



Leverage and risk in US commercial banking in the light of the current financial crisis

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Introduction

The current financial crisis has revealed systemic inadequacies which are strongly related to mal-functioning of the banking sector. These inadequacies are often claimed to be related to the extent of bank leverage in the years before the crisis.

Literature gaps

- Little formal empirical evidence has been gathered to provide definite answers to the relevance of leverage in the propagation of financial crises
- Scarce attention has been paid to the *overall* leverage behavior of financial institutions

Aim of the paper

We investigate the overall leverage of US ‘too-big-to-fail’ commercial banks before and after 2007, when the crisis erupted, and to what extent leverage affected the stability of the financial system.



Main types of leverage

On-balance-sheet leverage: the use of debt as a supplement of bank equity capital in financing an investment. This type of leverage maps the riskiness of an asset position into the corresponding riskiness of its on-balance-sheet equity stake.

Off-balance-sheet leverage: commercial banks often transfer some part of their leverage and thus of their risk, off their balance sheets through securitization and other modern financial activities. The risk, however, still burdens the sponsoring banks as investors in conduits and SIVs would return the assets back to the bank once they suffered a loss.



Main types of leverage (cont.)

Short-term leverage: Short-term debt has been relatively cheap for commercial banks, compared to long-term debt. But short-term borrowing can cause serious liquidity problems, especially in case of financial distress: the funding of long-term investments through short-term securitized debt widens maturity and liquidity gaps, making banks much more vulnerable to runs. Moreover, when the asset growth at banks is funded with short term debt, the funding risk is increased due to the higher volatility of these funding sources compared to more stable retail deposits.



Leverage and financial stability

Leverage can be potentially harmful for financial stability:

- In the case of economy-wide financial turmoil, highly leveraged firms are more likely to fall into financial distress, thus worsening their performance.
- In case of over-leverage, rapid and simultaneous unwinding of leveraged positions of financial institutions triggered by an adverse event (like the adverse price movements in the sub-prime sector of the securitized US mortgage market) can seriously threaten the soundness of the system.
- Reverse leverage (the phenomenon in which financial intermediaries all together attempt to shrink their balance sheets by reducing their debt) puts additional downward pressure on financial markets, especially in a system that consists of highly leveraged institutions. Any serious fall in asset prices or any cut in cash flows can exert reverse leverage effects on the system.

Empirical analysis

$$Y_{iq} = \alpha_{iq} + \sum \beta_k lev_{iq,k} + \sum \gamma_m x_{iq,m} + \varepsilon_{iq}, \quad i = 1, 2, \dots, N=17; \quad q=2002q1, 2002q2, \dots, Q=2009q3$$

$k=6$ (the total number of leverage variable measures)
 $m=7$ (the total number of control variables)

where:

Y_{iq} stands for the risk variables:

- joint insolvency risk measured as the average Z-score of the sample banks
- total bank risk-taking calculated as the quarterly standard deviation of each sample bank's weekly stock market returns

$lev_{iq,k}$ includes all different measures of leverage:

- 3 proxies for banks' on-balance-sheet leverage
- off-balance-sheet leverage
- embedded leverage
- short-term leverage



Empirical analysis (cont.)

$x_{iq,m}$ represents the vector of the bank-specific and macroeconomic control variables:

- 2 measures of credit risk
- interest-rate risk
- operating leverage
- asset composition
- liabilities composition
- economic growth

ε_{iq} is the regression error term

the vectors α , β , γ contain the parameters of interest to be estimated



Empirical analysis (cont.)

Data set: 17 largest US commercial banks as reported by the Federal Reserve Board (about 60% of total assets)

Data period: 2002q1-2009q3, divided into two sub-periods: 2002q1-2007q2 that includes the years before the outbreak of the crisis, which were characterized by stable financial conditions and strong economic expansion; 2007q3-2009q3 that refers to the crisis period in which financial turbulence and economic recession prevailed.

Data sources: FDIC Reports on Condition and Income (Call Reports), Office of the Comptroller of the Currency (OCC), Thomson Reuters Datastream, Bureau of Economic Analysis, US Department of Labor

Empirical analysis (cont.)

