

**Property-Casualty Risk-Based Capital Working Group  
National Association of Insurance Commissioners**

**Hearing on  
the Proposed Formula for  
RISK-BASED CAPITAL  
of Property-Casualty Insurance Companies**

**Statement of  
Richard E. Stewart  
Stewart Economics, Inc.**

**Kansas City, Missouri  
November 22, 1993**

## **Authorship of the Statement**

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The purpose of this testimony is to offer an appraisal of the risk-based capital formula as a centerpiece of solvency regulation of property-casualty insurance companies. While the testimony refers to the specifics of the formula, it is more directed at the concept and derivation of the approach and at how our efforts might be even better directed.

The first point I want to make is that the present focus on the RBC formula is entirely natural and understandable in light of what has gone before in insurance regulation.

The whole institution of state regulation of the national insurance business is best understood historically, and from its beginning the institution has put high priority on regulation for solvency.<sup>1</sup> Since the absence of capital is almost a definition of insolvency, it is natural that the concept of capital should be involved in solvency regulation. For a long time, however, it was used as an independently significant concept only at the inception of a company's activities, that is, as a prerequisite to incorporation, licensing or authorization to do a new kind of business.

State regulation of insurance has never relied much on barriers to market entry as a device for strengthening or stabilizing the industry. The minimum amounts of capital necessary to enter the market have been much lower than what prudence would require for a going concern. It is nice to think that the regulators of the past were repelled by the anti-competitive uses of high official barriers to entry in other regulated

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<sup>1</sup> Patterson [47] wrote in 1927 that: "...the most important grounds of [license] revocation are those relating to the company's financial condition. These powers are, indeed, the backbone of the regulatory organism. The chief object in view in creating separate insurance departments and in delegating to them extensive powers of regulation and investigation was to protect the public against financially unsound enterprises; and this remains the chief *raison d'être* of the insurance commissioner. (p. 192)

industries. We just do not know. Maybe they just wanted to encourage local businesses to spring up.

In any event, the statutory minimum capital amounts look ridiculous when applied to large, ongoing insurance companies, but it is awkward to explain in a public forum, after a company failure, that they were never intended for that purpose. Equally bad, it is hard to convince a judge that a company with more capital than the statute requires can be taken out forever because the commissioner thinks it is hazardous, when "hazard" looks like a subjective, conclusory, qualitative judgment by department staff put up against the legislature's clear number. After a few of these experiences, a practical regulator may well choose to harden the concept of hazard and to increase the minimum capital rather than to keep losing arguments about them.

When did this decision to expand the precision of the concept of capital come about? It was a process and not a single stroke, but it happened around the late sixties, that is, partly on my watch. That was a time when advances in information gathering and processing which we now consider primitive were opening up new vistas of precision and control in the social sciences. It was, after all, the same epoch that gave us the prospect of fine tuning the economy and conducting limited war.

Some first steps toward where we are today in refining the concept of capital date from that period – the first early warning tests, the first official changes in examination priorities based on financial analysis, and the identification of resources for diversification under the unforgettable title "the concept of surplus surplus."<sup>2</sup>

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<sup>2</sup> Starting in the late 1960s, scholars in a number of countries developed a variety of increasingly sophisticated statistical methods for detecting troubled insurers, both life and non-life. Surveys of the literature on such methods can be found in Kastelijn and Remmerswaal [29] and Kahane, Tapiero and Jacques [28]. Using the classification scheme of Kastelijn and Remmerswaal, the studies have included:

(1) Methods based on ratios – the NAIC-IRIS system; EEC minimum solvency margins; scoring systems built on regression analysis, such as the work of Trieschmann and Pinches [56], Aetna Life & Casualty for the American Insurance Association [1], Harrington and Nelson [23] and Ambrose and Seward [2]; and minimum capital calculations based on regression analysis, such as Hofflander [24].

In carrying the refinement of capital adequacy as a regulatory concept so far forward today, state regulation is exhibiting another of its strengths – the ability to learn from criticism from Congress. During the fifty years since it became clear that the federal government could constitutionally take over insurance regulation, it has been only sensible for the state regulators to pay respectful attention to congressional oversight.

There have been three big episodes. First, at the end of the 1950s, Senator O'Mahoney's subcommittee criticized the states for restraining competition and perpetuating cartel practices by rate regulation.<sup>3</sup> The states responded by approving rate deviations and moved toward competitive rating laws. That opened the market for the

(2) Methods based on ruin theory – models that use risk theory to determine the probability of ruin from fluctuations in claims. Examples are the Finnish models, especially the 1962 work of Pentikainen for calculating the maximum amount an insurer could place in an equalization reserve free of taxes, and the Norwegian application of those models to a break-up situation. Both are described in Kastelijn and Remmerswaal [29].

