Repo Runs: Evidence from the tri-party repo market

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Why care about the U.S. tri-party repo market?

- The tri-party repo market is a key source of financing for dealers
  - Sharp decrease in TPR financing associated with problems at Bear Stearns and Lehman Brothers
- Stress in this market could spill over to broader financial system
- Repo rates are important in price discovery for cash and derivatives instruments
- Market is critical for secondary market liquidity in Treasuries and other collateral—Key role in US Treasury's ability to fund its debt

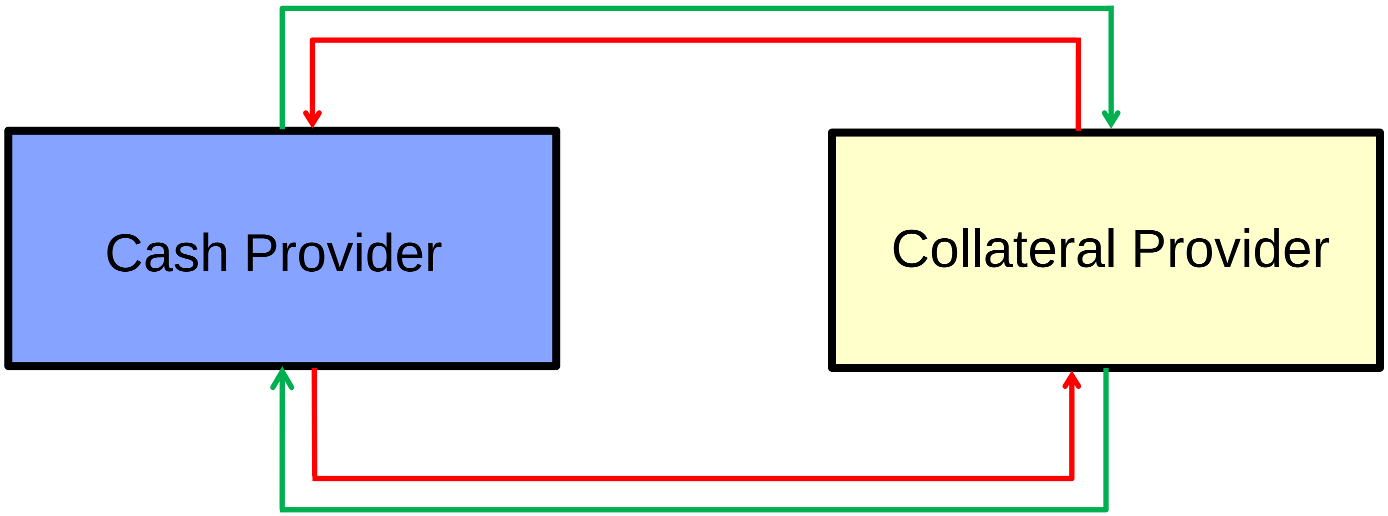
Outline

- Overview of US Tri-party Repo Market
  - What is a repo?
  - Market participants: *Borrowers, lenders and the clearing banks*
  - Key mechanics: Morning unwind
- What happened during the crisis?
  - Haircuts
  - Volume
- Interpretation
  - Why did haircuts in the bilateral repo market increase so much?
  - Why did haircut in the tri-party repo market increase so little?
  - Did different types of runs occur in repo markets?

What is a repo?

- A repo is the sale of a security, coupled with the promise to repurchase the security at a specific future date

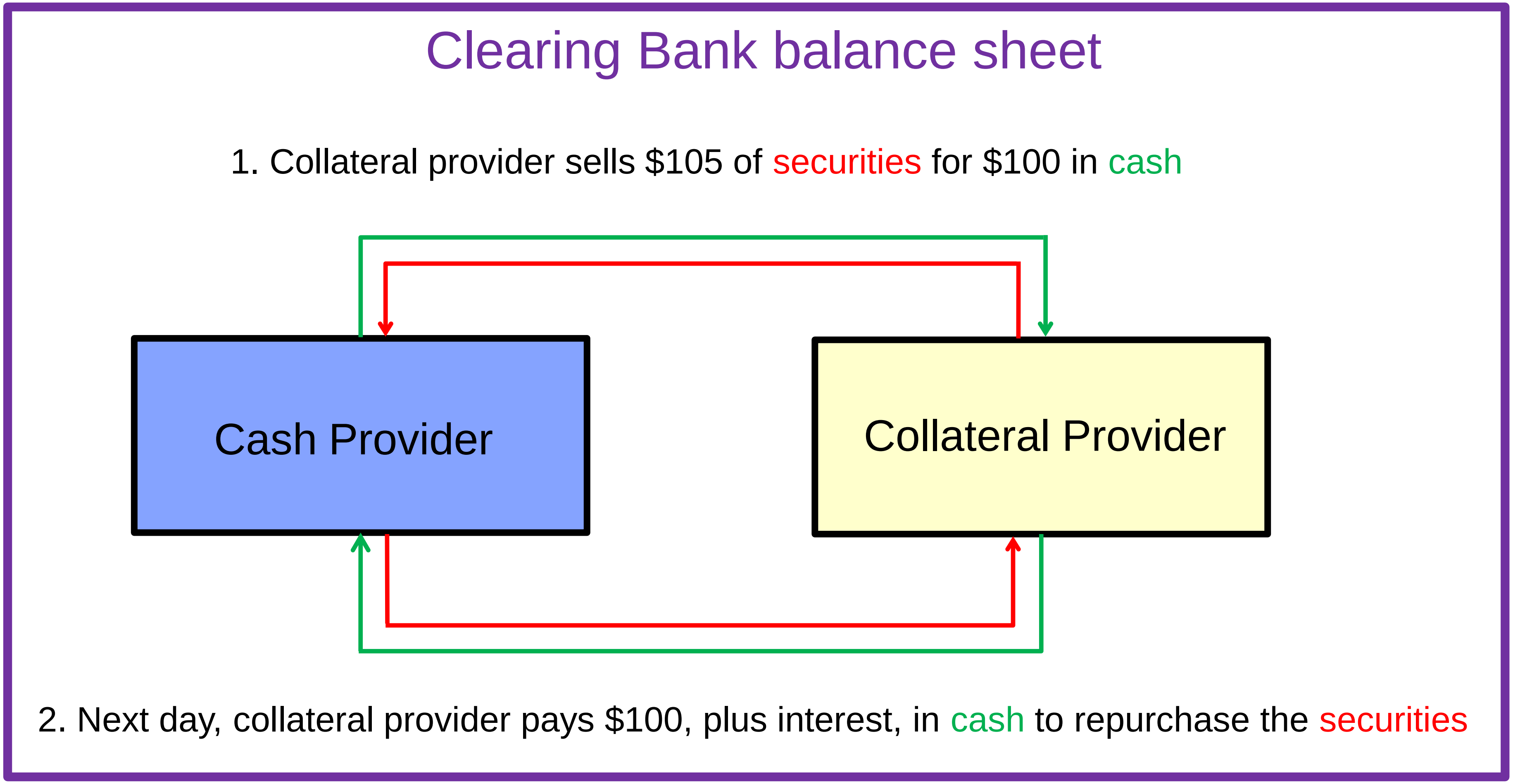
1. Collateral provider sells $105 of securities for $100 in cash



2. Next day, collateral provider pays $100, plus “interest”, in cash to repurchase the securities

What is a tri-party repo?

- In a tri-party repo, a third party called the clearing bank provides collateral management and settlement services



Tri-party Repo Borrowers (or Securities Providers)

- Who are they?
  - Primarily fixed income securities dealers
- Interest in tri-party repo
  - Use tri-party repo to fund their proprietary portfolios and the portfolios of their prime brokerage and other clients; some dealer borrowing is passed on to hedge funds
  - Seek a low cost, stable source of funding
  - Big dealers finance several hundred billions in collateral each day
- Size of market
  - Total collateral posted today is $1.6 T ($2.8 T at peak)
  - Approximately 70 firms between July 2008 and January 2010
  - Concentrated: top 10 account for almost 90%

Tri-party Repo Lenders (or Cash Providers)

