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The Price of Civilization

WHO WILL BEAR THE RISING COST OF DISASTER?

P. 2



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Enterprise Risk Management?

Message from Milliman CEO Pat Grannan

Financial risks and the prudent management of those risks present an increasing challenge for our society. Individuals, employers, insurers, and the economy in general all face new and evolving risk management issues. Such risks range from covering the costs of catastrophic events to planning for retirement.

In this, the second issue of *Insight* magazine, we illuminate some important management mechanisms and where they are headed. Within these pages you'll find perspectives from Milliman consultants who are working in the trenches, shaping the economic future.

Our cover story, "The Price of Civilization," examines the roles of insurers and government in paying for catastrophes. Can we expect insurers to shoulder the financial burden of events like Katrina and the even larger catastrophes that are sure to come?

Continuing our discussion of big questions facing the insurance industry, "Has the Future Finally Come for Enterprise Risk Management?" focuses on ERM, the highly touted yet seldom executed best practice. Will increased focus on ERM by rating agencies and regulators change the way insurers manage risks? Meanwhile, "The Future of Capital Modeling" analyzes emerging methods of structuring capital reserves and looks at what those might mean for life insurers.

We also offer our perspective on the heated debate over the future of America's retirement system. "Demystifying the Hybrid Pension Plan" considers the alleged demise of the defined benefit pension and suggests a new generation of retirement vehicles.

Finally, we take a longer look at the Medicare Part D prescription drug benefit. In our inaugural issue we discussed the impending arrival of the benefit; this issue resumes the discussion with two articles that go behind the scenes of this complicated (and controversial) federal program.

Businesses today face an increasingly complicated array of risks and financial intricacies. Our hope is that *Insight* magazine lends some transparency to these issues, and perhaps even encourages further discussion. We invite you to contact us with comments, questions, or letters to the editor at insightmagazine@milliman.com.

Pat Grannan

PATRICK GRANNAN

Milliman Chief Executive Officer







THE PRICE

OF CIVILIZATION

WHO WILL BEAR THE RISING COST
OF DISASTER?

BY DAVID SANDERS, FIA, ASA, MAAA

In 1755, after hearing of the devastation wrought by the Lisbon earthquake and the resulting tsunami, Jean Jacques Rousseau asked, “Is this the price mankind must pay for civilization?” Two hundred fifty years later, following last year’s unprecedented natural destruction, that price is at an all-time high. With Katrina, the Indian Ocean tsunami, and the Pakistan earthquake fresh in the collective memory, it may seem we’ve seen the worst-case scenario. But catastrophe models suggest the possibility of further calamities: a caldera explosion in the American Midwest, a landslide-generated tsunami on the American West Coast, super cyclones in Tokyo, a rising of world oceans and a flooding of our largest cities—not to mention the ever-present spectre of terrorism. Even if we can’t predict the next big event, history tells us the next catastrophe is only a matter of time.

What is not yet clear is who will pay the bill for this ever-rising price of civilization—beyond those unfortunate enough to have lost life or property as a result of a catastrophe. Some may believe it is the responsibility of insurers to foot the bill, and insurers certainly have a role to play. But there are sound practical and actuarial reasons why governments worldwide should take on a larger portion of the financial burden. The advantage of private insurance is lost in the face of extreme events; it should not be counted upon without an increased government role, lest we break the system. Can and should public policy develop an effective response to future catastrophic events? Have we now come to the stage where potential losses have become so large that insurance can no longer be relied upon?

Man is increasingly raising cities near oceans, where they are subject to windstorm exposure, on earthquake faults, and close to volcanoes.¹ Building in such vulnerable locations may be viewed as poor

risk management. According to the Red Cross: “These challenges emerge in the face of societal trends that are converging to increase the likelihood, magnitude, and diversity of disasters. Growing population, migration of population to coasts and to cities, increased economic and technological interdependence, and increased environmental degradation are just a few of the interacting factors that underlie the mounting threat of disasters.”²

Catastrophes: A Breed Apart From Other Insurable Events

To assess how dangerous an insurance risk is, it is often convenient to apply the Pareto parameter. This rule—commonly known as the 80/20 rule—states that 20% of the claims in a particular portfolio are responsible for more than 80% of the total portfolio claim amount. With the Pareto parameter as a baseline, we can assess a portfolio’s vulnerability. If a single event can spell financial ruin, there may be a problem.

Hurricane data in the Caribbean indicates that insurers can make profit for a number of years, and then find themselves hit by a “one-in-1,000-year” hurricane, which swallows up 95% of the sum insured in one go. For example, when Hugo hit the US Virgin Islands, the total cost of the loss for residential property insurers was equal to 1,000 years’ worth of premiums.

The regulators of the insurance industry generally target a one-in-100-year to one-in-200-year insolvency level. They do not cater to the one-in-1,000-year event. Typical solvency levels for major developed insurance markets that cover catastrophes are on the order of three to six times the cost of a once-in-a-century event. However, Katrina-type losses are not one-in-100-year events. Recent history indicates that they are more like one-in-five-year events, which means every five years the insurance industry can expect a \$50 billion loss (the last two being 9-11³ and Katrina⁴).

Given their frequency, catastrophes could potentially cripple any and all insurers that provide coverage; the amount of global insurance capital is limited and potentially threatened by a single mega-event. It seems that the public is fooling itself if it believes insurers can pay these types of losses. Three losses totalling in excess of \$100 billion would suffice to overwhelm the system. One minute of ground movement could destroy 40 years of business.

Outlining the Worst-Case Scenario

The many nightmare scenarios include:

SUPER CYCLONE A cyclone with sustained wind speeds in excess of 240 kilometers (150 miles) an hour smashing into a metropolis like Manhattan or Tokyo could generate claims approaching the total funds available from many insurers and their reinsurers.

METEORITE A meteorite is a meteor that hits the earth. Large ones are rare events; however, recent discoveries suggest that they are not as infrequent as once thought. The expected (mean) annualized rate of death is higher than what resulted from the 9-11 terrorist attacks; although large meteorites are rare, their destructive potential is enormous.

CALDERA EXPLOSION Yellowstone is one example of a caldera. Worldwide, caldera explosions occur approximately once every 60,000 years. The last one occurred 70,000 years ago. Based on the genetic information available, that explosion dramatically reduced mankind’s population.⁵

TSUNAMI The most destructive tsunamis occur from landslides, not earthquakes. They produce waves in excess of 100 meters (compared with the 10-meter waves of the recent Indian Ocean event). Speculation holds that at some time in the future a substantial part of the Cumbre Vieja volcano on La Palma, in the Canary Islands, will fall into the Atlantic, generating waves that will be more than 50 meters high by the time they hit Florida nine hours later.

These theoretical losses are unrealistic measures of insurers, but it is realistic to consider a repeat of storms, which in today’s values exceed \$80 billion. Other possibilities include an earthquake in Los Angeles, followed by a related fire, or a mega-quake off the coast of Seattle, which would be accompanied by massive landslides.

Furthermore, a series of interrelated events could lead to substantial losses. For example, high-level winds often force cyclones along

similar paths (e.g., Hurricanes Charley, Ivan, Francis, and Jeanne pumelled Florida in 2004; the windstorms that Lloyd’s has categorized as 90A, 90B, and 90D swept through London in 1990). There have been combinations of windstorms and earthquakes, such as when Hugo hit Puerto Rico.⁶ And there is always the increasing threat of terrorist attacks, which often occur as multiple events.

Given these possibilities, insurance companies have a limited number of options: 1) they can withdraw from the market; 2) they can write policies with exclusions, deductibles, and limits that reflect such major losses; 3) they can apply a (substantial) extra premium for purchasing additional cover; and 4) they can seek protection from government through a guarantee pool that will cover such losses.

These options are not mutually exclusive; in fact, a pairing of several approaches is not unusual. Insurance companies sometimes seek protection by applying one of their premiums to a guarantee pool. Looking forward to the rebuilding of New Orleans, we can expect that certain parts of the city will be viewed as uninsurable for floods, with some risks placed in a government-sponsored pool.

The Role of Government

Many policies do not exclude certain events. For example, how many policies exclude a meteorite hit? How many excluded terrorism before 9-11? What if the tsunami is a consequence of a landslide and not an earthquake? Terrorism has been an extra cover in the UK for a number of years following explosions in London, but this was only made possible with the establishment of a government-backed reinsurance company, Pool Re.

In many countries, questions like these have led to systems where extreme events are paid for not by the insurance industry but by government. The US government has a complex system for dealing with natural disasters through a partnership with state and local governments, nongovernmental organizations, and the private sector. The major government schemes in the US include:

EARTHQUAKE INSURANCE IN CALIFORNIA The state government requires private companies doing business in California to offer quake insurance and to contribute to the funding of the California Earthquake Authority, which underwrites these policies.

HOMEOWNERS’ INSURANCE IN FLORIDA The government of Florida has required private companies to continue writing

1 Faults are often near the ocean—though there are also thrust faults further inland, like those that created the Himalayas.

2 Red Cross, 2001. Center for Research on the Epidemiology of Disasters.

3 While the insured loss of 9-11 was below \$50 billion, the remainder of the loss—including removal of debris and many of the individual claims—was picked up by the US government in one of the more effective recent examples of private/public response to a catastrophe.

4 Extreme events are often cyclical or random. The US hurricane cycles were benign until recently. While statistics indicate hurricane cycles to be long, these cycles are also without reliable predictors. Some have credited global warming and generally warmer oceans as a source of increased tropical storms, but it remains difficult to say whether the recent increase in storm activity is due to cyclic events or global warming. Meanwhile, events like earthquakes have proved random in recent history, although there was a surge in earthquake activity in the Mediterranean in the late Bronze Age.

5 A caldera is formed when a volcano collapses into itself. They can explode—with catastrophic results—due to a buildup of volcanic gas.

