



THOUGHTS ON THE NEW FINANCIAL ARCHITECTURE

MARKUS K. BRUNNERMEIER

based on

- Geneva report with Crockett, Goodhart, Persaud and Shin
- “CoVaR” with Tobias Adrian



Overview

1. Theoretical background

- Role of financial institutions
 - Channeling funds – project selection
 - Monitoring
 - Maturity transformation – why so much?
 - Info insensitive securities/money creation
 - Payment system
- Capital (leverage) versus liquidity (maturity mismatch)

2. Changing of the banking landscape

3. Regulation

- Current regulation + challenges
- Regulating institutions
- Regulating asset trading/markets
- Misc.

|| Theory – Brunnermeier-Sannikov

- Heterogeneous agents
 - Type 1 with
 - special skills/more productive
Bernanke-Gertler-Gilchrist, He-Krishnamurthy, Kiyotaki-Moore
 - more risk tolerance ← Garleanu-Pedersen,...
 - more optimistic ← Geanakoplos
lever up and borrow from
 - Type 2 with less skill/risk tolerance/optimism through
 - Type 3: Intermediaries/experts
 - better in monitoring
... but asymmetric information problem (moral hazard)
 - inside equity (fraction α) needed
 - have to hold part of type 1 risks
 - Holmstroem-Tirole (1997), Diamond (1984)

