

ERM and the Insurance Industry: Investigating the Source of Value

By

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Risk Management Theory

20 Years of Evolution

- Actuarial Science vs. Corporate Finance Theory

$$\text{Value} = \sum_t \frac{E[\tilde{CF}_t]}{(1+r)^t}$$

- Recent contributions in financial theory rejects the Risk Management Irrelevance Principle
 - Cash flow effects
 - Taxes
 - Financial distress costs
 - Asymmetric informational costs
 - And others
 - Weighted average cost of capital

Does Risk Management Create Value?

Recent Empirical Evidence

- Most studies use Tobin's Q as a proxy for firm value

$$\text{Tobin's Q} = \frac{\text{Market Value Assets}}{\text{Book Value Assets}}$$

Study	What Was Examined?	Result
Allayannis and Weston (2001)	Non-financials and FX derivatives usage	+ 4.8%
Nain (2005)	FX derivatives usage increases value only if competitors do as well	+ 1.4 - 5.0%
Kim, Mathur and Nam (2006)	Financial and operational hedging of non-financials	Financial: + 5.4% Operational: + 5-17%
Hoyt and Liedenbergh (2006)	Insurers that adopt ERM programs	+ 3.6%

What is the source of this value?

Cash Flow Costs of Risk Bearing and Accessing Capital Markets

- Minton and Schrand (1999)
 - Cash flow shocks are associated with lower future investments in R&D
- Shin & Stulz (2000)
 - Unexpected increase in total equity volatility associated lower firm value (i.e., Tobin's Q)
 - Worse for financially weak and high growth firms
- Allayannis, Rountree & Weston (2005)
 - Unexpected increase in cash flow volatility reduces Tobin's Q
 - One standard deviation increase leads to 32 percent decrease
 - Unexpected increase in earnings volatility unrelated

What is the source of this value?

Cash Flow Costs of Risk Bearing and Tax Convexities

- Corporations that face tax-function convexities can reduce expected tax liabilities by reducing risk of pre-tax earnings
 - Smith and Stulz (1985)
- Graham and Smith (1999) conduct simulations on all Compustat firms from 1980 – 1994 (84,000 firm-year observations) and find
 - Slightly more than half of firm-year observations face convex tax schedules
 - For the median firm, a 5 percent reduction in volatility of pre-tax earnings yields a 2.5 percent reduction in expected tax liability
 - The average tax savings \$122,000

What is the source of this value?

Cash Flow Costs of Risk Bearing and Expected Financial Distress Costs

- The possibility of incurring additional costs when the firm experiences financial distress introduces concavities into the firm's objective function
 - Smith and Stulz (1985)
 - Phillips, Lin and Smith (2008)
- Andrade and Kaplan (1998) report ex – post costs of financial distress average approximately 10-20 percent of pre-event firm value
 - Wide variation in outcomes
 - But the probability of distress is low (AA historical average 1 year default probability is approximately 0.5% - Huang and Huang (2003))

What is the source of this value?

The WACC Argument

- Debt financing effects
 - Derivative users relative to non-users, carry higher leverage ratios
 - For insurers see → Cummins, Phillips and Smith (2001)
 - For non-financials see → Graham and Rogers (2002)

- Cost of equity capital effects
 - Guay (1999)
 - Simple means tests before-and-after beginning to use derivatives
 - No significant difference in CAPM beta

 - Lin, Phillips and Smith (2005)
 - Multivariate tests of CAPM and Fama-French costs of equity capital
 - Reduction in cost of equity capital → 60-80 basis points
 - Not always statistically significant
 - Economically significant?

What is the source of this value?

The Production Argument

- Rationale 1: MacKay and Moeller (2007) suggest a production view of the firm can justify risk management when

- Revenues are convex in output prices, or
- Expenses are concave in input prices

$$\begin{aligned} V &= E[\Pi(p, w)] = E[R(p)] - E[C(w)] \\ &= R(\bar{p}) - C(\bar{w}) + \frac{1}{2}R_{pp}\sigma_p^2 - \frac{1}{2}C_{ww}\sigma_w^2 \end{aligned}$$

- MacKay and Moeller estimate revenue and expense functions for a sample of oil refiners and find
 - Revenue functions are convex
 - Cost functions are generally not concave
 - Hedging activities increase net operating cash flows, on average, between 2-3 percent.

What is the source of this value?