(3) Comprehensive models – models that incorporate investment and other factors as well as claims fluctuations. Examples are the adaptation of the Finnish ruin models to the calculation of a solvency margin by Pentikainen and Rantala, and described more broadly in Beard, Pentikainen and Pesonen [5]; an English study group's development of a solvency margin with five components based on assets, loss reserves, reinsurance, underwriting risk and other risks, as outlined in Kastelijn and Remmerswaal [29]; and numerous American and other studies that use simulation techniques to assess the simultaneous effect of underwriting, investment and other risks on solvency.

(4) Portfolio theory models – models that use the tools of portfolio theory to determine solvency margins for different combinations of underwriting and investment risk and return. Examples are the work of Kahane and Nye [27], Bachman [3] [4], and Hammond and Shilling [22].

The amount and variety of statistical studies that have been done in recent years show dramatically in the list prepared by Willenborg [64] of nine categories and 120 specific variables that have been used to predict insolvency.

<sup>3</sup> A comprehensive study of the antitrust laws and the insurance business was authorized in 1958 by the U.S. Senate Subcommittee on Antitrust and Monopoly and presided over by Senator Joseph C. O'Mahoney. The subcommittee issued two reports: *The Insurance Industry: Aviation, Ocean Marine and State Regulation* [61] and *The Insurance Industry: Rates, Rating Organizations and State Rate Regulation* [62].

low cost direct writers to mop up personal lines. That led, or seemed to lead, to the creation and then the failure of some auto insurers, while the states stood by.

Throughout the sixties, Senators Dodd, Hart and Magnusson held hearings which criticized the states for allowing those auto insurers to run into the ground, stranding their policyholders.<sup>4</sup> The states responded by staffing up for solvency regulation, creating guarantee associations and giving the NAIC a professional staff for the first time.

Now Chairman Dingell has criticized the states for allowing too much risk taking by life and property-casualty insurers and for not taking them over sooner.<sup>5</sup> He did so at the very time Congress was pressing federal regulators to increase capital for banks, based on the past risk of default of various kinds of loan in their portfolios. Now the states are responding with a formula for computing the capital needed to support various kinds of asset and liability risk in what looks like an analogous industry.<sup>6</sup>

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<sup>4</sup> See *Hearings* 1965, 1968 and 1969 [63].

<sup>5</sup> In hearings before the Subcommittee on Oversight and Investigations of the U.S. House of Representatives Committee on Energy and Commerce (Rep. John D. Dingell, Chairman), the statement of the Assistant Comptroller General of the General Accounting Office [59] said:

We found many reasons for regulatory delay in dealing with troubled or insolvent insurers. In addition to relying on inaccurate and untimely data reported by insurers, states also generally lacked legal or regulatory standards for defining a troubled insurer, and vague statutory language made establishing insolvency difficult. Actions that are needed to correct these problems include developing a single uniform standard for determining if an insurer is financially troubled, requirements that certain actions be taken when specific hazardous conditions are present, and a single uniform legal definition of insolvency based on loss reserves and capital adequacy. Such action would improve protection of policyholders and state guaranty funds. (p. 19)

<sup>6</sup> The idea of an analogy between commercial banks and savings and loans on the one hand and property-casualty insurance companies on the other has to be handled with care. Both as to levels of aggregate capital and the relative complexity of the two businesses, banking is quite different from insurance. Bank regulation to increase capital stemmed from concerns that the capital of banks generally had not kept up with the increased risk characteristics of their assets. New regulations, beginning in 1990, caused bank capital to increase, from 6.1% of assets in 1988 to 7.1% in 1992. (See *Federal Reserve Bulletin*, July 1993 [11], p. 664.) Capital in property-casualty insurance, on the other hand, has not been perceived as generally too low, according to established rules-of-thumb and even to risk-based capital calculations. The NAIC's early test results of the RBC formula [41] show the industry's aggregate surplus at more than two times the company action level of risk-based capital (below which a company must file a corrective

All this is not bad. Indeed the ability to respond to criticism, and the continuing oversight of a somewhat friendly institution which mainly criticizes, are strengths of state regulation, not weaknesses. But we do have to be careful not to react too much.

So my first point has been a reminder that it is entirely natural for state regulation to be taking up a risk-based capital formula at this time. Please indulge me the next two points, which are avowedly negative.

One is that the present formula does not yield much, if any, incremental benefit in detection of future insolvency. The other is that the formula can have bad effects which may outweigh the gain. I'll get through this part quickly, both so as not to prolong offense and so as to get to the more interesting and productive questions, which follow when we ask why.

The best prescription for reducing the harm done to the public by the insolvency of individual insurance companies is well known. It begins with early detection of trouble, in which formulas play a part. That is promptly followed by firm action either to hold the company back or to take it out of the market. The final ingredient of the familiar prescription is guaranty funds to pick up those who are left depending on a bankrupt company's failed promises.<sup>7</sup>

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plan with the commissioner). The industry's aggregate surplus is also nearly six times the authorized control level (below which the commissioner would have legal grounds to take over a company).

