NC STATE UNIVERSITY COLLEGE OF MANAGEMENT ERM ENTERPRISE RISK MANAGEMENT

An Empirical Investigation of the Characteristics of Firms Adopting Enterprise Risk Management

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ERM is important

- There is a growing embrace of ERM
  - The rise of Chief Risk Officer to provide a holistic approach to risk exposure and put in place an early warning system.
- Risk is garnering more Board attention
- Regulatory Developments
  - SOX
  - Basel II
  - LSE Rules

ERM is important

- Rating Agencies are evaluating ERM
  - *"Having a solid enterprise risk management (ERM) strategy is key to remaining competitive, and it will be an increasingly important factor in our credit ratings. In 2007 and 2008, we are likely to raise and lower ratings in part based on companies' ERM."*
    - S&P Insurance Industry Survey, 12/7/06

ERM is important

- Growth of financial products that allow hedging of many operational risks
  - For example: Investors can now trade freight-rate swaps for ocean shipping.
    - Jan 4, 2007 WSJ

But how important?

- *"Considering the vast number of consultants, software firms and universities touting their expertise in ERM and the multiple seminars focused on this topic,* ***it would appear that ERM is the greatest development in the industry since marine risks were first pooled in Lloyd's coffee shop over three centuries ago****"*
  - Fitch Ratings Service

Our research question

- What are the characteristics of firms that are making the decision to implement ERM?
  - There is an ongoing need for research into the types of firms adopting ERM, why they are adopting ERM and the effects of ERM adoption.
  - This paper is part of an ongoing research stream to more fully understand ERM adoption.

Background

- Stulz (1996, 2003) presents arguments for why firms might adopt ERM.
  - Primary goal of ERM – "*By managing risk, a firm can reduce the probability of large adverse cash flow shortfalls.*"
  - Benefits of RM may not be same across all entities – hedging a FC receivable is cheaper than hedging exchange rate risk related to future sales
  - An increase in total risk is costly because it is more likely that a firm would have a cash/earnings/capital shortfall that would force it to give up valuable projects
  - Value creation comes about when ERM reduces "costly lower tail outcomes"

General Expectation

- Managers will perceive benefits to ERM when their companies are in situations in which the likelihood of “costly lower tail outcomes” increases.
- These firms are most likely to implement ERM.

Determinants of ERM adoption

- Four Factors associated with adopting ERM:
  - Likelihood of financial distress
  - Cost of Financial Distress
  - Market Characteristics
  - Managerial Characteristics

Likelihood of Financial Distress

- Leverage
  - Greater leverage increases risk
- Slack on the balance sheet
  - Slack (in the form of liquid assets) provides a cushion
- Earnings volatility
  - Greater volatility increases chance of an earnings shortfall
- Firms with higher leverage, lower slack, and more earnings volatility should adopt ERM

Cost of Financial Distress

- Asset Opacity
  - More opaque assets are less likely to realize fair market value if they have to be sold to cover a cash flow short fall.
- Growth options
  - Measured by R&D expense, Market to Book.
  - Growth options require consistent capital investment and may be under funded in a period of financial difficulty.
- Firms with opaque assets and significant value tied to future growth options should adopt ERM

Market Characteristics

- Share price volatility
  - Price volatility can capture operational and leverage risk.
- More volatile firms should adopt ERM

Managerial Characteristics

- CEO compensation
  - Equity based compensation (stock grants) can result in a CEO being undiversified and exposed to firm risk
  - Option based compensation is more valuable when the firm is more risky.
- The blend of stock based and option based compensation should influence whether a CEO would prefer ERM or not.

Data and Method

- CRO announcements proxy for ERM adoption
  - Consistent with ERM being a top down enterprise wide initiative.
- Time period: 1992-2004
  - Unique announcements -138
  - Financial institutions – 77
  - Utilities - 18

Data and Method

- To examine the determinants of CRO hires (and ERM adoption)

$$CROHIRE_{it} = f(Determinants_{it}, Controls_{it}) + e_{it}$$

  - We create an unbalanced panel data set comprising annual observations of all firms (for which data is available) from 1992-2004, irregardless of whether they hired a CRO.
    - In the year t when firm i does not hire a CRO, $CROHIRE_{it}=0$.
    - In the year t when firm i does hire a CRO, $CROHIRE_{it}=1$.