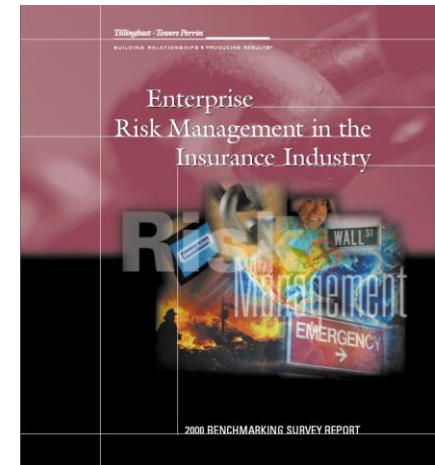
The Production Argument

- Rationale 2: practicing “ERM” may allow for better internal decision making
 - Risk-adjusted pricing and capital allocation decisions
 - Myers-Read (2001)
 - Cummins, Line and Phillips (2008)
 - Capital structure decisions
 - Graham and Rogers (2002)
 - Risk management decisions (e.g., more reinsurance vs. hold more capital)
 - Mayers and Smith (1990)
 - Cummins, Phillips and Smith (2001)

But how do we measure investments in Enterprise Risk Management?

Tillinghast ERM Benchmarking Surveys

- Conducted bi-annually since 2000
 - Goal – similar questions over time
- Survey participants
 - CFO, Chief Actuaries, CRO's of both life and non-life insurers world wide
 - In 2008, over 380 firms responded
- Stated objective
 - The goal of the *benchmarking* survey was to document the approach and status of activity regarding enterprise risk management among the industry's leading organizations....
 - For purposes of the survey questionnaire, enterprise risk management was defined as a rigorous approach to assessing and addressing risks from all sources (financial and operational) that threaten the achievement of the organization's strategic and financial objectives or represent an opportunity to exploit for competitive advantage.



Source: Tillinghast (2000)

Major Sections of the Survey

- I. Risk Management Objectives
- II. Organization of Risk Management
- III. Risk Measurement
- IV. Economic Capital
- V. Risk Reporting
- VI. Decision Making
- VII. Summary

Sample Questions from Surveys

Organization of the Risk Management Function

■ Question 4 from 2004

4. Who is responsible for risk management in your organization?

Please select one response.

- 1 Chief Risk Officer (CRO)
- 2 Chief Actuary
- 3 Internal Audit
- 4 Chief Financial Officer (CFO)
- 5 Risk Management Committee
- 6 Other (please specify)

■ Question 6 from 2004

6. Does your organization have a cross-functional risk management committee? Please select one response.

- 1 Yes
- 2 No, but considering
- 3 No, and not considering

Sample Questions from Surveys

Sophistication of Economic Capital Modeling Capabilities

■ Question 14 from 2006

14. What methodology do you use for aggregating risk?

Please select one response.

- | | | |
|--------------|---|---|
| Additive = 1 | { | 1 None |
| Simple = 2 | { | 2 Correlation matrix applied to risk capital results for each risk or business unit |
| | | 3 Simple correlation of individual risk distributions to give combined direction |
| Advanced = 3 | { | 4 Copulas used to combine individual risk distributions |
| | | 5 Structural model (i.e., multiple risks included in stochastic modeling) |
| | | 6 Other (please specify) |
| | | 7 Not applicable |

Sample Questions from Surveys

Risk Reporting Structures

- Question 25 from 2004

25. How does your organization internally communicate its key risk exposures and risk management activities? Please select all that apply.