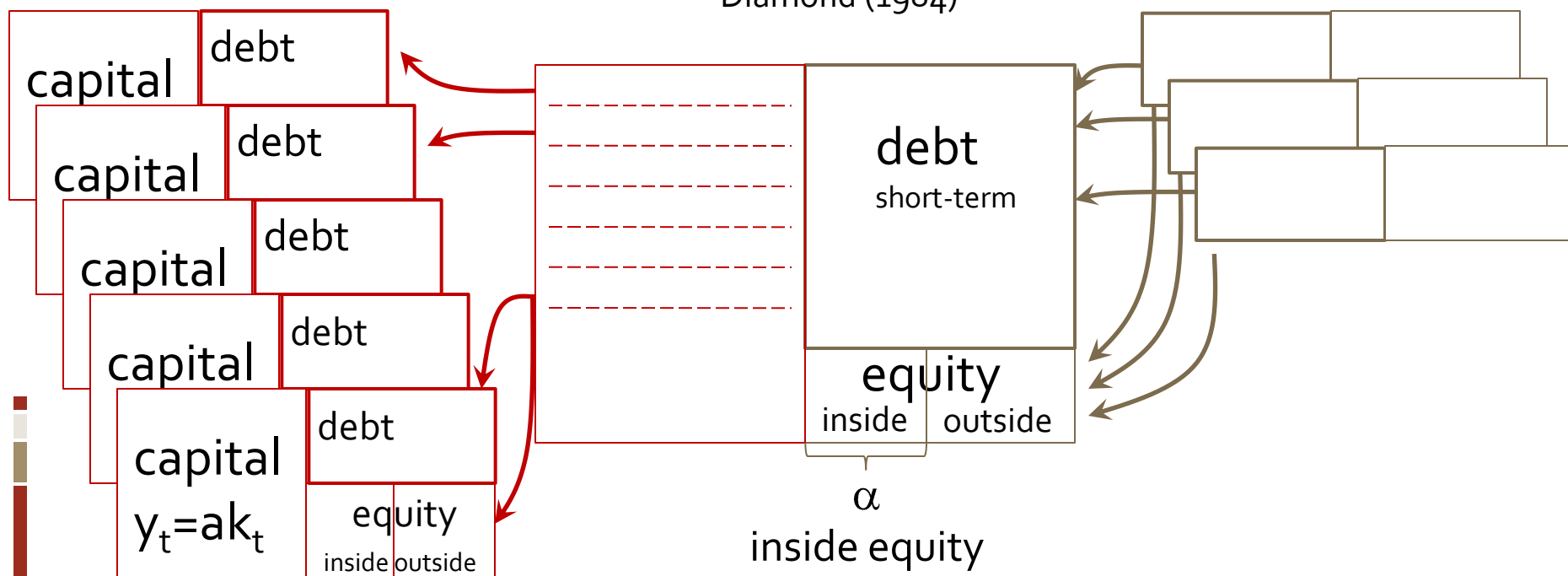
Theory: Brunnermeier-Sannikov

- Productive

- Intermediary

- Less productive

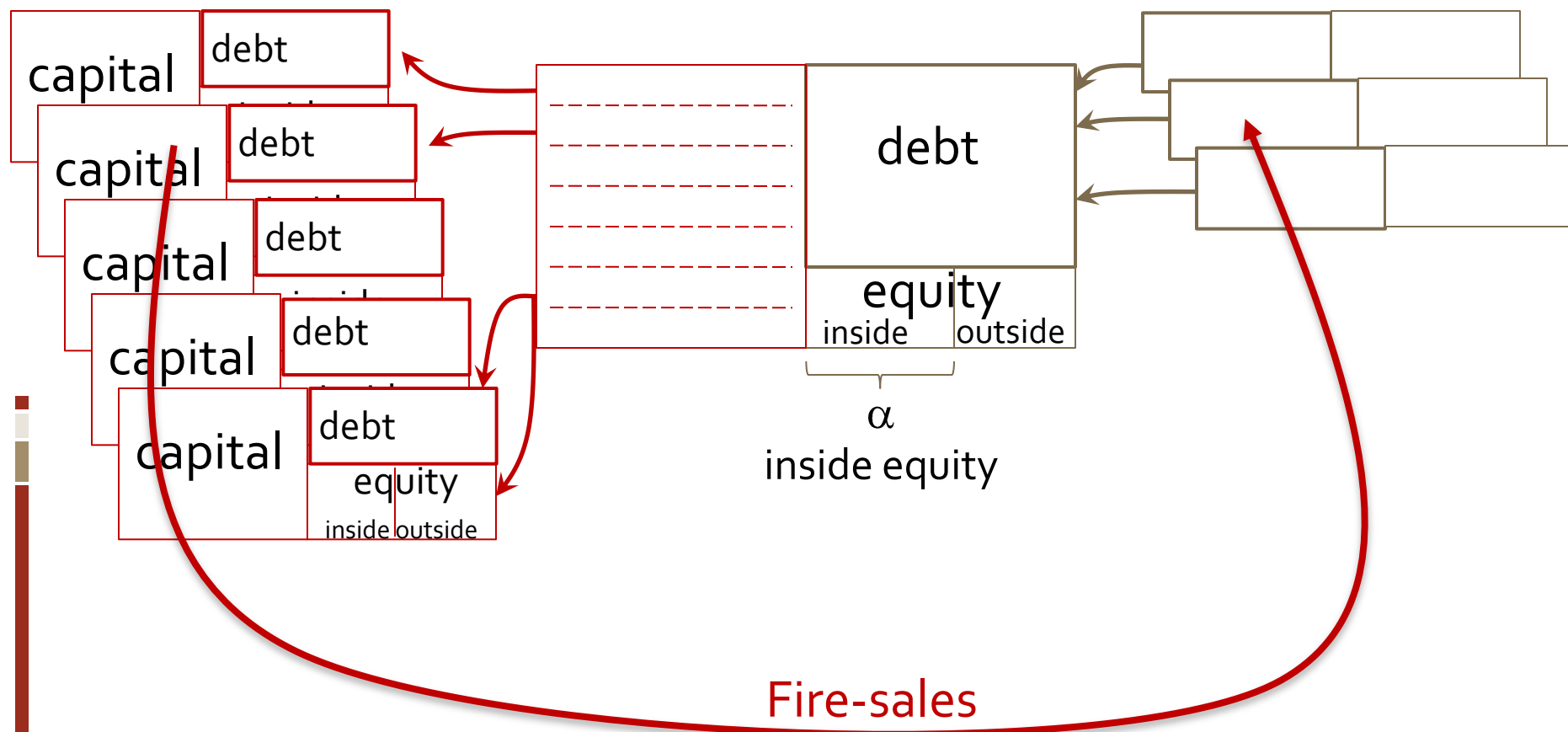
- Monitoring
Diamond (1984)