<sup>7</sup> That solvency regulation includes all three factors (early detection, prompt action and guaranty funds) was brought out in the 1974 study done by McKinsey & Company for the NAIC [38]. The study outlined key requirements of a surveillance system, the first two of which were detecting problems early and developing the information a regulator needs to determine the action to take. It continued:

Of course, an effective surveillance system is not enough: Once the facts are brought to his attention, a commissioner must have the determination and skill - as well as appropriate legal authority - to take action in the public interest.

With regard to protecting against insolvency, it is worth noting that guaranty funds do protect the policyholders and claimants of insolvent companies..., however, it must be recognized that guaranty funds only redistribute the cost of insolvencies among a broader group of policyholders. (p. 237)

Similar conclusions were reached in two studies by Stewart Economics [52] [54].

The present RBC formula has three functions – to anticipate company failure, to quantify the concept of hazard and to reduce discretion about whether to act. The first role is the main one and the formula does indeed, by itself, identify failing companies. But the NAIC's own studies show that it does not add to the detection ability of the older and simpler formulas already in place.<sup>8</sup> Others who will testify today have independently confirmed that finding. Our firm has not. But we would be surprised by any other conclusion, for reasons I will get to further on.

The RBC formula, with its thresholds, will, however, introduce new conundrums for regulators. Setting the threshold for the various stages of regulatory involvement under the RBC formula is an inherently insoluble problem. All the early detection formulas either clear many weak companies or trigger many strong ones.<sup>9</sup> That is not a serious problem with tests, like IRIS, that are just used to inform regulatory judgment about priorities, but RBC is destined to be more generally and mechanically applied.<sup>10</sup>

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<sup>8</sup> A study by Grace, Harrington and Klein [20] tested the ability of RBC, in its June 1993 version, to identify insurers which failed in 1990, 1991 and 1992. That study found the predictive ability of models containing IRIS and FAST variables was not improved much or at all by the inclusion of RBC percentages. (pp. 18-19)

<sup>9</sup> The Grace, Harrington and Klein study [20] concluded that very few insurers which failed had capital below regulatory action thresholds. It also stated that increasing the thresholds would only increase the number of solvent insurers incorrectly identified and increase the risk of "significant and undesirable market dislocations". (p. 15)

In 1992, the Insurance Services Office [26] tested the usefulness of a risk-based capital formula by developing its own "illustrative" formula. The ISO formula, though significantly different from the NAIC's proposed RBC formula, identified more solvent than later insolvent insurers as needing more capital and indicated that more capital should be added to solvent insurers than to later insolvent ones. (p. 2)

<sup>10</sup> The problem of mechanically applying capital formulas has been noted in banking. A 1991 report by the U.S. General Accounting Office [58] on bank supervision found that:

...bank capital typically was a lagging, rather than a leading, indicator of bank problems. Nevertheless, regulatory enforcement actions tended to focus on capital inadequacy, rather than on the underlying problems, as the key indicator of unsafe and unsound practices.  
(p. 3)



If the RBC threshold is set low, so as to let many weak companies through unflagged, it will justify inaction and be a marketing tool for weak companies. If the threshold is set high, it will cause unjustified public alarm and inspire competitive spreading of rumors. Multiple thresholds for different levels of action just compound these problems, as do different levels of confidentiality. The dilemma about where to set the thresholds for regulatory action is well illustrated by the present levels set by the NAIC, which are too permissive to identify many of the companies which have failed in the past.

Wherever the threshold is set, a measure with as confidence-inspiring a name as "risk-based capital" will inevitably be taken as a general indicator of strength. That will cause confusion, especially if, as appears likely, it does not correlate well with company evaluations published by the rating agencies.<sup>11</sup>

An abiding problem in insurance is incentive effects of the insurance itself, sometimes called moral hazard. There are moral hazards all over regulation, particularly leading to delay in moving on hazardous companies, and there may be other

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Another paper by bank regulators, which points out that risk concentration is common to both banking and insurance, states: "capital ratios do not decline in the risk-taking phase, and by the time they do, late in the problem realization phase, it is too late for even harsh supervisory action to avoid the consequences of the built-in problems". See Kopcke and Randall [33], pp. 42-43.

The fact that a negative capital account is one of the definitions of insolvency means there is a problem of logical circularity lurking in any technique of forecasting insolvency that depends heavily on changes in the capital account. To be really useful, a forecasting device has to do more than say that a large and growing capital account is safer than a small and shrinking one.

<sup>11</sup> This possibility has been explained by Belth [6] for the use of risk-based capital ratios in life insurance:

Unfortunately,...insurance consumers are likely to be victimized by misuse of RBC data....The problem is that ratios calculated from the RBC figures of many companies with weak financial ratings – or no financial rating – will be more favorable than the ratios of many companies with strong financial ratings.