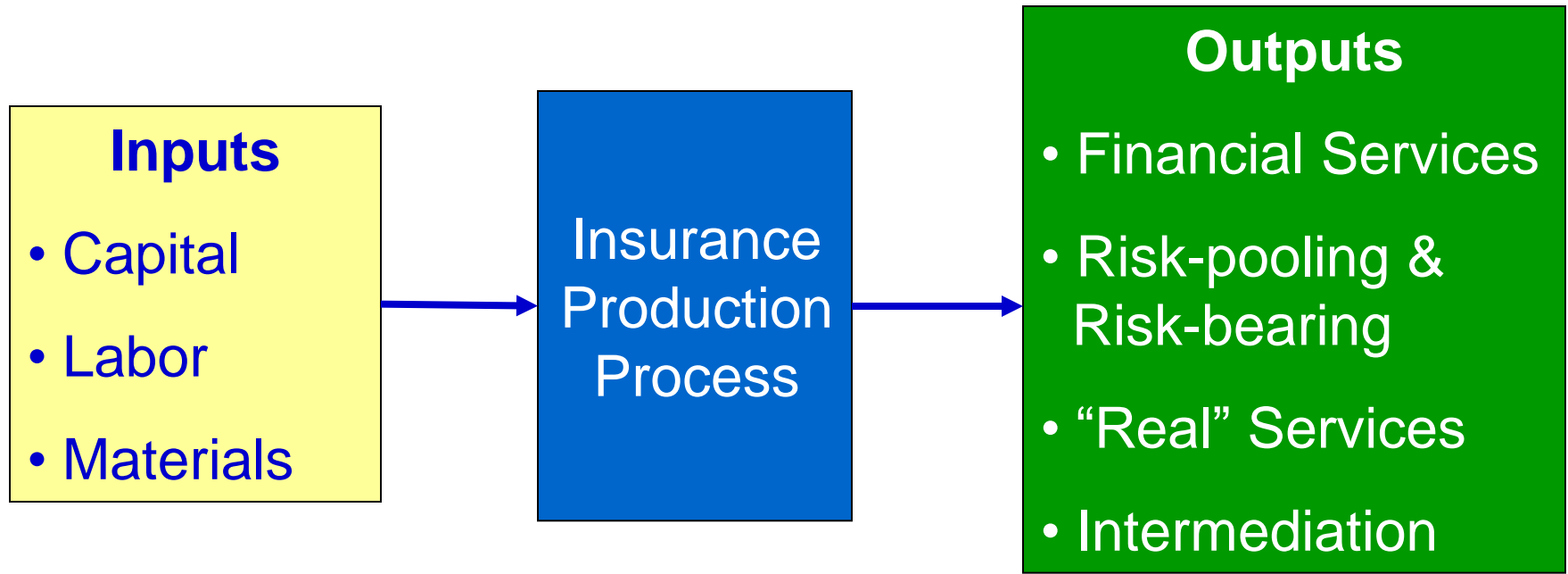
1 = response selected

0 = response not selected

- 1 Regular reports to executive committee/board of directors
- 2 Use of risk “dashboards” at the business or corporate level
- 3 On an ad hoc, as-needed basis
- 4 Regular reports to CRO
- 5 Use of regulatory reporting formats
- 6 Other (please specify)

Measuring Value Creation

The Insurance Production Approach



Inputs and outputs derived from the microeconomic theory of the firm assuming profit maximization. See Cummins & Weiss (2000)

Cummins & Weiss (2000)

Production Approach

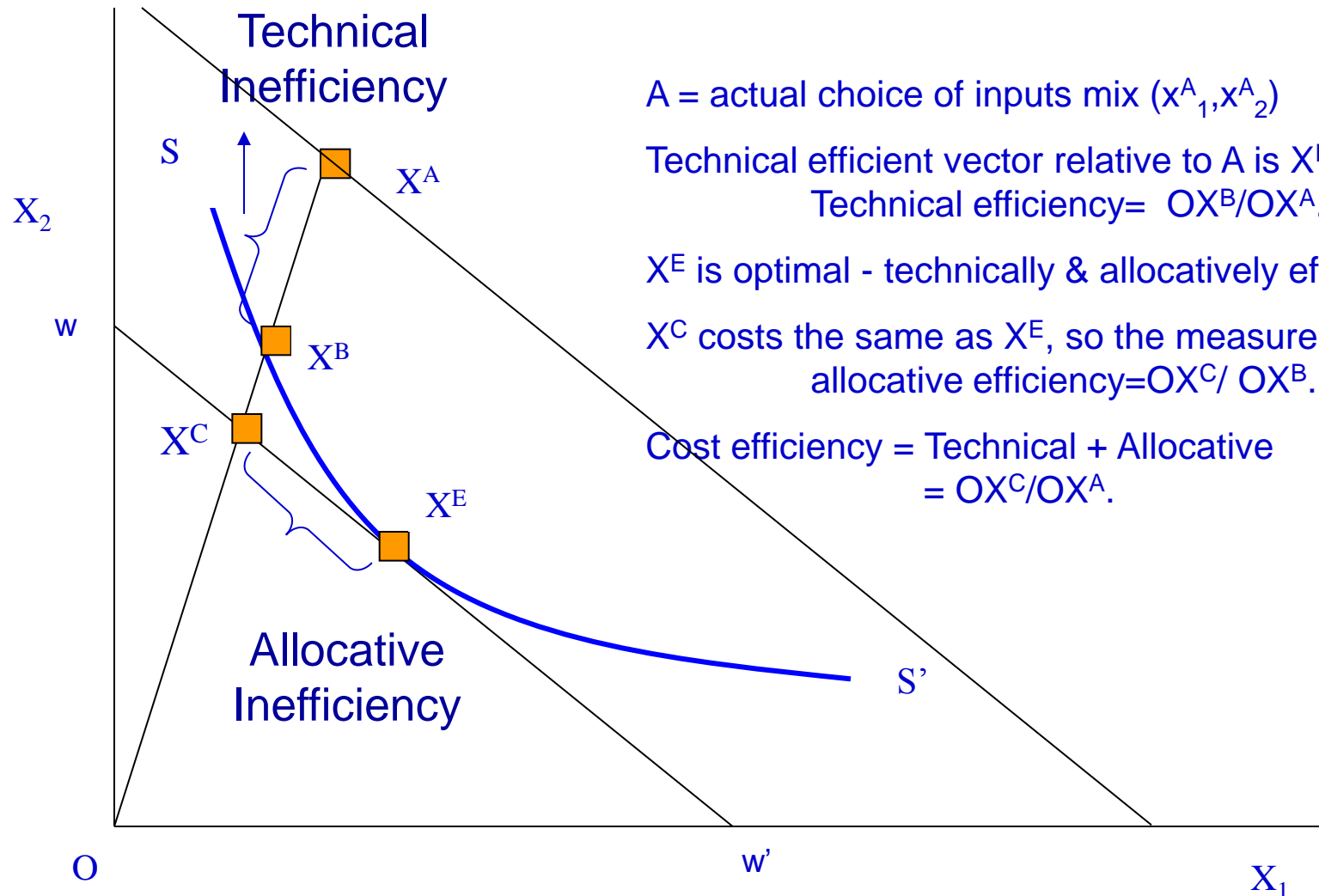
- Insurers produce:
 - Risk transfer services
 - Risk bearing & risk pooling
 - Loss services
 - Risk management, loss prevention services, legal defense in liability dispute, claims settlement
 - Intermediation services
 - Investment returns
 - Incidental function – collection of premiums in advance of claims payment to minimize contract enforcement costs