6 When Hugo hit Puerto Rico, there was a simultaneous submarine earthquake in the Puerto Rico trench that was recorded at a number of seismic sites. No one knows the impact of the earthquake since Hugo was devastating enough. The link between these two events—if any—is still unclear.



homeowners' policies in the state and to participate in various residual market mechanisms as a way of making hurricane coverage available.

FLOOD INSURANCE The federal government offers flood insurance through the National Flood Insurance Program. Property owners with existing structures inside the floodplain are charged “non-actuarial” rates, which create an implicit subsidy.

CROP INSURANCE The federal government offers farmers subsidized crop insurance, which can be triggered by natural disasters such as flooding.

DIRECT AID Emergency aid from government agencies and government employees often arrives at the time of the disaster and immediately following it.

Katrina-type losses are not one-in-100-year events. Recent history indicates that they are more like one-in-five-year events, which means every five years the insurance industry can expect a \$50 billion loss.

Other mechanisms include federal funding to repair state and local government facilities, loans and grants from the Small Business Administration, grants to individuals from FEMA, and occasional assistance to flooded-out farmers, whether or not they purchased crop insurance.

The US is not the only government to provide catastrophe schemes. Via Consorcio, established in Spain in 1954, provides cover from earthquakes, volcanic eruptions, atypical windstorms (those that exceed a certain threshold), atypical floods, meteorite strikes, terrorism, rebellions, sedition, riots, civil commotion, and actions of Security Forces in peacetime. France now provides a National Fund for Agricultural Disasters. And as already noted, the UK insures against terrorism via Pool Re, established after the St. Mary Axe bomb. Initially Pool Re was voluntary, and the premium was thought by many to be too high (the UK government wanted a commercial venture and saw itself as a lender of last resort). However, when the Bishopsgate bomb went off, there was a sudden rush for cover as insurers realized that their data was insufficient and their risk was further afield than they had thought. Indeed, the largest losses appeared to be from a location in Bristol over 100 miles away!

Governments are involved because catastrophe risk, by its nature, is a highly correlated risk, resulting in many people having claims. The pooling of correlated risk increases the variability of risk, which is exactly opposite the fundamental premise of insurance: namely, the law of large numbers. Thus the advantage of private insurance is lost. Techniques have been and are being devised to mitigate correlated risk, but private solutions are generally expensive. Some form of government involvement is needed to keep the cost manageable.⁷

Balanced against government involvement, there need to be incentives for private firms and people to make proper risk management decisions. One solution is to consider the losses both without and with government involvement. In the first case, risk analysis and insurance decision⁸ is vital; in the second, there is a reduction in insurance demand and loss mitigation (that is, there is the moral hazard of risk sharing—one of the main reasons governments do not get involved).

Furthermore, governments need to examine their own role in enabling catastrophes. Time and again, governments have undercut the goals of risk mitigation by sponsoring development and redevelopment in areas of known risks, including floodplains or brownfield sites.⁹

Politics Overwhelm Pragmatism

The potential political payoff from an investment in a national catastrophe risk management program may come too late for most politicians. Catastrophes often have a long return period, and the absence of a major recent event would render such an expensive program highly unpopular. You can imagine the objections: “It will never happen in my lifetime!” That said, when a major event occurs, it is often a trigger to do something (e.g., an Indian Ocean early warning system).

Further fueling objections is the fact that building a national catastrophe risk management program will divert national savings from investments in other, potentially more immediately productive projects. How does a developing country justify a catastrophe fund when people are in need of basic services? If anything, the mere existence of such a fund in a developing country would send the wrong message and undermine foreign aid.

Governments also bury their heads in the proverbial sand because it is politically convenient to do so. Consider:

- Land that was once floodplain is now developed upon. Rivers are “managed” to avoid flooding of these new properties.
- Local authorities approve potentially hazardous development projects because they think a one-in-100-year event won’t happen for another 100 years (well beyond their terms of office). Then the event happens in the first year.
- Building codes are seldom updated and often are only changed in response to an event. In California, apartments are built on sand foundations next to major quake lines, based on building codes last changed in 1936.
- Forests are cut down, resulting in higher risks for landslide (such was the case with the recent killer landslide in the Philippines).

Governments make the same blunders again and again—and insurance companies are expected to pick up the tab when things go wrong. These blunders are exacerbated by similar behavior among private

citizens and entities. How often do we see new development in volatile areas: floodplains, coastal regions, and the like? Saying “I didn’t know it could happen to me” does not absolve the private citizen of the economic cost of settling in a volatile area. That said, sometimes an event surpasses what is imaginable. Many of the people who were affected by the Indian Ocean tsunami lived near the sea because their livelihoods (fishing, tourism, etc.) depended upon it. These people may have expected storms, but certainly not a tsunami.

Knowing the risk does not necessarily increase the likelihood of being prepared. A recent study by the Rand Corporation shows that only half of US homeowners living in flood-prone areas purchase federal flood insurance. Many of them do so only because it is required by law. Of those who are not required by law, only 20% purchase flood insurance. If individuals won’t take measures to protect themselves, what are the chances of them agreeing to participate in a larger federal program?¹⁰

Actuarial Contributions to Public Policy

While there are events that are both predictable and understandable, such as floods and hurricane landfalls, there are others that are not so well understood. Epidemics such as AIDS and flu pandemics tend to be predictable, but the mechanics of disease transmission are not well understood. Earthquakes are understood and can be described by power laws, yet they are not predictable.

Then there are extreme events like climate change that are neither understood nor predictable and have implicitly chaotic structures. A recent headline stated, “*London could be among the ‘first cities to go’ if global warming causes the planet’s ice to melt, the UK government’s chief scientific adviser has warned.*” In addition to London, cities such as New York and Tokyo are also vulnerable. Yet the reaction from government appears to be minimal. Political and social deadlock abound, and until an actual event triggers reactive thinking, we will be no closer to realizing a sustainable risk management system.

Given this deadlock, actuaries have a role to play in helping influence public policy decisions. Actuarial techniques for handling uncertainty—and pricing it—can advance the debate by lending both predictability and understanding. Certainly the help would be welcome. Most science is restricted to the development of predictions and generalizations; an actuary analyzes uncertainty and applies a cost value to these predictions.

We are moving toward a more complex society, with mega-cities, mega-organizations, and mega-risks. The cost of this evolution is mounting: due to increased value at risk; due to the increased frequency of catastrophic events; due to the consolidation of populations; due to larger organizational and financial risks. The only solution in the long run will be a more complex insurance system with a mixture of private and state schemes. **M**

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7 Granted, that involvement may change depending on the type of event at hand.

A pandemic like the 1919 Spanish Flu—which can affect anyone, anywhere—is unique from a flood, which is contained to a specific region.

8 Insurance decision is a term encompassing an organization’s choices over what insurance to purchase and at what level.

9 A brownfield site is a housing development that has previously been used for industry or has otherwise been polluted. One example is the banks of the River Thames. The opposite is a greenfield site (previously used for agricultural purposes).

10 Rand Corporation, 2006: *The National Flood Insurance Program’s Market Penetration Rate.*



fig. 1



fig. 3



fig. 2



DEMYSTIFYING THE HYBRID PENSION PLAN

BY JOHN W. EHRHARDT, FSA, MAAA, EA

The pundits, academics and other prognosticators have spoken. Their verdict: the traditional pension plan in the US is dead and the only remaining formality is the burial.

News outlets, both print and electronic, trumpet the wholesale abandonment of pension plans by high profile companies caught up in bankruptcy proceedings. The experts on the Sunday morning talk shows paint a gloomy landscape, describing “cents on the dollar” payouts by the Pension Benefit Guaranty Corporation (PBGC) to retirees from companies in Chapter Eleven. More front page stories detail the decisions by some major corporations to close or “freeze” their defined benefit pension plans in favor of increased corporate contributions to employees’ 401(k) defined contribution plans. In those instances where companies tried to offer workers something in between (the hybrid “cash balance” plans), suspicion, hostility, and even lawsuits often followed.

The scary headlines and seeming collective rush to judgment all point in one direction: pensions and future retirees in America are in big trouble. And the trouble we are now confronting is, to a large degree, the handiwork of the very body that is now charged with fixing the mess: the United States Congress. In an apparent bow to the Law of Unintended Consequences, congressional revenue tweaking in the 70s and 80s has come home to roost, with potentially devastating results for US retirees and for our economy as a whole. Ironically, it is the individual employee and future retiree upon whom the onus has now been placed for managing his or her retirement planning.

Without a clear resolution in sight, this chain of events has created considerable confusion and consternation among both workers and employers alike. Recently, even executives at profitable companies with solid balance sheets and well-funded traditional pension plans have begun asking questions and demanding answers. “Should we

consider modifying our pension plan? Are we somehow placing ourselves at a competitive disadvantage if we stay the course? How will our shareholders react?”

The Pendulum Has Swung

The definitive answers to those questions are as unique as the executives who pose them and the companies that employ them. For some, change is inevitable, driven by the myriad variables that affect individual companies, markets, and the business cycle. They will follow the lead of others away from the traditional defined benefit plan in favor of less cumbersome and less costly defined contribution pension plans. For others, however, maintaining and prudently managing their existing defined benefit plans or, more likely, a “hybrid” version, may well prove to be an integral element in a successful long-term strategy. Further, it may be one that will become increasingly difficult

for competitors to match. To understand how these events might play out it is helpful both to consider the historical perspective and to lift the hybrid veil of mystery.

Once upon a time, a corporate pension plan in America was a defined benefit plan. Period. Often forgotten by many people is the fact that the 401(k) plan was conceived and introduced as a supplemental vehicle. It was created as a means to augment the Defined Benefit (DB) plan, not to replace it. Here is what happened.

Original Intent of the Defined Contribution Plan

The 401(k) Defined Contribution (DC) plan was set up as a supplemental means for employees to contribute to their own retirement on a tax deferred basis. These contributions would provide an additional lump sum, allowing employees some flexibility beyond their fixed annuity Defined Benefit plan. The DB plan paid that guaranteed annuity based on final average pay at the time of retirement. In most cases the worker received the annuity following a fairly long 20 to 30 year career with the same employer.