Table 2. Summary Statistics

	CRO Mean	Non CRO Mean	Difference	T- Test
Leverage	0.744	0.530	-0.214	-11.548***
Cash Ratio	0.088	0.170	0.082	8.798***
SDNI	0.876	0.564	-0.312	-1.921*
Opacity	0.054	0.074	0.019	2.148**
MB	2.447	4.844	2.396	6.349***
RD	0.005	0.045	0.040	26.870***
SDRET	0.026	0.040	0.015	10.133***
Value Change	0.657	1.644	0.987	5.213***
Vega/Delta	0.503	0.358	-0.145	-2.583**
Numseg	4.957	3.086	-1.871	-4.321***
NINST	196.507	61.240	-135.267	-9.043***
PINST	0.454	0.308	-0.145	-6.828***
Size	7.521	5.068	-2.453	-13.604***

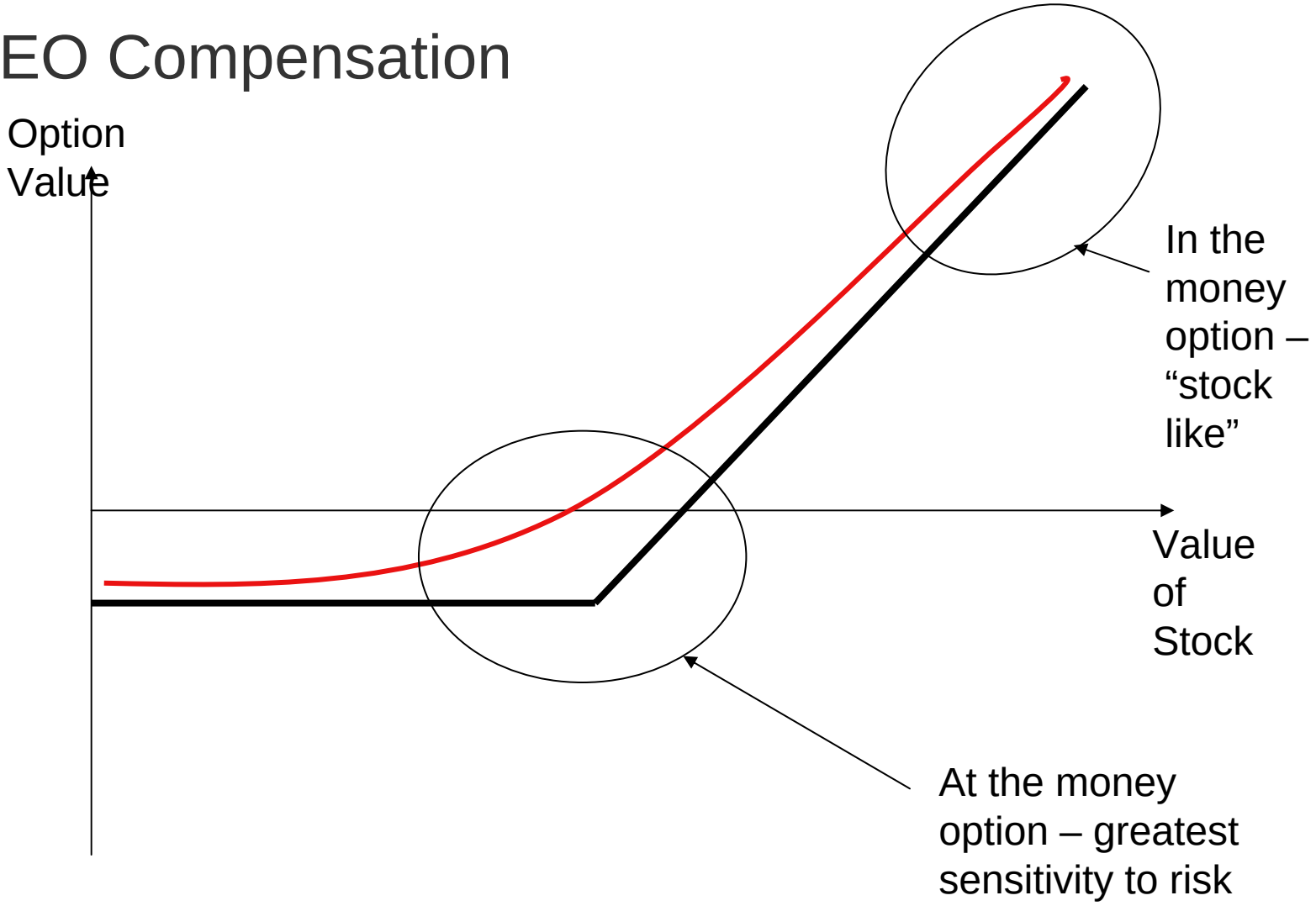
Data and Method

- Estimation issues
  - We use a Cox proportional hazard approach to estimate the regression model.
    - Hazard models estimate the probability of an event as a function of the independent variables.
    - Once the event occurs, the data is censored – i.e. the firm drops out of the sample.
    - Captures the change in likelihood of a CRO hire for a 10% change in the impendent variable