Production Approach Statistics

- Measures of Productive Efficiency
 - Technical Efficiency which can be decomposed into
 - Pure Technical Efficiency – operating with best practice technology
 - Scale Efficiency – operating with constant returns to scale
 - Allocative Efficiency – choosing cost-minimizing input combination
- Applicable to both revenue and cost efficiency

Cost Efficiency Concepts

Technical & Allocative Efficiency



A = actual choice of inputs mix (x^A_1, x^A_2)

Technical efficient vector relative to A is X^B .
Technical efficiency = OX^B/OX^A .

X^E is optimal - technically & allocatively efficient.

X^C costs the same as X^E , so the measure of allocative efficiency = OX^C/OX^B .

Cost efficiency = Technical + Allocative
= OX^C/OX^A .

Data Envelopment Analysis (DEA)

■ Estimates a firm's efficiency by seeking a combination of dominating firms, e.g., those that can produce the firm's outputs with less inputs (Charnes, Cooper and Rhodes, 1978):

$$\min \theta_s = T(y_s, x_s) = [D(y_s, x_s)]^{-1}$$

$$\text{Subject to: } Y\lambda_s \geq y_s$$

$$X\lambda_s \leq \theta_s x_s$$

$$\lambda_s \geq 0$$

where $T(y_s, x_s)$ = technical efficiency of firm s

$D(y_s, x_s)$ = distance function relative to production frontier

Y = $N \times S$ matrix of outputs for the s firms in the industry

X = $M \times S$ matrix of inputs for the s firms in the industry

y_s = $N \times 1$ output vector for firm s

x_s = $M \times 1$ input vector for firm s

λ_s = $S \times 1$ vector of intensity coefficients applicable to firm s

Cost Minimization Problem

- The Problem:

$$\text{Min}_{x_s} w_s^T x_s$$

$$\text{Subject to } Y\lambda_s \geq y_i, \quad i = 1, 2, \dots, N$$

$$X\lambda_s \leq x_j, \quad j = 1, 2, \dots, M$$

$$\text{and } \lambda_s \geq 0$$

w_s = $M \times 1$ input price vector for firm s

x_s = $M \times 1$ input vector for firm s

Y = $N \times S$ matrix of outputs for the s firms in the industry

X = $M \times S$ matrix of inputs for the s firms in the industry

y_s = $N \times 1$ output vector for firm s

λ_s = $S \times 1$ vector of intensity coefficients applicable to firm s

Defining Insurer Costs/Total Expenses

$$\sum_S w_S X_S$$

Item	Price w_S	Amount x_S
Ins. Agent Labor	Weighted average annual salary for insurance agents	Number of FTE agents by state
Employee Labor	Average annual salary for insurance employees in state of domicile	Number of FTE employees at home office
Business Services	Consumer Price Index	All other operating expenses divided by the CPI
Debt Capital	Year end yield on corporate debt per A.M. Best rating of the insurer	Insurance reserves and any debt capital on the balance sheet
Equity Capital	CAPM cost of equity capital adjusted for insurer leverage	Policyholder surplus

Steps in Empirical Methodology

- Step 1 - for each industry (life vs. non-life) and each year (2004 vs. 2006), use DEA to estimate the cost efficiency and revenue efficiency scores for all U.S. insurers.
- Step 2 – For just those insurers that participated in the Tillinghast surveys, regress the estimated cost/revenue efficiency scores as follows

$$CE_{i,t} = \alpha + \delta Y06_{i,t} + \theta'X_{i,t} + \varphi'ERM_{i,t} + \varepsilon_{i,t}$$

where

- $CE_{i,t}$ - cost (or revenue) efficiency for insurer i in year t
- $\alpha, \delta, \theta, \varphi$ - estimated regression coefficients
- $Y06_{i,t}$ - Dummy variable for year = 2006
- $X_{i,t}$ - vector of insurer characteristics
- $ERM_{i,t}$ - vector of variables documenting the ERM systems of the survey respondents
- $\varepsilon_{i,t}$ - error term

Interpreting the Regression Results

■ Cost Efficiency Regression Results

- Recall the cost efficiency score is the ratio of the insurer's predicted costs if it operated on the frontier relative to its actual costs.
- Therefore, any positive(negative) estimated coefficient from the regression is consistent with a increase(decrease) in cost efficiency and therefore actual costs are closer to the predicted best outcome.
- Using the estimated regression coefficient and the total costs for the average insurer, we can estimate the dollar savings (or increase in costs) based upon the manner the insurer organizes its risk management function.