RBC ratios, therefore, will be used to turn financial ratings upside down; that is, many companies and agents disadvantaged in the market by poor ratings (or no ratings) will use the ratios to suggest to unsuspecting consumers that the companies are financially strong. (p. 195)

perverse incentives in the guaranty funds. We never tire of reminding our congressional critics that deposit guarantees played a big part in the S&L debacle. So we ought to look out for incentives in anything we do, particularly if the incentive is to do something some people want to do anyway.

It looks as though such incentives are lurking here, so that the RBC formula could induce behavior detrimental to financial strength of insurance companies. Here are some possibilities.

Companies with low capital would have another incentive to dress up their accounts through devices, such as financial reinsurance, which improve a company's stated profits and capital in the short run but weaken the company in the long run. Companies with high capital or low returns on equity would have another incentive to reduce the capital dedicated to insurance in order to increase return on equity.<sup>12</sup>

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<sup>12</sup> The effort to develop standards for required capital and surplus historically has stemmed not only from an interest in establishing floors, that is, minimum amounts, but the effort has also been used as a rationale for establishing ceilings, to which insurers could reduce surplus. The legitimacy of using a capital standard to permit insurers to invest surplus in other activities was expressed in the 1968 report of the New York Insurance Department's Special Committee on Insurance Holding Companies [43]:

The "required surplus" is one that will be adequate to cover for a reasonable period of time any losses and expenses larger than those predicted and any declines in asset values, including all chance variations in the crucial factors of the operation. Any surplus beyond this cover is "surplus surplus" which, by definition, is unneeded; it may be treated quite differently in the process of regulation. (p. 191)

Further, when "surplus surplus" is ascertained, it could be freed for dividends or could be segregated as specific assets and used as pledges to secure the insurer's borrowing. (p. 192)

The notion that insurers might use their capital more productively elsewhere also stemmed from a study around the same time that concluded that rates of return in insurance were significantly below those in other industries. (Arthur D. Little, Inc. [36], p. 6). Although that study was directed at defending profits (the numerator of the rate of return), one response to it was to examine the base on which return was measured (the denominator). For example, one study (Bachman [3]) hypothesized that returns were low because insurers were overcapitalized. The study used risk-return analysis and portfolio theory to determine how much capital was required to maintain solvency. It concluded that required capital varied dramatically from company to company, but that many insurers could have substantially reduced their surplus (or increased their writings) without exposing their companies to the risk of insolvency.

A number of insurers are likely to have capital well in excess of the company action level for risk-based capital. In its June 1993 exposure draft [41], the NAIC calculated that 94% of the 1,807

To the extent the application of RBC led to the removal of financial capacity from the insurance industry, it would work against other sound regulatory objectives, such as the coverage of difficult pockets of demand and the maintenance of stable markets during periods of fear and uncertainty such as 1974-75 and 1984-85.

Where return-on-capital models are used in rate regulation, RBC would encourage the use of distress levels of capital as the allowable capital base for calculating such returns. That would increase the likelihood of rate suppression. When rates are suppressed, it is usually on the strongest competitors, and it is hard to work up solvency concerns about them. But usually they are the current competitive winners, which generally means low cost providers, and their rates are usually the market reality, even the cap, for all competitors, including the weakest.

The final untoward effect of RBC could be on regulation itself. Unlike the IRIS ratios, the RBC formula can be seen as a "black box" making solvency regulation automatic. It would give legislators and others another incentive to neglect the need for adequate staffing and funding at the professional staff levels<sup>13</sup> and for regulatory will at the highest levels.

So far I have commented on the reasonableness of trying to refine capital analysis in regulating for solvency, and I have also commented on the finding that we have gotten about all the available mileage out of it already. And I have warned about creating incentives which actually undermine solvency regulation. Now for the part of the analysis I find most interesting and promising for the future.

Let me state it as a proposition and then explain it, and we can go on from there. The reason the RBC formula adds little is that it is a refinement of solvency regulation

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insurers tested against the RBC formula had capital at least 25% in excess of the company action level, that is, the level below which an insurer only has to file a plan. Sample calculations by State Farm indicate that some insurers have capital three to four times the company action level.

<sup>13</sup> *Failed Promises*, the 1990 report of the House Subcommittee on Oversight and Investigations [60] on insurance company insolvencies, noted that "[i]nadequate staffing and regulatory resources [are]...a serious problem". (p. 72)

according to a paradigm<sup>14</sup> of company failure that is losing its ability to explain events and to deal with threats to the insurance system as a whole.

Insurance companies can fail for many reasons. Among them is competitive failure, sometimes abetted by regulatory inattention or timidity.

