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# Inside Debt and Bank Default Risk and Performance during the Crisis

Rosalind Bennett  
FDIC

Levent Guntay  
FDIC

Haluk Unal  
University of Maryland and CFR FDIC

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**Opinions expressed in this study are those of authors'  
and not necessarily those of the FDIC.**

# Executive Compensation

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- One of the focal points during the credit crisis
  - Is there a relation between compensation and risk-taking?
  - Can we control risk-taking by regulating compensation?
- Much of the literature examines whether there is a relation between risk taking and inside equity holdings of top management
  - Inside equity=stock options and firm equity
- In this paper, we examine whether there is a relation between risk-taking and inside debt holdings of the CEO

# What is Inside Debt?

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- Inside debt is the sum of
  - Defined benefit pensions and
  - Non-qualified deferred compensation
- Pension
  - The actuarial PV of accumulated benefits determined in accordance with SEC rules
- Non-qualified deferred compensation
  - Earned but not received
  - Not qualified as compensation under the tax code (hence not subject to taxes)
  - Long term (at retirement)

# Pensions and Deferred Compensation

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- Both are fixed claims subject to default risk
  - Due to the manager at retirement
  - Unfunded and unsecured liabilities under bankruptcy rules
- BHCs are subject to bankruptcy rules
- In failed bank resolutions, FDIC has the authority to treat these claims as general creditors, which have a low priority

# Optimal Compensation Structure Jensen and Meckling (1976)

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- Inside equity aligns the interests of the CEO with the shareholders and causes more risk taking. Inside debt compensation causes the CEO care more about the long-term solvency of the firm reducing the risk appetite.
- Optimal contract is a mix of inside debt and inside equity that matches the firm's external claims:

$$RDE = \frac{D_{CEO}}{E_{CEO}} / \frac{D_{FIRM}}{E_{FIRM}} = 1$$

- The CEO is paid a fraction of firm-value and the interests of the CEO and stakeholders are aligned.

# Prior Research

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- Sundaram and Yermack (2007)
  - Pensions are associated with lower risk taking (distance to default)
- Wei and Yermack (2010)
  - Inside debt is negatively (positively) related to disclosure announcement stock (bond) returns
  - Bolton, Mehran, and Shapiro (2010) find similar results for 27 BHCs
- Fahlenbrach and Stulz (2011)
  - Inside equity and BHC performance were negatively related during the crisis.
  - CEOs were maximizing shareholder wealth
  - Poor performance was merely an unexpected outcome
  - CEOs' risk-taking activities were not optimal for the other stakeholders of the bank

# Empirical Framework

Three research questions:

- How well does the Relative D/E ratio in 2006 explain default risk at the end of 2008?

$$DefRisk_{i,08} = \alpha_0 + \alpha_1 RDE_{i,06} + \alpha_2 CEO_{i,06} + \alpha_3 BHC_{i,06} + \varepsilon_{i,08}$$

- How well does the CEOs Relative D/E ratio explain financial performance over 2007-2008?

$$Perform_{i,07-08} = \beta_0 + \beta_1 RDE_{i,06} + \beta_2 CEO_{i,06} + \beta_3 BHC_{i,06} + \eta_{i,08}$$

- Is there an association between Relative D/E ratio 2006 and supervisory ratings in 2006?

$$RTG_{i,06} = f(\gamma_0 + \gamma_1 RDE_{i,06} + \gamma_2 CEO_{i,06} + \gamma_3 SIZE_{i,06} + \kappa_{i,06}) \quad 7$$

# Sample

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- Pension and deferred compensation data become available first in 2006
  - Prior to 2006: Limited disclosure on pensions and no disclosure on deferred compensation
  - January 17, 2006: SEC increased the disclosure requirements for retirement plans and post-employment benefits of the executives and directors
- We track BHC default risk and performance over the 2007 to 2008 period after the financial system was subject to a system-wide shock
- Start with 5,085 BHCs; match to CRSP; match to Execucomp and hand-collected data; final sample size 371 BHCs

# Empirical Analysis

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- Sample Characteristics
- Inside Debt and Default Risk
  - Alternative Default Risk Measures
  - Alternative Inside Debt Measures
  - Robustness Tests
  - Quantile Estimates
  - Bank Size
- Bank Performance Over the Crisis
- Compensation Measures
- Inside Debt and CAMELS Ratings

