The Flight from Maturity

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Explaining the Crisis

- How can a small shock cause a large crisis?

24 bps of realized losses on $1.9 trillion of AAA subprime issued in 2004, 2005, 2006, 2007 (as of Aug 2013).

↓

?

Ben Bernanke: “13 of the most important financial institutions in the United States, 12 were at risk of failure within a period of a week or two.”

Standard Narrative

- Standard view: Two shocks— “if not for Lehman . . . “
- Incoherent: Lehman must have been vulnerable. Why?

This paper

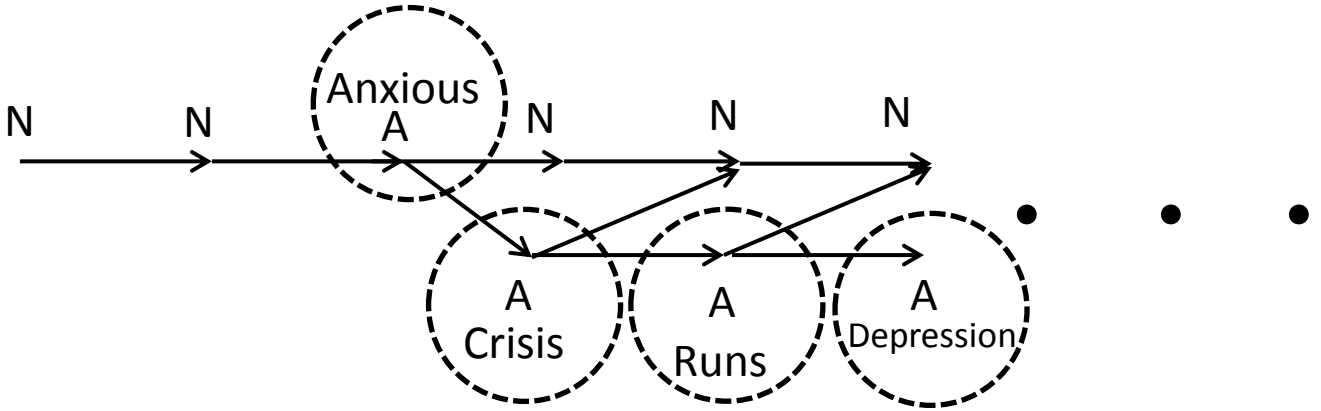
- Why did the failure of Lehman Brothers make the financial crisis dramatically worse?
- We argue that risk built up endogenously *during* the crisis as market participants tried to preserve the moneyness of money market instruments.
- A crisis is a *process* in which risk builds up.
- We test model predictions by providing a formal chronology of the crisis.

Private Money Market Instruments

- Secured: repo
  - GC repo
  - Repo backed by privately-created bonds
- Unsecured: CP, ABCP, Fed Funds, LIBOR
  - Issuers screened, either by bank regulatory authorities or by market participants
- When “moneyness” questioned, it can be re-created by: tighter screening of issuers, higher haircuts, better collateral, shorter maturities.

Model

Crisis Phases



Summary of Model Results

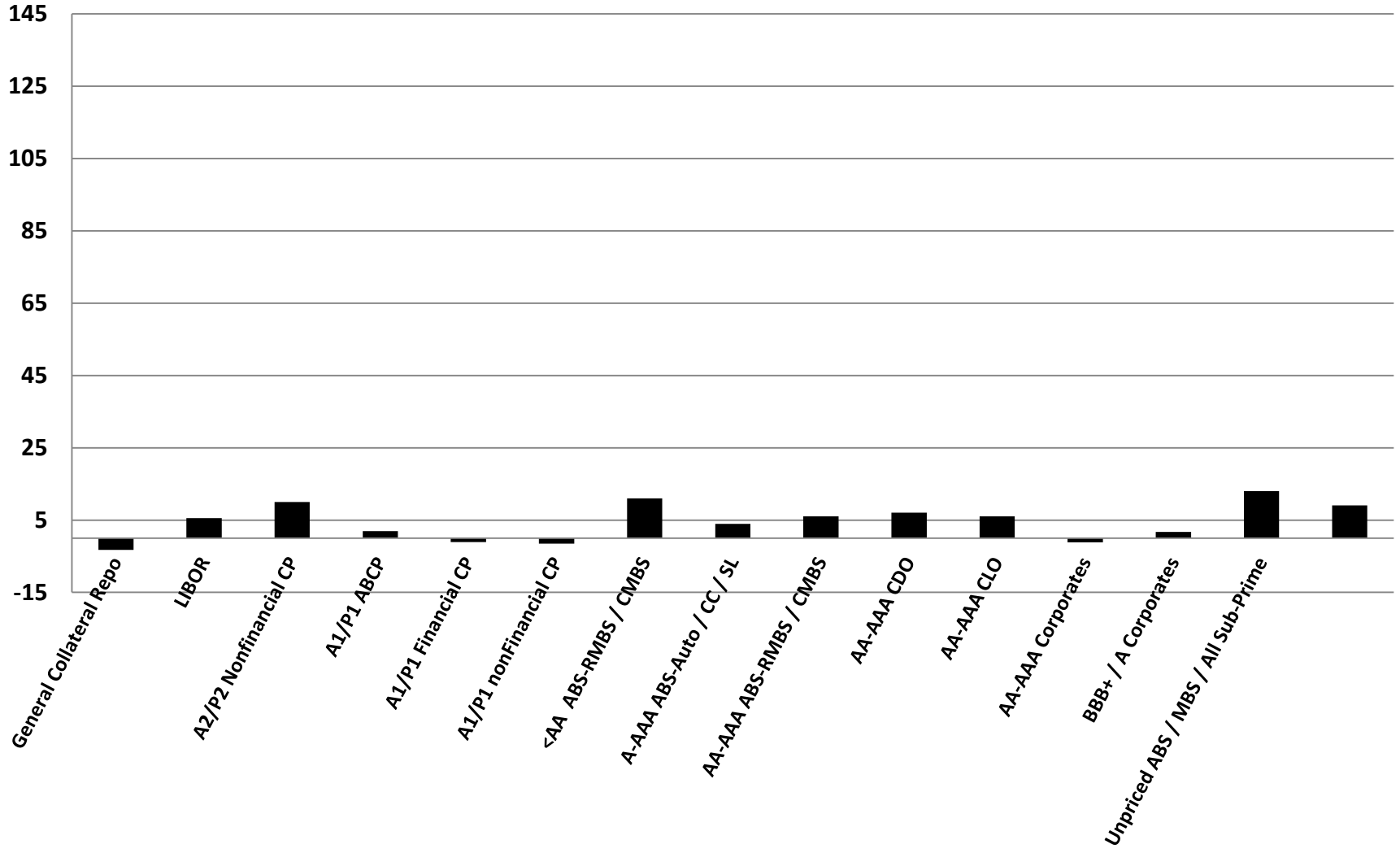
- Anxious banks want to borrow long, but Anxious lenders want to lend short.
  - Lenders want **option to exit**; borrowers want to **lock in loans** to avoid rollover risk.
- → Maturities shorten; term structure of spreads becomes upward sloping.
- Forest getting drier and drier. Lehman was the match.
- There can be a run if Anxious lenders exit to avoid expected future losses.
- Test chronology.