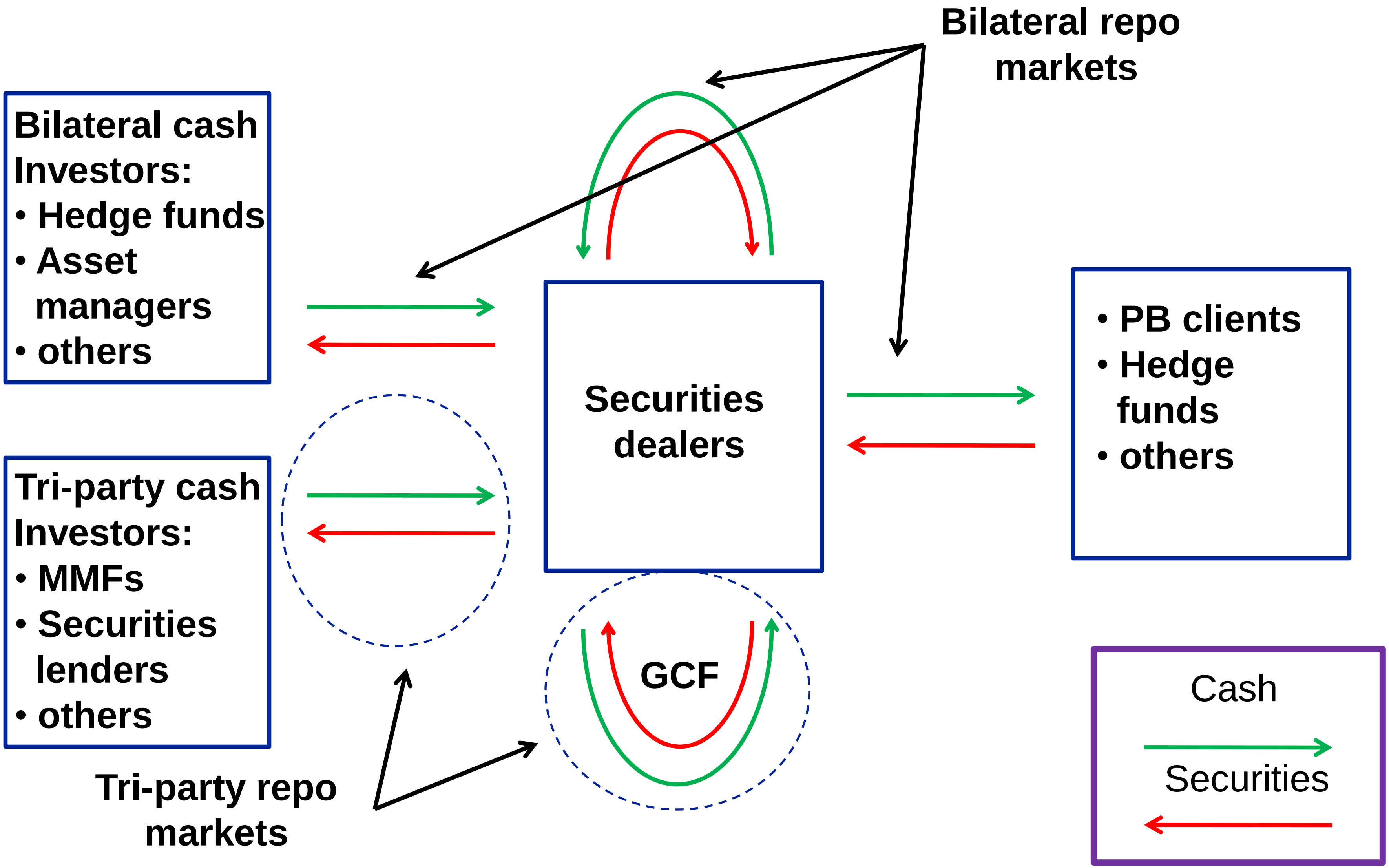
- Who are they?
  - Custodial banks investing cash collateral on behalf of their securities lending clients and MMFs account for over half of the cash invested
  - Thousands of municipalities and individual businesses participate directly, but provide relatively small sums to the market
- Interest in tri-party repo
  - Use tri-party repo to earn a return on invested funds while maximizing liquidity and preserving principal
  - Largest investors provide the market with $100+ billion each day (largest exposure to a single dealer around $20 billion)
- Size of market
  - Over 4,000 firms
  - Concentrated: top 10 account for 60%

The Clearing Banks' Role — *More than Agent*

The two US government securities clearing banks (JPMC and BNYM) play key roles:

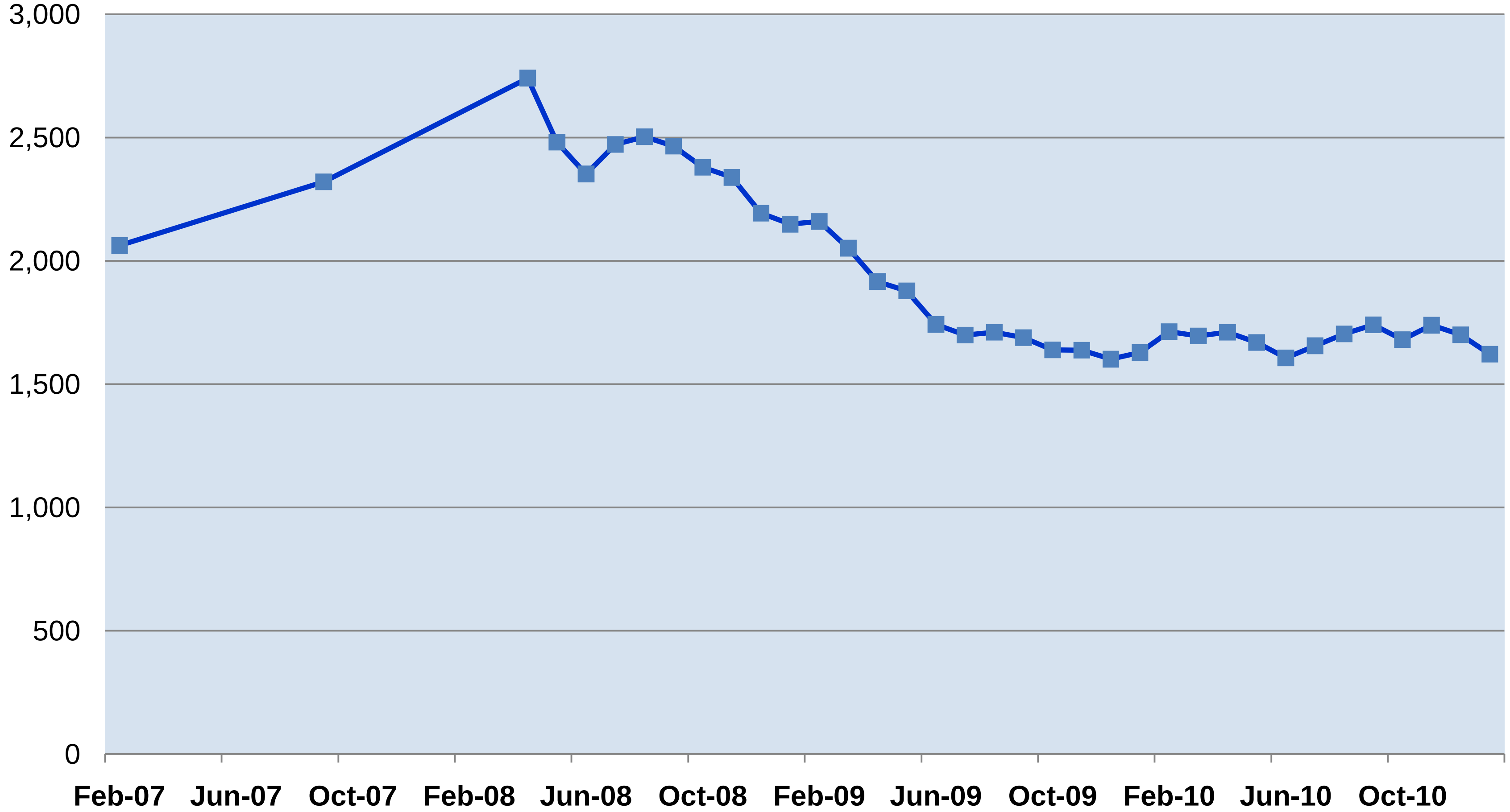
- Role as agent:
  - Settle the repos on their books: Administer the exchange of cash and collateral between investors and dealers and guarantee the availability of collateral in case of default
  - Value and allocate the collateral
- Role as principal:
  - Finance securities during the day to facilitate clearing and settlement activity of dealers
  - The clearing banks secure their intraday exposure by asserting a lien against the dealers' securities