How government regulates for solvency is strongly influenced by its standard explanation, or paradigm, of how failure occurs. Indeed it informs the selection of questions to pursue with research and elaborated rules. For a long time, the regulatory paradigm has been competitive and regulatory failure. Risk-based capital, like IRIS and the early warning tests, is an elaboration of solvency regulation according to the paradigm of competitive failure. The automatic or compulsory features of the RBC thresholds are attempts to redress the regulatory failure portion of the paradigm.

The mission of such formulary approaches is to identify incipient insolvencies, separate them for special treatment and then flag them unmistakably so that even a bad regulator has to act. That is why the techniques overlap and why they produce about the same results. They all use about the same aggregate financial data, trends and industry norms. They all use them for about the same purpose. The purpose is to make comparisons and to identify abnormal individual companies, for a deep assumption in the paradigm of competitive and regulatory failure is that normal companies do not go broke and good regulators do not let them.

Today's regulation has dealt rather well with insolvency according to the paradigm of competitive and regulatory failure, through early detection, prompt action

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<sup>14</sup> The word "paradigm" is used here in the sense used by Kuhn [34] for the natural sciences, that is, a clear, simple and enduring conceptual model of how things work, which has great power to explain observed facts. In his famous 1962 work, Kuhn described paradigms further as past scientific achievements which:

...served for a time implicitly to define the legitimate problems and methods of a research field for succeeding generations of practitioners. They were able to do so because they shared two essential characteristics. Their achievement was sufficiently unprecedented to attract an enduring group of adherents away from competing modes of scientific activity. Simultaneously, it was sufficiently open-ended to leave all sorts of problems for the redefined group of practitioners to resolve. (p. 10)

and guaranty funds. The shortcomings of regulation in dealing with insolvency on that paradigm are rooted more in the limitations of human nature and state jurisdiction than in a lack of analytical tools.

Let's examine how we came to adopt this paradigm of competitive and regulatory failure for organizing our regulation of the solvency of property-casualty insurance companies.

When insurance began in this country, insurance companies went broke in droves. There were two main reasons. The first and most common was that they were started on a shoestring. A few promoters would form a company with no money up front, as was permitted for mutuals and cooperatives. They would persuade a few friends and neighbors to buy fire insurance, not with cash but with premium notes.<sup>15</sup> If there were a fire early on, the company would either renege by invoking the representation and warranty clauses of the day or go under without collecting on the notes. Since the insurance was first-party, it was almost a free ride. The solvency of those fledgling companies was not much of a public concern. Their most durable legacies, besides the few companies which survived infancy and grew, were the low statutory minimum capital requirements for the next try.

But there was a second main cause of insolvency, and it was a big public concern. It was the urban conflagration, the huge fire that went on for days in the mid and late 19th century and took with it so much of the residential and business capital amassing in Chicago and New York and San Francisco at the time.

When a fire took a city, it took many insurance companies.<sup>16</sup> Building codes did not exist, and the only fire fighters were those employed by the insurance companies. Fire insurance was the only insurance line of consequence. Companies were local, often even to a portion of a single city. There was little reinsurance. So diversification

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<sup>15</sup> See the 1905 remarks by Oviatt [46], p. 45.

<sup>16</sup> See the 1905 remarks by Oviatt [46], p. 47.

of risk was impossible. Nor were financial cushions available. Capital of the magnitude necessary to sustain a total loss right in a company's only territory was probably impossible in concept, but it was surely unattainable in practice in a developing country. The only other possible cushion was to load the rates. But because of easy entry to the market, price wars were frequent, and the first rate component to go was the catastrophe loading.<sup>17</sup>

The urban fires swept right through the insurance industry in their path, taking the strong and weak and the cautious with the wildcat. It was a problem with the system, and any solution had to be a system solution.

The big city fire as an insurance catastrophe was dealt with effectively by establishment of one of history's most pervasive and effective cartels to preserve those catastrophe loadings, as well as by reinsurance to spread risk, by the standard fire policy to stop companies from cutting losses by denying claims and by conservative statutory accounting to cushion company solvency. Interestingly, general increases in minimum capital were not part of the package. Society supported the insurance reforms by really starting serious regulation and by acting outside insurance with municipal building codes and fire departments.<sup>18</sup>

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<sup>17</sup> In 1911 a Joint Committee of the New York State Senate and Assembly, known as the "Merritt" committee after its chairman, investigated fire insurance practices and recommended strong, regulated bureau rate-making. The report of the Merritt committee [45] acknowledged the impossibility of relying on individual company capital or on narrowly focussed rates to deal with the conflagration hazard. After calculating the dollars lost to conflagrations and what on average that would have meant as an annual premium charge to New York policyholders, the report stated:

But while this affords some notion of the size of the conflagration hazard it is of very little practical assistance to an insurance company, simply because the law of averages does not work; a fire may start in New York today which will make such calculations ridiculous and bankrupt most of the companies of the world. (p. 75)