Intermediaries have to hold outside equity of productive sector to have incentive to monitor

Fire-sales after “shock”

- Productive
- Intermediary
- Less productive



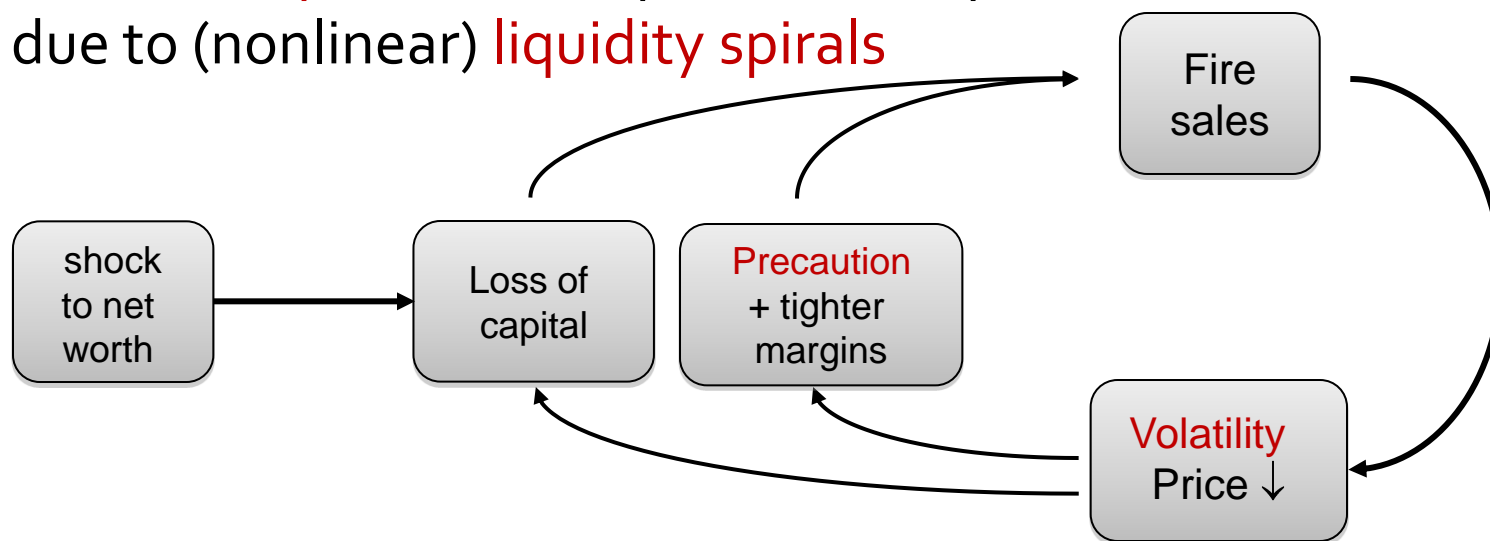
Intermediaries + productive sectors balance sheets contract!

Some Literature ...

- Bernanke-Gertler (1989)
 - Overlapping generations model, but with **persistence**
 - Bad shocks erode net worth of young entrepreneurs, who cut back on investments, leading to low productivity and low net worth of entrepreneurs in the next period
- Kiyotaki-Moore (1997), BGG (1999)
 - Infinitely-lived agents
 - KM: Leverage bounded by margins-KM; BGG: bankruptcy costs
 - Stronger **amplification** effects through **prices** (low net worth reduces leveraged institutions' demand for assets, lowering prices and further depressing net worth)
- Brunnermeier-Pedersen (2009)
 - Volatility effect due to higher margins/haircuts

Preview of results

1. **Unstable dynamics** away from steady state due to (nonlinear) **liquidity spirals**



2. Welfare: Fire-sale **externalities within financial sector**, externalities b/w financial sector and real economy...
 - When leveraging up, institutions ignore that their fire-sales depress prices for others --- inefficient pecuniary externality