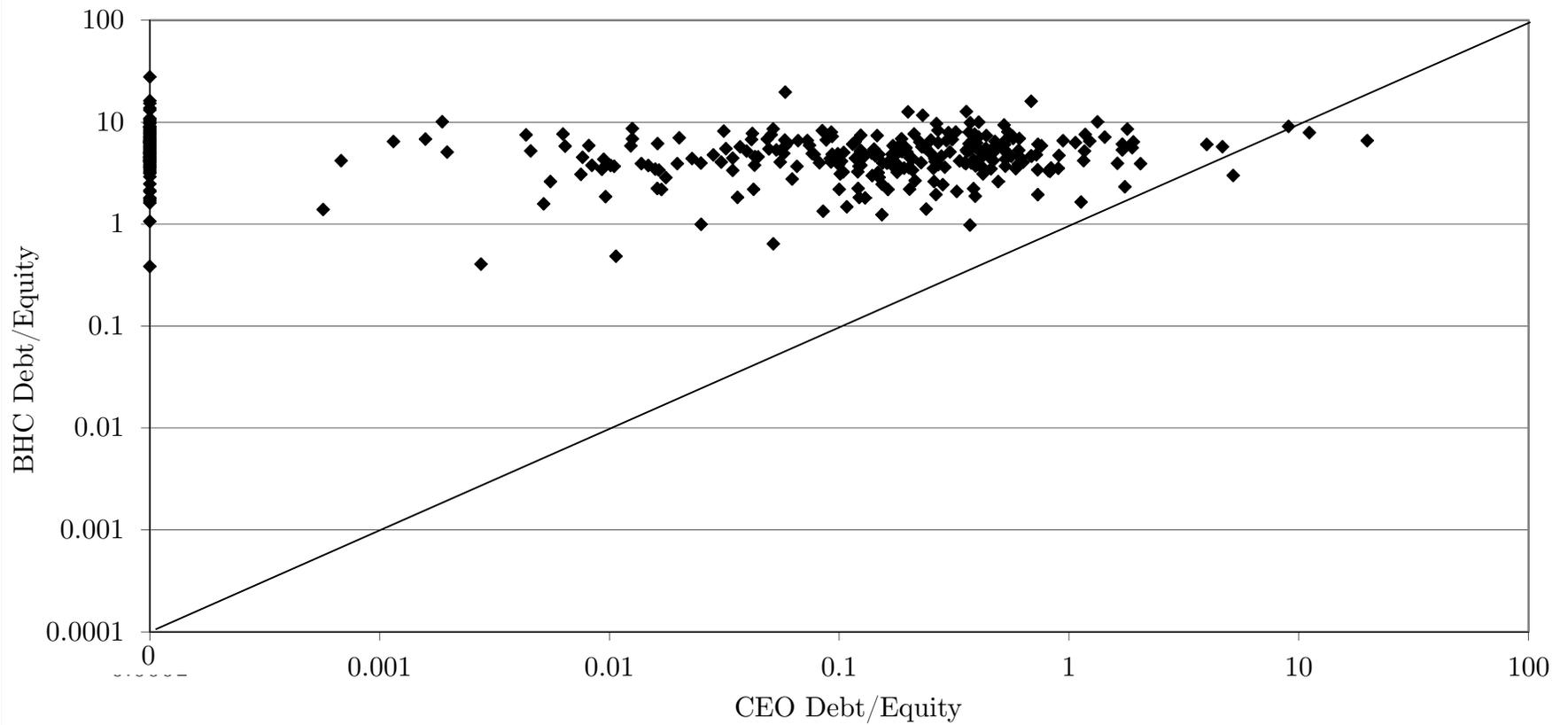
# Bank Default Risk and Performance

	Number	Mean	Median	Minimum	Maximum
<i>Default Risk Measures</i>					
Dec 2006 EDF (%)	371	0.13	0.08	0.01	7.14
Dec 2008 EDF (%)	371	3.21	1.02	0.01	35.00
May 2008 EDF (%)	371	0.78	0.24	0.01	35
Sep 2008 EDF (%)	371	1.42	0.43	0.01	35
Dec 2008 5-Year EDF (%)	371	3.13	1.52	0.01	22
Distance to Default	371	0.81	0.69	-1.9	11.7
Total Volatility (2007-2008)	371	0.41	0.36	0.0037	2.31
Failure Indicator through 2011	371	0.097	0	0	1
High Risk Indicator	371	0.20	0	0	1
<i>Performance Measures</i>					
Return on Assets (ROA), 2007-2008	371	0.22	0.65	-10.30	4.38
Return on Equity (ROE), 2007-2008	371	2.52	7.11	-129.3	42.8
Excess Returns, 2007-2008	371	-0.20	-0.07	-2.74	0.62
Interest Income (% of Total Assets), 2007-2008	371	6.39	6.33	0.47	10.90
Interest Expense (% of Total Assets), 2007-2008	371	2.93	2.91	0.086	5.07
Provisions for Loan Losses (% of Total Assets), 2007-2008	371	0.78	0.52	-0.2	5.11
Non-Interest Income (% of Total Assets), 2007-2008	371	1.21	1.03	-3.58	6.84
Non-Interest Expense (% of Total Assets), 2007-2008	371	3.36	3.21	-0.35	9.4

# CEO and Bank Characteristics

	Number	Mean	Median	Minimum	Maximum	Standard Deviation
<i>CEO Characteristics</i>						
Inside Debt Indicator	371	0.72	1	0	1	0.45
Pension Indicator	371	0.60	1	0	1	0.49