■ Revenue Efficiency Regression Results

- Recall the revenue efficiency score is the ratio of the insurer's actual revenue relative to its predicted revenue if it operated on the frontier.
- Therefore, any positive(negative) estimated coefficient from the regression is consistent with an increase(decrease) in revenue efficiency and therefore actual revenue is higher and closer to the predicted best outcome.
- Using the estimated regression coefficient and the total revenue for the average insurer, we can estimate the dollar increase (or decrease) in revenue based upon the manner the insurer organizes its risk management function.

Data Sources

- Estimate Cost and Revenue Efficiency Scores
 - NAIC Regulatory Data Statements 2004 and 2006
 - Supplemental data from various sources including
 - Bureau of Labor Statistics
 - Wage data for insurance employees and insurance agents
 - Consumer price index
 - Federal Reserve
 - Interest rate data
- Tillinghast survey respondents and responses
 - Years 2004 and 2006
- A.M. Best
 - Financial Strength Ratings
 - Supplemental demographic information

U.S. Industry Coverage of Tillinghast Survey Respondents

Year	<u>Industry</u>		<u>Survey Respondents</u>		<u>Percentage</u>	
	Assets	NPW	Assets	NPW	Assets	NPW
<i>Property-Liability Insurers</i>						
2004	1,152,993,989	385,534,659	345,344,330	122,853,169	30.0%	31.9%
2006	1,427,880,991	432,383,186	508,261,789	144,836,474	35.6%	33.5%
<i>Life-Health Insurers</i>						
2004	2,755,879,900	550,983,605	1,507,126,700	288,761,181	54.7%	52.4%
2006	2,846,672,800	571,723,134	1,301,929,800	247,495,476	45.7%	43.3%

Table displays the assets and premiums written by the U.S. insurance industry and the assets and premiums written by the respondents to the Tillinghast ERM surveys. A respondent is defined as any U.S. company that directly responded to the survey and U.S. affiliates of both domestic and foreign insurer groups. All dollars figures shown in 000's. All dollars figures shown in 000's.

Industry vs. Survey Respondents

P&C Insurers

Variable	All P&L Companies			Survey P&L Companies		
	Num	Mean	S.D.	Num	Mean	S.D.
Total Assets (000)	2890	775,378	3,855,567	366	2,023,834	6,241,472
Policyholder Surplus (000)	2890	294,412	1,814,354	366	752,619	2,689,825
Capital-to-Assets	2890	0.4261	0.1873	366	0.3875	0.1545
Return on Equity	2890	7.75%	29.50%	366	8.39%	18.80%
Return on Assets	2890	2.96%	7.15%	366	3.02%	7.17%
Net Premiums Written (000)	2890	262,419	1,325,753	366	675,146	2,247,838
% NPW Comm. Property	2890	22.20%	28.52%	366	23.28%	22.64%
% NPW Comm. Liab	2890	40.23%	38.86%	366	41.76%	29.48%
% NPW Pers. Property	2890	9.58%	14.41%	366	9.64%	10.70%
% NPW Pers. Liab.	2890	28.21%	30.13%	366	26.02%	24.97%
Stock indicator	2890	0.6938	0.4610	366	0.8825	0.3224
Mutual indicator	2890	0.2190	0.4137	366	0.0601	0.2380
Cost efficiency	2890	0.3082	0.1639	366	0.3252	0.1380
Revenue efficiency	2623	0.2381	0.1984	317	0.2241	0.1624

Table displays summary statistics for all U.S. property & liability insurers with sufficient data to estimate DEA cost efficiency versus summary statistics for the insurers classified as responding to the Tillinghast ERM surveys. A respondent is defined as any U.S. company that directly responded to the survey and U.S. affiliates of both domestic and foreign insurer groups. All dollars figures shown in 000's.