Things began to change significantly following enactment by Congress of the Employee Retirement Income Security Act of 1974 (ERISA). In fairly rapid succession, that new law was followed by a number of additional statutes, notably the Tax Reform Act of 1986 that imposed an excise tax on any asset reversion from a terminated pension plan and the Omnibus Budget Reconciliation Act of 1987 (OBRA87). These changes were designed to limit the amount of contributions or benefits that could be paid into or flow out from DB plans.

Importantly, most of these new laws totally ignored any retirement policy. They were purely revenue driven. As a result, the maximum benefit that could be paid, the maximum salary that could be reflected in a DB plan, and the maximum tax deductible contribution a corporation could make were limited. Not surprisingly, three things happened: some companies stopped contributing to their DB plans; benefits were cut (especially for executives); and plans became much more complicated and therefore more costly to administer.

Fast-forward to the “Go Go” late 80s and early 90s. Driven by a booming stock market, assets ran up and DB plans became fully funded. Despite strong earnings and healthy markets, prudent companies still

Hybrid pension plans will emerge and take hold. Their precise structure is not yet known but they will accommodate both the employer’s need to attract and retain a talented workforce and the employee’s increasing demands for a flexible, portable retirement benefit that assumes a pooled share of both the investment and longevity risks.

saw a need to contribute to their pension plans, given their expectations of continued growth, the need to provide for new hires, etc. But under the existing rules, contributions most likely would not be tax deductible, and instead might be subject to a 10% excise tax. That prompted many companies to go on what looked at the time to be a very long “contribution holiday.”

That government-imposed cutoff in plan funding had companies looking for another way to provide benefits to their employees. They had a budget for benefits that they no longer needed from a cash point of view, so 401(k) plans became more popular, including a few new wrinkles like increased investment options, daily valuation of accounts, increased use of matching contributions, shorter vesting periods, and improved employee communications. Still, the 401(k) plan remained a supplement to the DB plan.

Concurrently, new companies were starting up that didn’t want to take on the administrative burden of DB plans. And there were other considerations. At the beginning of the dot com bubble, stock was the “big new thing” in compensation. For these companies, awards of shares and future stock options replaced the traditional defined benefit plans.

As the leaders of this genre (Microsoft, Intel, Dell, and others) have grown up and become corporate mainstays, their old-line competitors, especially in the technology industries, increasingly found themselves on an uneven playing field, disadvantaged financially by their expensive DB plans. And the bad situation was about to get much worse. The stock market crashed and asset performance and interest rates nose-dived. Coupled with the bursting of the dot com bubble, DB plans suddenly and rapidly required big contributions.

What had been a trend became a stampede. 401(k) plans were increasingly in demand and the vast majority of new companies began to go “Defined Contribution-only.” Some of the old-line companies responded by closing or freezing their DB plans; instead, they offered enriched contributions to their workers in new DC plans.

Another fundamental shift was also underway, this time on the employee side. The concept of cradle-to-grave service at one employer was rapidly evaporating. Sometimes induced by layoffs or downsizing, sometimes pursued as career advancement, job-hopping had lost its old stigma. With a potential benefits gap for job-hoppers at retirement, the traditional DB plans designed for career-service with one employer were no longer attractive to the suddenly mobile workforce.

Enter the Hybrids

Companies were between the proverbial rock and a hard place. They had overfunded DB plans with excess assets. They wanted to use the money to provide benefits to their employees, but the rules governing DB plans were onerous. So some employers came up with an innovative solution. They would convert their existing final average pay plan to a “cash balance” plan where they would basically create a DC-type account within the DB plan. The only difference between that and a real DC plan (from the employee point of view) was the fact that the investment return on a cash balance account was defined, usually at some kind of fixed-income level, like 30-year Treasury rates. It was not tied to the actual return on plan assets.

Another innovation was the Pension Equity Plan (PEP). In those plans the benefit would be paid as a lump sum but based on a percentage of final average pay. Each year employees would earn a

certain percentage of final average pay, ultimately payable as a lump sum rather than as an annuity. Unlike a cash balance plan which is an account-based, indexed career average plan, a PEP plan was truly based on final average pay.

The line between DB and DC had begun to blur as other innovations followed. In a cash balance scenario, employers also could “grandfather” people near retirement and continue to provide guaranteed annuity benefits. And there were still more possibilities. As these new hybrids were reaching their peak of popularity, “employee choice” was introduced. It was simple: give employees a choice between the old plan and the new plan. The employer still had the investment risk because the company was contributing to the hybrid plans, and they were “defined benefit” because they had to pay out these promised accounts with an option for an annuity at retirement. 401(k) plans, on the other hand, normally don’t offer annuity options. The fundamental concept of a secure retirement remained: a defined benefit where the employer is taking the investment risk coupled with the option to pool the employees’ longevity risks through the payment of annuity benefits. The employer could cover the annuity, as he had in a large traditional DB plan, or he could purchase an annuity and have an insurance company cover the risk.

And, perhaps most important of all, the new concept was portable. The employee who chose to change jobs could simply take the accrued benefit with him as a lump sum and roll it over into his new employer’s 401(k) plan. It looked to many people like the best of all worlds.

The Pendulum Is Still Moving

Not everyone saw it that way. As these pages went to press, lawsuits charging age discrimination in cash balance plans were still being adjudicated, Congress continued to wrestle with pension reform legislation, companies were still freezing defined benefit plans and, in the interests of transparency, efforts continued to change accounting treatments by aligning the US Generally Accepted Accounting Principles (GAAP) with international accounting standards (IAS).

Clearly, the last chapter in the “pension wars” has not been written. In reality, it will probably never be written. Forty years ago, no one imagined working for five or even ten employers over the course of

a career. No one envisioned a pension plan directed by the employee. No one considered a retirement without a guaranteed annuity. And nowadays, it seems increasingly reasonable to assume that, in order to attract and retain a quality workforce, successful employers will need the flexibility to offer something more than highly competitive base compensation and a defined contribution 401(k) pension plan. In other words, pension plans will and should continue to evolve, in order to reflect the current reality of the workplace and serve their expressed purpose.

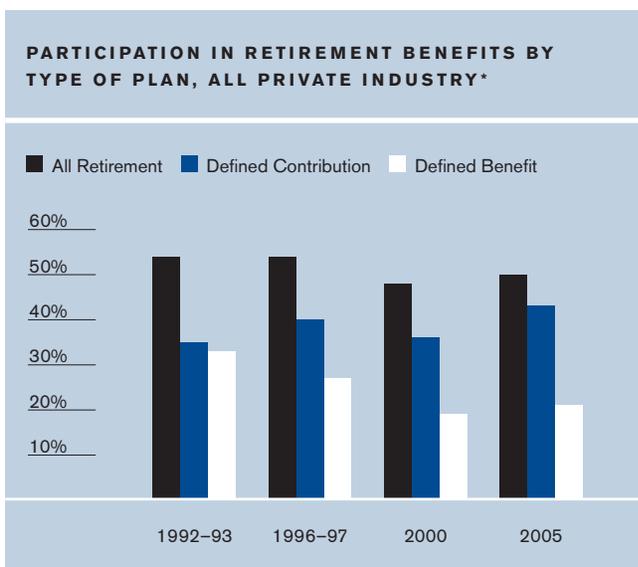
Uncharted Waters

The old saying was never more appropriate: “The only certainty is that things will change.” A year ago on these pages we wrote that some sort of Social Security reform seemed inevitable. As events have unfolded, what we saw as inevitable has been pushed a lot farther into the future. Undaunted, here is another attempt to read the tea leaves.

- Hybrid pension plans will emerge and take hold. Their precise structure is not yet known but they will accommodate both the employer’s need to attract and retain a talented workforce and the employee’s increasing demands for a flexible, portable retirement benefit that assumes a pooled share of both the investment and longevity risks.
- Hybrid DC plans will continue to emerge and evolve, while incorporating valuable features that are traditional to DB plans, such as variable annuity options to cover the employees’ longevity risks.
- For those companies with straight defined contribution plans, workers will increasingly find themselves enrolled automatically. They will begin to save for retirement from the moment they start their first job and continue to do so through every job change.
- Small employers will receive tax credits for offering employees the opportunity to make auto-enrollment-like deposits into their IRA accounts.
- We’ll offer a few thoughts, also, on health coverage in retirement. Long before the current controversy over pensions began, companies were already scaling back retiree health coverage. It now seems clear that if employers provide anything to employees for medical benefits in retirement, the trend will continue toward essentially defined contribution health reimbursement arrangements (HRAs) and high deductible plans for medical coverage. Retirees will accumulate either real dollars or credits that can be used to purchase medical benefits. The longevity risk, the medical risk, and the medical inflation risk will continue to be pushed onto the employee.

For our nation and for our implied social contract, the greatest danger always lies at the lowest end of the spectrum, where retirees have a limited source of assets. Lacking some kind of guaranteed annuity, with increases looming in both living costs and medical costs, future retirees will be forced to target something much longer than average life expectancy in order to be sure they don’t outlive their assets. **M**

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* Source: “Trends in retirement plan coverage over the last decade” by Stephanie L. Costo. From the Bureau of Labor Statistics’ *Monthly Labor Review*, February 2006.



SIZING UP THE HURDLES OF MEDICARE PART D

BY STEVE KACZMAREK, FSA, MAAA

Medicare Part D—the newly implemented prescription drug benefit of Medicare—has attracted a lot of attention since its official launch at the beginning of this year, and most would say the reviews are not good. Complaints and criticism abound, mostly from consumers, but many prescription drug providers are ready to argue that their challenges equal those of the beneficiaries they serve. Prescription Drug Plan sponsors face specific issues regarding plan design, pricing, liability valuation, and meeting the demands of government reporting requirements.