Deferred Compensation Indicator	371	0.44	0	0	1	0.50
CEO Debt (\$ thousands)	371	3,081	475	0	111,413	9,468
CEO Equity (\$ thousands)	371	40,929	4,280	12	4,475,412	239,999
CEO D/E	371	0.37	0.09	0.00	19.80	1.35
Firm D/E	371	5.34	4.92	0.38	27.8	2.78
CEO D/E to Firm D/E	371	0.074	0.021	0	3.01	0.22
Inside Debt/(Inside Debt+Inside Equity)	371	0.15	0.09	0	0.95	0.19
CEO Age (years)	371	57	57	34	81	7.39
CEO Tenure (years)	371	10	8	1	50	7.21
CEO Total Compensation (\$ thousands)	371	2,344	676	120	51,755	5,921
Delta	371	482	57	0	45,201	2,473
Vega	371	362	38	0	12,193	1,170
<i>BHC Characteristics</i>						
Total Assets (\$ millions)	371	26,574	1,907	226	1,884,318	150,792
Log of Total Assets	371	14.80	14.50	12.30	21.40	1.66
Small Bank (<\$1 Billion in Total Assets)	371	0.35	0	0	1	0.48
Medium Bank (\$1 to 10 Billion)	371	0.47	0	0	1	0.50
Large Bank (\$10 to \$100 Billion)	371	0.14	0	0	1	0.35
Mega Bank (Over \$100 Billion)	371	0.05	0	0	1	0.21
MVA/TA (% of Total Assets)	371	107.00	106.90	51.60	147.60	9.30
Loan Loss Reserves (% of Total Assets)	371	0.80	0.81	0.00	3.57	0.30
Non-Performing Assets (% of Total Assets)	371	1.05	0.87	0	5.21	0.81
Securities (% of Total Assets)	371	19.00	16.80	0.47	89.40	11.90
Brokered Deposits (% of Total Assets)	371	1.59	0	0	29.90	4.03
Cash (% of Total Assets)	371	3.14	2.63	0.11	33.7	2.48