Industry vs. Survey Respondents

Life Insurers

Variable	All Life Companies			Survey Life Companies		
	Num	Mean	S.D.	Num	Mean	S.D.
Total Assets (000)	1099	4,483,718	15,161,586	250	10,548,891	23,725,404
Policyholder Surplus (000)	1099	442,209	1,242,865	250	964,727	1,748,702
Capital-to-Assets	1099	0.2238	0.1853	250	0.1668	0.1444
Return on Equity	1099	8.59%	34.05%	250	9.64%	31.99%
Return on Assets	1099	2.25%	8.92%	250	1.89%	4.98%
Net Premiums Written (000)	1099	850,334	2,530,999	250	2,051,244	4,089,717
% NPW Annuities	1099	19.94%	30.02%	250	25.30%	32.05%
% NPW Life Ins.	1099	42.00%	36.49%	250	43.79%	35.92%
% NPW Acc & Hlth	1099	36.51%	39.43%	250	29.79%	33.76%
Stock indicator	1087	0.9227	0.2672	249	0.9357	0.2457
Mutual indicator	1087	0.0764	0.2657	249	0.0643	0.2457
Cost efficiency	1099	0.2811	0.2410	250	0.3248	0.2455
Revenue efficiency	1066	0.1293	0.1788	239	0.1184	0.1673

Table displays summary statistics for all U.S. life & health insurers with sufficient data to estimate DEA cost efficiency versus summary statistics for the insurers classified as responding to the Tillinghast ERM surveys. A respondent is defined as any U.S. company that directly responded to the survey and U.S. affiliates of both domestic and foreign insurer groups. All dollars figures shown in 000's.

Summary Statistics for Efficiency Regressions

All Insurers vs. Life Insurers vs. Non-Life Insurers

Variable	All	Life Only	P&C Only
Revenue Efficiency Score	0.180	0.114	0.224
Cost Efficiency Score	0.395	0.494	0.328
<i>Risk Management Variables</i>			
Ind = 1 if insurer has Simple ECM x Ind = 1 for life insurer	0.071	0.177	-
Ind = 1 if insurer has Advanced ECM x Ind = 1 for life insurer	0.088	0.219	-
Ind = 1 if insurer has Sophisticated ECM x Ind = 1 for life insurer	0.071	0.177	-
Ind = 1 if insurer has Simple ECM x Ind = 1 for P&L insurer	0.081	-	0.136
Ind = 1 if insurer has Advanced ECM x Ind = 1 for P&L insurer	0.115	-	0.192
Ind = 1 if insurer has Sophisticated ECM x Ind = 1 for P&L insurer	0.109	-	0.183
Ind = 1 if at least 1 or 3 principal risk metrics is market based	0.430	0.465	0.407
Ind = 1 if entity resp. for risk mgmt is a CRO	0.468	0.526	0.429
Ind = 1 if entity resp. for risk mgmt is a dedicated committee	0.226	0.144	0.281
Ind = 1 if entity resp. for risk mgmt is other C-Suite or other	0.306	0.330	0.290
Ind = 1 if entity resp. for risk mgmt primarily reports to the board	0.126	0.042	0.183
Ind = 1 if entity resp. for risk mgmt primarily reports to the CEO	0.414	0.428	0.404
Ind = 1 if entity resp. for risk mgmt primarily reports to the CFO	0.380	0.479	0.312
Ind = 1 if entity resp. for risk mgmt primarily reports to a committee	0.021	0.005	0.032
Ind = 1 if entity resp. for risk mgmt primarily reports to other	0.060	0.047	0.069
Ind = 1 if ERM output is incorporated into insurer's incentive comp.	0.282	0.349	0.237
Ind = 1 if insurer is confident risk is reflected in business decisions	0.586	0.544	0.615
Number of Observations	532	215	317

Summary Statistics for Efficiency Regressions

Year 2004 vs. Year 2006

Variable	2004	2006
Revenue Efficiency Score	0.172	0.187
Cost Efficiency Score	0.447	0.347
<i>Risk Management Variables</i>		
Ind = 1 if insurer has Simple ECM x Ind = 1 for life insurer	0.110	0.036
Ind = 1 if insurer has Advanced ECM x Ind = 1 for life insurer	0.059	0.116
Ind = 1 if insurer has Sophisticated ECM x Ind = 1 for life insurer	0.078	0.065
Ind = 1 if insurer has Simple ECM x Ind = 1 for P&L insurer	0.098	0.065
Ind = 1 if insurer has Advanced ECM x Ind = 1 for P&L insurer	0.094	0.134
Ind = 1 if insurer has Sophisticated ECM x Ind = 1 for P&L insurer	0.133	0.087
Ind = 1 if at least 1 or 3 principal risk metrics is market based	0.271	0.578
Ind = 1 if entity resp. for risk mgmt is a CRO	0.498	0.440
Ind = 1 if entity resp. for risk mgmt is a dedicated committee	0.180	0.267
Ind = 1 if entity resp. for risk mgmt is other C-Suite or other	0.322	0.292
Ind = 1 if entity resp. for risk mgmt primarily reports to the board	0.075	0.173
Ind = 1 if entity resp. for risk mgmt primarily reports to the CEO	0.424	0.404
Ind = 1 if entity resp. for risk mgmt primarily reports to the CFO	0.431	0.332
Ind = 1 if entity resp. for risk mgmt primarily reports to a committee	0.004	0.036
Ind = 1 if entity resp. for risk mgmt primarily reports to other	0.067	0.054
Ind = 1 if ERM output is incorporated into insurer's incentive compensation	0.329	0.238
Ind = 1 if insurer is confident risk is reflected in their business decisions	0.753	0.433
Number of Observations	255	277

