# Changing Market Perceptions of Who is 'Too Big to Fail' During the Financial Crisis of 2007-2008

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Government Intervention and Moral Hazard in the Financial Sector
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# Motivation

Stern and Feldman (2004) argued that 'Too Big To Fail' support would come into play to prevent spillovers for any U.S. financial firm of great enough complexity or relative size in critical markets such as payments processing, securities settlement, or over the counter derivatives trading.

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This study seeks to quantify investor belief in future government 'To Big To Fail' support via changing price premiums in the securities of large U.S. financial firms during a series of crisis events beginning in the summer of 2007.

# The Moral Hazard Mechanism

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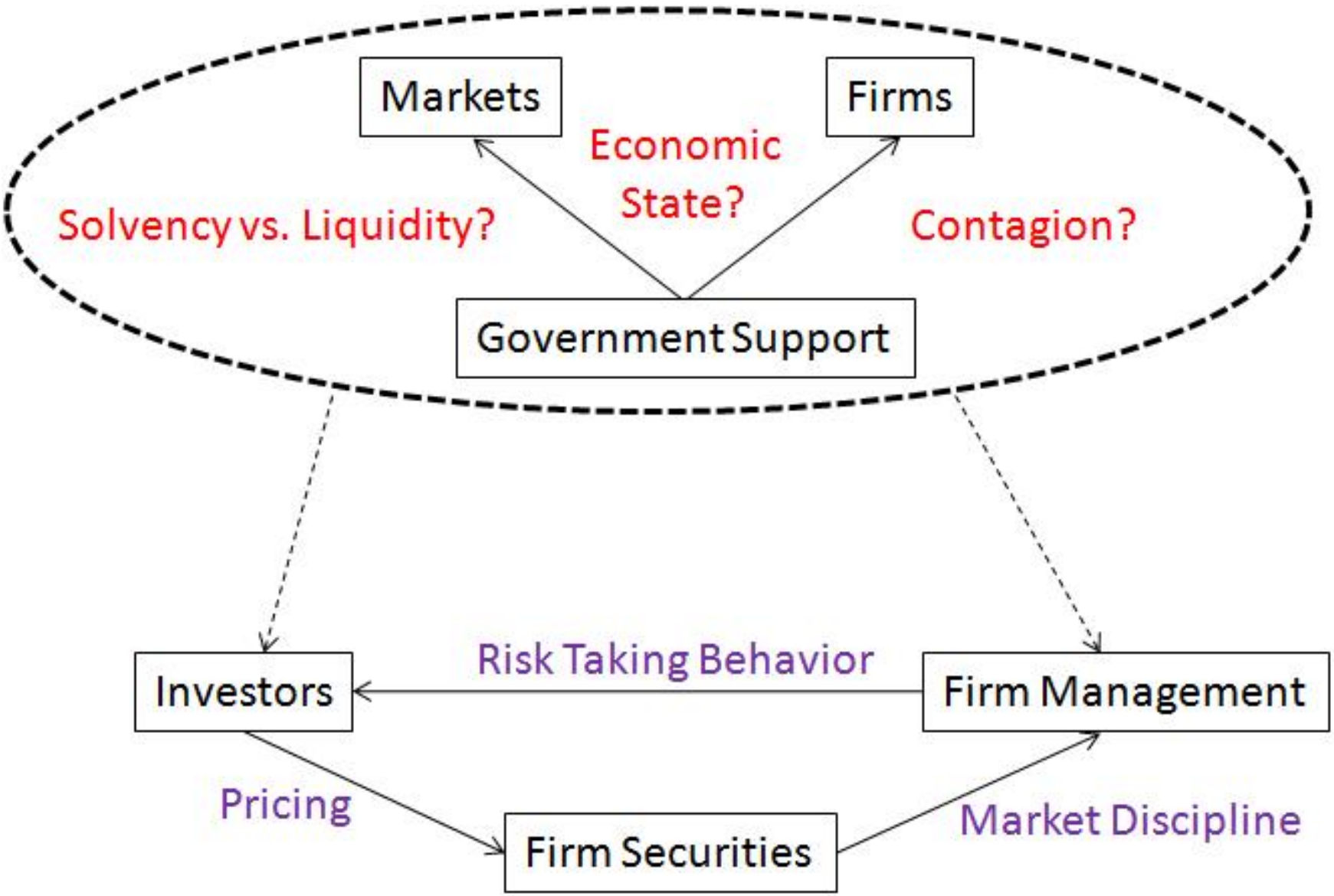
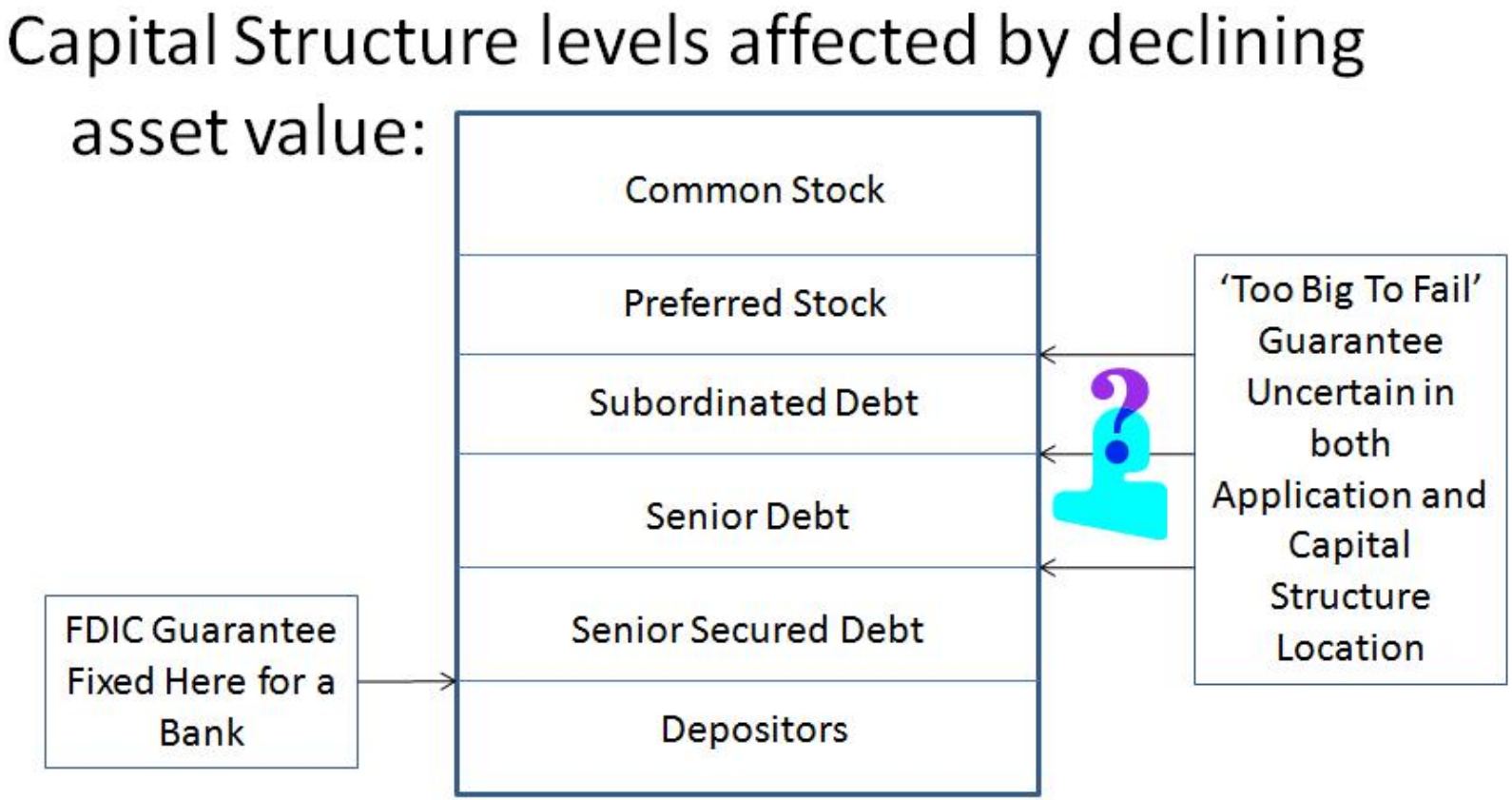