# Bank Leverage vs CEO Leverage



# Default Risk and CEO Inside Debt

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	OLS	OLS	OLS	OLS	WLS		Probit
	December	May	September	December	Distance to	Total Volatility	Ordered Probit	Failure
	2008 EDF	2008 EDF	2008 EDF	2008 5-Year	Default	(2007-2008)	CAMELS	Indicator
	(Percent)	(Percent)	(Percent)	EDF (Percent)				through 2011
Inside Debt Ratio	-0.334*** (3.85)	-0.060** (2.10)	-0.127*** (2.80)	-0.278*** (4.45)	0.044** (2.34)	-0.010*** (3.01)	-0.068*** (3.56)	-0.084** (2.56)
Log Firm D/E	1.215** (2.14)	0.230 (1.27)	0.737** (2.49)	1.169*** (2.87)	-0.641*** (4.42)	0.036 (1.32)	0.658*** (5.11)	0.322 (1.37)
Log of Total Compensation	0.650** (2.32)	0.277** (2.06)	0.521** (2.48)	0.578*** (2.77)	-0.261*** (4.38)	0.060*** (4.92)	0.245*** (4.59)	0.290*** (3.27)
Log of CEO Age	-3.068 (1.15)	-2.060 (1.06)	-2.274 (1.07)	-2.166 (1.21)	0.406 (1.07)	-0.173 (1.58)	0.293 (0.59)	-1.463 (1.62)
Log of CEO Tenure	0.348 (1.00)	0.223 (1.43)	0.227 (1.03)	0.266 (1.08)	-0.038 (0.46)	0.016 (1.17)	-0.076 (1.05)	0.229 (1.60)
MVA/TA	-0.002 (0.04)	-0.008 (0.79)	-0.004 (0.27)	-0.010 (0.33)	0.018*** (2.60)	-0.002 (1.16)	0.000 (0.02)	-0.010 (0.94)
Loan Loss Reserves	-1.626 (1.45)	-0.907 (0.97)	-1.033 (1.06)	-1.223 (1.58)	0.140 (0.85)	0.059 (0.83)	0.041 (0.20)	-0.208 (0.59)
Non-Performing Assets	1.256*** (3.41)	0.373*** (2.85)	0.683*** (3.52)	1.074*** (4.28)	-0.186* (1.95)	0.039*** (2.88)	0.314*** (4.08)	0.132 (1.13)
Securities	-0.091*** (3.52)	-0.027** (1.97)	-0.047*** (2.64)	-0.074*** (4.24)	0.017** (2.42)	-0.004*** (2.98)	-0.027*** (4.22)	-0.039*** (2.65)
Brokered Deposits	0.325*** (3.13)	0.054 (1.28)	0.162** (2.39)	0.237*** (3.48)	-0.032*** (3.00)	0.008** (2.53)	0.022* (1.69)	0.065*** (3.29)
Cash	-0.215** (2.29)	-0.091*** (2.73)	-0.128*** (2.67)	-0.183*** (2.63)	0.081*** (2.93)	-0.009** (2.37)	-0.021 (1.02)	-0.095 (1.12)
Constant	9.444 (0.87)	8.105 (1.00)	6.625 (0.76)	7.095 (0.97)	-0.207 (0.12)	0.784* (1.69)		3.123 (0.78)
Adjusted R-Squared	0.198	0.074	0.151	0.257	0.216	0.186		
Pseudo R-Squared							0.121	0.230
Observations	371	371	371	371	371	371	371	371

# Alternative Measures of Inside Debt

	(1)	(2)	(3)	(4)	(5)
	OLS	OLS	OLS	OLS	OLS
	End of 2008	End of 2008	End of 2008	End of 2008	End of 2008
	EDF (Percent)	EDF (Percent)	EDF (Percent)	EDF (Percent)	EDF (Percent)
Log of Inside Debt	-0.284** (2.49)				
Log of Inside Equity	0.513*** (2.73)				
Log Relative D/E		-0.368*** (4.06)			
CEO D/E Ratio			-0.322** (2.07)		
Inside Debt Indicator				-1.860*** (2.74)	
Inside Debt/(Inside Debt+Inside Equity)					-5.355*** (4.92)
Log of Firm D/E	1.289** (2.31)		1.178** (2.01)	1.095* (1.92)	1.259** (2.19)
Other Control Variables	Yes	Yes	Yes	Yes	Yes
Adjusted R-Squared	0.203	0.195	0.171	0.185	0.197
Observations	371	371	371	371	371

# Robustness Tests

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- Skewness
  - High EDF indicator
  - Natural Logarithm of EDF and covariates
- Bounded dependent variable
  - Percentile rank of EDF (Johnson, 2004)
  - Fractional Probit (Papke and Wooldridge, 1996)
- Outliers
  - Winsorizing
  - Quantile Regression