Spreads

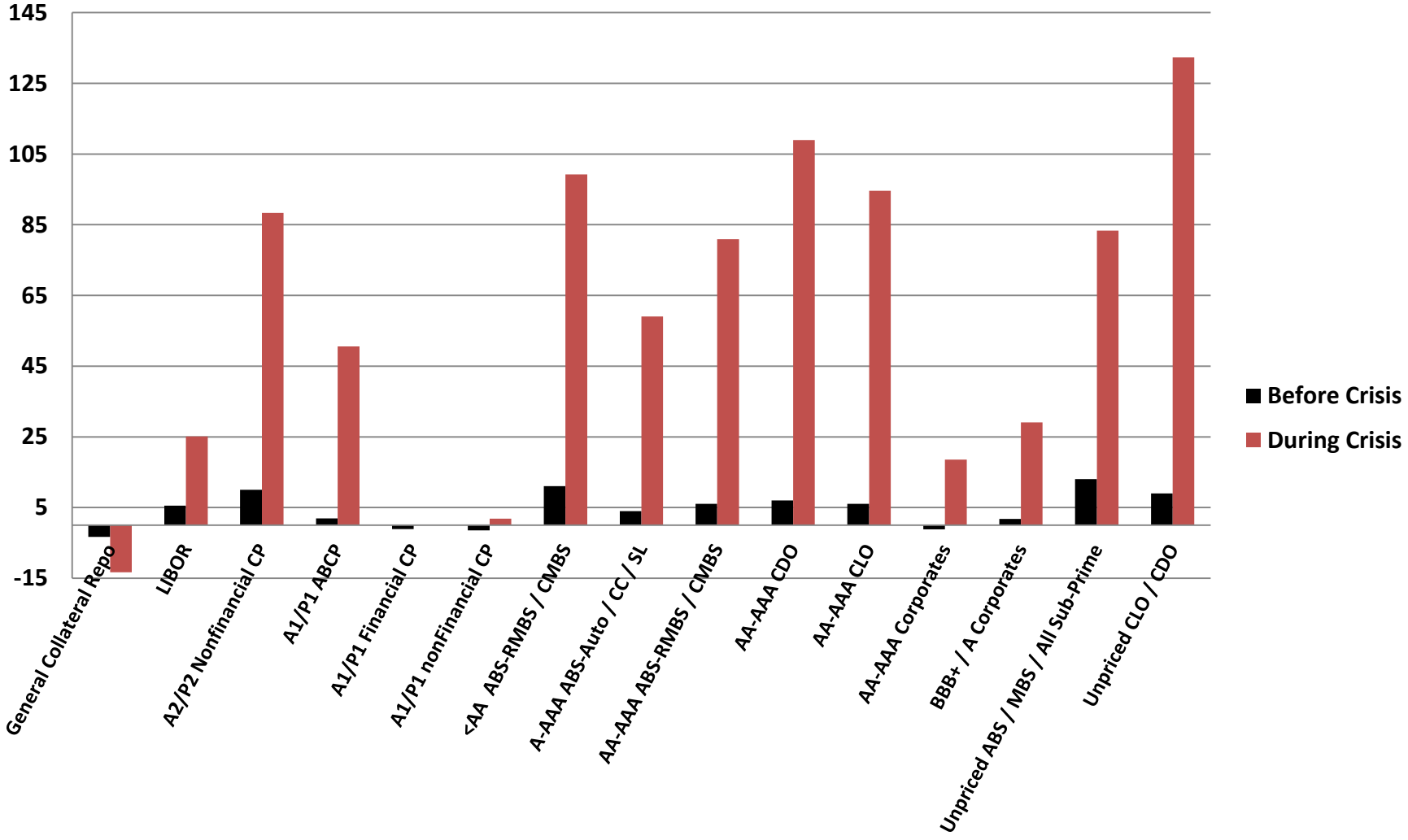
- r_{ti}^{τ} is the annualized rate of return at time t for money market instrument i with maturity τ.

- Define: $\theta_{t,i}^{\tau} \equiv r_{t,i}^{\tau} - r_{t,FF}^{\tau}$ as the spread between the rate on money market instrument i and the Federal Funds target rate at date t for maturity τ.

Overnight Money Market Spreads Before the Crisis



Overnight Money Market Spreads Before and During Crisis



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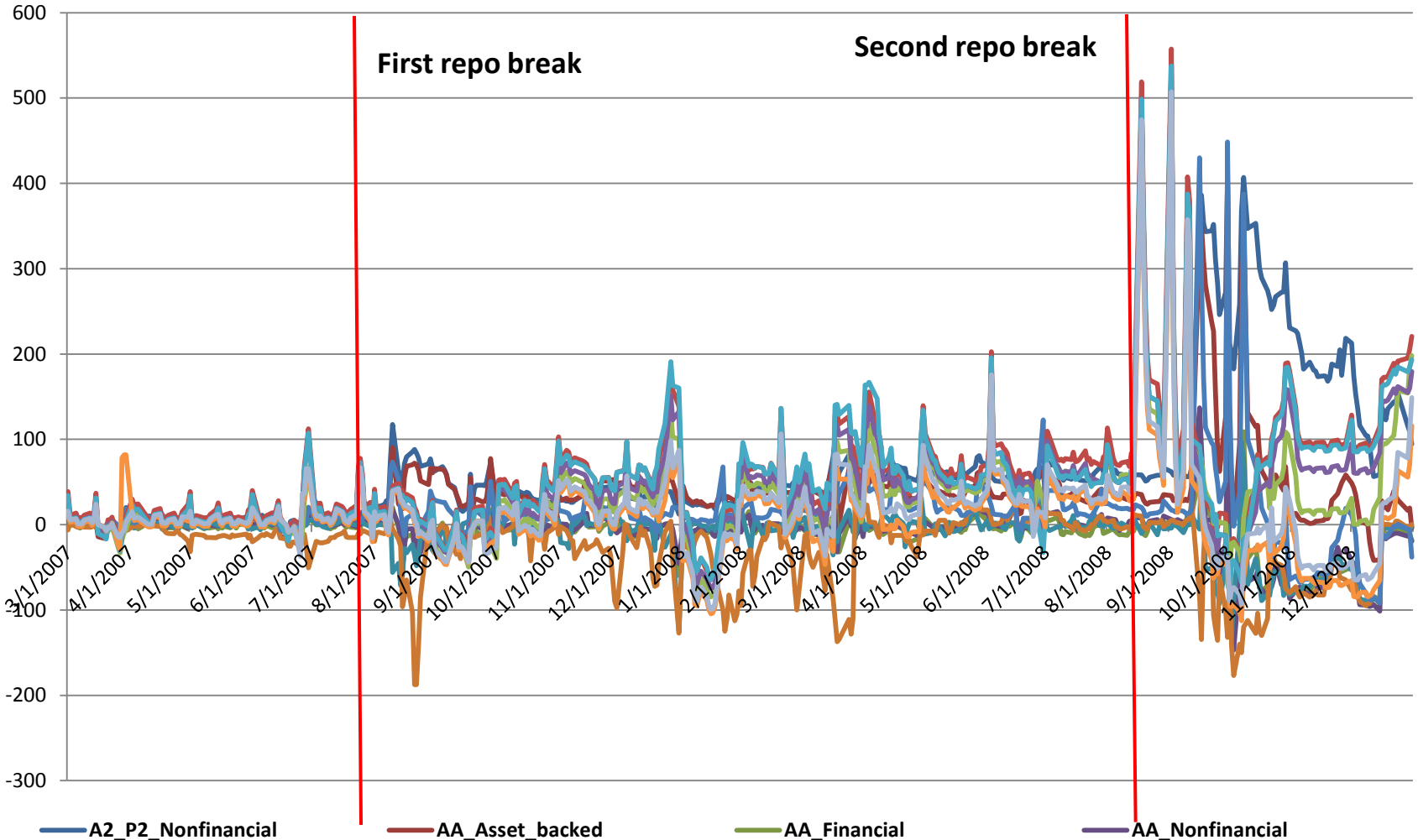
Money Market Spreads