<sup>18</sup> The Merritt committee report [45] recognized the need for a system solution to the conflagration hazard:

It has been recognized that the conflagration hazard has no proper place in insurance, that there is no machinery in the system that will properly take care of it, and accordingly, it is too much to expect that the ordinary principles regarding reserves can be strictly adhered to. In practice there are at least two serious difficulties; first, the

After the insurance business, government regulation and society as a whole cooperated to bring under control the insurance catastrophe of big city fires, the problem of insurance company insolvency subsided for several decades. The insolvency problem revived with the breakdown of the cartel system of high and uniform premium rates, which happened after the S.E.U.A. antitrust case, the competitive success of low cost insurers and the determinations by Congress and the NAIC that price competition was desirable.

Since then, insurer insolvency has been associated with competitive failure, and the paradigm has been the company that ran itself into the ground while inattentive or timid regulators let it go. The auto insurer insolvencies in the late 1950s, and the ensuing Congressional investigation, confirmed the paradigm of competitive and regulatory failure.

What is limiting the effectiveness of the RBC formula are the limitations of that paradigm. Yet we elaborate it further and further, because that has paid off in results during the past forty years and we really remember no other paradigm of insurer insolvency. As new analytical machinery becomes available for importation from elsewhere in finance, we even aspire to further progress from further refinement. But the paradigm is running out of steam, out of ability to explain those events which we do not understand already. We now need not to replace it, for competitive and regulatory failure still explains a lot of what happens. But we need to put another model alongside it.

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inability of companies, immediately after a serious conflagration, to hold the proper conflagration reserves, and, second, the fact that a restriction upon the amount that a company could write in a conflagration district would almost certainly result in a shortage of insurance. (p. 105)

The report had stated earlier:

....the companies are interested in preventing fires in large cities. They recognize that the conflagration hazard must be stamped out; it cannot be tolerated, there is no economic machinery which can cope with it; it must be stamped out just as tuberculosis must be stamped out. (p. 75)

At the level of public policy, the insolvency problem which has not been adequately addressed is widespread insolvency caused by losses running right across the entire insurance industry or across a substantial segment of it. The insurance concept of a catastrophe should be broadened beyond physical events to include any occurrence which causes financial loss across the industry and which can neither be reduced by ordinary care nor diversified within the insurance business by ordinary methods, and we will call it "systematic catastrophe".<sup>19</sup> So broadened, the concept of a systematic catastrophe would include:

- a. property catastrophes in the classic sense, such as hurricanes and earthquakes, with a greater chance than ever of their striking areas of high concentration of insured values;<sup>20</sup>
- b. liability changes, driven by broad shifts in applicable law, science or expectations, as happened with asbestos, pollution, pharmaceuticals and some other products;
- c. adverse economic conditions, such as inflation (affecting loss reserves) or depression (affecting premiums and claims);<sup>21</sup>

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<sup>19</sup> The word "systematic" in this context is conceptually similar to its use in modern portfolio theory. Systematic risk in portfolio theory is that part of the variation in the return of an individual asset that is related to the variation of the return of a combination of assets, typically a stock market index. Because all assets have a "common dependence on the over-all level of economic activity" (Sharpe [51], p. 405), it is not possible to diversify away this systematic risk. In an insurance context, we are calling a systematic catastrophe an event or change in circumstances that, in a single stroke, affects a very large number of individual insurance claims. Because individual claims are affected in a similar way, it is not possible to diversify away the systematic catastrophe.

<sup>20</sup> The impact on the insurance system from the billions of dollars of claims that would result from a catastrophic earthquake in a populated area has been described by Stewart Economics [53].

<sup>21</sup> The collapse of the savings and loan industry began with very high market interest rates that lasted from 1979 through 1982. Higher rates caused an outflow of deposits and need to realize on fixed-interest assets whose market value had fallen with the rise in rates. It was enough to wipe out the industry's net worth. See National Commission on Financial Institution Reform, Recovery and Enforcement [42], pp. 29-32. The interest rate shock was a "systematic catastrophe" as used in this statement.



- d. unplanned, industry-wide shortfalls in revenue, such as from widespread state rate suppression or federal price controls;
- e. calls on off-statement financial guarantees, as happened with bank deposit guarantees in the Depression and could happen now with derivatives or guaranteed contracts of many kinds;<sup>22</sup>
- f. collapse of investment markets, such as happened recently with real estate and junk bonds;
- g. widespread default on trade receivables, as with reinsurance recoverable and agents' balances if a major reinsurer or broker failed;<sup>23</sup> and
- h. socio-economic changes which fundamentally alter the nature of the risk or of the insurance mechanism, such as nationalization of health insurance.

We can see from the list that systematic catastrophes are big, sweeping and beyond useful forecasts.<sup>24</sup> We can also see that they do happen in real life.