Summary Statistics for Efficiency Regressions

Non-U.S. Headquartered Companies vs. U.S. Companies

Variable	Non-U.S.	
	HQ	US HQ
Revenue Efficiency Score	0.163	0.192
Cost Efficiency Score	0.407	0.386
<i>Risk Management Variables</i>		
Ind = 1 if insurer has Simple ECM x Ind = 1 for life insurer	0.035	0.098
Ind = 1 if insurer has Advanced ECM x Ind = 1 for life insurer	0.155	0.039
Ind = 1 if insurer has Sophisticated ECM x Ind = 1 for life insurer	0.066	0.075
Ind = 1 if insurer has Simple ECM x Ind = 1 for P&L insurer	0.075	0.085
Ind = 1 if insurer has Advanced ECM x Ind = 1 for P&L insurer	0.199	0.052
Ind = 1 if insurer has Sophisticated ECM x Ind = 1 for P&L insurer	0.133	0.092
Ind = 1 if at least 1 or 3 principal risk metrics is market based	0.593	0.310
Ind = 1 if entity resp. for risk mgmt is a CRO	0.575	0.389
Ind = 1 if entity resp. for risk mgmt is a dedicated committee	0.186	0.255
Ind = 1 if entity resp. for risk mgmt is other C-Suite or other	0.239	0.356
Ind = 1 if entity resp. for risk mgmt primarily reports to the board	0.261	0.026
Ind = 1 if entity resp. for risk mgmt primarily reports to the CEO	0.412	0.415
Ind = 1 if entity resp. for risk mgmt primarily reports to the CFO	0.319	0.425
Ind = 1 if entity resp. for risk mgmt primarily reports to a committee	0.009	0.029
Ind = 1 if entity resp. for risk mgmt primarily reports to other	0.000	0.105
Ind = 1 if ERM output is incorporated into insurer's incentive compensation	0.341	0.239
Ind = 1 if insurer is confident risk is reflected in their business decisions	0.482	0.663
Number of Observations	226	306

Second Stage Efficiency Regression Results

All Insurers vs. U.S. Headquartered Insurers

Variable	Cost Eff Score		Revenue Eff Score	
	All	US Only	All	US Only
Intercept	0.280 **	0.160	0.224 ***	0.121
Ind = 1 for year = 2006	-0.088 ***	-0.101 ***	0.059 ***	0.049 **
Company Control Variables				
Ind = 1 if insurer part of a group	0.008	0.052	-0.096 **	-0.097 *
Ind = 1 if insurer is licensed as a P&C insurer	0.118	0.051	0.287 ***	0.236 **
Log(Total Assets)	0.005	0.005	-0.013 ***	-0.008 **
Capital-to-Asset Ratio	-0.229 **	-0.217 **	-0.172 ***	-0.145 **
Ind = 1 for insurers with A.M. Best B+ or better	-0.016	-0.009	0.028 *	-0.008
Ind = 1 if insurer is part of a publicly traded group	0.079 ***	0.044	-0.011	-0.032
Ind = 1 if insurer is a private held stock co.	0.098 ***	0.091	-0.001	0.010
Ind = 1 if self-reports primarily a life insurer	0.015	-0.018	0.033 **	0.071 **
Ind = 1 if self-reports primarily a P&L insurer	0.052 **	0.128 ***	0.047 ***	0.081 ***
% NPW in P&C comm. property ins.	-0.281 **	-0.076	-0.012	0.065
% NPW in P&C comm. liability ins.	-0.295 **	-0.258 *	-0.170 **	-0.084
% NPW in P&C personal property ins.	0.081	0.514	0.079	0.362
% NPW in life annuity ins.	0.124 ***	0.282 ***	0.066 ***	0.115 ***
% NPW in life ins.	-0.107 ***	0.012	0.048 **	0.072 **
Risk Management Variables				
Ind = 1 if insurer has Simple ECM x Ind = 1 for life insurer	0.084 ***	0.076 **	0.061 ***	0.051 **
Ind = 1 if insurer has Advanced ECM x Ind = 1 for life insurer	0.098 ***	0.112 ***	0.020	-0.019
Ind = 1 if insurer has Sophisticated ECM x Ind = 1 for life insurer	0.098 ***	-0.043	0.025	-0.048 *
Ind = 1 if insurer has Simple ECM x Ind = 1 for P&L insurer	-0.056	-0.090 *	-0.020	-0.074 **
Ind = 1 if insurer has Advanced ECM x Ind = 1 for P&L insurer	-0.039	-0.034	-0.004	-0.029
Ind = 1 if insurer has Sophisticated ECM x Ind = 1 for P&L insurer	-0.074 *	-0.070	-0.027	-0.031
Ind = 1 if at least 1 or 3 principal risk metrics is market based	0.043 **	0.061 **	-0.010	-0.012
Ind = 1 if entity resp. for risk mgmt is a CRO	0.072 ***	0.083 ***	-0.033 **	-0.034 *
Ind = 1 if entity resp. for risk mgmt is a dedicated committee	0.115 ***	0.127 ***	-0.043 **	-0.029
Ind = 1 if entity resp. for risk mgmt primarily reports to the board	-0.016	0.042	0.041	0.077
Ind = 1 if entity resp. for risk mgmt primarily reports to the CEO	-0.022	-0.004	0.045 *	0.045
Ind = 1 if entity resp. for risk mgmt primarily reports to the CFO	-0.045	0.009	0.068 **	0.074 **
Ind = 1 if entity resp. for risk mgmt primarily reports to a committee	-0.022	-0.025	-0.019	-0.039
Ind = 1 if ERM output is incorporated into insurer's incentive compensation	0.002	0.070 ***	0.007	0.020
Ind = 1 if insurer is confident risk is reflected in their business decisions	0.048 **	0.042 *	0.008	-0.008
R2	0.398	0.591	0.400	0.453