Rarely has a government-sponsored program caused such confusion among its participants and generated as much negative publicity as the new prescription drug benefit provided under Medicare Part D. Beneficiaries, federal and state officials, sponsors of private Prescription Drug Plans (PDPs), and pharmacists all have been forced to confront the magnitude and complexity

of Part D. Principal among the concerns of consumers and drug plan sponsors are the program's difficult-to-forecast costs and benefits.

Medicare Part D was envisioned as an insurance program that both protects participants from catastrophically high drug expenses and provides access to basic coverage for everyday prescription drugs, the cost of which can quickly sap the financial resources of many seniors. Yet, despite a federal government price tag of nearly \$800 billion over the coming decade, the program features complexities that leave most seniors confused—and perhaps some even worse off than they were before. Several months into implementation, the chaos continues to grow.

A Hallmark Moment

Consider just this sampling of evidence: One editorial page writer in a major daily newspaper recently dubbed the program “Dead On

Arrival.” Pharmacies and patients by the thousands are complaining about jammed phone lines at call centers, inaccurate computer lists, and overcharges resulting from a lack of clear instructions from the Federal government. AARP, one leading organization for retirees, has devoted a large part of the homepage on its website to helping resolve questions around Medicare Part D. In February, a Valentine's Day promotion in *People* magazine included a tear-out card for the Baby Boomer generation to send their aging parents, listing “Five ways to say I love you.” In addition to a few somewhat predictable phrases, the card also offered, “Let's talk about Medicare prescription drug coverage.”

The confusion started last fall when the 43 million people of all economic levels who were eligible for the program were encouraged to choose a plan. The premiums associated with the multitude of available plans vary widely, depending on covered drugs, participating pharmacies, and cost sharing. For some retirees, it seemed to make no

sense to enroll at all, but if they chose not to enroll then, there would be a heavy penalty for joining a plan later.

With so many people involved and so many different options from which to choose, the amount of confusion generated is understandable—and perhaps should have been expected. Parallels can be drawn between the early consumer confusion and the current confusion being felt by the private PDP sponsors who are trying to make sense of their financial results several months into the program. Interpreting beneficiary response, financial data, claims activity—just to name a few challenges—is made all the more difficult for PDPs by the fact that there is no history against which to measure success or upon which to project future results.

PDP Success Will Depend on Finding Solutions

It's important that PDPs clarify this ambiguity and overcome the challenges of this new market environment through use of sophisticated modeling and projection capabilities. PDPs that have the greatest probability of success as sponsors must now develop an understanding of their emerging experience on a month-by-month basis and then become as accurate as possible in their ability to project how that cumulative experience will unfold over the longer term.

Let's take a look at how confusion over this program developed in the first place and what drives its continuing evolution of complications, starting with the *typical* plan design:

- Most beneficiaries have an upfront deductible of around \$250.
- After the beneficiary covers the first \$250, they are then covered for up to about \$2,000 in spending. Of that \$2,000, about 75% of drug costs are covered.
- What follows is a big gap of almost \$3,000 in spending, for which there is no coverage whatsoever for the beneficiary. (See accompanying article on “Climbing out of the Donut Hole.”)
- After that gap, federal reinsurance covers 80% and the PDP sponsor covers approximately 15% of remaining drug costs. Beneficiaries who reach what is known as the “catastrophic layer” of drug expenditures are then only responsible for the remaining 5% of costs.

Questions arise when one considers that the program we've ended up with is not really designed to provide the *most* well-being possible. Rather, it is designed to *balance* the well-being it provides in a way that satisfies the parameters agreed upon by the lawmakers who fashioned Part D.



CLIMBING OUT OF THE “DONUT HOLE”

BY THOMAS D. SNOOK, FSA, MAAA

As the calendar year progresses, many seniors with big drug expenses will start to fall into the Medicare Part D coverage gap, colloquially known as the “donut hole.” Expressions of member dissatisfaction remain mild as this article goes to press because most seniors are still within the first layer of benefit coverage. But many will soon hit the outer wall of the gap—the approximately \$3,000 spending band in which there is no coverage for the beneficiary under a typical Part D Prescription Drug Plan (PDP)—and the outcry for more coverage seems likely to grow. Presuming that Part D coverage will be able to recover from its shaky start and gain a firm footing in the marketplace, coverage levels will become an increasingly important competitive factor for PDPs.

The vast majority of PDP designs for 2006, the first year of the Part D benefit, are fairly conservative. Most carriers have been hesitant to take risks that might be associated with filling the gap or, in the parlance of the Dunkin’ Donuts® chain, making marketable munchies out of all that empty space. Only one carrier nationally is offering an enhanced product with brand name coverage in the gap.

There are good reasons for the plan design conservatism. First, Medicare Part D is a brand new program and no one has known exactly what to expect in terms of enrollment or member behavior. Part D is not mandatory coverage, so individuals can elect to use it or not. Second, the population of enrollees is still relatively unknown in terms of their health status and level of prescription drug use, so there is merit in proceeding cautiously. Consequently, the few plans that have offered options for filling the gap generally do so for generic drugs only.

That said, filling the donut hole may be a key area in which PDPs will compete in 2007 and 2008, as perceptions of market need and knowledge of the enrollee population increase. Additionally, PDPs will be competing with Medicare HMOs, or Medicare Advantage Prescription Drug (MAPD) plans in many geographic areas. Many of these older, traditional Medicare health plans have added prescription drug coverage in 2006 to align with the Part D introduction. This may eventually play to their competitive advantage because, unlike PDPs, they have a medical expense component. As a result, they may be able to manage overall plan pricing in such a way as to offer enhanced drug benefits, conceivably with little or no additional premium. They have an existing membership base, they know the health status of those members, and they have claims history. Consequently, they are probably in a better position than any of the PDPs to determine what their prospective drug costs will be over the next couple of years.

Still, there are other dangers to consider for more proactive or less risk-averse PDP sponsors. If you did have a PDP fill the coverage gap, that PDP would charge a higher premium for the richer benefit. This could lead to a detrimental enrollment trend that actuaries call “adverse selection,” where prospective beneficiaries choose a richer plan benefit structure because they anticipate higher drug costs and hence perceive a greater need for that richer plan. This rationale, taken to its logical conclusion, will mean that a higher proportion of healthy people will

enroll in the less expensive, lower benefit plan, while a large number of the less healthy people will enroll in the higher premium plan. This could possibly lead to one phenomenon of adverse selection that is called the “selection spiral.” Under this scenario, plan designers try to anticipate adverse selection by raising the premium rate to reflect the amount that would be needed to cover sicker beneficiaries. There remains, however, a significant problem: the spiral that develops exacerbates and feeds the adverse selection process—the higher the carrier raises the rates, the more severe the adverse selection becomes. Ultimately, the spiral proves financially disastrous to the carrier, because there is no way to adequately price the plan to cover so many unhealthy enrollees.

The Medicare Modernization Act includes two provisions for PDP sponsors to manage their risk. First, payments to the plans are risk-adjusted based on the historical claims experience of the enrollees. Second, for the first two years of the program, there are risk corridors that limit the total amount of loss a plan might experience. These two provisions provide some protection against adverse financial impact attributable to adverse selection. However, for enhanced plans, that protection is not complete. Both the risk adjustment mechanism and risk corridors apply only to the basic Part D benefits. For the enhanced portion of the benefits, the PDP is fully at risk with no federal protection from financial loss.

The risk of the adverse selection spiral may be mitigated by the penchant of seniors to be cautious and buy insurance when they can (and when they can afford to do so). Most people can’t perfectly predict their future drug needs. The older people get, the more susceptible they are to costly medical care and unexpected health problems. Just to be on the safe side, many seniors may err on the side of paying a little extra premium for the hope of a lot more protection, just in case. The resolution of this key issue of the Part D program will no doubt impact plan designs and competitive posturing for quite some time to come.

With time and more experience, plan carriers will have to make a conscious decision about balancing the market need with strong design features and attractive pricing. This is where it could really get interesting from a competitive standpoint. The PDP sponsor who can figure out how to provide meaningful coverage in the coverage gap—and do so in a way that enables it to effectively manage risks and remain financially sound—will definitely have a marketplace advantage. Achieving this will require a careful balance of three key elements: plan features that attract many of those impacted by the donut hole; other plan features that also attract healthy lives; and pricing that suits both of those targeted groups. **M**

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Rising Drug Costs Made Part D a Necessity

If one is diplomatic, the design is best described as strange. The fact is that the Part D program was 20 years in the making. When Medicare was enacted in 1965, the discussion began over whether to offer a prescription drug benefit. At that time, prescription drugs accounted for only 1% of total medical costs, so excluding them made more sense than it does today when they account for approximately 20% of every healthcare dollar spent in the US. To not have coverage now—particularly when pharmaceutical advances provide so much help to people who are dependent on them to live—would constitute a big void in Medicare’s mission.

Questions arise when one considers that the program we’ve ended up with is not really designed to provide the *most* well-being possible. Rather, it is designed to balance the well-being it provides in a way that satisfies the parameters agreed upon by the lawmakers who fashioned Part D. Many will argue that it provides great value for the people who need it most—those in the catastrophic level of need and those who are eligible for additional coverage because of their income level. Others maintain that it provides relatively little financial relief to millions of seniors caught in the middle.

First, an Overview of Key Issues

So how has this been working for PDP sponsors in the first few months of the program’s inaugural year? Most will say that—from a financial standpoint—they had a very good first month (January) because beneficiaries were satisfying their deductibles and the PDPs did not have much liability. A lot of claims were processed, but members were footing most of the bills in plans that have a deductible. The PDPs’ share of the pharmacy claims grew substantially in February, as people exhausted their deductibles and started to receive 75% coverage on eligible prescriptions. The typical PDP’s share of the claims doubled, on average, growing from \$40 pmpm (per member per month) to \$80. The PDPs’ share of total drug spending continued to

Most senior managers at PDPs want (and need) to know how the year is developing and how earnings are likely to develop for the next quarter and for the full year. In addition, PDP managers feel the heat of a fast approaching deadline for submitting 2007 bids, which will require reliable outlooks on the adequacy of the 2006 pricing. The deadline is June 5th.

rise in March and April; it will begin to drop once some of the beneficiaries’ drug spending exceeds the initial coverage limit of \$2,250 and the PDP sponsor’s liability decreases to 0% throughout the coverage gap (also known as the “donut hole”). We expect that, over the course of 2006, PDPs will be on a roller coaster ride with their share of incurred claims—a major departure from the predictable patterns of typical healthcare coverage. Confusing enough, perhaps, but in reality the challenges are just beginning.