Tri-party and bilateral and repo markets



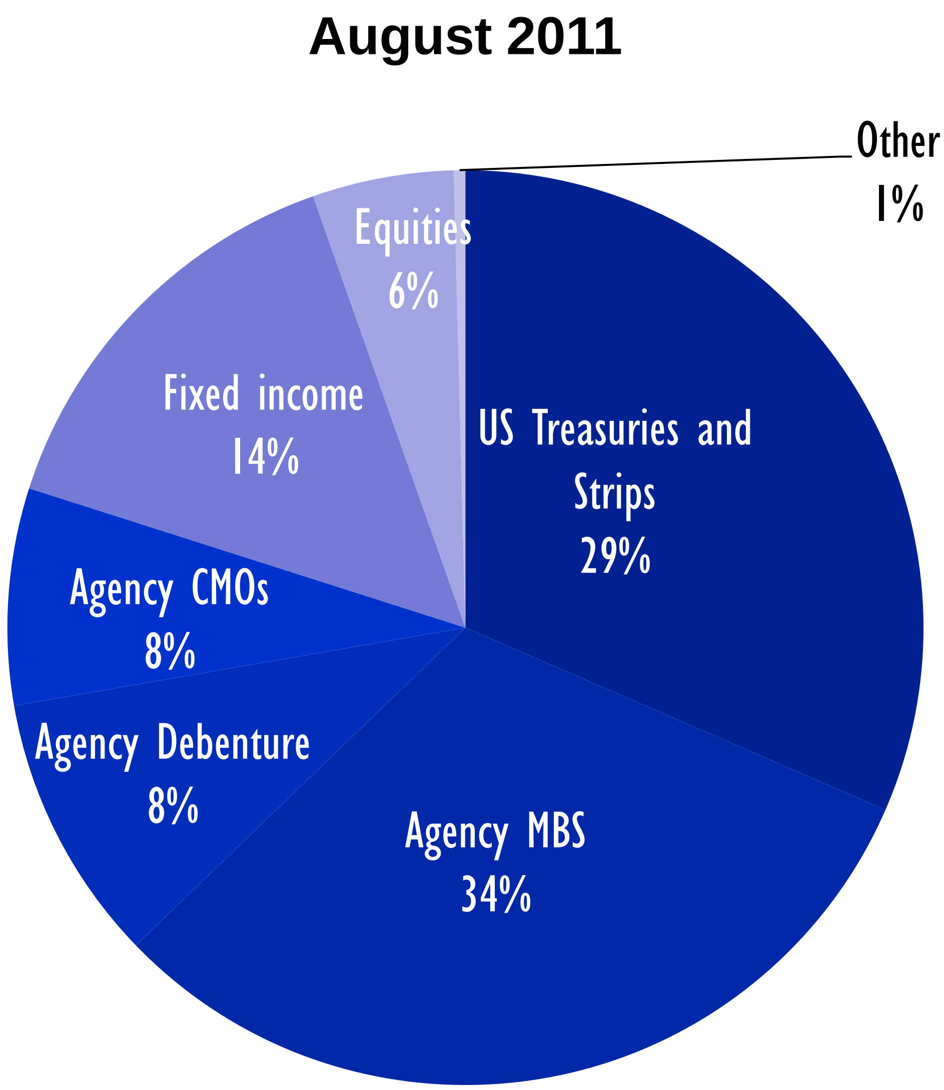
Aggregate Value of Tri-Party Repo Market

($ billions, monthly average)



Source: Bank of New York Mellon and JPMorgan Chase. Limited data provided by clearing banks prior to April 2008. Graph reflects data points provided (markers) and smoothed trend line between them.

Tri-party Repo Collateral



Key mechanics: The “unwind”

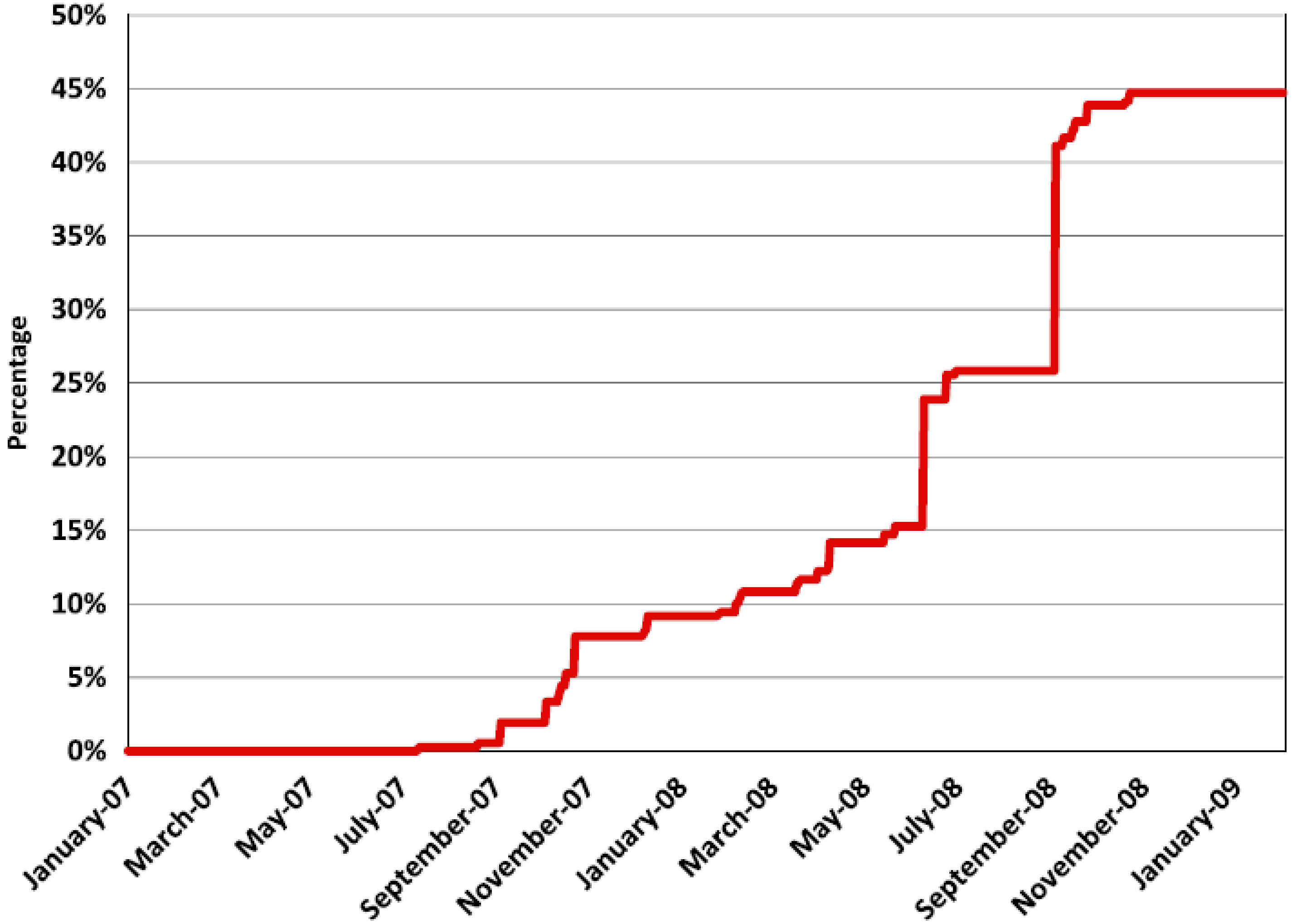
- Before 8:30AM, clearing banks “unwind” **all** repos, maturing or not
- The unwind sends cash back to investors and collateral back dealers
- Term and rolling repos are “rewound” in the afternoon, at the same time as new repos are settled
- Clearing banks extend intraday credit to dealers since securities are no longer financed by cash investors (huge exposure)
- Intraday credit is neither capped nor committed
  - Unwind is at the discretion of clearing banks
  - Not unwinding would likely force a dealer into bankruptcy

What happened during the crisis?