Table 4 Determinants of CRO hires – selected results

	HR	Coef	Std HR
Leverage	4.116	1.415	1.078
	(2.57)**		
ln(SDNI)	1.305	0.266	1.047
	(3.85)***		
Ln(MB)	0.764	-0.269	1.019
	(1.75)*		
RD	0.991	-0.009	1.042
	(1.92)*		
ln(SDRET)	1.481	0.393	1.143
	(1.70)*		
Value Change	0.925	-0.078	1.013
	(1.82)*		
Financial	4.139	1.420	1.029
	(5.52)***		
Utility	4.508	1.506	1.005
	(4.72)***		

CEO Compensation



CEO Compensation

- Delta: Sensitivity of options to price change.
- Vega: Sensitivity of options to stock price volatility.
- Vega and Delta are computed using data on options and stock holdings from ExecuComp.
- A higher ratio of Vega to Delta indicates a higher incentive to take on risk.

Table 5. Determinants of CRO hires, with CEO compensation.

	HR	Coef	Std HR
Vega/Delta	**1.332**	**0.287**	**1.035**
	(1.98)**		

Summary

- Firms that implement ERM:
  - Are more volatile, have greater earnings volatility and greater leverage.
  - Have seen recent poorer stock performance
  - Tend to be less opaque and have fewer growth options.
- CEOs with compensation that increases in value with risk are more likely to hire CROs.
  - Are Boards implementing ERM to offset the risk taking incentives that they have granted to the CEO?

Future and ongoing work

- This paper is the second of three papers which look at ERM implementation.
  - The first (with Mark Beasley, forthcoming JAAF) finds that stock market reaction to ERM implementation depends on the potential for value creation by ERM.
  - The third paper asks – Do firms (and shareholders) benefit from ERM? (Supported by a grant from GARP)
- Related research
  - How is reputational risk affected by ERM? (Supported by a grant from The Society of Actuaries)

Thank you.

NC State University's Enterprise Risk Management Initiative http://mgt.ncsu.edu/erm/

The Value of Enterprise Risk Management: Evidence from the U.S. Insurance Industry

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Motivation & Purpose

- **Growing interest in ERM**
  - **Market and regulatory factors (corporate governance, COSO, Basel II, Solvency II, etc.)**
- **Lack of academic research regarding ERM**
- **Difficult to observe whether a firm has an ERM program**
- **Determine whether specific insurers are implementing ERM programs**
  - **What factors drive ERM activity by insurers?**
  - **Does ERM activity enhance firm value?**

Reasons for Traditional RM Activities

- **Reasons for traditional risk management activities (e.g. hedging and corporate insurance purchases) are well documented in the literature**
- **Theory suggests that firms should engage in hedging activities because they:**
  - **reduce the costs associated with conflicts of interest between owners and managers and between shareholders and bondholders**
  - **reduce expected bankruptcy costs**
  - **reduce the firm's tax burden**
  - **reduce the costs of regulatory scrutiny**
  - **improve the firm's ability to take advantage of attractive investment opportunities**

Why ERM Adds Value to the Firm

- **Better understand the aggregate risk inherent in different business activities**
- **Avoid duplication of risk management expenditures by exploiting natural hedges**
- **Benefit from being able to select investments based on a more accurate risk-adjusted rate**
- **Enables these financially opaque firms to better inform outsiders of their risk profile and also serves as a signal of their commitment to risk management**
- **Growing interest by rating agencies (A.M. Best and S&P)**

ERM Measure

- **Firms are not required to report whether they engage in enterprise risk management**
- **Detailed search of financial reports, newswires, and other media for evidence of ERM activity**
  - **use Factiva, Thomson, and other search engines to perform separate keyword searches for every publicly-traded insurer that appears on the Compustat database between 1995 and 2005**
  - **search strings included the following phrases, their acronyms, as well as the individual words within the same paragraph:**
    - **"enterprise risk management", "chief risk officer", "risk committee", "strategic risk management", "consolidated risk management", "holistic risk management", "integrated risk management"**