Breakpoints in Panels

- Bai (2010): Consider a panel of N series, as follows:

  $Y_{it} = \mu_{i1} + \sigma_{i1}\eta_{it}, \quad t = 1,2, \ldots, k_0$

  $Y_{it} = \mu_{i2} + \sigma_{i1}\eta_{it},, \quad t = k_0+1, \ldots T$

  $i = 1,2, \ldots, N$

  where $E(\eta_{it})=0$ and $var(\eta_{it})=1$, and for each i, η_{it} is a linear process; there are other assumptions as well.

- The breakpoint, k_0 in means and variances is unknown. Consistent estimation requires that there are breakpoints in either the means or the variances (or both).

Breakpoints (cont.)

- Monte Carlo experiments show that panel can be very small, e.g., one series.
- Once the breakpoint date is found, Chow tests confirm.
- No power against gradual change. Nothing here about gradual vs. sudden change.

Panels

- We group the data series into five different panels with recognizable economic content:
  - (1) the real sector of the economy;
  - (2) the subprime housing sector;
  - (3) financial firms;
  - (4) the unsecured money markets; and
  - (5) the secured money markets.

- We further divide the financial firms to consider including and excluding Lehman. We also consider subsets of the real sector and subprime, as well.

Real Sector

VIX

S&P 500

JPM HY Index

DJ CDX.IG

Subprime

ABX

HEL

Financial Firms

Financial CDS

Interbank Money Markets

Fed Fund

LIBOR

OIS

Commercial Paper

A2/P2 Nonfinancial

AA Asset-backed

AA Financial

AA Nonfinancial

Repo Categories

GC

<AA ABS-RMBS / CMBS

A-AAA ABS-Auto / CC / SL

AA-AAA ABS-RMBS / CMBS

AA-AAA CLO

AA-AAA Corporates

BBB+ / A Corporates

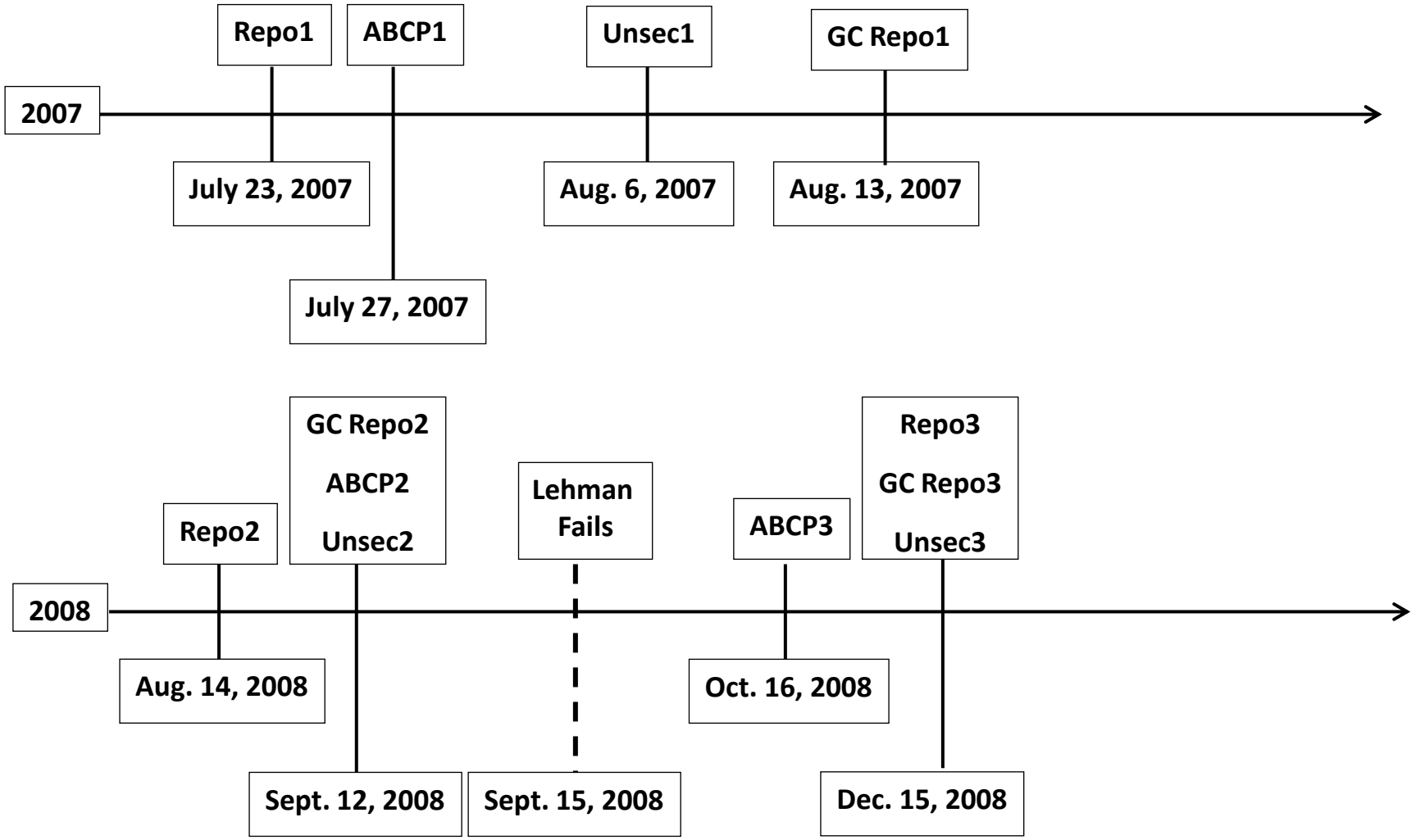
Crisis Chronology: First Breakpoints

Description	Num. of Securities	Break Point	Lower bound	Upper bound
Subprime: ABX & HEL	5	2007/1/4	2007/1/4	2007/1/11
Repo	6	**2007/7/23**	2007/7/20	2007/7/25
Financial CDS: Include Lehman	10	**2007/7/23**	2007/7/23	2007/7/24
CP, Fed Funds, LIBOR	7	2007/8/8	2007/8/8	2007/8/9
Real Sector: VIX, S&P 500, JPM HY Index, DJ CDX.IG	6	2008/1/3	2008/1/3	2008/1/10

Breakpoints (cont.)

