi} Psychologists speak of this as cognitive dissonance: managers with incentives to avoid labor strife will over-estimate the probability and cost of labor strife and under-estimate the probability of falling demand.

^{xxii} ERM is not restricted to insurance transactions, and many professionals are potentially competent. Some actuaries presume that because they are skilled in financial risk transfer they are natural ERM specialists. But financial training is only part of ERM expertise. Actuaries who recognize the gaps in their training are most likely to succeed as ERM specialists.