Value Measure

- **Use Tobin's Q as a proxy for firm value**
  - **ratio that compares the market value of a firm's assets to their replacement cost**
  - **reflects market expectations, it is relatively free from managerial manipulation**
- **Following Cummins et al. (2006) and Chung and Pruitt (1994), for our sample of insurers we define Tobin's Q as:**
  - **(market value of equity + book value of liabilities) / (book value of assets)**

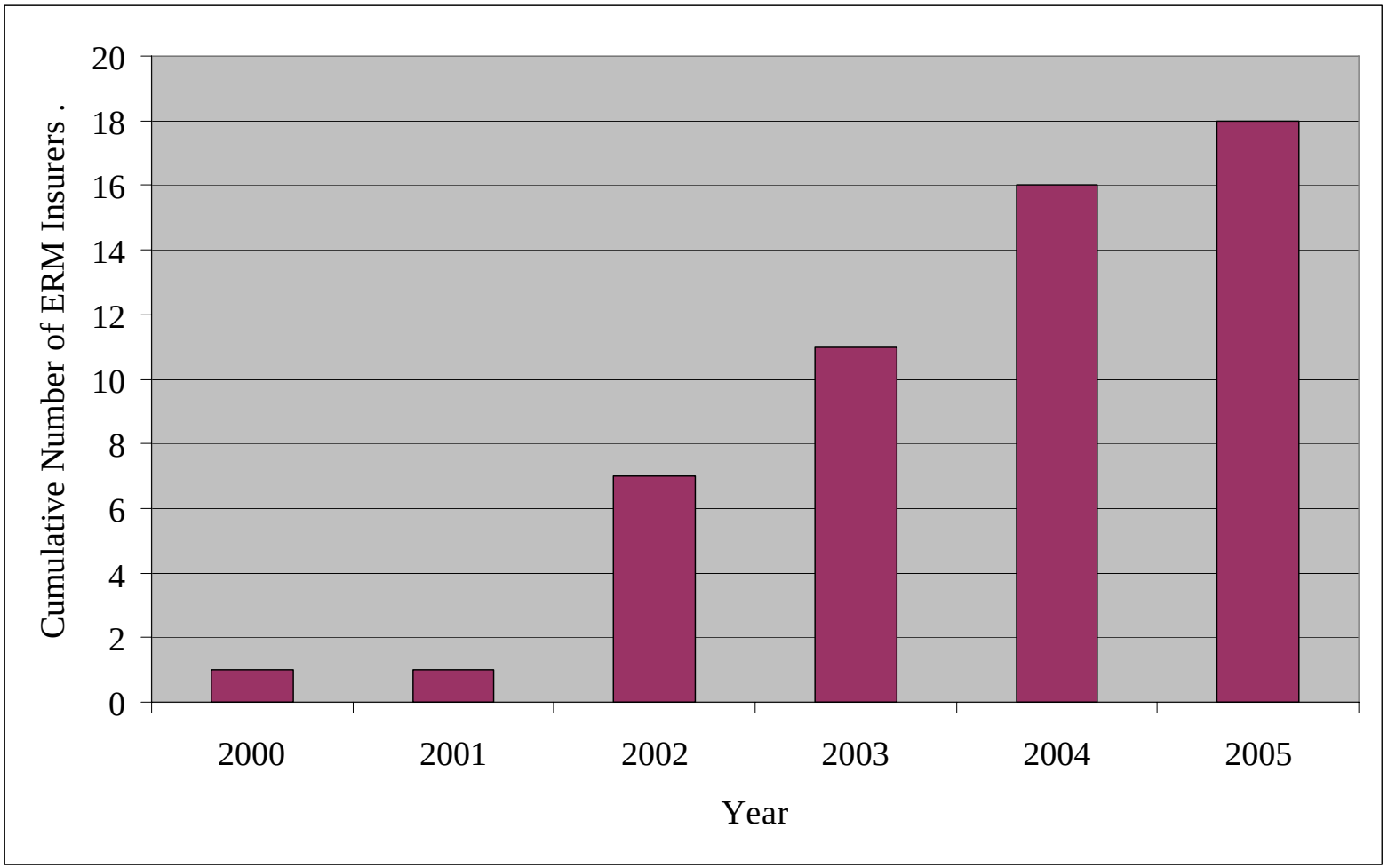
Sample and Data

- **Initial data period: 1995-2005**
- **Sample selection:**
  - **To control for regulatory and market differences across industries, we focus on U.S. insurers only**
  - **Focus on publicly-traded insurers so we have market-based measures of value**
  - **Universe of insurers in the Compustat database**
- **Initial sample of 275 unique insurers**

