



Stronger Risk Controls, Lower Risk: Evidence from U.S. Bank Holding Companies

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Motivation: The Financial Crisis

- ▶ Risk-taking by banks in the run up to the financial crisis:
 - ▶ Banking system had substantial balance-sheet exposure to sub-prime risk, largely funded by short-term market borrowing (Kashyap et al. (2008), Acharya et al. (2009))
 - ▶ At the same time, there were **cross-sectional differences across banks in terms of risk exposures, and how they fared during the crisis** (Senior Supervisors Group (2008))



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 - ▶ At the same time, there were cross-sectional differences across banks in terms of risk exposures, and how they fared during the crisis (Senior Supervisors Group (2008))

- ▶ Why did some banks expose themselves, more than others, to such risks in the first place?

- ▶ “Failure of risk management” at banks
 - ▶ Agency conflicts within banks: Risk managers unaware of risks/ unable to restrain traders and security desks (Kashyap et al. (2008))
 - ▶ Banks were assessing risks incorrectly (Shleifer (2011))



Failure of Risk Management

The Policymakers' View

“The failure to appreciate risk exposures at a firmwide level can be costly. For example, during the recent episode, the senior managers of some firms did not fully appreciate the extent of their firm’s exposure to U.S. subprime mortgages. They did not realize that, in addition to the subprime mortgages on their books, they had exposures through the mortgage holdings of off-balance-sheet vehicles, through claims on counterparties exposed to subprime, and through certain complex securities. . . .”

Chairman of the Federal Reserve, Ben Bernanke - May 2008



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“what distinguished well-managed institutions that fared well during the crisis was that they had strong and independent risk management functions... and there was a robust dialogue between their senior management team and business segments regarding organization-wide risk preferences...”

Senior Supervisor Group (2008) Survey



Our Paper

Research Question:

Can cross-sectional differences in tail risk exposures across BHCs be explained by differences in the organizational structure of their risk management functions?

- ▶ We construct a **Risk Management Index (RMI)** that measures:
 - ▶ **Importance attached to the risk management function** within each BHC; and
 - ▶ **Quality of risk oversight** provided by the BHC's board of directors
- ▶ *Tail Risk*: Negative of the average return on the BHC's stock over the 5% worst return days for the BHC's stock over the year.
 - ▶ This is the "Expected Shortfall" measure widely used by financial institutions



Main Hypothesis

BHCs with **strong and independent risk management functions** should have **lower tail risk**, all else equal

- ▶ Executives and traders have incentives to take on excessive tail risk that will enhance short-term performance, but when it materializes, will cause significant damage to the institution (Kashyap, Rajan, and Stein (2008))
- ▶ Such risk-taking behavior is difficult to check
 - ▶ Deposit insurance/bailout expectations blunt monitoring by debtholders
 - ▶ Large size shields them from discipline of takeover market
 - ▶ Ever-increasing complexity makes supervision difficult
- ▶ Even if risk officers are aware of risks, they may be powerless to act
- ▶ Hence, a strong and independent risk management function required to restrain risk-taking behavior (Kashyap et al. (2008), Stulz (2008))



Alternative Hypothesis

- ▶ **Risk management does not have any impact on tail risk exposures**
 - ▶ This may be because banks appoint risk managers, without giving them any real powers, merely to satisfy bank supervisors, whereas the real power rests with trading desks and bank executives who control the bank's risk exposure.
 - ▶ Compensation packages of traders may be so convex that they cannot be restrained by risk officers (Landier et al. (2008))
 - ▶ This is highlighted by the experience of David Andrukonis, a risk manager at Freddie Mac, who tried to alert his senior management to the risks in subprime and Alt-A loans, but was unable to restrain them (see Calomiris (2008)).



Endogeneity of Risk Management

- ▶ We recognize that a BHC's risk management function is itself endogenous
- ▶ “Business Model Channel”:
 - ▶ BHC's underlying business model (or risk culture) determines both the choice of the risk and the strength of the risk management system, such that conservative (aggressive) BHCs take lower (higher) risks and also put in place stronger (weaker) risk management systems
- ▶ “Hedging Channel”:
 - ▶ Some BHCs optimally choose to undertake high risks coupled with a strong risk management function, whereas others optimally choose low risks coupled with a weak risk management function.
 - ▶ Consistent with theories of hedging (Smith and Stulz (1995), Froot et al. (1993))
- ▶ We attempt to distinguish between these two channels by examining how BHCs changed their RMI in response to their losses in the 1998 Russian crisis