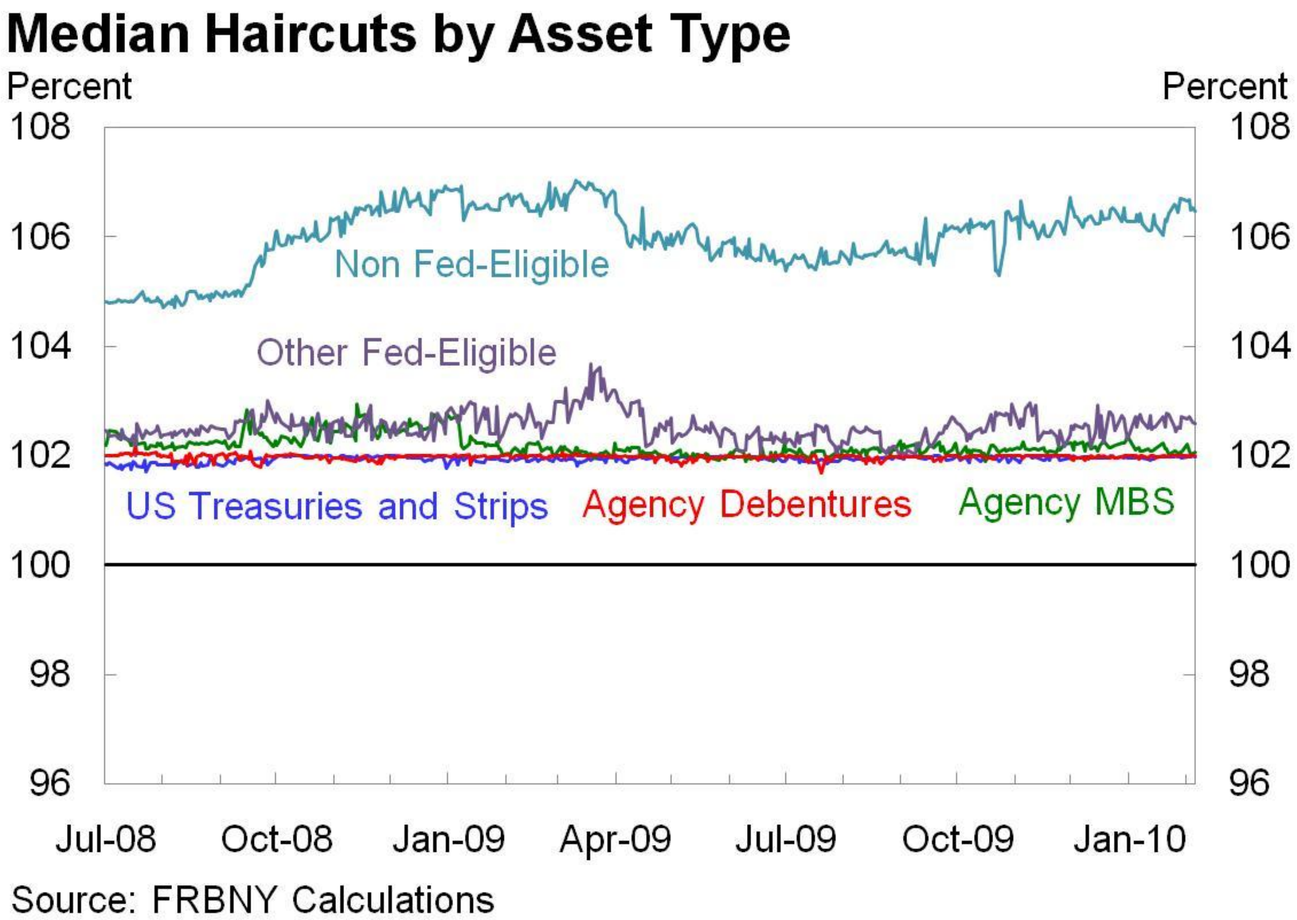
Tri-party and bilateral repo market behaved very differently

- Bilateral repo market:
  - Large increase in margins
- Tri-party repo market:
  - Almost no change in margins
  - In some cases (Bear Stearns, Lehman) precipitous decline in quantities

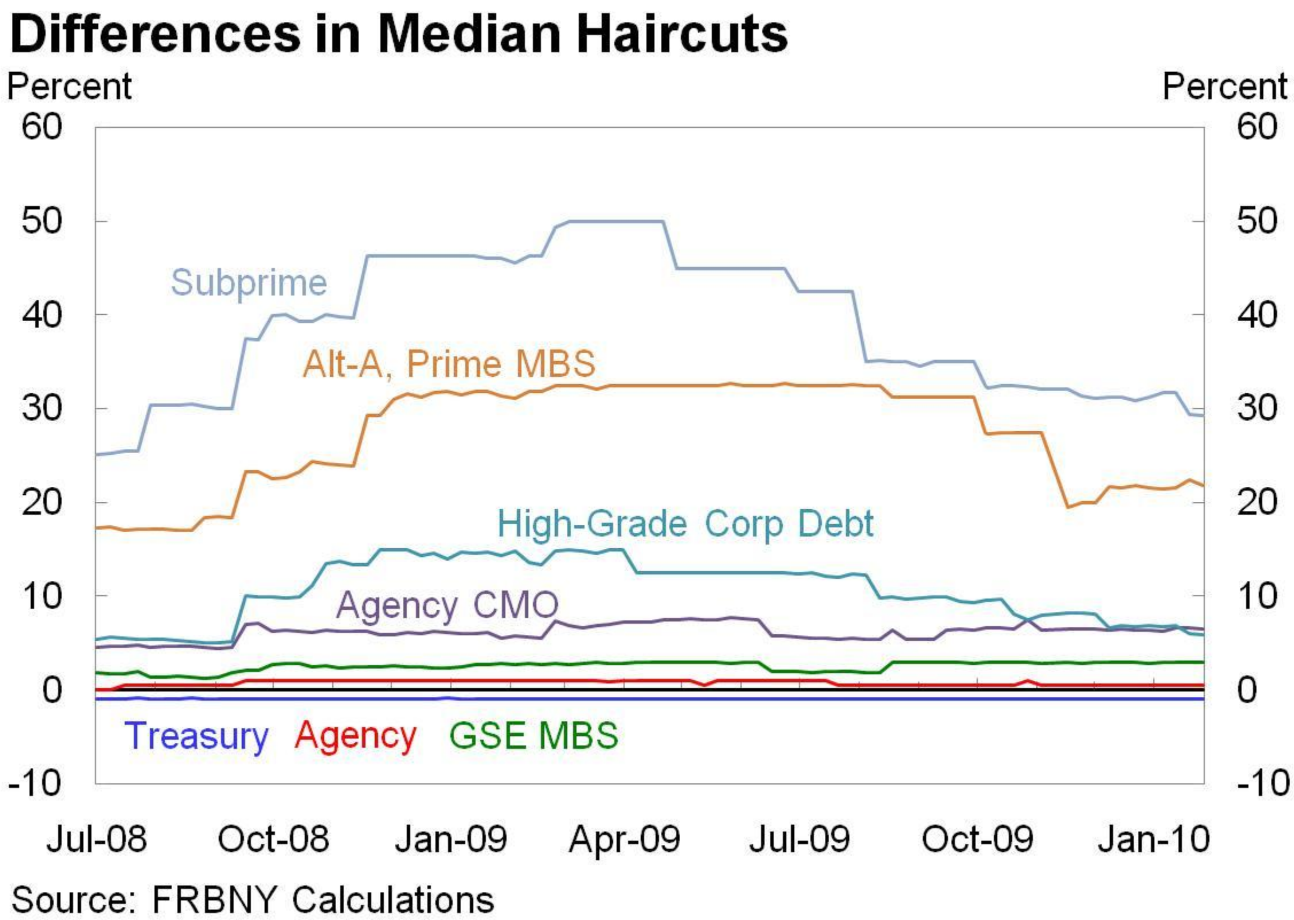
Gorton-Metrick: The (bilateral) repo-haircut index