The real challenge for the PDP centers on the “Four Hurdles of Part D”: 1) ongoing increases in enrollments; 2) sheer numbers of plan options; 3) the problem of “dual eligibles”; and 4) risk corridors.

1. INCREASES IN ENROLLMENTS A lot of prospective beneficiaries took advantage of the advance enrollment period beginning last fall. But a sizeable number of potential new beneficiaries remain who have yet to sign up. The program is still in the open enrollment phase—and we don’t know how many of those currently on the sidelines will eventually join or when they might decide to enroll (if at all). Overlay that uncertainty with the up and down pattern of claim payments mentioned earlier and the plot begins to thicken.

Consider the following key points regarding enrollment:

- The month of enrollment will have a major impact on profitability. The 11th and 12th months of coverage are expected to be much less costly for a PDP than the fifth and sixth months of coverage. PDPs will not have the opportunity to provide an 11th or 12th month of coverage in 2006 for anyone who enrolls in March (or later). This will drive up the average monthly cost of coverage (but there is no adjustment made to the direct subsidy or the beneficiary premium).
- Most PDP sponsors did not plan on the enrollment pattern that is emerging. Beneficiaries who enroll in May are likely to have a higher average monthly cost that is more than \$25 greater than January enrollees. If a PDP was priced with \$6 pmpm profit, those enrollees will generate a significant loss in 2006.
- Some experts expect healthier beneficiaries to enroll later in the year since prescription drug coverage may not be as vital to them as it is for beneficiaries with serious health conditions. However, there are risk adjusters in place as part of the initial program. These were developed assuming a standard plan design and 12 months of coverage, so the issue of an inadequate premium is still likely to occur during the inaugural year.

2. DIFFERENT PLAN OPTIONS A number of national PDP sponsors have 102 different individual PDPs that they need to monitor (up to three different plan designs in each of the 34 regions), and a couple even offer plans in the US territories. The pattern of coverage can vary with each plan design (e.g., some plans have a lower deductible or no deductible while others offer some form of coverage in the coverage gap) and the PDP liability is greatly affected by the plan design. Some of the plans being offered will provide approximately 50% of the total annual benefit (for a typical beneficiary) by the end of the fourth month of coverage; other plans will provide closer to 40% of the full year benefit in the same time span for the same beneficiary. Understanding how each unique plan is operating (and its impact on financial outcomes) requires precise

calculations and complex monitoring systems. Managing the volume of data, on top of getting a handle on emerging claims experience (and the other challenges yet to be discussed), makes this area another big challenge.

3. DUAL ELIGIBLES AND THE MIX OF BENEFICIARIES “Dual eligibles” is a term given to people who qualify for both Medicare and Medicaid. Much of this population has a very high rate of drug utilization. While projecting claims for such a group can be handled by finance professionals, it is the mix of dual eligible participants combined with all other beneficiaries that creates a new and complex twist to projecting future costs. Traditional methods used to forecast the total cost of the Part D benefit are not likely to be sufficient to produce accurate claim projections for most Part D plans. This is because the standard approach to projecting health claims does not involve reshaping the assumed distribution of beneficiaries—only rescaling their projected spending level. The Part D benefit, however, requires this simplifying of assumption to be revisited due to the irregular benefit pattern.

4. RISK CORRIDORS The federal government put risk corridors in place to protect PDPs’ liability during the first year and thereby attract them to the new program. Each PDP provided the expected cost for beneficiaries in the bid that they submitted to the Centers for Medicare and Medicaid Services (CMS) for consideration. The bids that were submitted typically projected around \$1,000 per beneficiary per year. If the full year actual results are within 2.5% of the projected amount, the risk corridors do not come into play. If the claim experience for the year is more than 2.5% higher than expected, the government pays the sponsor more money; if the claim experience is better (by the 2.5% margin), the sponsor must return some of the excess gain to the government.

This built-in risk protection does in fact reduce PDP sponsor risk, but it also adds one more layer of complexity that must be dealt with when projecting financial results. The PDP sponsor must perform their risk corridor calculations at the plan level in order to

We expect that, over the course of 2006, PDPs will be on a roller coaster ride with their share of incurred claims—a major departure from the predictable patterns of typical healthcare coverage. Confusing enough, perhaps, but in reality the challenges are just beginning.

INCORRECT (Without Risk Corridors)	Target/Allowed	Risk Corridor Payment for claims in excess +/-2.5%
PDP SPONSOR	\$1,000 / \$1,025	\$0
TOTAL		\$0

CORRECT (With Risk Corridors)	Target/Allowed	Risk Corridor Payment for claims in excess +/-2.5%
PLAN 1	\$1,000 / \$1,000	\$0
PLAN 2	\$1,000 / \$1,100	\$58.75 per member per year
PLAN 3	\$1,000 / \$975	\$0
AGGREGATE		\$19.58 per member per year

provide the granularity needed to accurately measure true results. Using the aggregate PDP sponsor results will usually mask the true outcome. The table above, which illustrates a 2% difference in earnings for one region for a sample PDP sponsor, highlights the disparity between the incorrect and correct methods of viewing results.

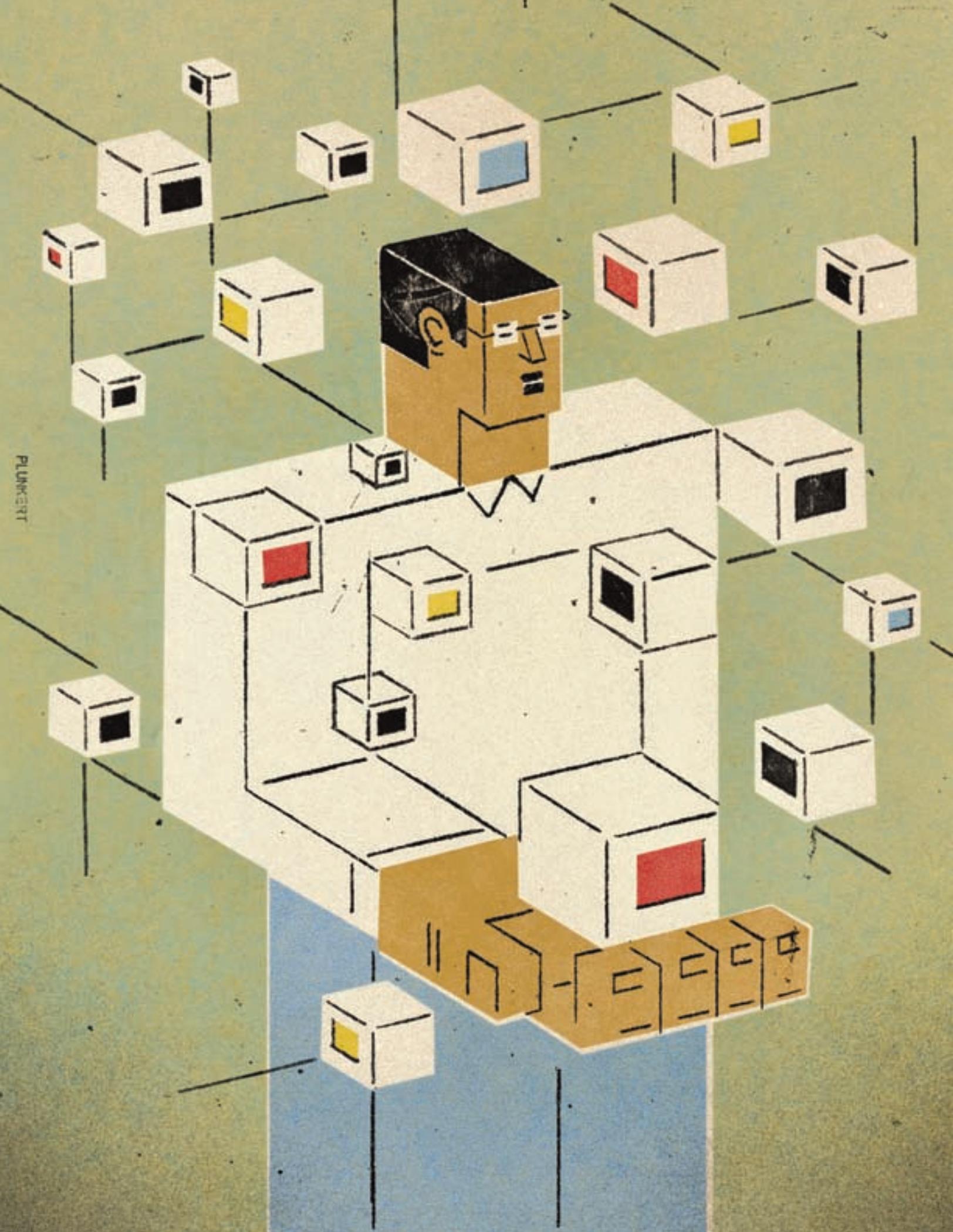
The Heat Is On

Most senior managers at PDPs want (and need) to know how the year is developing and how earnings are likely to develop for the next quarter and for the full year. In addition, PDP managers feel the heat of a fast approaching deadline for submitting 2007 bids, which will require reliable outlooks on the adequacy of the 2006 pricing. The deadline is June 5th. All of this together means it is essential for PDP sponsors to clear all four of the hurdles outlined above and draw key conclusions as to how their plan is running compared to how it was priced for 2006.