Our Contribution to the Literature

- ▶ Was the financial crisis a “100-year flood” that affected all banks equally? (Shleifer (2011))
 - ▶ Negative association between *Risk* and *RMI* goes against this narrative
 - ▶ Keys et al. (2009): Lower default rates on mortgages originated by lenders with more powerful CROs



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- ▶ Literature on corporate governance of financial institutions
 - ▶ Beltratti and Stulz (2009): Shareholder-friendliness of boards
 - ▶ Minton et al. (2010): Independence/ financial expertise of directors
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 - ▶ Erkens et al. (2009): Sensitivity of CEO t/o to shareholder losses
- ▶ Strength and independence of risk management **may be** an important determinant of bank risk



Data Sources

- ▶ **Organizational structure of the risk management function**
 - ▶ Hand-collected from 10-K, proxy statements, and annual reports of BHCs
 - ▶ Restricted attention to top 100 BHCs at the end of 2007 (92% of total banking assets)
 - ▶ We collect this information for 74 publicly-listed BHCs for 1994–2009
- ▶ **Consolidated financial information (FR Y-9C reports)**
- ▶ **Other sources: CRSP, Execucomp, 13-F (ownership), and IRRC (governance)**



Risk Management Index (RMI)

The variables that we collected

- ▶ Variables that measure **importance of Chief Risk Officer (CRO)**
 - ▶ *CRO Present* identifies if BHC has an **officer exclusively tasked with managing enterprise risk (“CRO”)**
 - ▶ *CRO Executive* identifies if the CRO is an executive officer
 - ▶ *CRO-Top5* identifies if CRO is among five highest paid executives
 - ▶ *CRO Centrality*: ratio of the CRO’s (or CFO’s if there is no CRO) total compensation, excluding stocks and options, to the CEO’s total compensation



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- ▶ Variables that measure **quality of risk oversight by the board**
 - ▶ *Risk Committee Experience* identifies whether at least one of the directors serving on the board’s risk committee has some banking experience
 - ▶ *Active Risk Committee* identifies if risk committee met more frequently during the year compared to the average across all BHCs
 - ▶ *Reports to Board* identifies if key management-level risk committee reports directly to the board instead of to the CEO



Risk Management Index (RMI)

- ▶ RMI is the **first principal component** of six variables:
 - ▶ *CRO Present, CRO Executive, CRO Top5, CRO Centrality*
 - ▶ *Risk Committee Experience* and *Active Risk Committee*
- ▶ Why principal component analysis (PCA)?
 - ▶ Collapses variables into a single factor (RMI) that captures maximum variance (88%) in the variables
 - ▶ No need for subjective judgements on relative importance of variables (Tetlock (JF, 2007))
- ▶ We also examine impact of *CRO Centrality* and *Quality of Risk Oversight* separately



Descriptive Statistics: RMI Components

Importance of Risk Officer

	Mean	Median	Std. Dev.	p25	p75	N
RMI	0.595	0.555	0.282	0.398	0.808	1007
CRO present	0.806	1.000	0.395	1.000	1.000	1007
CRO executive	0.402	0.000	0.491	0.000	1.000	1007
CRO top5	0.205	0.000	0.404	0.000	0.000	1007
CRO centrality	0.313	0.303	0.124	0.216	0.403	1007

- ▶ CRO reported as present in 80.6% of BHCs
- ▶ CRO was an executive officer in 40.2% of BHCs, and was among the 5 highest paid executives in only 20.5% of BHCs
- ▶ On average, CRO's total compensation, excluding stocks and options, was 31.3% of the CEO's total compensation



Descriptive Statistics

Quality of Risk Oversight

	Mean	Median	Std. Dev.	p25	p75	N
RMI	0.595	0.555	0.282	0.398	0.808	1007
Experienced risk committee	0.307	0.000	0.461	0.000	1.000	1007
Freq. meetings risk committee	5.369	5.000	3.443	3.000	8.000	1007
Active risk committee	0.439	0.000	0.497	0.000	1.000	1007

- ▶ Board risk committee had a director with banking experience in only 30.7% of cases
- ▶ On average, a BHC's risk committee meets 5.4 times per year