Repo haircuts: Tri-party



Repo haircuts: Bilateral versus Tri-party

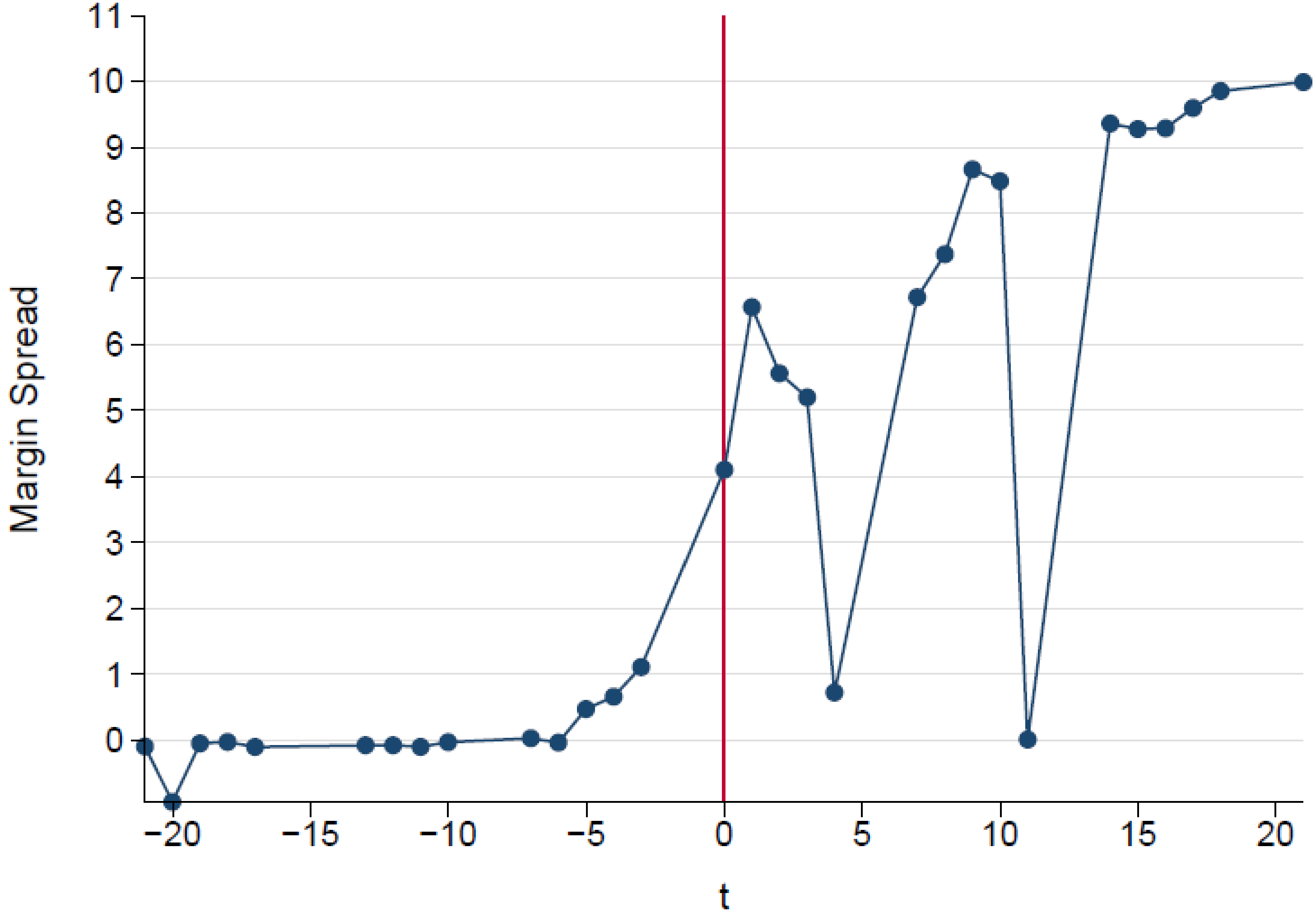


Event studies: Lehman and other stressed dealers

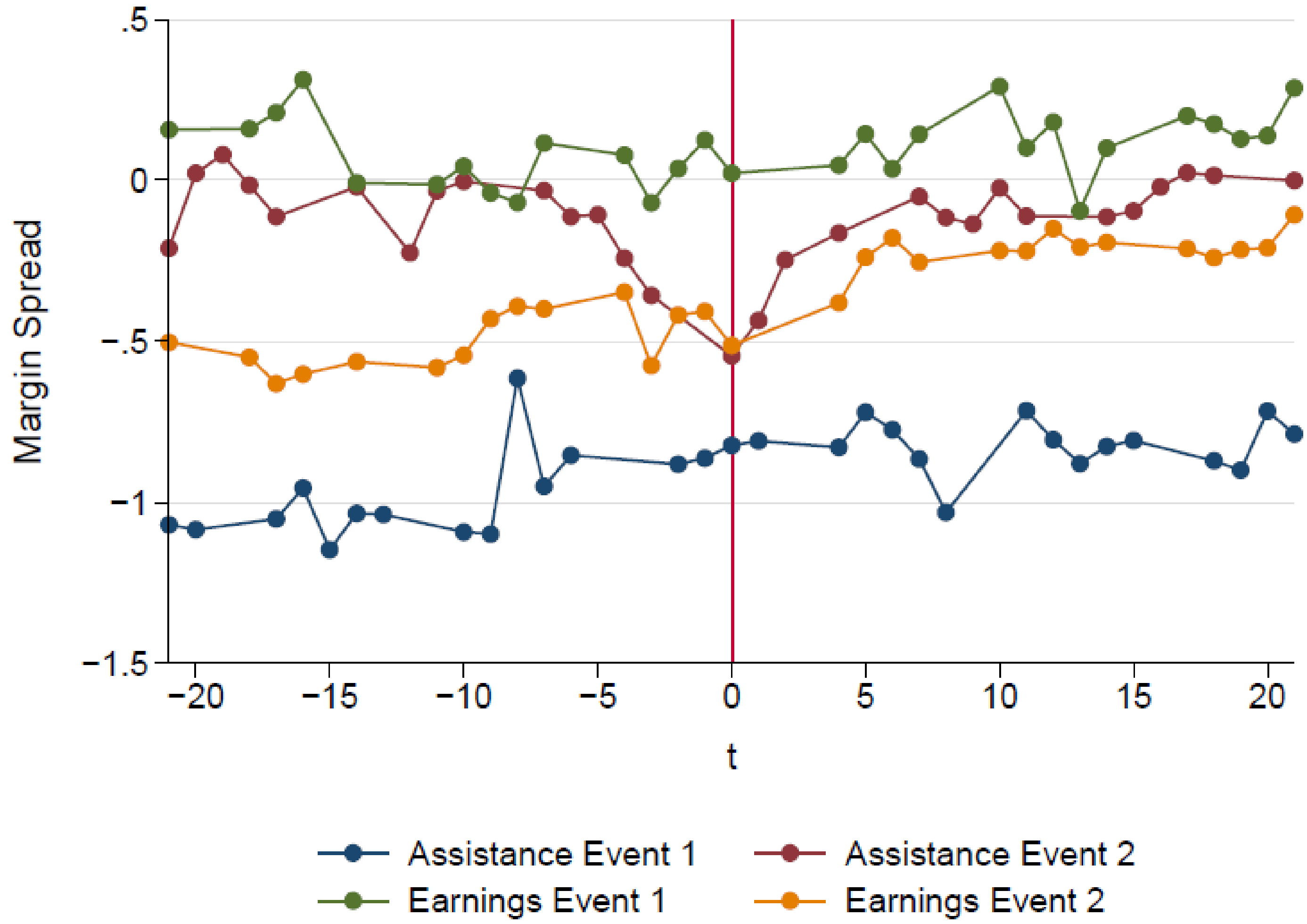
- Compare what happened to Lehman with the case of 4 cases of dealer stress:
  - In 2 cases, we consider dealers who received assistance
  - In 2 cases, we consider dealers who released bad earning reports