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<sup>22</sup> The savings and loan industry again provides a good illustration of systematic catastrophe. In the early 1980s permissive regulatory policies gave S&Ls strong incentives to engage in risky lending practices, and deposit insurance made it possible for S&Ls to attract large cash deposits regardless of the risks they were taking. As stated in an official study of the collapse of the industry, "deposit insurance was the necessary condition for the S&L debacle". See National Commission [42], pp. 62-66.

<sup>23</sup> The property-casualty market crunch of the mid 1980s was in large part caused by uncollectible reinsurance. Much of that uncollectible reinsurance was from captive insurers that failed. Those companies, in turn, had entered the market in large numbers in the late 1970s in response to legal advice that a captive's ability to provide tax shelter for its corporate parent would be maintained if it also assumed third-party risks. Much of the third-party business was accepted carelessly, and the losses that resulted eventually drove some ninety companies from the market. See Winter [66], p. 475.

<sup>24</sup> These examples of systematic catastrophe suggest it is similar to the concept of "fundamental hazard" that was described by Kulp [35] in the many editions of his textbook on casualty insurance, starting in 1928. Kulp distinguished between "fundamental" hazard and "particular" hazard.

Fundamental hazards are essentially group hazards: the conditions which cause them are not the fault of any one in particular. Most fundamental hazards are economic, social or political in source....Some fundamental hazards are the result of natural causes.

A company's exposure to systematic catastrophe can be several hundred times its capital, so the RBC formula is essentially irrelevant to that kind of problem. More broadly, regulation on the paradigm of competitive failure gives little information or guidance for a business threatened more by systematic catastrophe.<sup>25</sup>

We can see the new paradigm emerging in the insolvencies of the mid-1970s, as general inflation hit loss reserves, and in the insolvencies of the mid-1980s due to bad

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Particular hazards are due to special or particular causes that operate in particular cases. They are, unlike fundamental hazards, essentially personal in cause....Because of their origin, the individual has a degree of control over them.

Kulp also noted that the classification of a hazard as fundamental or particular could change along with "social or natural conditions, the advance of human knowledge or capacity for social action". (pp. 3-4)

The point made by Kulp and by the present statement, about fundamental hazard and systematic catastrophe respectively, also overlaps with the distinction between risk and uncertainty sometimes found in economics. Knight [32] described "risk" as measurable and "uncertainty" as unmeasurable. Keynes [30], in explaining uncertainty, wrote:

The sense in which I am using the term is that in which the prospect of a European war is uncertain, or the price of copper and the rate of interest twenty years hence, or the obsolescence of a new invention, or the position of private wealth owners in the social system in 1970. About these matters there is no scientific basis on which to form any calculable probability whatever. We simply do not know. (p. 113)

Recent work on modeling for solvency makes similar distinctions. For example, Coutts, Devitt and Ross [13] distinguish between "macro" and "micro" risks. Macro risks are those that affect all companies, and micro risks are those that relate to the particular portfolio of assets and liabilities of the individual company (p. 130). Conning & Company's analysis [15] of risk-based capital requirements distinguishes two causes of insolvency: mismanagement and misfortune. Mismanagement is related to internal causes of insolvency and misfortune to external causes (pp. 20-27).

Apparently, the first attempt in insurance to distinguish between risk and uncertainty was by Willett [65]. In his classic doctoral thesis, published in 1901 and later in his book, Willett described risk as an objective phenomenon which could be measured empirically in the real world and uncertainty as a personal, subjective evaluation. While an interesting perspective, it is not the one we are employing for systematic catastrophe, which adds to the problem of unpredictability the problems of magnitude and extensiveness.

<sup>25</sup> The difficulty of devising solvency formulas that could deal with systematic catastrophe was expressed 25 years ago by Mayerson [37]:

The forces which threaten solvency are varied and complex. What formula for solvency devised even two years ago would have allowed for the large riot losses of July, 1967, and April, 1968? What is the probability of a 25 percent decline in the market value of common stocks included in an insurer's investment portfolio? (p. 149)

reinsurance. It has become clearer in the insolvencies of the early 1990s, caused by natural disasters striking huge concentrations of insured property.

In recent years, where the potential for systematic catastrophe has been identified in a specific exposure, it has been addressed, as with riot damage in the 1960s and swine flu vaccine liability in the 1970s, but the more general exposures to even greater systematic catastrophe have not been so addressed and seem to have mounted to unprecedented levels.

Although for many years the tools and priorities of regulation have been directed to the insolvency paradigm of competitive and regulatory failure, if we look even further back we see that insurance regulation dealt well with systematic catastrophe when it had to. Today new tools exist to do so again.

For the next several years, the big payoff from thinking about solvency regulation is likely to be in the area of systematic catastrophe – where a number of insurers can be strong and successful one day and gone the next. That is where the insurance mechanism fails today, more than with the individual company eliminated by competition.