Admittedly, the four hurdles pose extraordinary challenges for actuaries, as well as for accountants and PDP sponsors. Milliman has taken a proactive role in helping sponsors deconstruct traditional models and develop new forecasting techniques in order to smooth out the complexities and solve the riddles of Medicare Part D.

Successful management of financial performance will depend on the PDPs’ ability to monitor their experience on a timely basis, forecast how it will develop throughout the year, manage the program-based information, and comply with government reporting requirements. These steps are unquestionably essential to the successful management of a well performing PDP. **M**

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PLUNKERT

THE FUTURE OF CAPITAL MODELING

BY PAT RENZI

Life insurance policyholders depend on their insurer to pay claims as promised, despite the ongoing threat of market failures or other unforeseen catastrophes. Similarly, insurers rely on key assumptions and projection techniques to set aside the amount of capital they need to meet claim demands and achieve their own performance objectives. Soon, the process and rules governing reserve setting and other projections will change from deterministic formulas that have been around for 30 years to more dynamic capital models. Milliman professionals have been tracking and participating in these changes for years. In this article, we explore the background of this issue and provide some tips for getting prepared.

Historically, setting reserve requirements on life products has been a fairly straightforward, formulaic process of determining the present value of expected future benefits, less the

present value of expected future premiums, based on prescribed assumptions. The key word was *formulaic*. This approach worked for a very long time.

That is until the paradigm for life insurance products started to shift. Companies began developing products that had significant variability due to embedded options. The result was a good deal more uncertainty as to whether appropriate reserves had been set aside to cover the benefits that would be paid out. Chief among these products were variable annuities, in which companies took on a whole new level of risk that was not captured by the prescribed reserving requirements.

Meanwhile, some companies felt that the recent changes in reserve requirements on life insurance products designed to address no-lapse guarantees using a formulaic approach generated redundant reserves (no-lapse guarantees are discussed in “A Primer on Life Insurance

Products” on p. 20). So over the past several years, the life industry has considered changes to how it sets reserves on certain products.

Running New and Unprecedented Risks

New products, such as variable annuities, represent an attractive offer for customers, giving them the opportunity to invest in the equity markets while still providing protection on death, retirement, or other insurable events. On the flip side, life companies assume a significant risk of loss if the financial markets drop precipitously, unless these risks are appropriately managed and adequate reserves and capital are established. So while life companies are shifting the competitive battlefield with their new offerings, they also are venturing into areas of financial unpredictability that require a more sophisticated methodology for assessing all of the risks embedded in the new product guarantees.

Reserves, Required Capital, and the Role of Actuaries

Accountants and actuaries know that an insurance company balance sheet is very different from that of most other companies. In an insurance company, particularly a life insurance company writing mostly term insurance,¹ the liabilities are future promises. It is uncertain if and when they might be paid. The expected value to be paid, and the expected timing of those payments, must be estimated. Actuaries are the professionals that provide this estimate. The estimate takes into account all of the probabilities involved in providing the insurance benefit, and the time value of money to produce a reserve.

In most other industries, liabilities are known amounts and are relatively straightforward to calculate. These liabilities include outstanding invoices, leases, and debt. While some companies may have reserves to estimate (for example, a manufacturing company would normally have a product warranty reserve), the reserve portion of the total liabilities is a relatively small percentage—5 to 10%, as opposed to a life insurance

company where reserve estimates may constitute as much as 90% of the liabilities on the balance sheet.²

In earlier times, actuaries and regulators established reserves with conservative assumptions related to life insurance in order to manage life insurance portfolios.³ The resulting reserves had enough redundancy that the insurance company would be viewed as solvent if it had assets that at least covered the reserves. More recently, reserves have been calculated on a basis somewhat closer to fair estimate, and companies separately estimate the amount of capital they need. Today's regulators establish metrics for the amount of capital an insurance company needs in order for it not to be subject to day-to-day scrutiny, or to be placed into rehabilitation by the regulators.

1 Life insurance with no fund component that a policyholder may withdraw.

2 The other liabilities are mostly unpaid amounts.

3 "Conservative assumptions" in this context means assumptions that tend to increase reserves.

A Primer on Life Insurance Products

VARIABLE ANNUITIES AND MINIMUM GUARANTEES

Variable annuities originally were a way for a policyholder to invest in a mixture of equities and debt to save for retirement. This exposed the policyholder to all of the risk of market fluctuation. Starting about 10 years ago, insurance companies began writing minimum guarantees. The first of these were guaranteed minimum death benefits and they were relatively simple. They provided that the policyholder would receive at least the amount deposited if they died. These guarantees then became more complex. They offered death benefits in excess of the initial deposit. For example, the minimum death benefit might be the initial deposit increased at a specified rate of interest; or it might be reset every year to the current account value if the account value was higher than the previous guarantee. As the market became more competitive, additional minimum guarantees were added to variable annuities. These include guaranteed minimum withdrawal benefits which specify minimum amounts that may be withdrawn at specific points in time, and guaranteed minimum income benefits, which specify the minimum income the annuity would pay after it was converted to a payout annuity, even if the account value would not support that income level.

All of these minimum guarantees expose the insurance company to risk if the market goes down without a compensating opportunity to profit should the market go up. The insurance company charges a premium for these benefits—typically expressed as basis points times account value to cover the expected costs of these guarantees across a range of scenarios. Most companies hedge these risks with options available in the marketplace to reduce their exposures under extreme scenarios.

NO-LAPSE GUARANTEES

In the early days of insurance, the typical insurance product was whole life. The insured paid a fixed premium every year to the insurance company as long as he or she was alive, and the insurance company paid a fixed death benefit when he or she died, as well as offering surrender values if the policyholder chose to surrender the coverage.

These products were frequently criticized because the purchaser could not easily tell what mortality rates were assumed and what investment they were obtaining. In the early 80s, an unbundled insurance product called Universal Life was developed. The policyholders could pay any premium they liked, within certain limits, whenever they wanted. The account value was increased each month, by adding in any premiums received and crediting interest on the balance, and reduced by deducting mortality and expense charges. If the account value went to zero, the policy lapsed. Again, as competition heated up, insurance companies found ways to enhance these products with no-lapse guarantees. Essentially a no-lapse guarantee says that as long as a specified premium is paid each year (or more commonly, a specified cumulative premium has been paid) the insurance will not lapse. The policy will pay in the event of death. A no-lapse guarantee does not guarantee any account value for the policyholder, but guarantees of the death benefit protection stay in force. Again, the insurance company has risk if interest rates are low, without a compensating return if interest rates are high. Companies embed a charge in these contracts to cover the anticipated costs of this guarantee over a range of scenarios. Fewer companies hedge these interest-related risks than is the case for stock market risks in the variable annuity arena.

Naturally, as this new paradigm began to unfold, regulators and actuaries took a closer look at what these changes meant from their respective points of view. Without the old formulas, regulators were concerned about how to set reserve requirements for products with the potential for unpredictable performance. Actuaries realized they could no longer quantify the future risks of variable products based on a single, prescribed economic environment.

Newfound Sensitivity to Market Volatility: A Coincidental Driver

The poor performance of the capital markets and a newfound sensitivity to this performance on the part of insurers further fueled a new approach for setting reserve requirements that would satisfy (as much as possible) the concerns of all the interested parties. Actuaries turned to stochastic economic models and assumptions based on company experience to evaluate the distribution of possible outcomes (these models are discussed in “Reserves, Required Capital, and the Role of Actuaries” on p. 20 and in “Nested Stochastic Modeling” on p. 22). But while the use of a stochastic process and experience-based assumptions to set reserves and capital requirements made sense, it introduced a whole new dimension to the issue—judgment, which life insurance regulators view as neither easy to define nor monitor.

The industry has been discussing reserving for life and annuity products based on first principles rather than prescribed formulas for more than 20 years; hundreds of representatives from the life insurance industry, regulating bodies, and actuarial firms have weighed in on the issue. These discussions have found new traction in recent years as the industry has been unable to devise workable formulas for minimum guarantee and no-lapse guarantee products. Technology has also evolved to enable much broader, more holistic approaches. This will probably result in major changes in reserve setting on *all* life and annuity products.

A Look at the New Models

A number of key assumptions go into developing the new models, but principal among those is the economic scenario generator—the mechanism for projecting a set of possible scenarios of future equity returns and interest rates that is consistent with the current market. The American Academy of Actuaries (AAA) developed a generator from which they provided a set of 10,000 economic scenarios for companies to use in performing the C3 Phase II analysis. Companies may use a subset of the set provided or may use a different generator, as long as it can be demonstrated that the scenario set being used has the same characteristics as the set of 10,000 provided by the AAA.

As a principles-based reserves system is implemented in coming years, we expect changes to the life industry that go well beyond how the system is put to work. These changes will drive further discussions about managing and governing, particularly in assessing an organization's appetite for risk.

The challenge for the life industry now is one of preparing for the inevitable, including understanding how the new process will work and what its implications are for key performance measures. We believe that a short list of effective preparation priorities for the near future will include the following:

- Investigate and assess company-wide hardware needs to accommodate the new modeling techniques
- Explore specially-developed software tools that support the type and number of calculations involved, not just for compliance with the new reserve and capital requirements, but to properly reflect the requirements in pricing, business planning, and risk management
- Review implications for internal planning and controls as they relate to regulatory tracking and third-party auditing of findings
- Consider additional management actions required under more dynamic modeling processes, such as risk identification and mitigation strategies, documenting and supporting judgment calls, and defining and implementing a peer review process.

Let's take a closer look at how technology and management considerations underpin these priorities.

Technology Needs to Accommodate New Modeling Techniques

Two aspects of the new approach will dictate a change in both hardware and software functionality: the sheer number and size of calculations (discussed further in “Nested Stochastic Modeling” on p. 22); and the ability to audit, analyze, and justify results and assumptions.

Traditionally, companies had reserving systems that were “locked down,” in terms of the assumptions and formulas to use. From an audit control perspective (especially post-Sarbanes-Oxley), it was easy to implement procedures around the old systems due to this controlled and prescribed methodology.