- In each case, we look at haircuts and volume

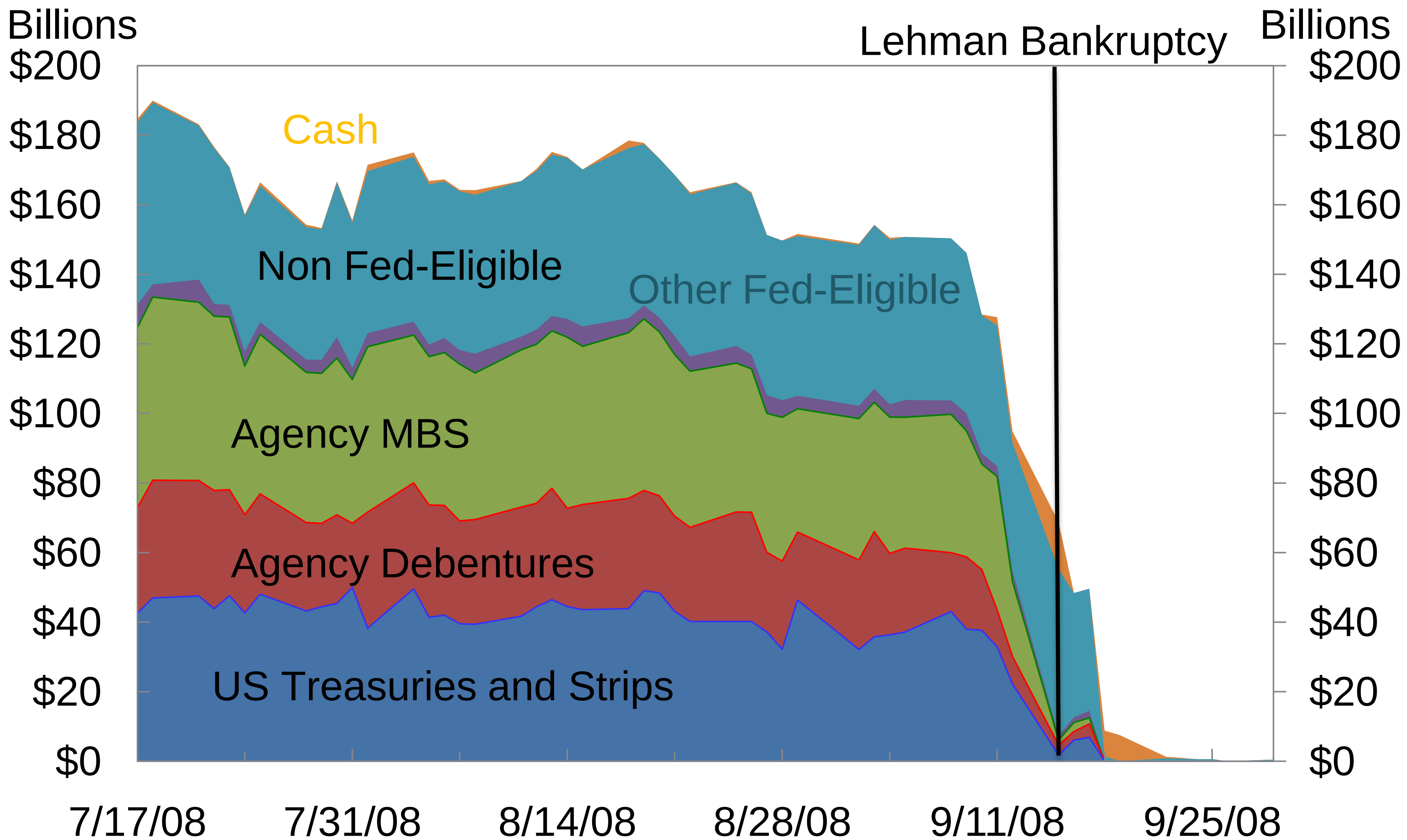
Lehman's haircut



Stressed dealers’ haircut

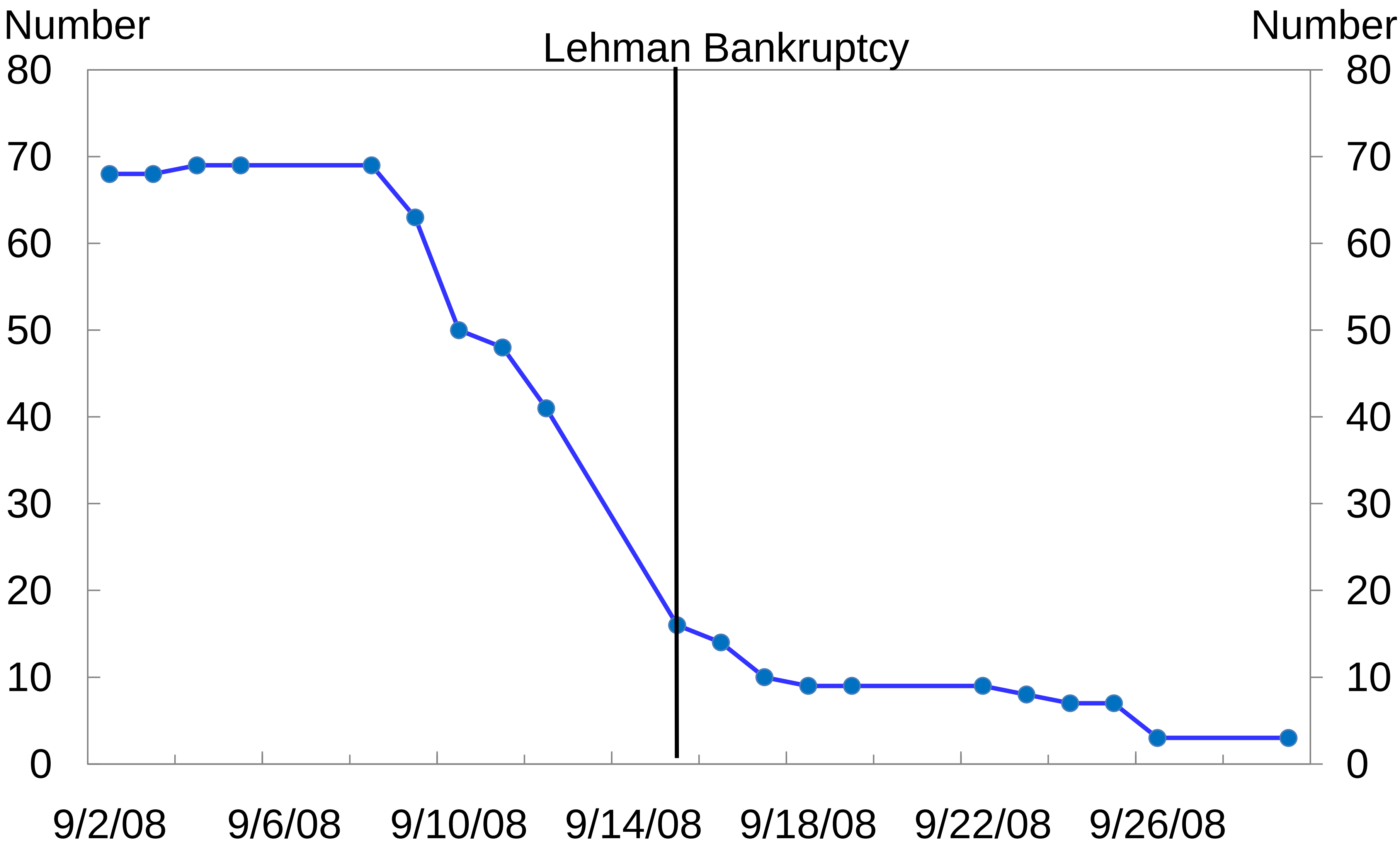


Lehman's tri-party repo book

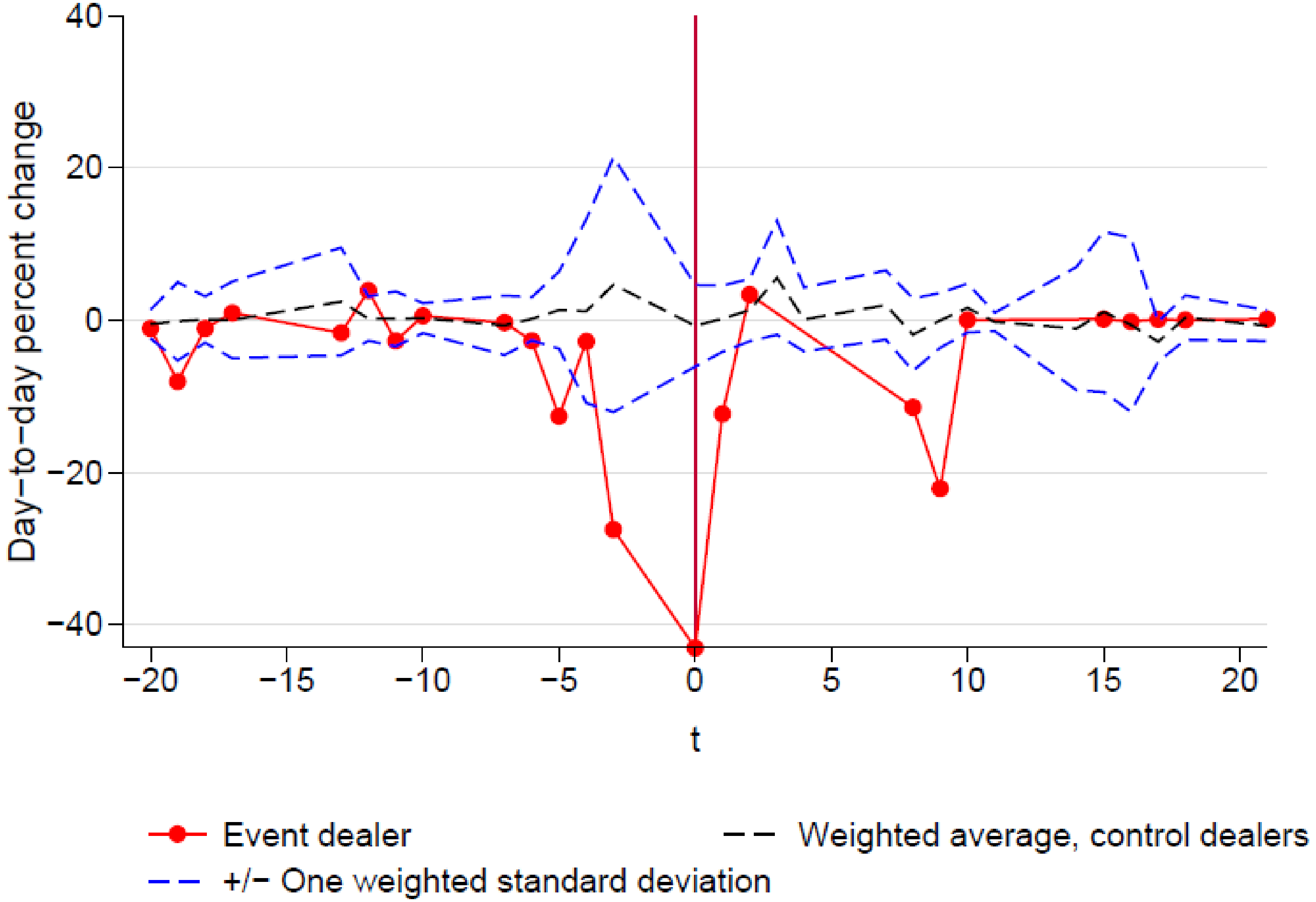


Note: Stacked graph.