Economic Significance

- The analysis allows us to quantify the “value” created based upon the characteristics of the insurers ERM program. For example:
 - The average life insurer that responded to the survey had \$751 million in total costs
 - For life insurers, the estimated coefficient on the Simple ECM indicator suggests a percentage point increase in efficiency of 8.4 percent which will yield savings of \$63 million. Relative to average total assets, this would yield an increase in ROA of 0.54 percent.

Statistically and Economically Significant Results

Variable	Cost Savings				Revenue Enhancement			
	All		US Only		All		US Only	
	Decrease in Costs	ROA	Decrease in Costs	ROA	Increase in Revenue	ROA	Increase in Revenue	ROA
Life Insurer with Simple Capital Model	\$ 62,962	0.54%	\$ 56,930	0.49%	\$ 23,976	0.20%	\$ 20,147	0.17%
Life Insurer with Advanced Capital Model	\$ 73,591	0.63%	\$ 83,822	0.71%				
Life Insurer with Sophisticated Capital Model	\$ 73,509	0.63%						
Non-Life Insurer with Simple Capital Model							\$ (17,191)	-0.87%
Non-Life Insurer with Advanced Capital Model								
Non-Life Insurer with Sophisticated Capital Model								
Use 1 of 3 market Value Based Risk Metrics	\$ 19,832	0.34%	\$ 27,088	0.46%				
Entity resp. within the Org. is the CRO	\$ 33,149	0.56%	\$ 37,203	0.63%	\$ (10,360)	-0.18%		
Entity resp. within the Org. is a Dedicated Comm.	\$ 52,830	0.89%	\$ 56,693	0.96%	\$ (13,370)	-0.23%		
Primary Report for Entity resp. for RM is the BOD								
Primary Report for Entity resp. for RM is the CEO								
Primary Report for Entity resp. for RM is the CFO					\$ 21,024	0.36%	\$ 23,126	0.39%
Primary Report for Entity resp. for RM is a Comm.								
ERM Output is Incorporated into Insurer's Incentive Comp.			\$ 31,027	0.52%				
Insurer is Confident Risk is Reflected in Bus. Decisions	\$ 22,296	0.38%	\$ 18,697	0.32%				

Table displays only those results estimated to be statistically significant at the 5 percent level or greater.

Concluding Comments

- Risk management is not just a “cost center”
 - Evidence is building that managing risk at the firm level is valuable
 - Several studies show market-book ratios are positively correlated with proxies for active risk management
- A review of the overall literature suggests cash flow effects appear to dominate the lower discount rate argument
- The manner in which risk management processes are defined and embedded into the business appear to be important determinants of success
- Further research investigating other economic outcomes as a function of the way risk management is organized would be interesting.

Parting thought...

This is an e-mail from a former student that I received in early January, 2009.

“I’m wondering why risk management across the whole industry is behaving the way it is. Leave alone its role in business which is not much more than window dressing. But still it seems so dumb that people are doing this \$&@# day after day and after they lose again and again. People who have advanced math skills dive into over-complex formulae and model for modeling itself. People who don’t have skills trying to mimic what everyone else is doing such as matching duration or delta hedging as precise as they can which doesn’t make much sense to me.

To me risk management should totally go another approach. Everything should start from fundamental and it is not too hard to do. To set an expectation of risk and the most important is to set an exit strategy when our expectation is wrong, to identify risky signals, to set hedging strategy when it doesn’t seem hedging is necessary (and when it is cheap) and to distinguish what is uncertain from what is unknown. As an example, our business here is fixed income and OAS and prepayment risk dominate. I can not understand why everybody in the whole industry could ignore or overlook default risk. I guess people would be laughing now if they would have had too much “prepayment risk” a few months ago. It’s like people are thinking about what I can do with one million dollars if I won the lottery but forgot to buy a ticket.”

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