Tail Risk, Governance and Ownership Characteristics

	Mean	Median	Std. Dev.	p25	p75	N
Tail risk	0.047	0.038	0.033	0.027	0.052	989
Annual return	0.104	0.086	0.302	-0.070	0.273	989
G-Index	9.252	9.000	2.963	7.000	11.000	934
Board independence	0.606	0.625	0.120	0.522	0.697	942
Board experience	0.179	0.152	0.114	0.088	0.235	946
Inst. ownership	0.393	0.373	0.247	0.178	0.596	898
CEO's delta (in \$ '000)	0.012	0.004	0.022	0.002	0.012	525
CEO's vega (in \$ '000)	0.123	0.041	0.243	0.014	0.116	496
CEO's tenure (in years)	8.049	6.000	6.792	2.000	12.000	636
Change in CEO	0.049	0	0.215	0	0	1007
Large M&A	0.215	0	0.411	0	1	989



High RMI vs. Low RMI BHCs

	<i>High RMI= 0</i>	<i>High RMI= 1</i>	Difference
<i>Size</i> _{<i>t-1</i>}	15.920	17.110	-1.198***
Annual return _{<i>t-1</i>}	0.122	0.120	0.002
Tail risk _{<i>t-1</i>}	0.044	0.040	0.004*
(ST borrowing/ Assets) _{<i>t-1</i>}	0.032	0.052	-0.020***
(Tier-1 capital/ Assets) _{<i>t-1</i>}	0.086	0.074	0.012***
(Bad loans/ Assets) _{<i>t-1</i>}	0.005	0.006	-0.001*
(Non-int. income/ Income) _{<i>t-1</i>}	0.214	0.248	-0.034***
(Deriv. trading/ Assets) _{<i>t-1</i>}	0.283	1.837	-1.555***
(Deriv. hedging/ Assets) _{<i>t-1</i>}	0.047	0.121	-0.074***

- ▶ BHCs with High RMI are larger, more likely to be funded by short-term debt, have lower capital ratios, and rely more on non-interest income and off-balance sheet activities



High RMI vs. Low RMI BHCs

	<i>High RMI= 0</i>	<i>High RMI= 1</i>	Difference
Inst. ownership _{<i>t-1</i>}	0.338	0.411	-0.074***
G-Index _{<i>t-1</i>}	9.359	9.093	0.266
Board independence _{<i>t-1</i>}	0.579	0.626	-0.047***
Board experience _{<i>t-1</i>}	0.183	0.173	0.009
Change in CEO _{<i>t-1</i>}	0.027	0.056	-0.030*
CEO's tenure _{<i>t-1</i>}	9.133	6.874	2.260***
Large M&A _{<i>t-1</i>}	0.263	0.195	0.068*

- ▶ BHCs with High RMI have higher institutional ownership, more independent boards, and CEOs with shorter tenures
- ▶ No significant differences in G-Index



RMI over the years

Year	RMI	CRO present	CRO executive	CRO top5	CRO centrality	Risk comm. experience
1994	0.479	0.400	0.289	0.111	0.199	0.311
1995	0.472	0.420	0.280	0.120	0.206	0.420
1996	0.466	0.455	0.291	0.218	0.206	0.418
1997	0.466	0.518	0.304	0.214	0.206	0.411
1998	0.473	0.590	0.311	0.230	0.203	0.508
1999	0.478	0.609	0.406	0.266	0.256	0.453
2000	0.566	0.738	0.538	0.323	0.299	0.446
2001	0.617	0.818	0.515	0.303	0.332	0.500
2002	0.656	0.894	0.530	0.288	0.329	0.500
2003	0.683	0.909	0.545	0.318	0.348	0.394
2004	0.678	0.900	0.614	0.314	0.286	0.486
2005	0.681	0.915	0.634	0.296	0.282	0.493
2006	0.663	0.957	0.571	0.300	0.274	0.514
2007	0.644	0.972	0.486	0.278	0.258	0.542
2008	0.643	1.000	0.522	0.343	0.277	0.552
2009	0.729	1.000	0.645	0.435	0.305	0.565

- ▶ Gradual improvement in all of the RMI components over the years.
- ▶ Big across-the-board increase between 1998-2000. Russian crisis?