# Government Support of the Firm

Contrast explicit support like deposit insurance with 'Too Big To Fail' support



# Government Support of the Firm in a Merton Model World

Merton (1974) structural model of the firm where assets, $A_0$, underlie a put option the debt holders have sold to the owners of the firm for a promised return premium over what they would have required for an equivalent risk free loan. The value of this put is:

$$\hat{E}[\text{Max}(X - A_T, 0)] \tag{1}$$

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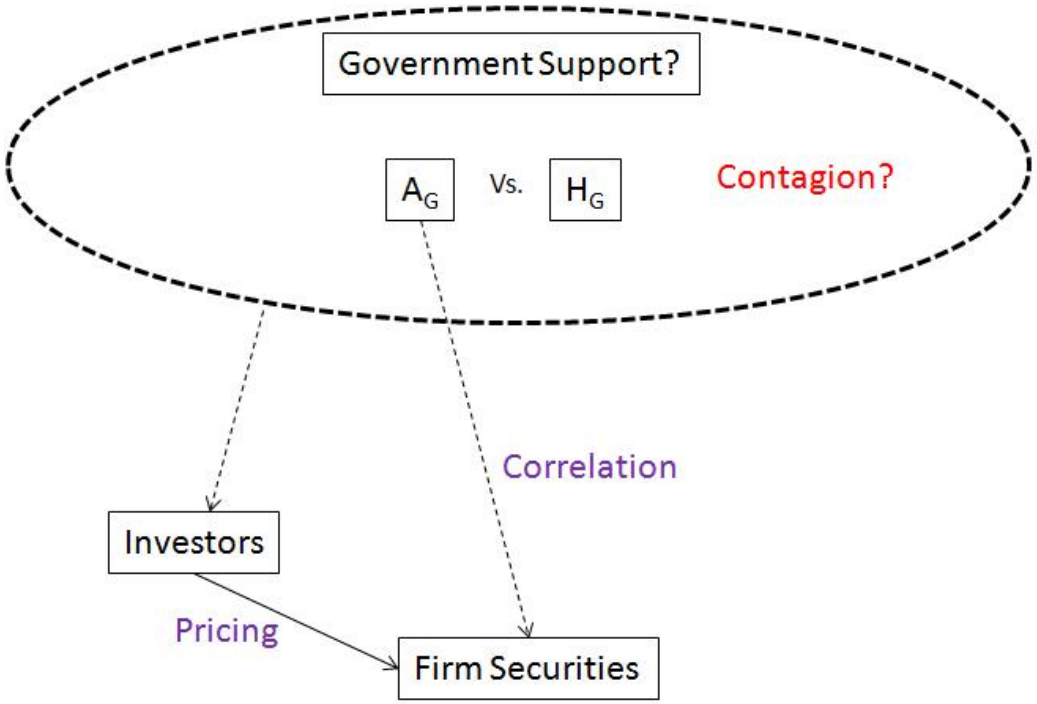
Now introduce a government agent selected and monitored index of systemic firm assets, $A_G$, as well as a boundary point for this index, $H_G$, below which the government agent supports the potential 'Too Big To Fail' firm. The index composition and lower boundary will not be observable to investors. The value of the new put is:

$$\hat{E}[\text{Max}(X - A_T, 0) * 1_{\{A_{G_T} < H_{G_T}\}}] \tag{2}$$

# 'Too Big To Fail' Firm Investor Model

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- How close is the government index to the support barrier?