If we attempt to use locked down systems with stochastic modeling, we confront the “black box problem”—results are opaque rather than transparent. An actuary has to explain these results to management, regulators, and rating agencies—often without clear understanding of what the results mean.

So how do companies overcome the black box problem? The next generation of modeling software must allow users to drill down through and across various dimensions, to access as much detail as necessary for the actuary to understand and audit the calculations.

The cost in time and infrastructure of implementing this major change in reserve calculation presents a significant concern, particularly for smaller companies that lack the requisite human or financial resources and expertise to develop the infrastructure. It is important that software developers and consultants focus on solutions that can benefit all sizes of affected companies.

Additional Management Actions

As a principles-based reserves system is implemented in coming years, we expect changes to the life industry that go well beyond *how* the system is put to work. These changes will drive further discussions about managing and governing, particularly in assessing an organization's appetite for risk, in establishing internal controls to monitor or contain risks, and in selecting consultants to support the company's risk management efforts.

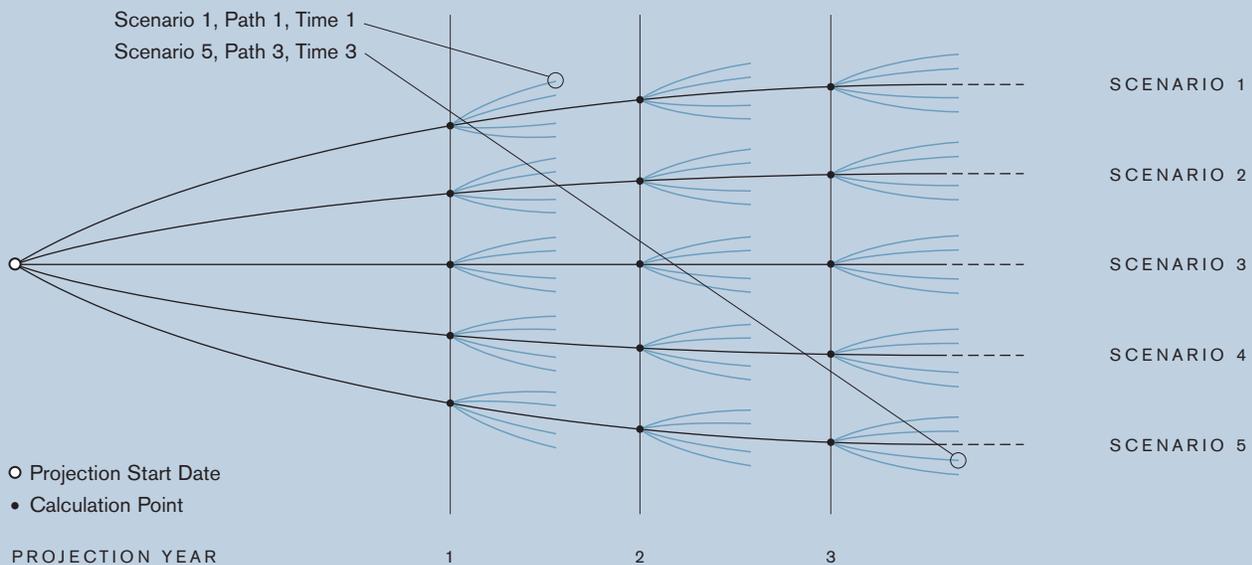
Nested Stochastic Modeling

Stochastic modeling is a complex, mathematical process that uses a combination of probability and random variables to forecast financial performance, or, in the case of reserve setting, to forecast financial requirements. The word *stochastic* comes from a Greek word that means “skillful in aiming.” So the term refers to a process of tightly targeting a numerical probability or projected end result.

“Nested” stochastic models, as the name implies, are stochastic models inside of other stochastic models. They are not explicitly part of the principles-based reserve method, but since the setting of reserves and capital will be based on a stochastic valuation, earnings projections will require stochastic projections at each future projection date, across all scenarios. This means that nested stochastic models are needed to appropriately manage the business, price new products, project

earnings, or measure risk. These models are not for the technologically challenged—a 1,000 scenario model with reserves and capital based on 1,000 paths at each valuation point for a 30-year monthly projection requires the cash flows for each policy to be projected 360 million times. Layer on top of this the desire to look at the implications of stochastic mortality or credit and we have introduced additional nested loops into the projections.

The ability to run these types of projections and analyze the resulting information will require significant changes in the hardware and software infrastructure at most companies. Ultimately, a solution for many of these challenges will involve grid computing (linking many PCs together under common control). Some companies are already running stochastic and nested stochastic projections on grids with as many as 1,500 PCs.



Turbulent financial markets and heightened regulatory scrutiny have put risk management in the spotlight, but it is shareholder interest in how well the company lives up to its intentions that will add or detract from the company’s perceived value. This broader definition of risk management will influence both internal model development and the professional judgment that will be exercised in implementing the new models.

Riding the Wave of the Future

In the end, successful handling of the new requirements will involve strength both in theory and in practice. Our firm has been involved with these changes since their inception, including the research we have undertaken to understand their implications. We have invested in developing our capabilities in both the science and the application. As a result, we’ve been able to develop a knowledge base and tools to support the implementation of the new reserve and capital requirements. Having a long history of client advisory services, we’re prepared to help our clients understand—and

implement—the capital requirements of their businesses both today and into the future.

We recognize, too, that our own role as actuarial consultants is changing. Greater accountability for our “judgment calls” demands a more institutionalized approach to use of stochastic models as well as the capability to deliver a broader array of compliance skills and services. Clients will be looking for help from firms like ours who can combine knowledge of issues and needs with the tools to resolve and fulfill them. We stand ready to embrace that challenge—and that opportunity. **M**

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Solvency II: Overhauling an Outdated System and Better Managing Risks in the EU

Solvency II is the name that has been assigned to the significant change in the regulation of insurance companies in the European Union. According to a white paper by Milliman Principals Ed Morgan and Marc Slutzky, “Solvency II is part of a convergence between economic and regulatory management of insurance companies based on a realization that, ultimately, companies that are profitable and well managed are those most likely to remain solvent.”

Much like the process that is currently moving US companies toward the adoption of principles-based reserve setting, Solvency II also will rely on stochastic capital models replacing a much simpler, formulaic process. As with the changes in the US, the European movement has captured the attention of a wide group of participants, including insurers and national and transnational bodies governing and regulating the insurance industry. Chief among these is the Committee of European Insurance and Occupational Pensions Supervisors, or CEIOPS, which advises the European Commission in preparing for new regulatory measures, and the International Actuarial Association (IAA).

Solvency II has also drawn from other international standards governing the financial service industry. The Basel II banking rules, regarding the adequacy of a bank’s capital, provided a point of reference. Still it

Strength today is more often associated with transparency and realistic assessments, not prudence. Companies have to know how well they can weather difficulty.

is important to note that EU insurance regulators are ultimately working among themselves to come to a collective standard. Some of the companies are also active in trying to shape the direction of future approaches to assessing capital needs.

“A few of the larger European multinational companies—perhaps 10 to 15—are quite well down this road,” Ed notes, “in terms of their investment of time, energy, and money in developing their own internal capital models. But most—numbering in the hundreds—are watching and waiting a bit longer.” In other words, the situation in Europe is much like the situation in the US.

“Whether US or Europe or elsewhere, the whole business world has gotten much more switched on to risk over the last 10 years,” Marc says. “In the case of Solvency II, risk alone has not been so much a motivator as a coincidental factor, because the system has needed overhauling for a long time. Particularly in Europe, more sophisticated capital requirements were needed. Prudence had always been regarded as the important thing, but now we know that prudence alone can actually obscure some very important factors. Strength today is more often associated with transparency and realistic assessments, not prudence. Companies have to know how well they can weather difficulty.”

Nevertheless, Ed and Marc agree that there is no question that the shape and focus of Solvency II and the role of capital models in the process is very much influenced by the greater awareness of risk. Ed underscores this point by adding, “Risk awareness and risk management are crucial to stability in the overall economy, regardless of the country—some in Europe even say that the Chief Risk Officer is now more powerful than the Chief Executive Officer, although perhaps they shouldn’t be. Few would argue that if companies manage their risks effectively, they will significantly enhance their chances of success.”

Experience Counts More Than Ever: Will Smaller Companies Have What It Takes?

As we move to the new paradigm of principles-based reserve methodology, Karen Rudolph, a Milliman Principal and a member of the Life Reserve Working Group sub-team on sample modeling, expects to see increased focus on internal experience studies especially in terms of how they relate to the judgment exercised in setting reserves going forward.

According to Karen, “To the extent that a company has credible experience, they can make use of it in their reserve calculations. Large companies, for example, already have the resources and know-how to perform lapse studies, premium payment pattern studies, mortality studies, and so on, because they were used in the past for business planning or informational purposes. Now, the capabilities behind those studies are going to evolve into a new and very important role—establishing the statutory liability and capital on the company’s books. But this is likely to be a serious issue for smaller insurers that may not have either the number or type of human resources required or the technical tools to perform these studies.”

The issue of potential small company disadvantage has been raised, Karen notes, but neither industry task forces nor regulators have yet taken any concrete steps to explore exemptions, identify exclusions, or develop solutions. “At this point in time,” she says, “the most you can say is that small companies need to be aware of the changes that will be coming to fruition and to start thinking about their strategy or approach.” Even companies that only have a small life block—such as those that are primarily oriented toward health or long-term care services—will feel the impact, because they have life reserves on their books.

“It’s undisputed that all companies are going to need additional resources just to get the job done,” Karen emphasizes, “but the larger companies already have the tools and expertise in place to refresh their experience studies with appropriate frequency and granularity. It’s difficult to tell for sure, but my sense is that smaller companies simply don’t have this functionality; it’s an issue that needs to move from the back burner to the front burner really soon.”

BY THE NUMBERS...