- Multiple breakpoints: After the first breakpoint is located, the two subsamples can be investigated further for other breakpoints, and so on.

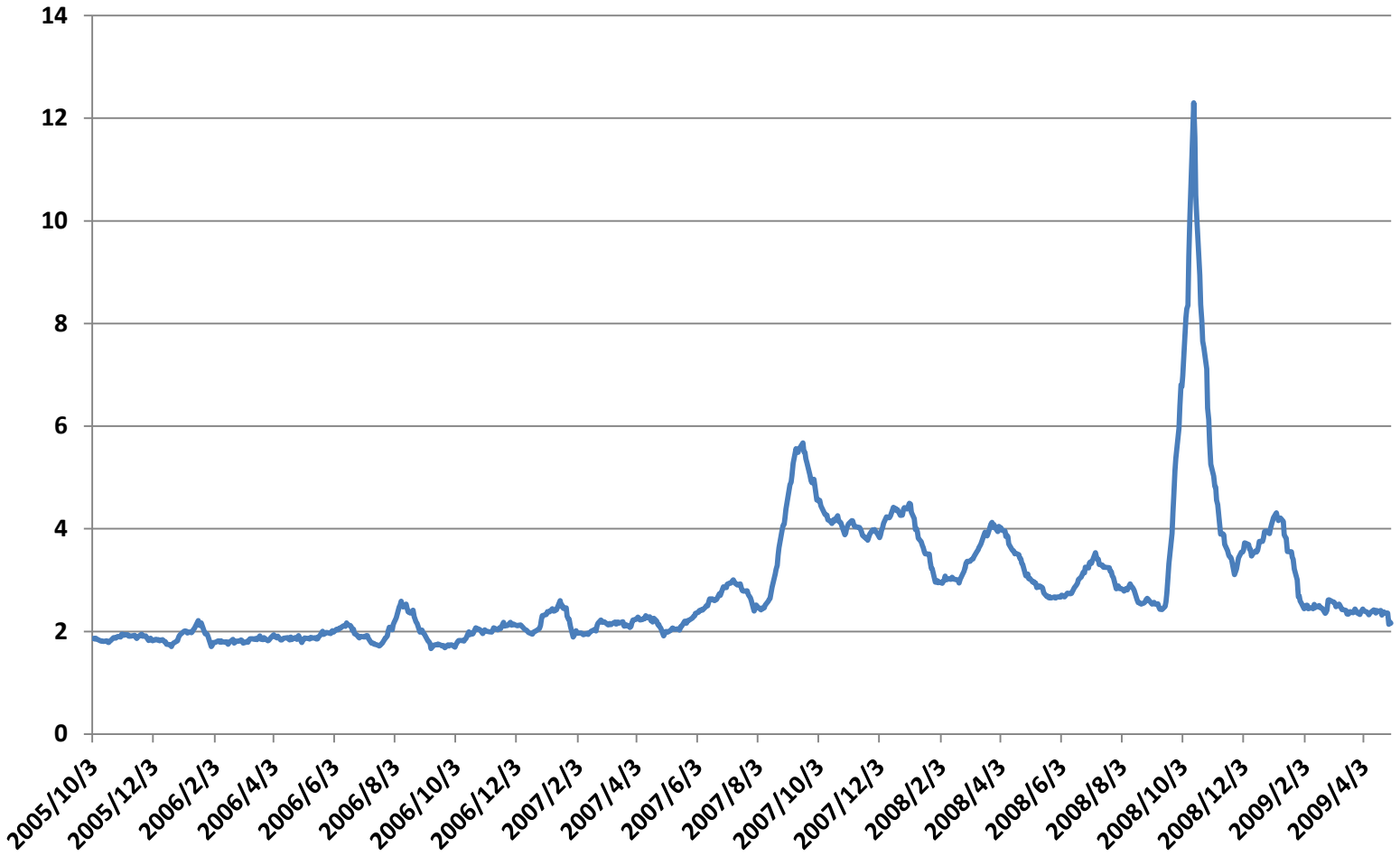
Money Markets: Crisis Chronology for Spreads