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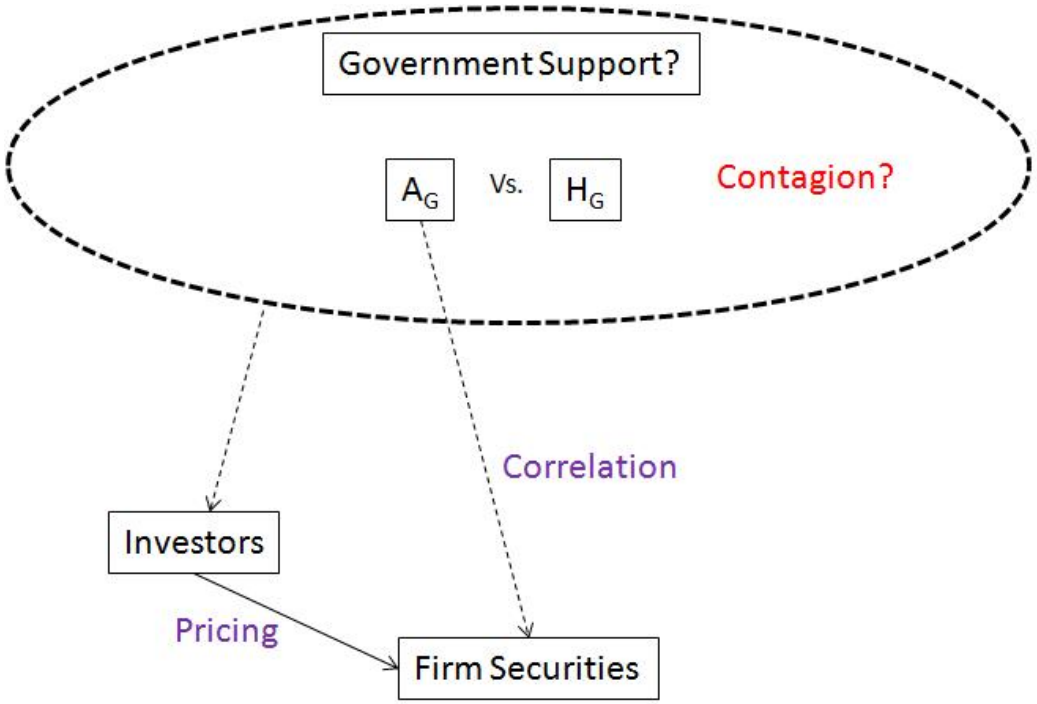