834,000

Living Longer Although long-term demographic projections must always be taken with a grain of salt, big changes are expected in the age distribution of the US population over the next 50 years. Not surprisingly, longevity is increasing. The proportion of US residents aged 65 and older is predicted to double by 2030 to 70 million, making up 20% of the total US population.¹ If this forecast is accurate, reaching one's 100th birthday may become almost commonplace. The population of centenarians in this country is projected to number 834,000 by 2050.²

10%

No, They Don't Advertise Interstellar Insurance on TV Satellite insurance is little-reported but critical to the many industries that rely on satellites. The extreme technical complexity of the equipment and the need for absolute precision set a high bar for success; up to 10% of launches are beset with problems significant enough to be called "failures." Not all failures are total losses; sometimes satellites end up in the wrong orbit or simply malfunction, compromising their operability enough to result in a financial loss.³

50/100

And You Thought It Was Hard to Get All Those Clowns in That Little Car In 1950, there were six Social Security beneficiaries for every 100 covered workers; in 2004 there were 30. In about 35 years the ratio will grow to almost 50 beneficiaries per 100 covered workers.⁶ As time goes on, that demographic shift will eat away at the trust fund surplus, until eventually either the system's benefits or payroll taxes will need to be revised.

Digital Fingerprints The average number of megabytes of personal information stored per US individual is 3,500 megabytes.⁷

\$12,214

Doesn't Anything Ever Get Less Expensive? The average annual medical cost for a family of four increased by 9.1% from 2004 to 2005. This annual cost went from \$8,414 in 2001 to \$12,214 in 2005, a 9.8% annualized rate of increase.⁸

114

Lost and Found Out of 3,050 Gulf of Mexico drilling platforms that lay in the paths of Katrina and Rita, losses included 114 destroyed, 69 damaged, 19 adrift, and three missing. Most were older facilities which accounted for only a tiny fraction of production in the region. Only one major modern facility was destroyed.¹²

1/4

Not What You Might Expect From Your Homeowners Insurance One-quarter of homeowners liability insurance claims in 2003, or \$321.6 million worth, were a result of dog bites, costing insurers an average of \$16,000 per claim.¹³

- 1 US Census Bureau, "(NP-T3) Projections of the Total Resident Population by 5-Year Age Groups, and Sex with Special Age Categories: Middle Series, 1999 to 2100," *National Population Projections, I. Summary File*, www.census.gov.
- 2 Constance A. Krach and Victoria A. Velkoff, *Centenarians in the United States*, www.census.gov.
- 3 Derek Newton, "Satellite Insurance," *Milliman Global Insurance*, May 2005.
- 4 *Insurance Issues Series*, Volume 1/Number 4, August 2003, Insurance Information Institute, www.iii.org.
- 5 Ibid.
- 6 *The 2005 OASDI Trustees Report*, <http://www.ssa.gov/OACT/TR/TR05/index.html>.
- 7 Chris E. Stehno and Craig Johns, "You Are What You Eat: Using Consumer Data to Predict Health Risk," *Contingencies*, Jan./Feb. 2006.
- 8 *Milliman Medical Index*, 2005.
- 9 Carl X. Ashenbrenner and Kyle Mrotek, "Taming the Turbulent Cycle of Aviation Insurance," *Milliman Global Insurance*, January 2005.

Thanks, I'll Stick to Scrabble Some sports are more dangerous than others. Injuries per thousand participants vary from 20 or more (football and basketball) to less than one (bowling and billiards). Martial arts (seven injuries per thousand participants) are safer than baseball (11) but watch out for fishing (two) which is twice as dangerous as mountain climbing (one).⁴

<one

\$3bn

Menacing Mold Mold-related insurance claims more than doubled from \$1.3 billion in 2001 to \$3 billion in 2002. Average homeowners insurance claims run \$3,000 to \$4,000, while mold-related payouts are typically \$15,000 to \$30,000.⁵

30x

Planes Trains and Automobiles In the 13 years from 1989 to 2001, there were only 0.03 fatalities for every 100 million passenger miles flown compared to 0.87 fatalities per 100 million passenger miles driven—making driving almost 30 times as dangerous as flying.⁹ That may be cold comfort to the approximately 20% of Americans who say they are afraid of flying.¹⁰

4x

Even More Dangerous Than Walking and Chewing Gum at the Same Time A recent study conducted in Australia and published in the *British Medical Journal* shows that drivers using cell phones are four times more likely than those not using phones to be involved in an accident resulting in a hospital stay. The increased crash risk was consistent regardless of age, gender, and whether the injured was using a handheld or handsfree phone.¹¹

Got some facts or figures you'd like to share with us? Write us at insightmagazine@milliman.com.

\$56,878

From the Department of Pennies, Re: Rainy Day From year-end 2003 to year-end 2004, average 401(k) account balances grew approximately 10%, from \$51,569 to \$56,878. Participants in their 20s with five or more years of 401(k) investment averaged balances of \$31,844; those in their 40s averaged \$100,106; while those in their 60s averaged \$136,400—which is actually \$6,761 less than the average balance among similar participants in 1999.¹⁴

10 "The Fear Factor," *American Demographics*, October 1, 2001.
11 S. McEvoy, et al, "Role of Mobile Phones in Motor Vehicle Crashes Resulting in Hospital Attendance: A Case-Crossover Study," *British Medical Journal* doi:10.1136/bmj.38537.397512.55, July 12, 2005.
12 Robert P. Hartwig, "Hurricane Season of 2005: Impacts on US P/C Insurance Markets in 2006 and Beyond," Insurance Information Institute, www.iii.org.
13 *Insurance Issues Series*, Volume 1/Number 4, August 2003, Insurance Information Institute, www.iii.org.
14 "401(k) Account Balances, Asset Allocation by the Numbers," *Fast Facts*, October 4, 2005, <http://www.ebri.org/pdf/publications/facts/fastfacts/fastfact100405.pdf>.

HAS THE TIME FINALLY COME FOR ENTERPRISE RISK MANAGEMENT?

BY LARRY BERGER, PH D

Insurers have been discussing Enterprise Risk Management (ERM) for a long time. They seem to agree on the virtue of ERM's central premise: companies should maintain control over the risk-taking environment in the context of *all* the exposures that present themselves to management. Successful application of ERM will give insurers more confidence that capital is adequate for every strategic decision and investment selection. The approach stresses integration, and encourages companies to link business lines and operations so that risk-taking is balanced in all areas. While this sounds good on paper, the promise of better risk management remains unfulfilled. To date, ERM has been more talked about than practiced.

Now it appears that institutional forces could make ERM a reality in the boardroom. Standard & Poor's (S&P) has formally added ERM as a component of its ratings methodology, and the agency expects that all the insurers they rate will have ERM evaluations by the end of this year. The aim of the S&P ERM review is to urge companies to match the magnitude of exposures with an appropriate level of risk management. Companies with diverse and complex risks should configure economic capital models to match these risks, assuring examiners that the business accurately measures and allocates risk capital. S&P is less interested in specific procedures that make ERM a "box-checking exercise" than it is in effective execution.

The S&P ERM review will evaluate the following five areas: (1) risk management culture, (2) risk controls, (3) extreme event management, (4) risk and economic capital models, and (5) strategic risk management. S&P will rate each area as weak, adequate, strong, or excellent. To earn a designation of "excellent" or "strong," companies will need to demonstrate depth and breadth of risk management policies and be able to apply them consistently. The key difference between these two designations is the likelihood that the company will experience unexpected losses.

RISK MANAGEMENT CULTURE The first goal of S&P's evaluation is to see if the company has a culture built around ERM awareness. Companies with such a culture employ specialized, experienced risk managers; clearly communicate risk management policies, procedures, and objectives to upper- and mid-level managers; link incentives to achieving risk management goals; and assign responsibilities for measuring and monitoring risk separately from those areas taking on and managing the risk. A strong risk management culture also includes the appointment of high-ranking decision-makers who are responsible for overseeing risk management and have the authority to enforce ERM standards, and a board that hears regular reports on risk positions and management strategies.

RISK CONTROLS Risk controls, another component of the ERM evaluation, include identification of all significant risks, regular monitoring, documented limits and standards, enforcement, and routinely and consistently applied programs.

EXTREME EVENT MANAGEMENT Under extreme event management, S&P will look for companies with strong disaster plans that consider a range of worst-case scenarios and the associated losses that might occur. These plans will need to demonstrate management of risk tolerances and consistent execution on a daily basis.

RISK AND ECONOMIC CAPITAL MODELS Risk and economic capital models that satisfy ERM standards will be clearly understood by management and timely enough to support the strategic risk-management process. Insurers should seriously consider modifying regulatory or rating agency risk-based capital formulas to properly determine the capital that is needed to meet their particular circumstances. The review of risk modeling will consider the sources of data and assumptions underlying the models, and whether or not these sources have been validated.

STRATEGIC RISK MANAGEMENT Under the category of strategic risk management, the last of the five ERM components, insurers will be assessed on how they incorporate risk management into the corporate strategic decision-making processes. The calculation of risk capital is essential in determining the risk profile of each exposure, and insurers should demonstrate that they understand how these calculations affect business decisions. Strategic processes to be considered include capital budgeting, asset allocation, dividend practices, and incentive compensation.

As S&P establishes its ERM program, other ratings agencies and regulators are likely to follow. The expanded scrutiny will require a comprehensive re-sorting of risk management priorities for many insurers. The rapid evolution of actuarial software—continuously updated to incorporate new regulatory and accounting standards, new products, and emerging risks—will help companies meet the demands of ERM.

With greater control of risk exposure, insurers can enjoy greater negotiating power with reinsurers and potential merger and acquisition partners. Successful ERM implementation builds confidence among prospective customers and investors. As the insurance industry adjusts to broader standards, it will find itself composed of better-managed, more professional companies. ERM initiatives establish expertise and reliability at the company level, and have the potential to lift the reputation and credibility of the entire insurance industry. **M**

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