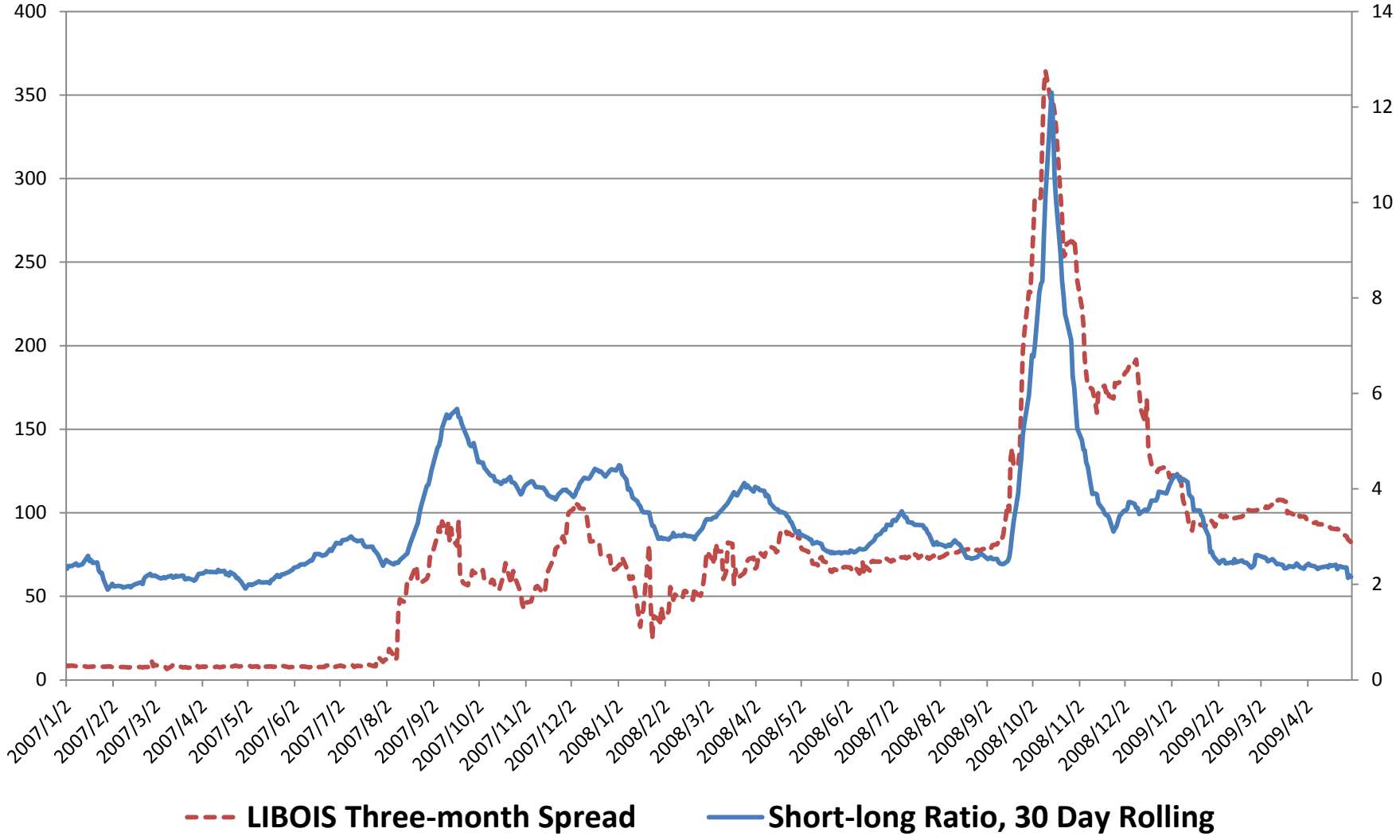
The Flight from Maturity

- Only CP has issuance data by maturity.
  - But issuer mix is changing as low quality issuers are forced to exit.
- $\theta_{t,i}^{\tau} \equiv r_{t,i}^{\tau} - r_{t,FF}^{\tau}$ is the spread between the rate on money market instrument i and the Federal Funds target rate at date t for maturity τ.
- $\Phi_{t,i}^{\tau 2,1} \equiv \theta_{t,i}^{\tau 2} - \theta_{t,i}^{\tau 1}$, where $\tau 2 > \tau 1$, is the slope of the term structure of spreads (various maturities).
- Slope flat in normal times, but increases in crisis.

Short/Long Issuance Ratio, AA Asset-Backed CP



Counterparty Risk (bps) and CP Maturities



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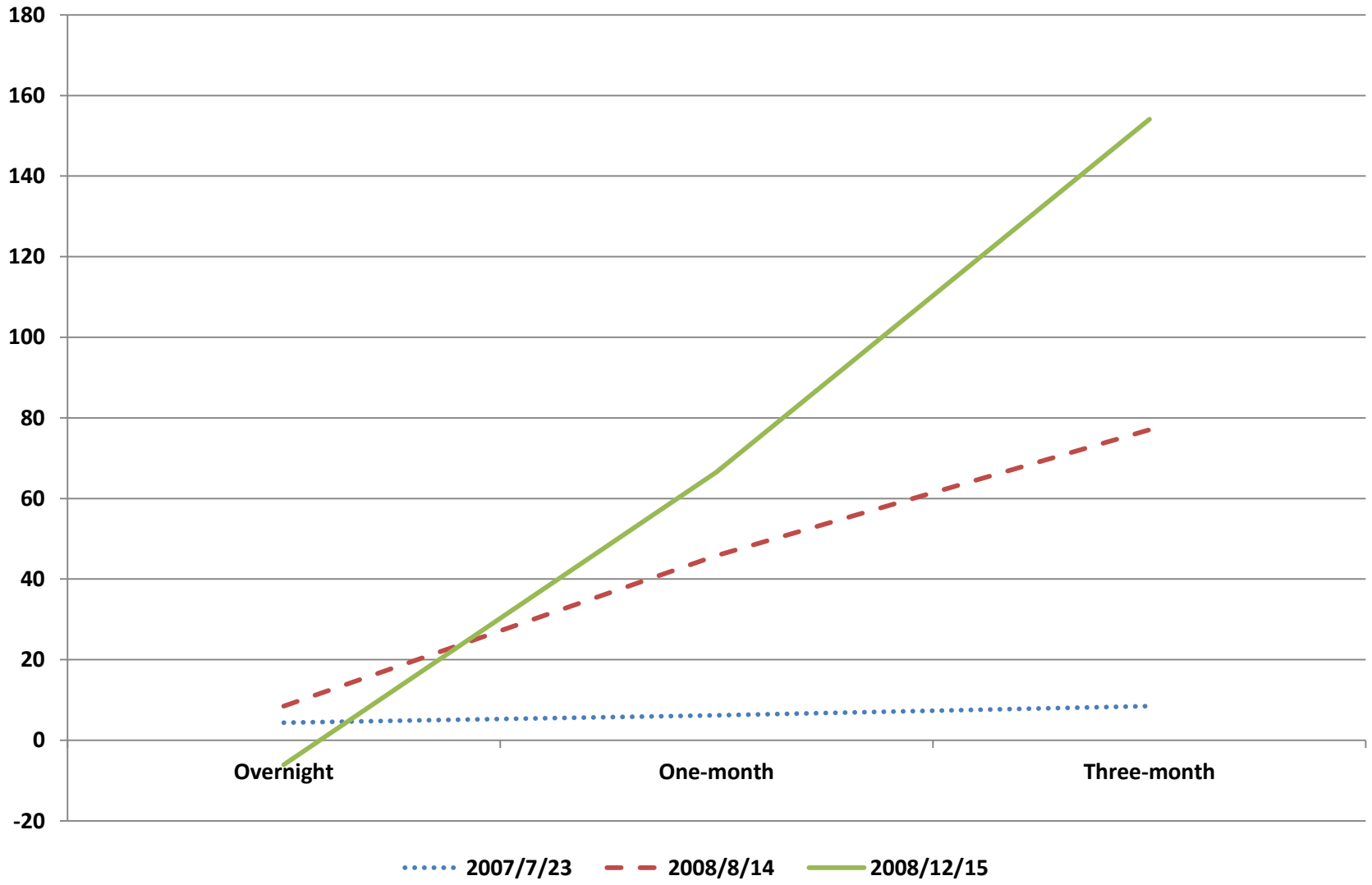
Term Structure of Spreads

- Maturities endogenous, to be consistent with "moneyness" – so the term structure should be flat during normal times.

- If dealers want to borrow long (pay a higher spread) and lenders will only lend short (a lower spread), then term structure steepens.