Key Correlations

	Tail risk _t	RMI _{t-1}	Size _{t-1}
Tail risk _t	1.000		
RMI _{t-1}	-0.031	1.000	
Size _{t-1}	0.127*	0.498*	1.000
ROA _{t-1}	-0.253*	-0.008	-0.058*
(Tier-1 capital/Assets) _{t-1}	0.000	-0.084*	-0.180*
(Deposits/Assets) _{t-1}	-0.144*	-0.193*	-0.573*
(ST borrowing/Assets) _{t-1}	0.118*	0.176*	0.267*
(Bad loans/Assets) _{t-1}	0.453*	0.066*	0.095*
(Non-int. income/Income) _{t-1}	-0.072*	0.258*	0.481*
(Deriv. trading/Assets) _{t-1}	0.046	0.196*	0.501*
(Deriv. hedging/Assets) _{t-1}	0.030	0.296*	0.427*
Inst. ownership _{t-1}	0.263*	0.355*	0.509*
G-Index _{t-1}	0.036	-0.036	-0.049
Board experience _{t-1}	0.022	-0.046	0.064*
Board independence _{t-1}	0.087*	0.281*	0.204*
CEO's tenure _{t-1}	0.077*	-0.149*	-0.164*
CEO's delta _{t-1}	0.053	-0.151*	-0.272*
CEO's vega _{t-1}	0.153*	0.302*	0.501*



Determinants of RMI

Panel regression:

$$\text{RMI}_{j,t} = \alpha + \beta * X_{j,t-1} + \text{Year FE} + \text{BHC or Size decile FE}$$

- ▶ Apart from *Size* and *Size*², we control for:
 - ▶ **Balance-sheet composition:** *Deposits/Assets, Loans/Assets, Tier1 Capital/ Assets*
 - ▶ **Business Composition:** *Non-int income/Income*
 - ▶ **Past Performance:** *ROA, Bad Loans/ Assets, Annual Stock Return*
 - ▶ Derivatives usage for trading and hedging purposes
 - ▶ **Governance and CEO pay:** *Inst. Ownership, G-Index, Board Independence, Board Expertise, CEO's Delta, CEO's Vega, Change in CEO*
 - ▶ Year fixed effects, and **BHC fixed effects** (in some specifications) to control for unobserved heterogeneities



Determinants of RMI

Summary of results from Table III

- ▶ Monotonic but concave relationship between RMI and Size
- ▶ BHCs with higher proportion of non-banking income and large derivative trading operations have high RMI
- ▶ RMI and capital are substitutes.
- ▶ Governance and CEO compensation characteristics matter
 - ▶ BHCs with high G-Index, less independent boards, and entrenched CEOs have low RMI
 - ▶ Board expertise and RMI are substitutes
 - ▶ CEO compensation and RMI are substitutes (BHCs with high CEO Vega also have high RMI)
 - ▶ No relationship between institutional ownership and RMI



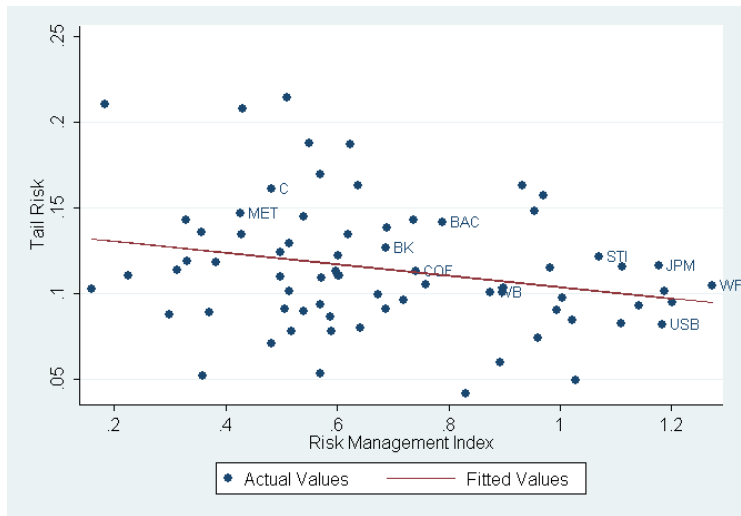
Business Model Channel vs. Hedging Channel

- ▶ We examine how BHCs changed their RMI in response to losses suffered during the 1998 Russian Crisis
- ▶ Our results below are more consistent with the business model channel
 - ▶ BHCs with large left-tail losses in 1998 did not increase their RMI more after 1999