1. Procyclicality: Bubbles & Liquidity spirals

- Risk *builds up* during (credit) **bubble**
 - Why did nobody delever/act against it earlier?
 - Ride bubble: “dance as long as the music plays” Abreu-Brunnermeier (2003)
 - Lack of coordination/synchronization as to when to go against the bubble
- ... and materializes in a **crisis**
- Credit bubble led to housing bubble
 - Note similarity to Nordic countries, Japan,...
(foreign capital, agency problems were less of an issue there)

2. Externalities

“stability is a public good”

■ Externalities within financial sector

1. Pecuniary (fire-sale) externality

- Maturity mismatch + Leverage

➡ *Fire-sales depress prices for others*

2. Credit Crunch: Precautionary hoarding externality due to volatility effect

3. Runs – dynamic co-opetition

4. Network Externality

- counterparty credit risk due to interlocking of claims
- Hiding own's commitment ➡ uncertainty for counterparties

■ Externalities to labor sector

- Payouts occur too early
- (Production function with endogenous growth element)

Welfare analysis

- Economy is risky (time-series), but due to externalities (cross-section)
 - ➔ Excessive risk taking (when net worth is high)
 - ➔ Excessive payout policy
 - ➔ Excessive financial instability

Capital versus Liquidity

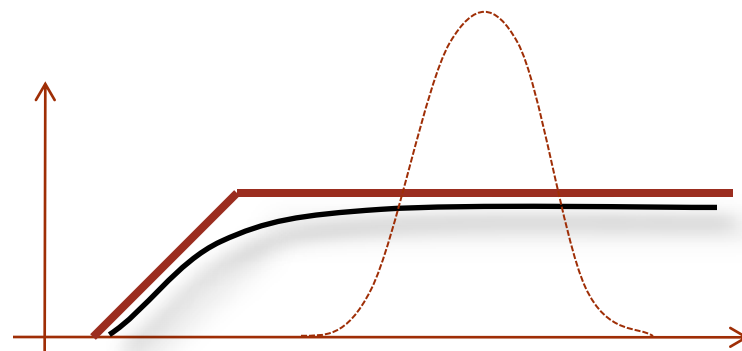
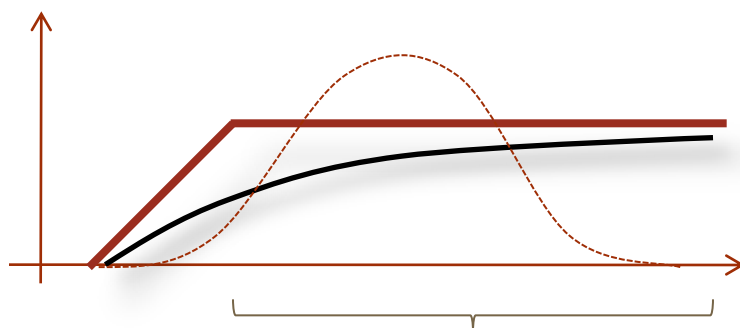
- Low leverage = high capital
 - static
- Low (funding) liquidity = excessive maturity mismatch
 - dynamic
- Illiquidity arises due to frictions which prevent **fund flows** to investors with expertise limits optimal risk sharing

|| Maturity mismatch: Why short-term debt?

1. Liquidity shock insurance (Diamond-Dybvig)
 - maturity transformation is *good*, but bank run caveat
2. Incentivize management (Calomiris-Kahn)
 - Maturity mismatch is *good*
3. Less info sensitive, but sharper switch
lower delta, but higher gamma (option language)