LIBOR Spread Term Structures (bps)



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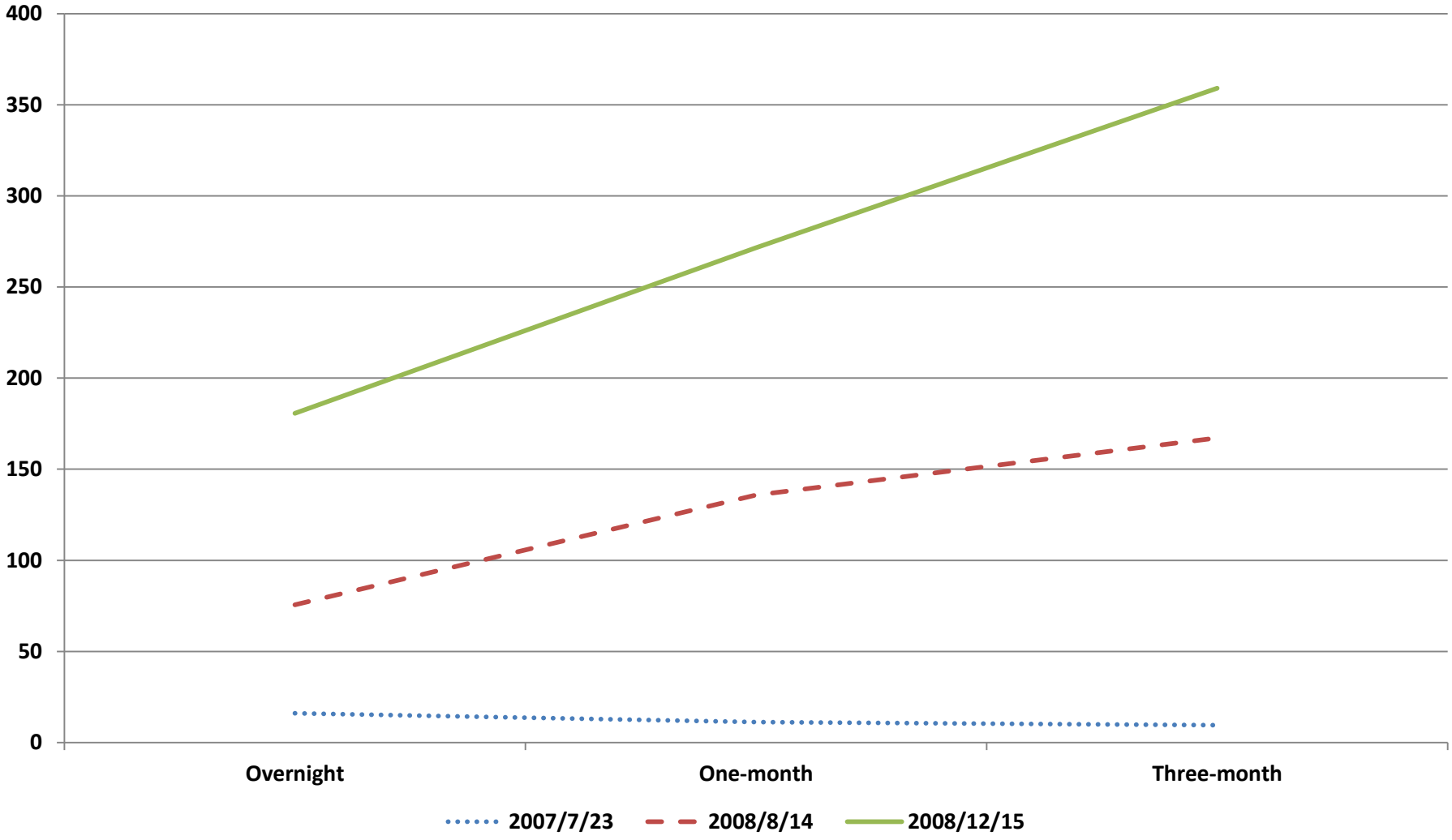