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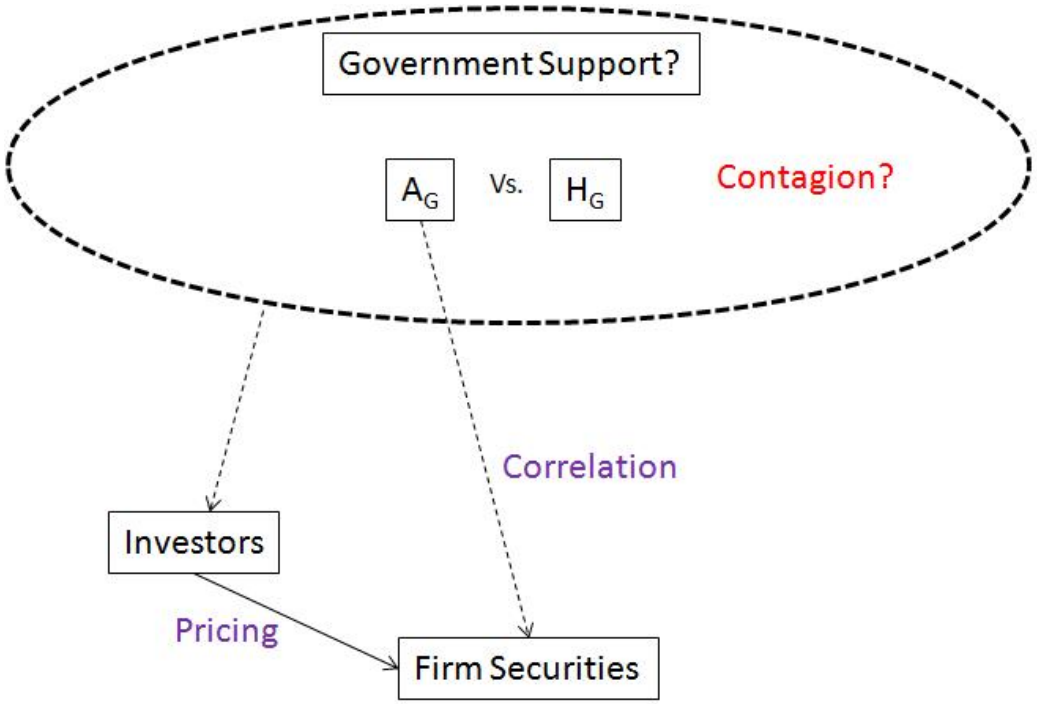
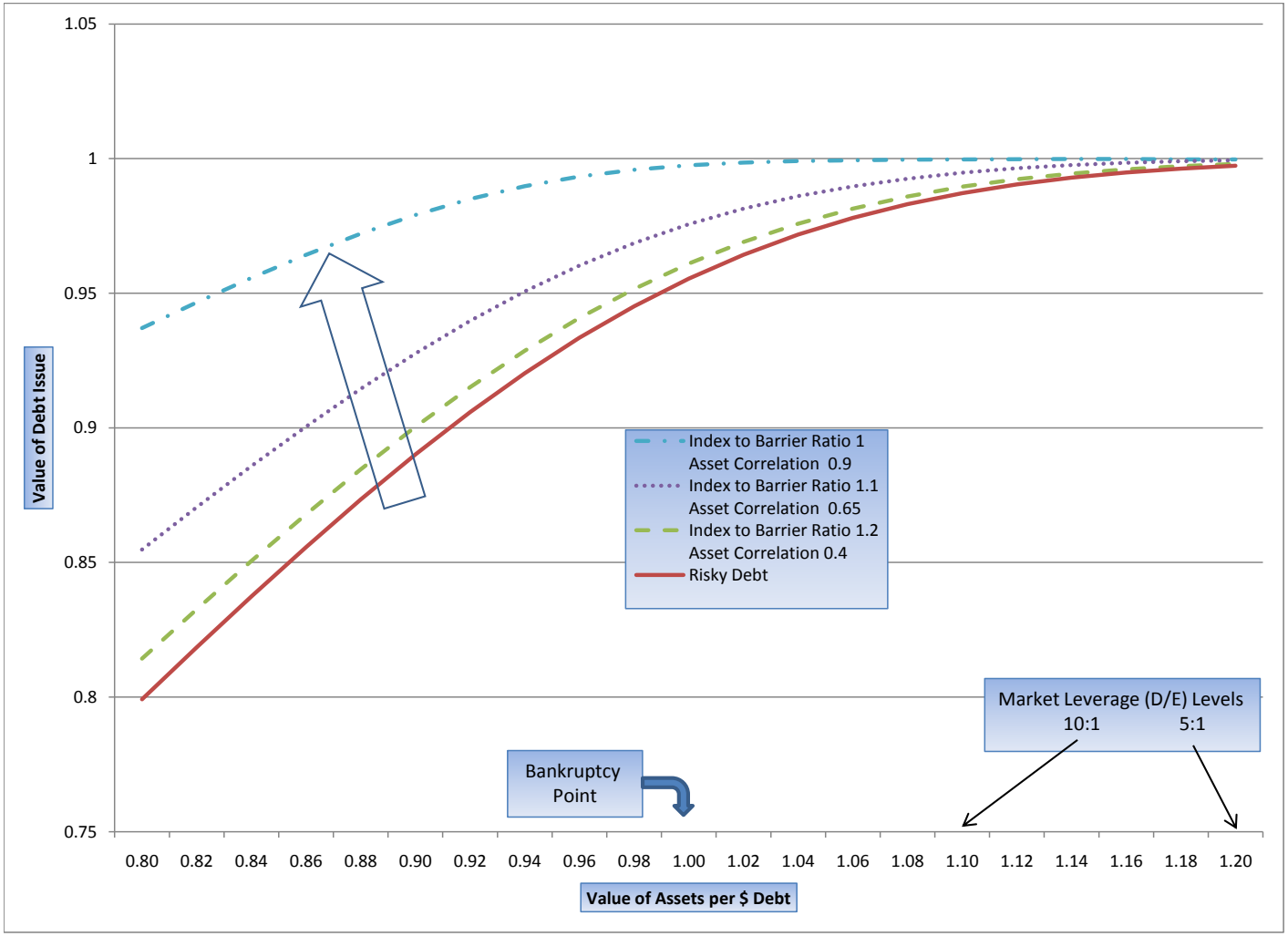



For any given firm, investors will consider:

- How close is the government index to the support barrier?
- How correlated are the firm's assets to those of the government index?
- To what degree do government agents perceive contagion among firms?