Sample and Data

- **Search media and SEC filings for ERM activity**
  - **Factiva, Thomson, Edgar**
    - **“ERM”, “IRM”, “CRO”, etc.**
- **Almost no ERM activity before 2000**
  - **Narrow sample period to 2000-2005**
    - **Impose data constraints**
  - **Final Sample has 125 firms (549 firm-years)**

Number of Sample Insurers Engaged in ERM



Sample Selection

Action	Observations	Firms	Data Souce
Initial Sample	1598	275	Merged CRSP/Compustat
Search for ERM use	1598	275	Factiva, Thomson, Edgar
1. Delete if year lt 2000 and missing sales, assets, and equity	1000	218	Merged CRSP/Compustat
2. Delete American Depository Receipts	955	208	Merged CRSP/Compustat
3. Delete where insurance segment sales < 50% ot total	863	187	Compustat Segment Database
4. Delete where ownership data are missing or invalid	781	160	Compact Disclosure SEC
5. Delete where one-year sales growth data missing	747	159	
5. Merge with statutory return data	549	125	NAIC Infopro Database

Univariate Comparison

6.6% ERM premium

	ERM=1		ERM=0		Difference			
Variable	Mean	Median	Mean	Median	Mean		Median	
Book Value of Assets	93,487	34,114	11,338	2,023	82,150	**	32,092	***
Book Value of Liabilities	83,402	27,255	9,581	1,558	73,822	***	25,697	***
Market Value of Equity	19,813	8,141	2,695	505	17,118	***	7,635	***
Tobin's Q	1.138	1.075	1.072	1.023	0.066	***	0.052	***
BV Liabilities/MV Equity	5.170	3.002	7.030	3.077	-1.860	**	-0.075	
Return on Assets %	2.4%	1.4%	1.0%	1.5%	1.4%	**	-0.1%	
International Diversification	0.207	0.000	0.057	0.000	0.150	***	0.000	***
Industrial Diversification	0.369	0.000	0.276	0.000	0.093	*	0.000	*
Dividend Dummy	0.991	1.000	0.644	1.000	0.347	***	0.000	***
Institutional Ownership	79%	81%	43%	41%	36%	***	40%	***
Insider Ownership	2%	1%	17%	6%	-15%	***	-6%	***
One-Year Sales Growth	13.831	9.917	13.959	9.516	-0.128		0.401	
Life Insurer Dummy	0.234	0.000	0.174	0.000	0.061		0.000	*
Reinsurance Usage	0.131	0.123	0.181	0.124	-0.051	***	0.000	
Line-of-Business Diversification	0.633	0.755	0.603	0.648	0.031		0.107	*
Number of observations	111		438					

Note: All values are in millions of dollars.

Multivariate Method

- **Maximum Likelihood Treatment Effects**
  - **First-stage Treatment regression**
    - **ERM = f (Size, External Pressure, Complexity)**
  - **Second-stage Value regression**
    - **Tobin's Q = f (ERM, other value determinants)**
    - **standard errors adjusted for firm-level clustering**

1st Stage Treatment Regression

Dependent Variable: ERM		
Intercept	-4.344	***
Institutional Ownership	0.020	***
ln(Book Value of Assets)	0.337	***
Industrial Diversification Dummy	-0.123	
International Diversification Dummy	-0.275	
Life Insurance Dummy	0.403	
BV Liabilities/BV Equity	-0.092	**
Intra-industry diversification	-0.405	
Reinsurance Usage	-3.708	**

*** and ** indicate statistical significance at the 1 and 5 percent levels, respectively.

2nd Stage Value Regression

16.7% ERM premium

Dependent Variable: ln(Tobin's Q)		
Intercept	0.040	
ERM	0.167	***
ln(Book Value of Assets)	-0.003	
International Diversification Dummy	0.032	
Industrial Diversification Dummy	0.010	
Dividend Dummy	0.046	*
Insider Ownership	0.002	*
Insider Ownership Squared	-0.00003	**
BV Liabilities/BV Equity	0.000	
One-Year Sales Growth	0.000	
Return on Assets	0.119	
Number of Observations	549	
Log Pseudolikelihood	183.89	
Wald test of independent equations	8.41	***

***,**, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively.

Conclusions

- **ERM Insurers are…**

  Larger

  more controlled by institutional investors

  less leveraged

  and less reliant on reinsurance

…than are non-ERM insurers

Conclusions

- **ERM users are valued roughly 17% higher than non-users.**
- **Support for agency-theoretic predictions relative to insider ownership**

Further Research

- **When is ERM most valuable?**
  - **And for whom?**
- **More refined methods to identify ERM**