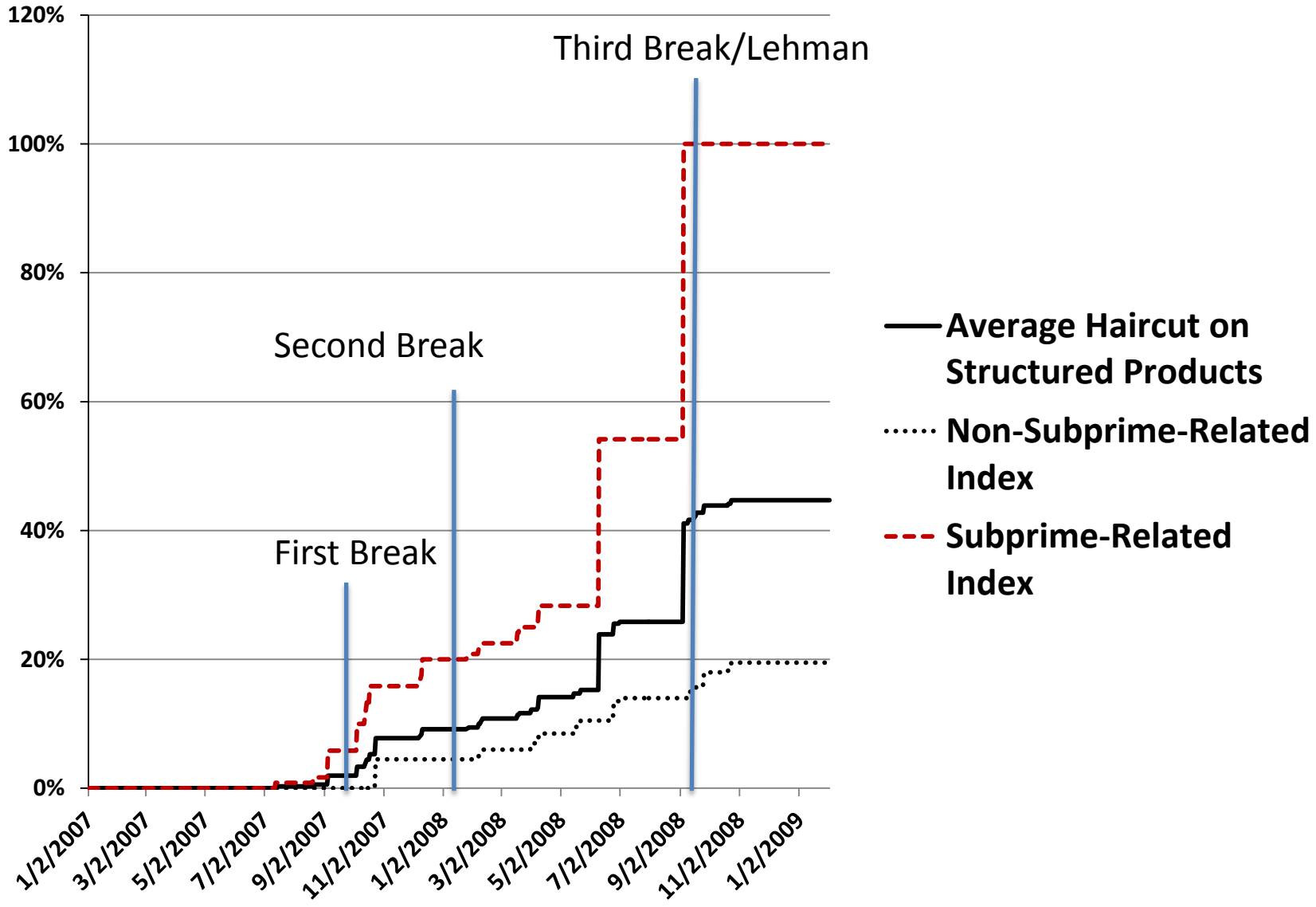
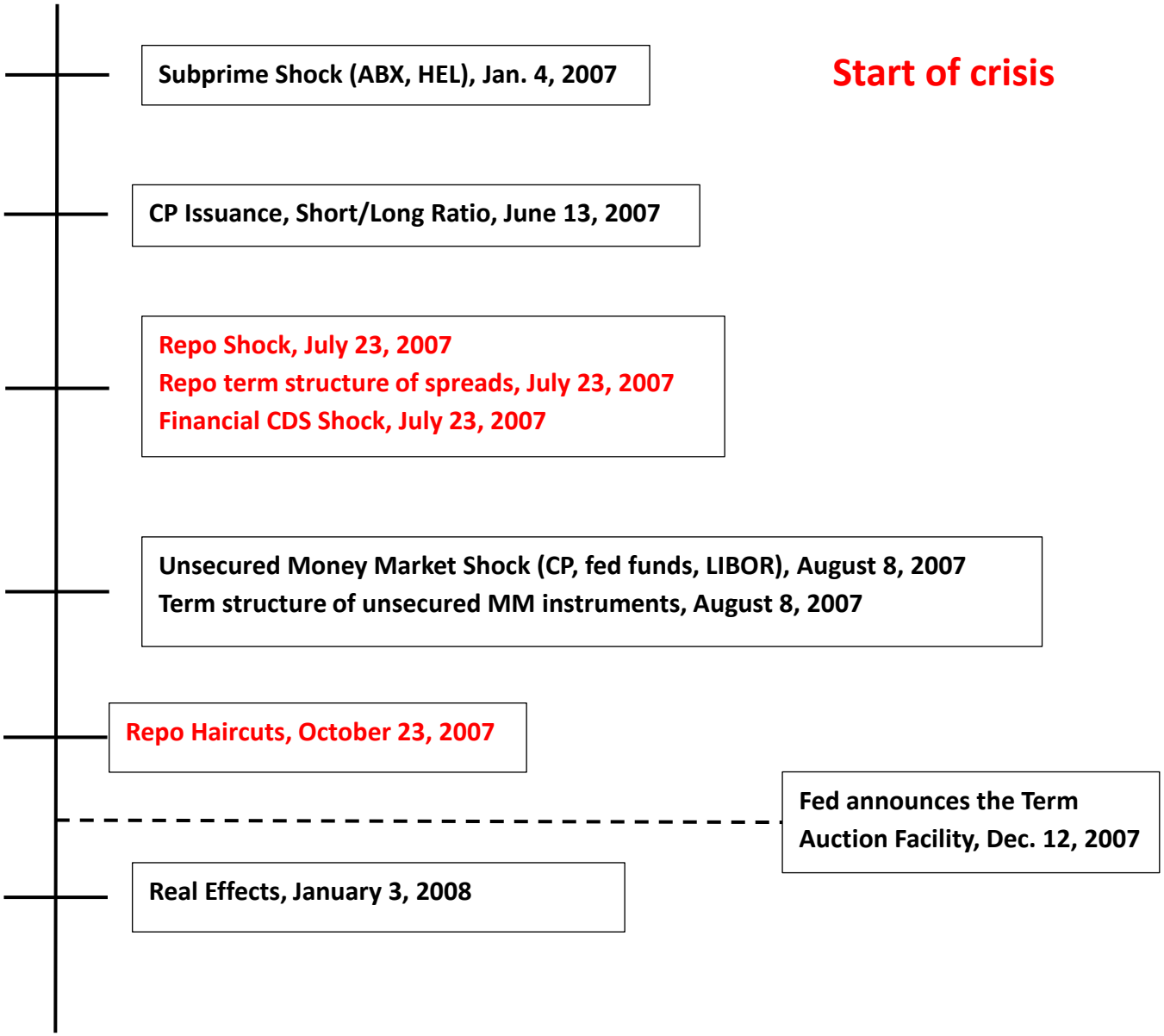
<AA ABS-RMBS / CMBS Repo Spread Term Structures (bps)