# Model Implications for Potential 'Too Big To Fail' Firms



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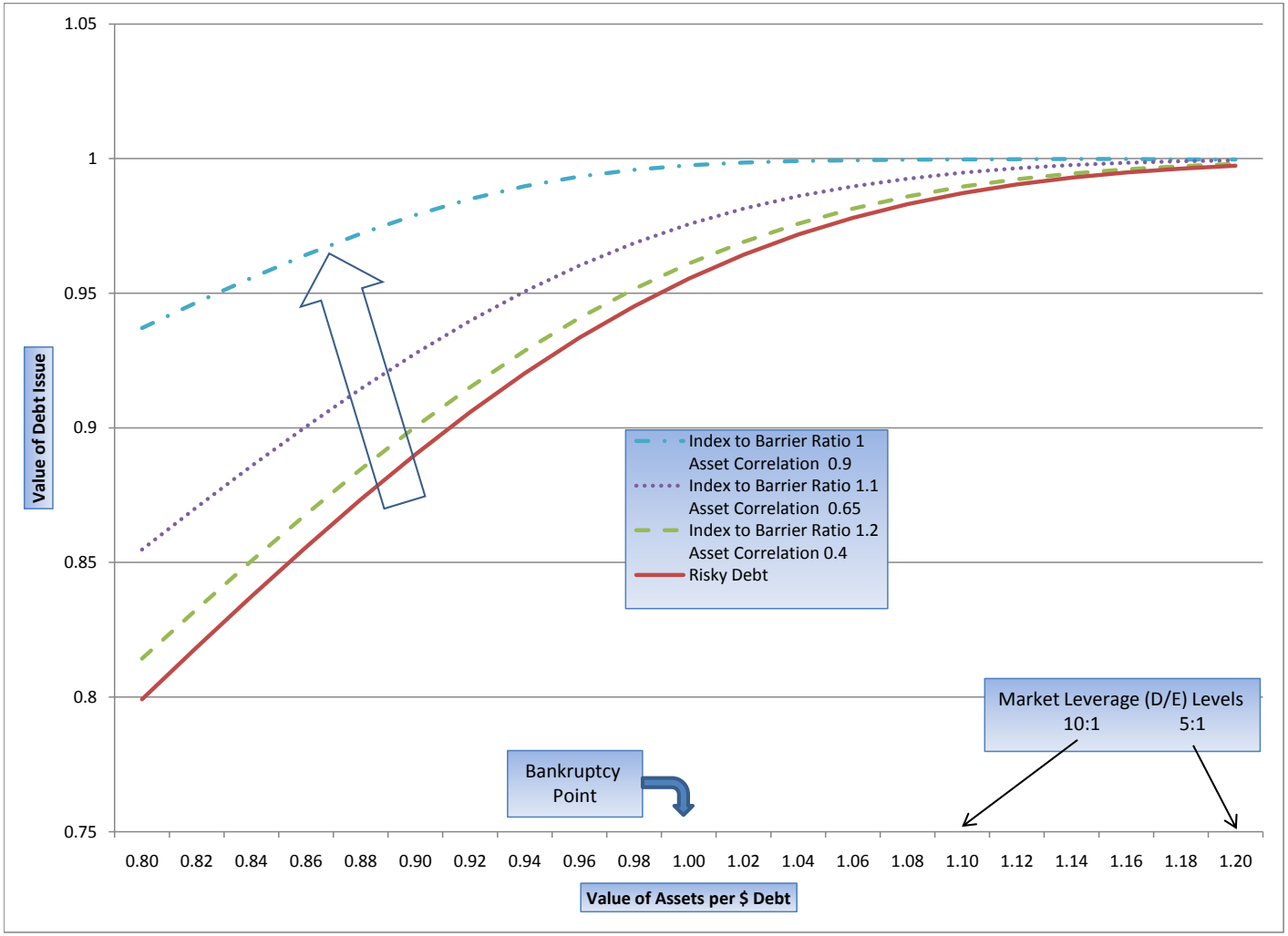


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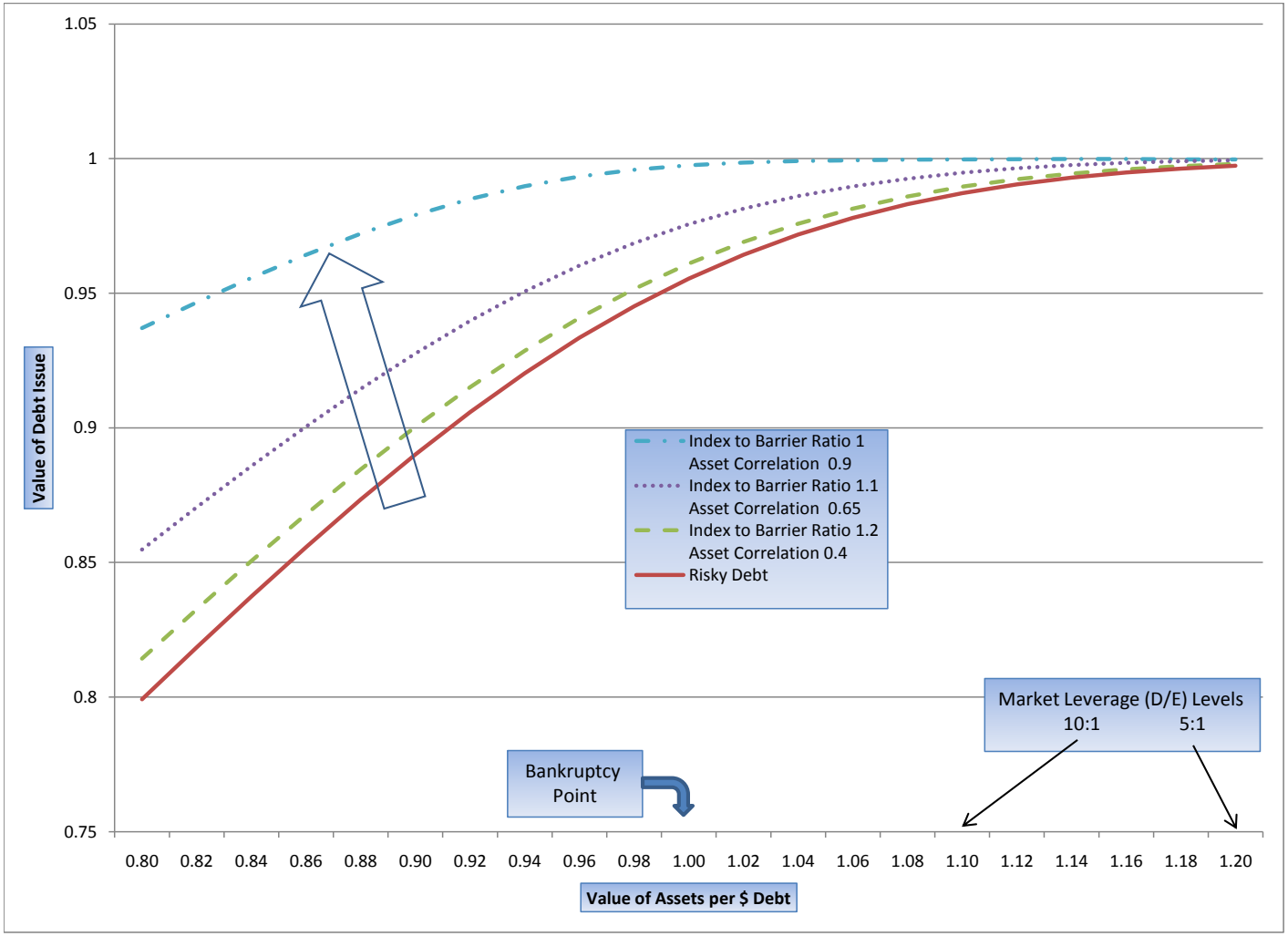