# Bank Size

	(1)	(2)
	End of 2008 EDF	End of 2008 EDF
	(Percent)	(Percent)
Inside Debt Ratio	-0.380*** (4.17)	
Residual Compensation	1.723*** (2.73)	2.102*** (3.15)
Log of Total Assets	5.583*** (2.60)	
Log of Total Assets Squared	-0.168** (2.50)	
Inside Debt Ratio * Small Bank		-0.288** (2.49)
Inside Debt Ratio * Medium Bank		-0.275** (2.39)
Inside Debt Ratio * Large Bank		-1.410*** (3.51)
Inside Debt Ratio * Mega Bank		0.410 (0.96)
Medium Bank		1.501** (2.03)
Large Bank		-1.681 (1.26)
Mega Bank		1.533 (0.82)
Log Firm D/E	1.335**	0.913
Other Control Variables	Yes	Yes
Adjusted R-Squared	0.215	0.237
Observations	371	371

# Bank Performance over the Crisis

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Excess Returns	ROE	ROA	Interest Income	Interest Expense	Provision Expense	Non-Interest Income	Non-Interest Expense
Inside Debt Ratio	0.028*** (3.91)	0.538** (2.40)	0.048** (2.26)	0.001 (0.07)	-0.024** (2.08)	-0.033*** (2.88)	0.027** (2.06)	0.020 (0.95)
Log Firm D/E	-0.154*** (3.16)	-2.683* (1.96)	-0.232* (1.67)	-0.143 (1.52)	0.215*** (2.85)	0.117* (1.69)	-0.208** (2.00)	-0.402*** (2.88)
Log of Total Compensation	-0.099*** (4.09)	-2.713*** (3.32)	-0.229*** (3.26)	-0.197*** (4.12)	0.015 (0.44)	0.236*** (6.76)	0.236*** (4.36)	0.029 (0.47)
Other Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-Squared	0.268	0.177	0.170	0.245	0.182	0.272	0.332	0.122
Observations	371	371	371	371	371	371	371	371

# Compensation Measures

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	OLS	WLS	WLS	WLS
	End of 2008	End of 2008	End of 2008	Excess Return	Excess Return	Excess Return
	EDF (Percent)	EDF (Percent)	EDF (Percent)			
Inside Debt Ratio			-0.271*** (2.65)			0.024*** (2.95)
Log of Delta	0.689*** (3.39)		0.267 (1.11)	-0.053*** (2.90)		-0.014 (0.70)
Log of Vega		0.408** (2.12)	0.256 (1.31)		-0.038** (2.43)	-0.028* (1.81)
Log Firm D/E	1.276** (2.25)	1.246** (2.20)	1.315** (2.36)	-0.157*** (3.21)	-0.155*** (3.20)	-0.163*** (3.42)
Other Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-Squared	0.186	0.176	0.202	0.253	0.249	0.273
Observations	371	371	371	371	371	371

# Inside Debt and CAMELS Ratings

	(1) Capital Adequacy	(2) Asset Quality Rating	(3) Management Rating	(4) Earnings Rating	(5) Liquidity Rating	(6) Sensitivity to Market Risk	(7) Composite CAMELS
Inside Debt Ratio	-0.063*** (2.84)	-0.027 (1.17)	-0.067*** (3.14)	-0.048** (2.34)	-0.026 (1.20)	-0.068*** (3.26)	-0.068*** (2.96)
Log Firm D/E	0.681*** (4.01)	0.484*** (3.28)	0.622*** (4.08)	0.874*** (4.34)	0.239 (1.61)	0.504*** (3.47)	0.813*** (5.05)
Other Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R-Squared	0.109	0.122	0.106	0.139	0.151	0.083	0.140
Observations	371	371	371	371	371	371	371

# Conclusion

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- Higher CEO inside-debt to equity ratio to firm debt-to-equity ratio in 2006 is associated with:
  - lower default risk of the BHC at the end of 2008.
  - better financial performance between 2007-2008
- Inside debt holdings of the CEO is significantly related to more favorable CAMELS ratings

# Conclusion

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- Signal interpretation
  - Structure of compensation a signals managers propensity to take risk
  - John, Saunders, Senbet (2000)
  - Can infer BHC's exposure to default risk by looking at the inside debt ratio of the CEO
- Causal interpretation
  - Inside debt causes managers to take less risk
  - Dodd-Frank Act
- How much of the association is due to signaling versus causal effect is left for future work.