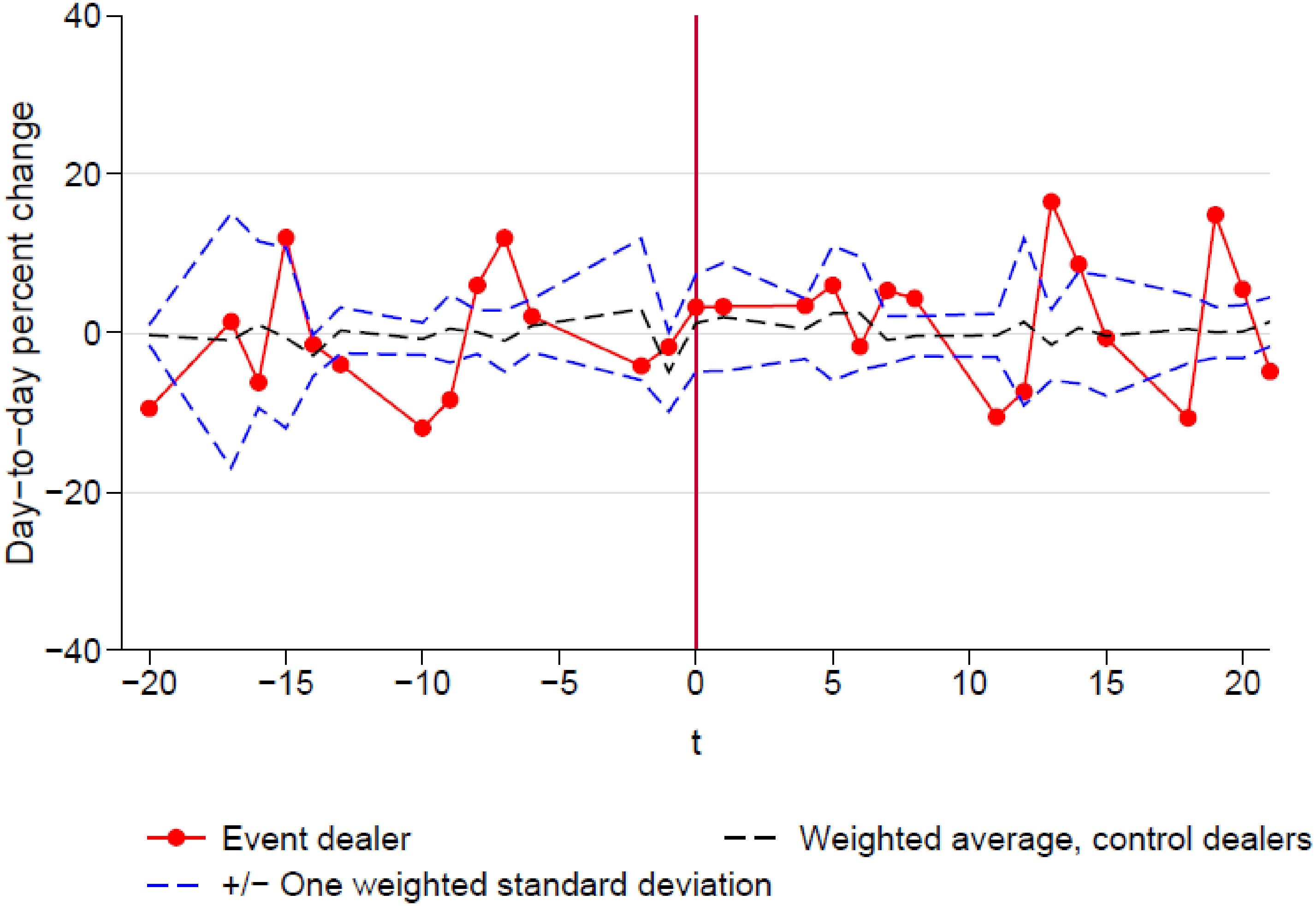
Cash Investors in Lehman Brothers



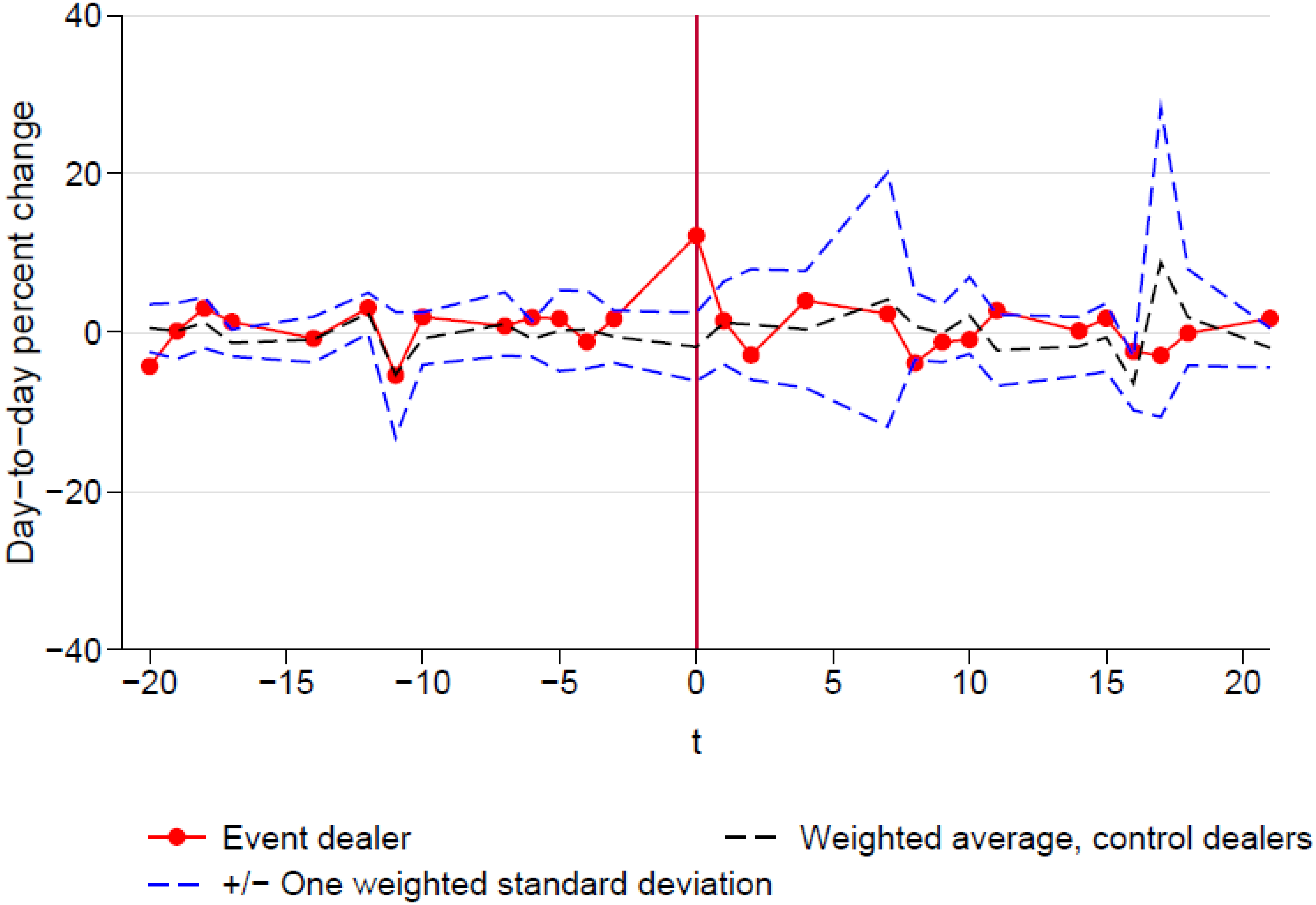
Another perspective on Lehman's book



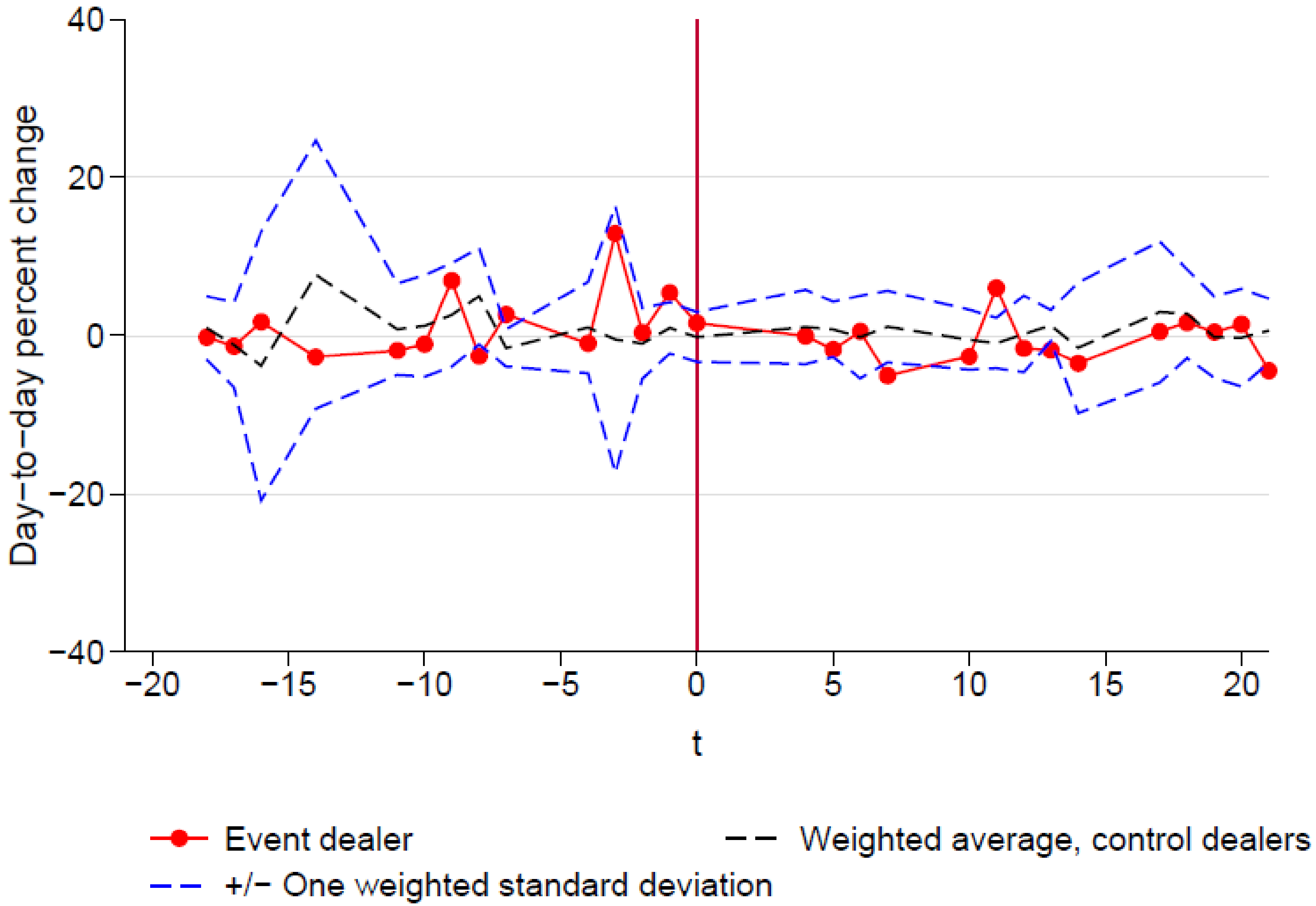
Assistance event 1



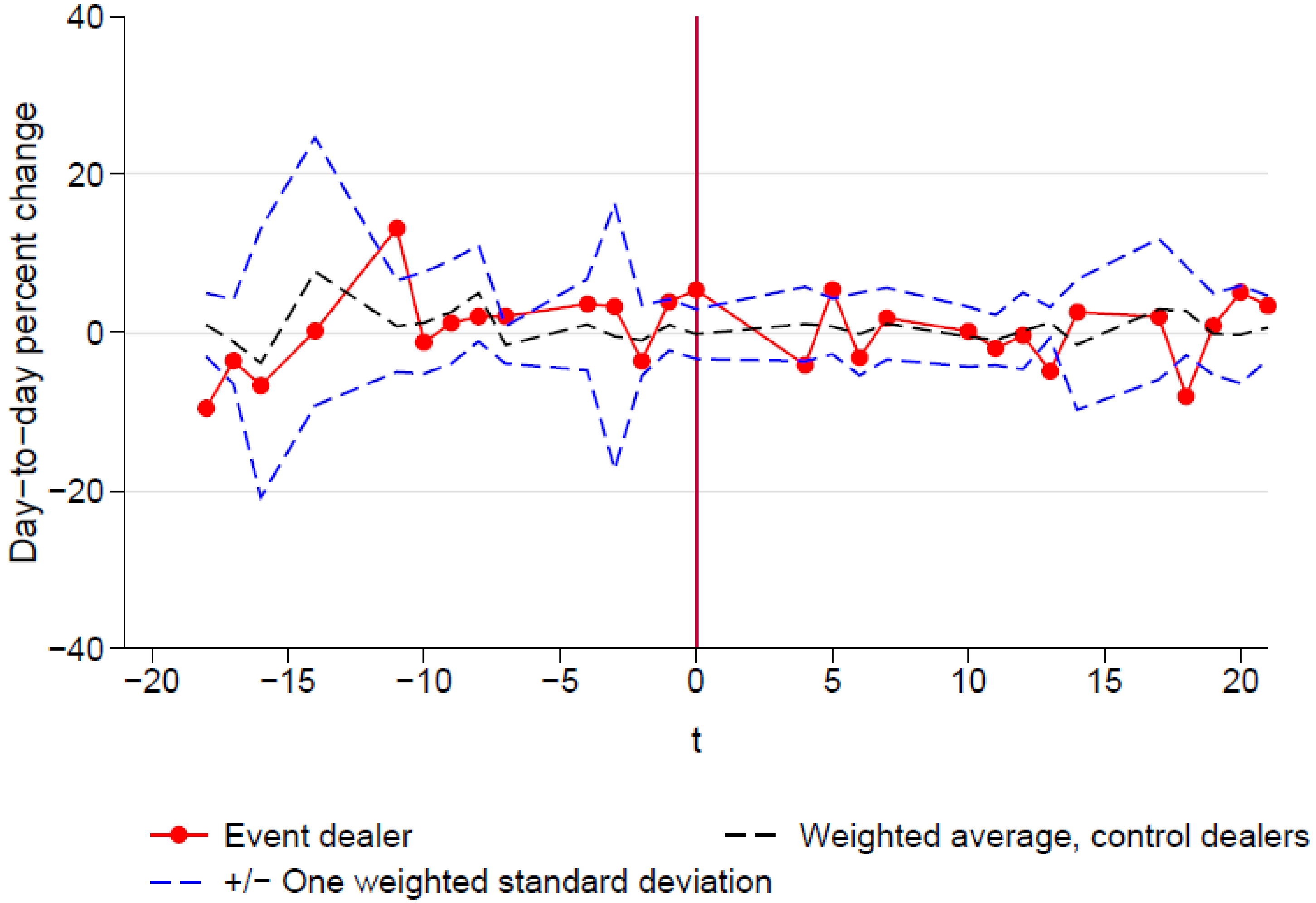
Assistance event 2



Earning event 1



Earning event 2



Interpretation:

- Why did haircuts in the bilateral repo market increase so much?
- Why did haircut in the tri-party repo market increase so little?
- Did different types of runs occur in repo markets?

Why did bilateral haircuts increase so much?

- Gorton-Metrick: Collateral became "informationally sensitive"
  - Consistent with higher haircuts for lower quality collateral

Other potential factors:

- Do haircuts reflect increased counterparty risk?
  - Could explain increase in some subset of the bilateral market
  - But not consistent with lack of increase in tri-party haircuts

- Do haircuts reflect market power?
  - Prime brokers may have had market power during the crisis
  - But not clear market power was a factor in the interdealer market

Why did tri-party haircuts increase so little?

- Some cash investors appear to be reluctant or unprepared to take possession of the collateral
  - Prefer to withdraw funding if dealer is perceived to be uncreditworthy

- These investors may not use haircut as a risk management tool
  - Haircuts do not protect from runs or “headline” risk

- The “unwind” may have convinced investors that they could pull funding away before problems occurred

Did different types of runs occur in repo markets?