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- Value changes easier to find than steady state levels

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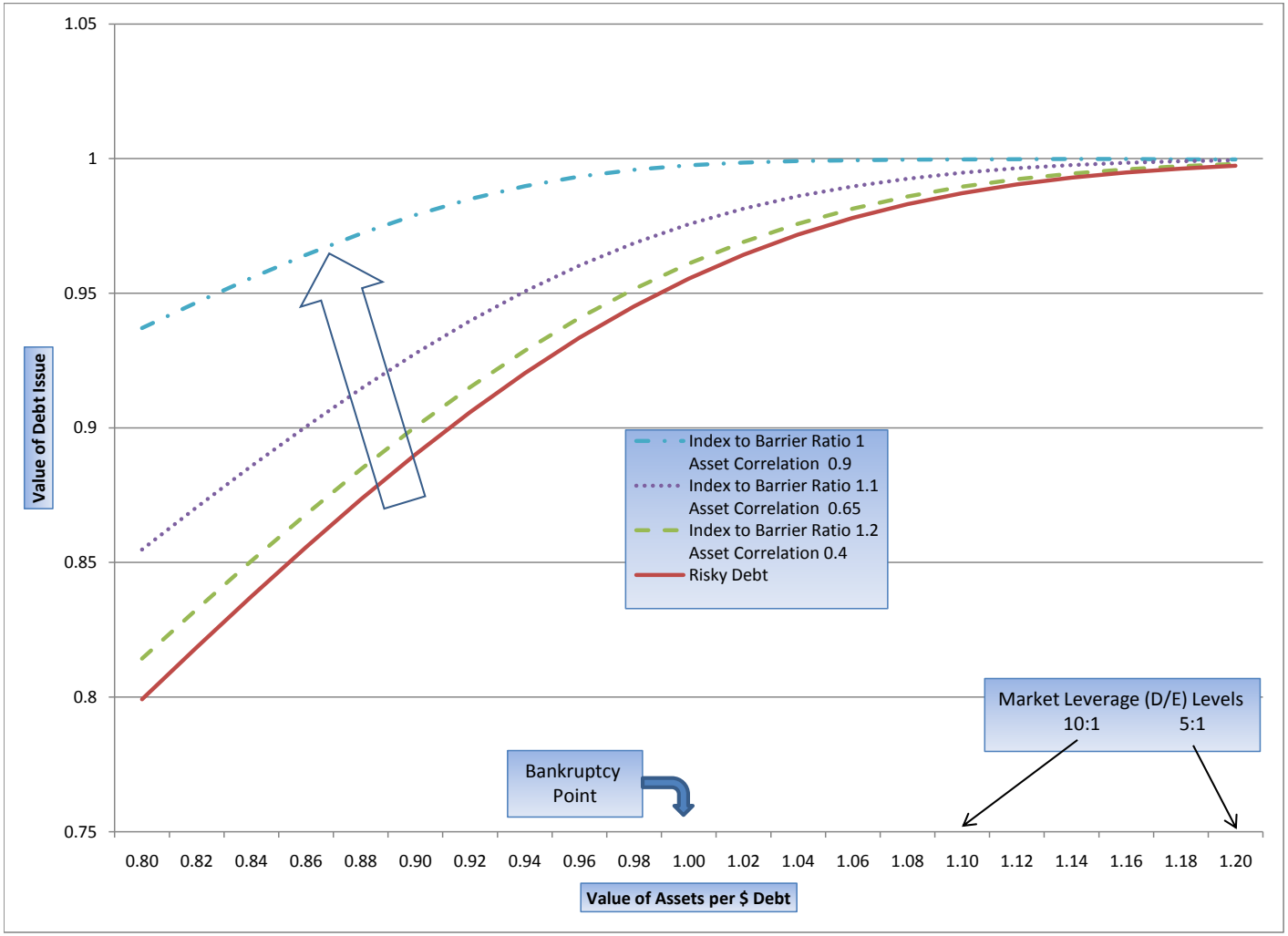


- Option value far from the money in normal economic states
- Value changes easier to find than steady state levels
- Falling asset values lead to rising debt values if investors revise government agent measures

# Identification Strategy

1. Define 'Too Big To Fail' drivers for investors such as
   - Government intervention in markets (TAF, PDCF)
   - International bank bailouts (IKB, Northern Rock)
   - Systemic events or whispered support (Monoline insurers, Countrywide)
   - Direct support of firms (Bear Stearns, Fannie/Freddie, AIG/Lehman)