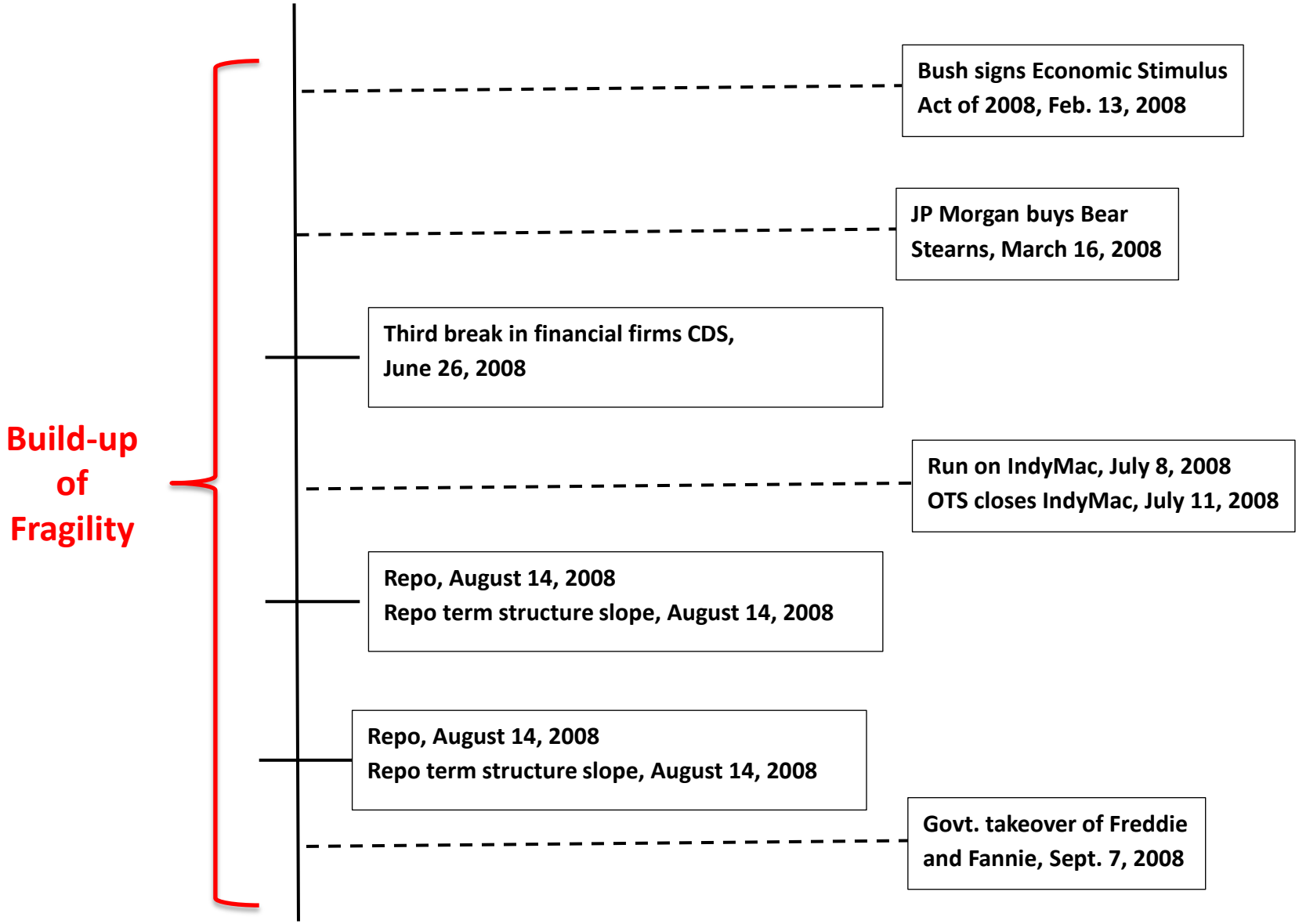


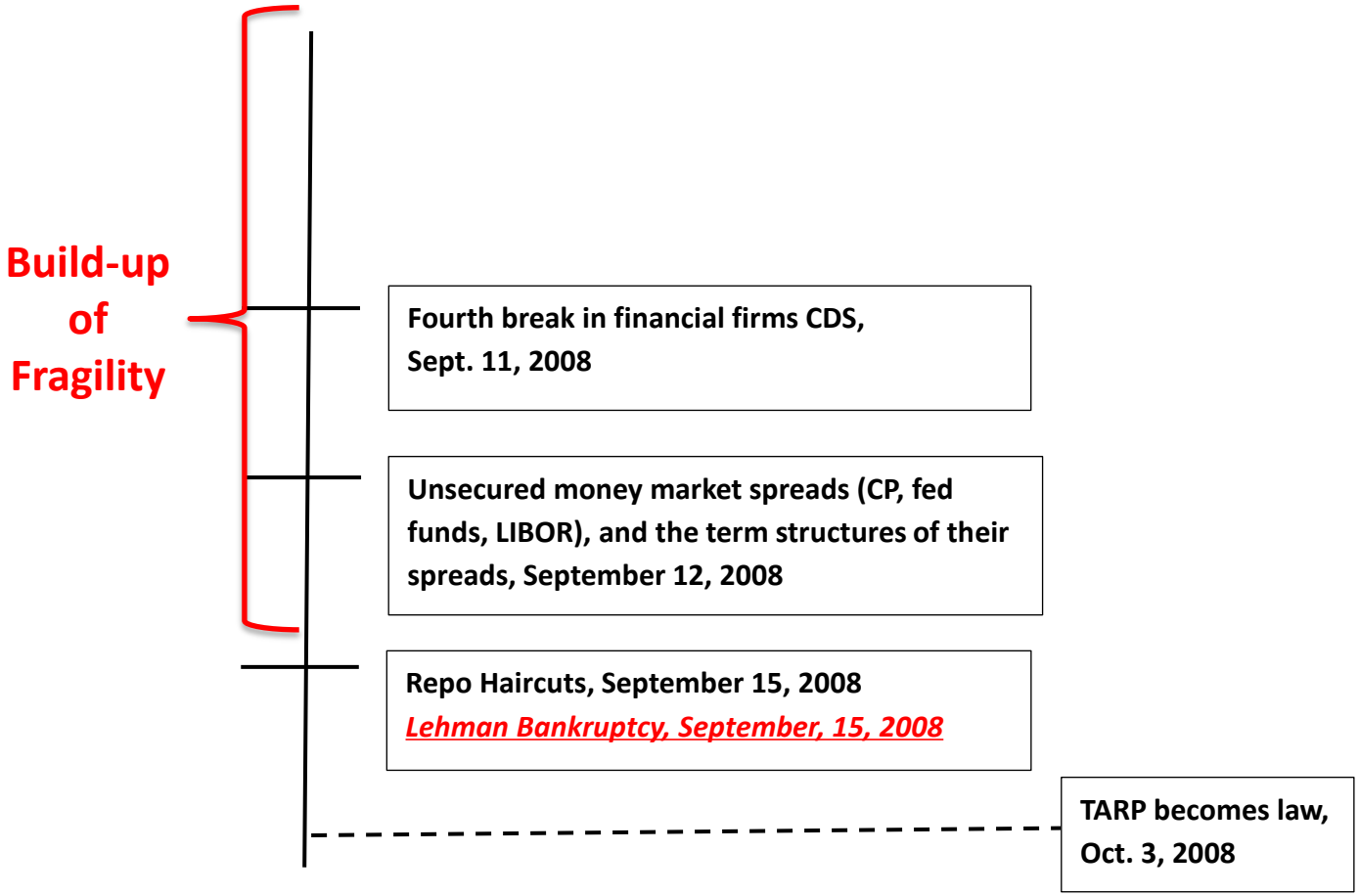
Breaks in Repo Haircuts

	Break point	Lower bound	Upper bound
First Break	**2007/10/23**	2007/10/23	2007/10/24
Second Break	2008/2/6	2008/2/6	2008/2/7
Third Break	2008/9/15	2008/9/15	2008/9/16


120%
100%
80%
60%
40%
20%
0%
Third Break/Lehman
Second Break
First Break
1/2/2007
3/2/2007
5/2/2007
7/2/2007
9/2/2007
11/2/2007
1/2/2008
3/2/2008
5/2/2008
7/2/2008
9/2/2008
11/2/2008
1/2/2009
Average Haircut on Structured Products
Non-Subprime-Related Index
Subprime-Related Index


Subprime Shock (ABX, HEL), Jan. 4, 2007
Start of crisis
CP Issuance, Short/Long Ratio, June 13, 2007
Repo Shock, July 23, 2007
Repo term structure of spreads, July 23, 2007
Financial CDS Shock, July 23, 2007
Unsecured Money Market Shock (CP, fed funds, LIBOR), August 8, 2007
Term structure of unsecured MM instruments, August 8, 2007
Repo Haircuts, October 23, 2007
Fed announces the Term Auction Facility, Dec. 12, 2007
Real Effects, January 3, 2008


Build-up of Fragility
Bush signs Economic Stimulus Act of 2008, Feb. 13, 2008
JP Morgan buys Bear Stearns, March 16, 2008
Third break in financial firms CDS, June 26, 2008
Run on IndyMac, July 8, 2008
OTS closes IndyMac, July 11, 2008
Repo, August 14, 2008
Repo term structure slope, August 14, 2008
Repo, August 14, 2008
Repo term structure slope, August 14, 2008
Govt. takeover of Freddie and Fannie, Sept. 7, 2008


Build-up of Fragility
Fourth break in financial firms CDS, Sept. 11, 2008
Unsecured money market spreads (CP, fed funds, LIBOR), and the term structures of their spreads, September 12, 2008
Repo Haircuts, September 15, 2008
Lehman Bankruptcy, September, 15, 2008
TARP becomes law, Oct. 3, 2008

Summary

- A financial crisis is not a "shock."
  - Fragility builds up during the preceding credit boom (Gorton and Ordonez).
  - But, fragility also builds up *during the crisis*.
- A "crisis" is the result of an endogenous build-up of fragility.
- A key element is the shortening of maturity during the crisis.
- "Tail risk" is endogenous.