We need to do a lot of work on our attitudes. Much work can then be done on our tools. But attitudes come first, for we perceive the utility of solvency tools only as they serve the paradigm of insolvency. For example, the statutory financial statements, which deal in broad aggregates and their trends over time, do not really try to measure exposure to systematic catastrophe, and nearly all regulation is based on those statements.

How to deal with the risk of systematic catastrophe is the aspect of insurance company solvency regulation most in need of intelligent consideration by the business, its regulators and its advisory professions, and promising areas to examine would include:

- a. how to reflect and quantify such risk in the annual statement and other reports, and how great the exposure of the insurance industry is;
- b. whether (and, if so, how) capital is a meaningful concept for testing safety in relation to systematic catastrophe, both for the industry and for individual companies;<sup>26</sup>
- c. how management and regulators might limit a company's exposure to systematic catastrophe without impairing its ability to function;
- d. whether limiting in advance a company's exposure to systematic catastrophe might both obviate limiting conduct at the point of claim and make the direct exposure amenable to dispersion through wider reinsurance markets and through non-insurance markets such as those for trading securities or commodities;
- e. whether catastrophe reserves and rate loadings, addressed to the problem of systematic risk, are feasible and, if so, whether they should be encouraged by regulatory and tax rules; and
- f. whether the insurance industry's aggregate exposure to systematic catastrophe needs to grow as fast as, or faster than, the growth of the

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<sup>26</sup> The ability of capital to absorb a systematic catastrophe leads to questions about the safety net. In its 1974 report [44] on financial condition regulation, the New York Insurance Department asked, with regard to guaranty funds:

What kinds of major catastrophes could impose strains on the capacity to absorb insolvencies, and how can these consequences be guarded against? (p. 86)

Rethinking the role of capital as a financial cushion may lead us to re-examine our mental image of the institutional structure of the industry. The traditional picture has been of a large number of small, independent competitors without market power. Much regulation is predicated on that picture, which is largely a memory. It may be fortunate that the real industry structure has migrated to something quite different. The companies hardest hit by the Florida hurricane of 1992 survived only because they had well capitalized affiliates which either explicitly reinsured them or were otherwise committed to back them up. In the wake of those storms and of the dissolution of the London excess property (or LMX) market, the entities being formed to provide capacity for natural disasters are heavily capitalized.

total insurance business or whether, instead, it can be limited or even caused to decline.

The point here is that, for a very long time, we have not thought much about systematic catastrophe from the perspective of solvency regulation. We have thought much more about individual company insolvencies due to the inability to make it in the increasingly competitive marketplace. That is entirely appropriate, because competition at the consumer level was a novel feature of many insurance markets at the end of the second world war, and Congress was pressing us to get out of the way of competition and to adjust regulation to cope with its undesirable side-effects like individual company failure. State regulation has done all that rather well, which is why there is not much more to be gained through further refinements like RBC.

Now more progress is possible by re-addressing the new manifestations of that old problem – the financial conflagration sweeping through books of business and consuming companies not one small straggler at a time but in quantity and in all sizes. It is a kind of exposure that cannot be diversified in conventional ways and can impair the working of the insurance system and not just of individual firms. It does not seem to be well addressed by the ways insurance regulators now detect trouble and protect the public.

Systematic catastrophe has not been a focus of management attention either, not the way it once was, and it has probably been mounting fast. One reason it builds up is that if a company will take on exposure to systematic catastrophe without tracking, restricting or even worrying about it, then that company will attract a lot and will even get paid a little for doing so.

If you share my concern about and interest in the topic and would accept a specific suggestion about where to look first, I would suggest looking at the information you collect. Look at the annual statement. It is full of broad financial aggregates and broad classes and general trends. That remains true no matter how far you stretch the data out or how finely you carve it up or how assiduously you mine it. The statement is,

in short, a fine and sophisticated instrument for collecting and analyzing information of the particularity possible a few decades ago. The data in the annual statement and other reports is all insurance data, and it all tacitly assumes steady relationships between premiums and exposures and between time and money. The data speaks accurately of an isolated business in another era.

To say look at the information you collect is not, of course, to say just get more of it. The information problem is qualitative and goes to the purpose of the data and to the paradigm of failure the data fills out. It is true that the gathering and management of information is becoming much more accurate and inexpensive.

That will be helpful, but it is not the point. The need is to rethink where the insolvency threat of the future will come from and then to reason out what you need to know, and what managements need to know, to stay on top of it. Then the information revolution will help, but public priorities will be in command. That is how you will do most to identify, measure and perhaps control exposure to systematic catastrophe, more than was either possible or relevant only a few years ago. That is the area in which the expenditure of effort and resources is likely to pay off best in reducing insolvencies of a socially damaging kind.

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