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2. Review daily financial press over the course of the crisis to look for potential driver events and define their start and end points
3. Perform a series of side by side single large financial firm debt and equity event studies (10) and use firm and market index returns to search for positive actual and abnormal debt returns in the face of declining assets or rising asset volatility to identify investor perceptions of 'Too Big To Fail'
   - 42 U.S. financial firms from Banks, Broker Dealers, P&C Insurers, Life and Health Insurers, Finance firms, Surety firms and the GSEs

# Result 1: 'Too Big To Fail' is an Extension of Deposit Insurance for the Largest Banks

In response to the bailout of IKB Deutschebank (July 27 - August 3, 2007) only the largest U.S. banks displayed actual and abnormal positive debt return premiums:

| | **Equity Returns (bp)** | | | **Debt Returns (bp)** | | | One Yr CDS |
|---|---|---|---|---|---|---|---|
| Industry/Firm | Actual | CAR | p-val | Actual | CAR | p-val | Level (bp) |
| Market Return | -325.4 | | | -50.9 | | | |
| **Banks** | | | | | | | |
| Bank of America | -59.7 | 384.8** | 0.007 | 19.6 | 74.2** | 0.000 | 11.5 |
| Citigroup | -338.6 | 199.5 | 0.255 | 33.0 | 99.1** | 0.000 | 13.5 |
| JP Morgan Chase | -108.5 | 547.9** | 0.002 | 39.1 | 111.7** | 0.000 | 21.6 |
| Wachovia | -659.7 | -159.8 | 0.357 | 34.7 | 97.9** | 0.000 | 14.1 |
| Washington Mutual | -1113.2 | -389.9 | 0.121 | -136.5 | -0.2 | 0.995 | 22.3 |
| Wells Fargo | -260.5 | 275.5 | 0.055 | 11.9 | 60.2** | 0.000 | 20.2 |
| Westpac | -380.8 | -61.4 | 0.793 | -27.3 | -10.4* | 0.021 | 7.9 |

* and ** refer to statistical significance at the 5% and 1% levels, respectively

# Result 2: 'Too Big To Fail' is an Extension of Implicit Government Guarantees for the GSEs

In response to the bailout of Bear Stearns (March 10-17, 2008) only the two GSEs displayed actual and abnormal positive debt return premiums with strong significance:

| | Equity Returns (bp) | | | Debt Returns (bp) | | | One Yr CDS |
|---|---|---|---|---|---|---|---|
| Industry/Firm | Actual | CAR | p-val | Actual | CAR | p-val | Level (bp) |
| Market Return | -186.9 | | | -37.6 | | | |
| **Banks** | | | | | | | |
| Bank of America | -217.0 | 444.8 | 0.092 | -83.4 | -53.9 | 0.330 | 86.7 |
| Citigroup | -1099.5 | -309.0 | 0.371 | -141.7 | -88.8 | 0.258 | 137.3 |
| JP Morgan Chase | 727.1 | 1439.1** | 0.000 | -121.0 | -93.0 | 0.074 | 84.4 |
| Wachovia | -599.7 | 365.8 | 0.405 | 152.0 | 211.8* | 0.048 | 239.0 |
| Washington Mutual | -1376.8 | -173.3 | 0.871 | -169.9 | -73.0 | 0.804 | 1098.6 |
| Wells Fargo | 233.5 | 951.1* | 0.017 | -51.8 | -19.4 | 0.740 | 86.2 |
| Westpac | 513.2 | 812.7 | 0.117 | -76.5 | -44.5 | 0.404 | 52.6 |
| **Surety & GSE** | | | | | | | |
| AMBAC | -4308.3 | -3179.1 | 0.213 | -854.0 | -756.9 | 0.313 | 1997.6 |
| Fannie Mae | -250.6 | 879.5 | 0.383 | 78.5 | 100.1** | 0.001 | 55.6 |
| Freddie Mac | 611.7 | 1895.9 | 0.076 | 88.3 | 113.5** | 0.000 | 58.2 |
| MBIA | -996.9 | 486.1 | 0.813 | -747.8 | -641.8 | 0.314 | 1942.8 |
| MGIC Investment | -486.1 | 636.2 | 0.597 | -21.6 | 56.3 | 0.838 | 1299.8 |
| PMI | -1456.7 | -329.7 | 0.769 | -97.8 | -4.4 | 0.988 | 1248.2 |
| Radian | -1866.6 | -611.6 | 0.666 | -457.8 | -425.9 | 0.173 | 1852.1 |

* and ** refer to statistical significance at the 5% and 1% levels, respectively

# Result 3: Radian Appeared to be 'Too Big To Fail'

In response to the explicit support of Fannie Mae and Freddie Mac (U.S. Treasury Secretary Paulson's Bazooka - July 9-14, 2008) investors embedded a strong expectation of future support to the debt of Radian as well:

| | **Equity Returns (bp)** | | | **Debt Returns (bp)** | | | One Yr CDS |
|---|---|---|---|---|---|---|---|
| Industry/Firm | Actual | CAR | p-val | Actual | CAR | p-val | Level (bp) |
| Market Return | -285.7 | | | 9.8 | | | |
| **Surety & GSE** | | | | | | | |
| AMBAC | -2502.3 | 8436.0** | 0.001 | 92.9 | 1.2 | 0.998 | 1988.1 |
| Fannie Mae | -4479.7 | -2070.3** | 0.007 | 147.3 | 133.6** | 0.000 | 44.3 |
| Freddie Mac | -4719.4 | -2446.8** | 0.002 | 153.1 | 138.8** | 0.000 | 43.6 |
| MBIA | -1620.1 | 5180.5** | 0.000 | 485.5 | 560.9 | 0.335 | 2132.4 |
| MGIC Investment | -4761.7 | -1132.7 | 0.224 | -171.8 | -244.0 | 0.218 | 1294.8 |
| PMI | -2681.6 | 1090.4 | 0.245 | 196.6 | 156.6 | 0.508 | 1794.2 |
| Radian | -4738.6 | -1389.6 | 0.397 | 1399.9 | 1400.4** | 0.008 | 4228.1 |