Appendix I: Sample of banks

- | | |
|-------------------------------|----------------------------------|
| 1. BANK OF NA | 10. SUNTRUST BANK |
| 2. JP MORGAN CHASE BANK | 11. PNC BANK NATIONAL ASSN |
| 3. CITIBANK NATIONAL ASSN | 12. WACHOVIA BANK NATIONAL ASSN |
| 4. US BANK NA | 13. NATIONAL CITY BANK (OH) |
| 5. WELLS BANK NA | 14. LASALLE BANK NATIONAL ASSN |
| 6. BANK OF NEW YORK | 15. MELLON BANK NATIONAL ASSN |
| 7. HSBC BANK | 16. FIRST TENNESSE BANK NAT ASSN |
| 8. STATE STREET BANK&TRUST CO | 17. NORTHERN TRUST & CO |
| 9. KEYBANK NATIONAL ASSN | |

Regression results: Tables 1&2

A. Pre-Crisis period: 2002q1-2007q2

Variable	Coefficient	t-statistic	Variable	Coefficient	t-statistic
DepVar: Z-index			DepVar: Z-index		
<i>LEVI</i>	31.82	0.32	<i>LEVI</i>	20.59	0.20
<i>EMBEDLEV</i>	-0.11	-1.00	<i>OBSLEV</i>	131.42	0.29
<i>SHORTLEV</i>	-164.89*	-1.91	<i>SHORTLEV</i>	-160.33*	-1.84
<i>CREDRISK1</i>	-7340.21	-0.19	<i>CREDRISK1</i>	-8022.71	-0.21
<i>INTRISK</i>	-10570.64***	-3.26	<i>INTRISK</i>	-10381.86***	-3.20
<i>ASSETCOMP</i>	-418.75	-0.44	<i>ASSETCOMP</i>	-358.57	-0.35
<i>LIABCOMP</i>	-1836.34	-0.37	<i>LIABCOMP</i>	-2724.64	-0.51
<i>LGDP</i>	57542.21***	5.35	<i>LGDP</i>	56332.48***	4.99

Regression results: Tables 3&4

A. Pre-Crisis period: 2002q1-2007q2 (cont.)

Variable	Coefficient	t-statistic
DepVar: Total Risk		
<i>LEV1</i>	0.07***	2.76
<i>EMBEDLEV</i>	0.00	-0.96
<i>SHORTLEV</i>	-0.02	-0.78
<i>CREDRISK1</i>	20.24*	1.86
<i>INTRISK</i>	0.36	0.42
<i>ASSETCOMP</i>	-0.86***	-3.04
<i>LIABCOMP</i>	1.50	0.95
<i>LGDP</i>	-11.82***	-3.80

Variable	Coefficient	t-statistic
DepVar: Total Risk		
<i>LEV2</i>	1.52*	1.79
<i>OBSLEV</i>	3.57*	1.84
<i>SHORTLEV</i>	0.00	-0.09
<i>CREDRISK1</i>	21.07**	2.01
<i>INTRISK</i>	0.37	0.43
<i>ASSETCOMP</i>	-1.04***	-3.49
<i>LIABCOMP</i>	0.32	0.22
<i>LGDP</i>	-15.47***	-5.30



Regression results

A. Pre-Crisis period: 2002q1-2007q2 (cont.)

- short-term leverage increases systemic risk potential
- market turmoil as reflected in the increased level of interest rate risk increases systemic risk.
- Economic activity reduces both the risk potential and total bank risk
- Total bank risk is increased by on- and off-balance-sheet leverage, *i.e.*, high-levered banks imply a riskier banking system
- Lower quality credits increase total risk
- Asset composition exerts a negative effect on total bank risk, *i.e.*, banks that concentrate on traditional banking activities are in a better position in terms of their risk exposure than those that focus on new financial instruments.