- Increases in haircuts in bilateral markets can be viewed as a market-wide run (Gorton, Metrick)

- Runs on some asset classes (non-agency ABS/MBS) may have also occurred in the TPR market (Krishnamurthy, Nagel, Orlov)
  - However, there was not a market-wide run on the TPR market

- In the TPR market run occurred on individual institutions
  - These runs resembled standard bank runs

- Martin, Skeie, von Thadded (2010) provide theory of “repo runs”

Unwind and Fragility: A simple framework

- One dealer currently financed by 3 investors
- The dealer survives if at least two investors re-invest
- Investors payoff:
  - S if invest and dealer survives
  - O if not invest **and** gets cash back
  - F if invest and dealer defaults
- Assumption: $S > O > F$
- Consider Nash equilibrium of one-shot reinvestment game
- More sophisticated analysis in Martin, Skeie, von Thadden (2010)

One short reinvestment game

- Investors payoff with unwind:

Number of other investors that choose to invest	0	1	2
Invest	F	S	S
Do not invest	O	O	O

- Investors payoff without unwind:

Number of other investors that choose to invest	0	1	2
Invest	F	S	S
Do not invest	F	F	O

Conclusion

- The tri-party repo market was at the center of the crisis
- Margins did not change much during the crisis, in contrast to bilateral repo market
- Volumes did not change much, except in rare cases where they dropped precipitously
- Lack of adjustment of margin produced fragility similar to traditional bank runs
- Fragility may be related to settlement practice
- Current reforms should reduce fragility