Performance during 1998 Crisis and RMI in 1999-2009

	(1)	(2)	(3)	(4)	(5)
	RMI	ΔRMI	$\Delta RMI_{1998-00}$	$\Delta RMI_{2000-03}$	$\Delta RMI_{2003-06}$
High tail risk 1998	-0.075*** (0.022)	-0.009 (0.006)	-0.015 (0.057)	-0.063 (0.072)	-0.001 (0.046)
Constant	0.283 (0.221)	0.001 (0.014)	0.122 (0.579)	0.330 (0.602)	-0.077 (0.317)
Observations	570	549	37	48	55
R ²	0.480	0.270	0.834	0.301	0.357
Year FE	Yes	Yes	No	No	No
Size decile FE	Yes	Yes	Yes	Yes	Yes
BHC controls	Yes	Yes	Yes	Yes	Yes

Avg. Tail Risk during Crisis Years vs. Pre-Crisis RMI



RMI and performance during the crisis years

Cross-sectional regression:

$$Y_{j,t} = \alpha + \beta * \text{Pre-crisis RMI}_j + \gamma * X_{j,2006} + \text{Year FE}$$

- ▶ As a preamble to our analysis, we want to test if BHCs with high *Pre-crisis RMI* (average *RMI* over 2005–06) “fared better” during the crisis years, 2007 and 2008
- ▶ $Y_{j,t}$ is one of the following:
 - ▶ *Private-label MBS and Deriv. Trading*
 - ▶ *ROA, Bad Loans/Assets and Stock Return* to measure operating and stock performance
 - ▶ *Tail Risk*
- ▶ BHCs with a high *Pre-crisis RMI* had **lower non-performing loans, higher ROA and stock returns, and lower Tail risk** during the crisis years.

RMI and performance during the crisis years

Cross-sectional regression:

$$Y_{j,t} = \alpha + \beta * \text{Pre-crisis RMI}_j + \gamma * X_{j,2006} + \text{Year FE}$$

	(1)	(2)	(3)	(4)	(5)	(6)
	Private MBS	Deriv. trading	Bad loans/Assets	ROA	Return	Tail risk
<i>Pre-crisis RMI</i>	-3.355	5.246	-0.019**	0.017***	0.330***	-0.029***
Size ₂₀₀₆	2.330***	-0.569	0.002	-0.003	-0.140***	0.004
Size ₂₀₀₆ ²	7.799***	10.340***	-0.001	0.001	0.048	-0.003
(Tier1 capital/Assets) ₂₀₀₆	-58.127	75.824*	-0.004	0.313***	-0.602	0.002
(Bad loans/Assets) ₂₀₀₆	115.540	-92.799	2.934***	-0.562	-11.789	1.949*
(Deposits/Assets) ₂₀₀₆	1.358	12.452**	0.021	-0.007	0.160	-0.033
(Loans/Assets) ₂₀₀₆	-7.756**	-5.035	-0.016	-0.014	-0.322	0.004
Observations	138	138	138	138	138	138
R ²	0.720	0.646	0.415	0.769	0.174	0.666
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

- ▶ BHCs with a high *Pre-crisis RMI* had lower non-performing loans, higher ROA and stock returns, and lower *Tail risk* during the crisis years.



RMI and Tail Risk

Panel regression:

$$\text{Tail risk}_{j,t} = \alpha + \beta * \text{RMI}_{j,t-1} + \gamma * X_{j,t-1} + \text{BHC or Size Decile FE} + \text{Year FE}$$

- ▶ Apart from *Size* and *Size*², we also control for:
 - ▶ **Balance-sheet composition:** *Deposits/Assets, Loans/Assets, Loan Concentration, Tier1 Capital/ Assets*
 - ▶ **Business Composition:** *Non-int income/Income*
 - ▶ **Past Performance:** *ROA, Bad Loans/ Assets, Annual Stock Return*
 - ▶ **Governance and CEO pay:** *Inst. Ownership, G-Index, CEO's Delta and CEO's Vega*
 - ▶ Year fixed effects, and **BHC fixed effects** to control for unobserved heterogeneities