Regression results: Tables 5&6

B. Crisis period: 2007q3-2009q3

Variable	Coefficient	t-statistic	Variable	Coefficient	t-statistic
DepVar: Z-index			DepVar: Z-index		
<i>LEVI</i>	-54.12	-1.10	<i>LEVI</i>	-45.35	-0.94
<i>EMBEDLEV</i>	0.24	0.39	<i>OBSLEV</i>	268.84	0.79
<i>SHORTLEV</i>	14.05	0.21	<i>SHORTLEV</i>	9.79	0.16
<i>CREDRISK1</i>	-23800.45*	-1.92	<i>CREDRISK1</i>	-23337.17**	-1.98
<i>INTRISK</i>	-7551.71***	-10.57	<i>INTRISK</i>	-7515.75***	-10.52
<i>OPERLEV</i>	-28441.01	-1.27	<i>OPERLEV</i>	-29766.93	-1.33
<i>ASSETCOMP</i>	245.20	0.38	<i>ASSETCOMP</i>	258.15	0.44
<i>LIABCOMP</i>	4819.29*	1.82	<i>LIABCOMP</i>	5092.77**	1.98
<i>LGDP</i>	201085.50***	8.27	<i>LGDP</i>	201014.80***	8.30

Regression results: Tables 7&8

B. Crisis period: 2007q3-2009q3 (cont.)

Variable	Coefficient	t-statistic	Variable	Coefficient	t-statistic
DepVar: Total risk			DepVar: Total risk		
<i>LEV3</i>	57.64***	2.51	<i>LEV3</i>	69.11***	2.92
<i>EMBEDLEV</i>	0.00	-0.92	<i>OBSLEV</i>	16.76*	1.92
<i>SHORTLEV</i>	0.20*	1.73	<i>SHORTLEV</i>	- 0.10	-0.90
<i>CREDRISK2</i>	5.17	0.23	<i>CREDRISK2</i>	9.20	0.43
<i>INTRISK</i>	-1.30	-0.88	<i>INTRISK</i>	-1.46	-1.00
<i>OPERLEV</i>	-330.26***	-2.70	<i>OPERLEV</i>	-420.05***	-3.42
<i>ASSETCOMP</i>	-0.12	-0.08	<i>ASSETCOMP</i>	2.64	1.36
<i>LIABCOMP</i>	-1.17	-0.23	<i>LIABCOMP</i>	0.86	0.17
<i>LGDP</i>	43.58	0.86	<i>LGDP</i>	39.31	0.79



B. Crisis period: 2007q3-2009q3 (cont.)

- Systemic risk potential increases in credit risk and interest rate risk
- Traditional banking reduces the likelihood of systemic risk
- Both on- and off-balance-sheet leverage is positively related to total bank risk
- Total risk is also increased by short-term leverage
- Operating leverage has a negative effect on total bank risk



Overall results and policy implications

Leverage contributes to systemic risk potential and to the total risk of the banking sector

Systemically important banks do not maintain a level of leverage that could allow equity capital to act as a buffer, absorbing losses and enabling the business to continue in case of a financial turmoil. Instead, banks accumulate leverage, both on- and off- balance sheet, forcing the system to either fail or consider large-scale bailouts. From the investors' viewpoint, even the most sophisticated ones may tend to underestimate the overall level of an institution's leverage and hence to undervalue risk, as they are not capable of properly pricing the off-balance-sheet leverage.



Overall results and policy implications (cont.)

A positive relationship between short-term leverage and risk

Leverage is one of the main factors responsible for the severe bank liquidity shortages in the crisis era. By largely relying on new financial products before the crisis, banks managed to extend the short-term funding of their medium- and long-term assets. This increased the maturity mismatch raising the probability of bank runs and rendering the financial system more fragile.



Overall results and policy implications (cont.)

Traditional banking activities typically carry less risk than those that are involved with new financial instruments

On the asset side of banks' balance sheets, the replacement of traditional loans with tranches of Asset Backed Securities (ABS), Collateralized Debt Obligations (CDO) and other associated derivatives increases both measures of risk used in our analysis regardless of the specific period examined. Turning to the liability side of the balance sheets, the traditional business of taking deposits from households, which has declined compared to non-interest income business, is found to lower systemic risk potential. All things considered, these findings could play a role in the current discussion about a possible revival of the Glass-Steagall Act.