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# Result 4: The Remaining Broker Dealers were not 'Too Big To Fail'; Government Programs to Intervene in Markets Did Not Lead to 'Too Big To Fail' Expectations

In response to the Bear Stearns rescue (March 10-17, 2008) and the introduction of the PDCF, there was no positive abnormal debt return for other broker dealers:

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| **Broker Dealers** | | | | | | | |
| Bear Stearns | -9314.3 | -9269.6** | 0.000 | 56.5 | 85.3 | 0.619 | 791.7 |
| Goldman Sachs | -570.0 | 65.8 | 0.869 | -46.0 | 12.0 | 0.874 | 171.4 |
| Lehman Brothers | -3154.9 | -2307.0** | 0.003 | -455.5 | -357.0* | 0.018 | 381.6 |
| Merrill Lynch | -891.8 | -85.7 | 0.869 | -198.1 | -119.8 | 0.262 | 304.0 |
| Morgan Stanley | -877.5 | -144.5 | 0.765 | -203.0 | -143.9 | 0.132 | 299.8 |

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The introduction of the TAF (December 12-20, 2007) did not lead to positive abnormal debt returns for the banks:

| | Equity Returns (bp) | | | Debt Returns (bp) | | | One Yr CDS |
|---|---|---|---|---|---|---|---|
| Industry/Firm | Actual | CAR | p-val | Actual | CAR | p-val | Level (bp) |
| Market Return | -133.9 | | | 0.3 | | | |
| **Banks** | | | | | | | |
| Bank of America | -734.2 | -192.7 | 0.323 | -4.0 | -18.9 | 0.601 | 19.4 |
| Citigroup | -1013.4 | -73.9 | 0.795 | 6.1 | -6.0 | 0.887 | 34.9 |
| JP Morgan Chase | -576.8 | 2.3 | 0.993 | -15.1 | -33.7 | 0.395 | 24.0 |
| Wachovia | -792.8 | -67.7 | 0.819 | -81.6 | -85.0 | 0.056 | 36.8 |
| Washington Mutual | -1586.5 | 32.3 | 0.957 | -226.1 | -234.3 | 0.214 | 358.7 |
| Wells Fargo | -139.0 | 578.3 | 0.077 | -54.5 | -69.4 | 0.079 | 34.0 |
| Westpac | -724.4 | -571.6 | 0.123 | 5.7 | 14.9 | 0.513 | 15.8 |

# Result 5: Lehman's Demise was not a Surprise to Investors but AIG's Rescue Was

Behavior of Lehman, Merrill Lynch, and AIG in the events leading to the fateful days of September 15-16, 2008:

| | Equity Returns (bp) | | | Debt Returns (bp) | | | One Yr CDS |
|---|---|---|---|---|---|---|---|
| Industry/Firm | Actual | CAR | p-val | Actual | CAR | p-val | Level (bp) |
| **Bear Stearns Rescue** | | | | | | | |
| **March 10-17, 2008** | | | | | | | |
| Market Return | -133.9 | | | 0.3 | | | |
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| Merrill Lynch | -891.8 | -85.7 | 0.869 | -198.1 | -119.8 | 0.262 | 304.0 |
| AIG | -722.8 | 98.0 | 0.856 | -223.0 | -165.5 | 0.068 | 220.9 |
| **GSE Explicit Support** | | | | | | | |
| **July 9-14, 2008** | | | | | | | |
| Market Return | -285.7 | | | 9.8 | | | |
| Lehman Brothers | -4433.8 | -3029.2** | 0.000 | -401.2 | -477.8** | 0.001 | 495.2 |
| Merrill Lynch | -2104.9 | -44.0 | 0.900 | -224.6 | -248.4* | 0.011 | 328.1 |
| AIG | -1772.5 | -157.3 | 0.673 | -34.5 | -84.2 | 0.224 | 248.5 |
| **GSE Conservatorship** | | | | | | | |
| **Aug 18-Sep 8, 2008** | | | | | | | |
| Market Return | -273.0 | | | -18.8 | | | |
| Lehman Brothers | -1257.6 | -788.8 | 0.620 | -107.1 | 31.3 | 0.891 | 727.0 |
| Merrill Lynch | 484.5 | 695.4 | 0.407 | -66.5 | 10.4 | 0.955 | 401.7 |
| AIG | -13.1 | 182.2 | 0.864 | -534.4 | -405.2** | 0.002 | 370.0 |

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- Most crisis 'Too Big To Fail' findings seemed to be an extension of pre-existing explicit and implicit government insurance policies
- Dramatic expansion of explicit insurance programs is disturbing for the future: Federal Reserve Bank and Thrift Holding company status awarded to remaining broker dealers and applied for by most finance and insurance companies
- Common wisdom that letting Lehman Brothers fail is the *cause* of the worst of the crisis also calls into question any future decision by regulators to let another large financial firm fail during a crisis