- ▶ We have suppressed coefficients on controls in the next slide

RMI and Tail Risk

	(1)	(2)	(3)	(4)	(5)
RMI_{t-1}	-0.009**	-0.008**	-0.009**	-0.010**	-0.022**
$Size_{t-1}$	0.001	0.000	0.003		0.004
$Size_{t-1}^2$	0.002*	0.003***	0.004**		0.007***
ROA_{t-1}	-0.688***	-0.760***	-1.266***	-0.695***	-0.747**
Annual return $_{t-1}$	-0.010***	-0.009***	-0.011**	-0.009***	-0.007***
(Tier-1 capital/Assets) $_{t-1}$	0.164***	0.192***	0.058	0.164***	0.226***
(Bad loans/Assets) $_{t-1}$	1.061***	1.156***	1.587***	1.125***	0.906**
Inst. ownership $_{t-1}$		0.015***	0.015***	0.013***	0.018**
G-Index $_{t-1}$		0.000	0.001	0.000	0.001*
Observations	803	701	368	701	701
R^2	0.809	0.837	0.883	0.839	0.877
CEO Delta/Vega	No	No	YES	No	No
Year FE	Yes	Yes	Yes	Yes	Yes
Size decile FE	No	No	No	YES	No
BHC FE	No	No	No	No	YES

- ▶ As per coefficient in column (5), a one SD increase in *RMI* associated with a 13.2% decrease in *Tail Risk*

RMI and BHC Performance

	ROA _t			Annual return _t			Abnormal return _t		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
RMI _{t-1}	0.006**		0.007*	0.072**		0.037	0.075**		0.074
Crisis year		0.008***			-0.295***			-0.731***	
RMI _{t-1} *Crisis year		0.010***			0.157**			0.147**	
RMI _{t-1} *(1-Crisis)		0.005*			0.048			0.054	
Observations	805	805	805	804	804	804	803	803	803
R ²	0.726	0.728	0.802	0.523	0.525	0.565	0.572	0.573	0.605
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Size decile FE	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No
BHC FE	No	No	Yes	No	No	Yes	No	No	Yes
BHC controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

- ▶ Positive association between ROA_t and RMI_{t-1}, which is stronger in crisis years.
- ▶ Weaker relationship between RMI and returns.



Resolving Association vs. Causality

- ▶ Two interpretations for negative association between RMI and Risk
 - ▶ Strong risk management function **lowers** tail risk by restraining risk-taking behavior
 - ▶ Both risk and risk management are jointly determined by some **time-varying omitted variable** (e.g., change in risk preferences)
- ▶ We identify instruments by examining how BHC's changed their RMI in response to the 1998 Russian crisis
- ▶ Use *Comparable BHCs' ΔRMI_{98-00}* as instrument for BHCs' RMI in years 2001 and beyond
 - ▶ Defined as average increase in RMI during 1998-2000 for all other BHCs in the size category to which the BHC belonged in 1998.
 - ▶ Satisfies *exclusion restriction* because proximate causes of the financial crisis were very different from those of the 1998 crisis.
 - ▶ Also satisfies *relevance criterion* because BHCs that increased RMI during 1998-00 had higher RMIs in subsequent years.



IV Regression: Performance during Crisis Years

	(1) Pre-Crisis RMI	(2) ROA	(3) Annual Return	(4) Tail Risk
Pre-crisis RMI		0.018* (0.010)	0.582** (0.271)	-0.049* (0.027)
Comparable BHCs' $\Delta RMI_{1998-00}$	1.603*** (0.474)			
Constant	0.578** (0.259)	-0.008 (0.010)	-0.583* (0.326)	0.158*** (0.027)
Observations	116	116	116	116
R^2	0.428	0.348	0.146	0.699
F-stat (p-value) of excluded instrument	12.83 (0.0005)			
Year FE	Yes	Yes	Yes	Yes
BHC controls	Yes	Yes	Yes	Yes



IV Regression: Tail Risk and RMI

	(1)	(2)
	RMI _{t-1}	Tail Risk _t
RMI _{t-1}		-0.021* (0.012)
Comparable BHCs' Δ RMI ₁₉₉₈₋₀₀	1.736*** (0.571)	
Constant	0.518* (0.291)	0.097*** (0.013)
Observations	524	524
R ²	0.420	0.840
F-stat (p-value) of excluded instrument	9.24 (0.0035)	
Year FE	Yes	Yes
BHC controls	Yes	Yes



Conclusion

- ▶ We develop a Risk Management Index to measure the strength of the risk management function at BHCs
- ▶ BHCs with a high Pre-crisis RMI fared better during the crisis years:
 - ▶ lower ratio of non-performing loans, higher ROA and stock returns, and lower tail risk
- ▶ Strong robust negative association between $Tail Risk_t$ and RMI_{t-1} over the period 1995-2010
- ▶ BHCs with higher RMI have higher ROA, and higher stock returns during crisis periods