long-term debt

short-term debt



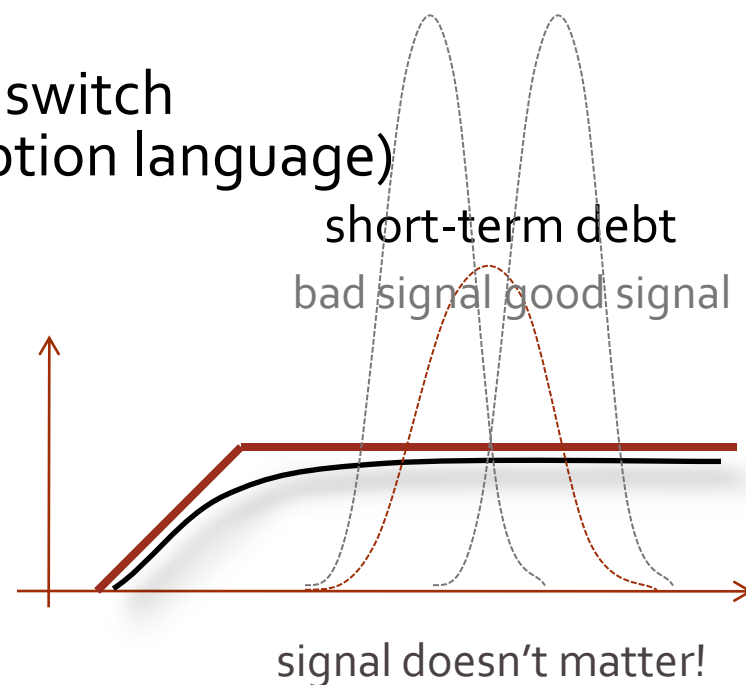
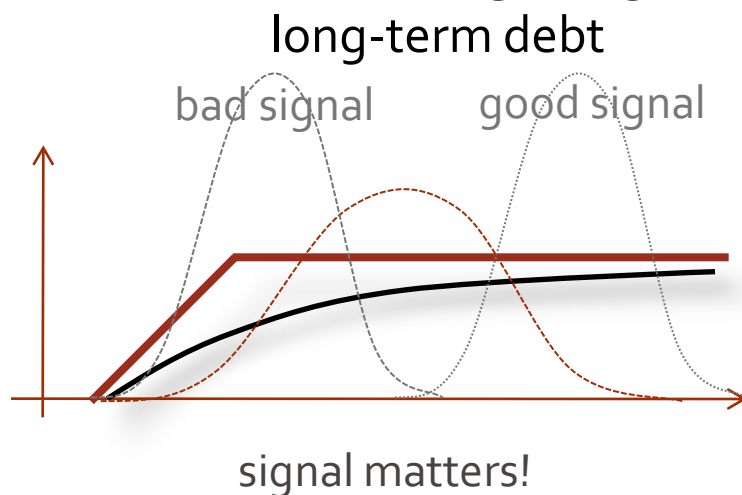
info insensitive

- *Shorter maturity allows higher leverage!!!!*

4. Maturity rat race (Brunnermeier-Oehmke)
 - Maturity mismatch is *bad*

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|| The Maturity Rat Race

- Leads to a unraveling to short-term debt
- Friction with multiple creditors with differing maturities
- Mechanism:
 - Creditors with shorter maturity can adjust face value (reduce interest rate) since they can pull out in bad states
 - Part of cost in low state is borne not by borrower but by remaining long-term creditors (long-term debt holders are diluted)
- Overall maturity structure is not exogenous



Liquidity problems

A

L

Funding liquidity

- Can't **roll over** short term debt
- **Margin**-funding is recalled

Liquidity problems

A

L

Market liquidity

- Can only sell assets at **fire-sale prices**

Ease with which one can raise money by **selling** the asset

Funding liquidity

- Can't **roll over** short term debt
- **Margin**-funding is recalled

Ease with which one can raise money by **borrowing** using the asset as collateral

Each asset has **two** values/prices

1. price
2. collateral value

- Illiquidity arises due to frictions which prevent **fund flows** to investors with expertise limits optimal risk sharing

Liquidity problems

A

L

Market liquidity

- Can only sell assets at **fire-sale prices**

Funding liquidity

- Can't **roll over** short term debt
- Margin**-funding is recalled

measures	quantity	price	quantity	price
static	Trading volume	Bid-ask	Unsecured vs. collateralize funding	TED spread (term spread)
		VIX Downside correlation	Haircuts/ margins/LTV	
dynamic			Debt maturity to <ul style="list-style-type: none"> • Asset maturity • Asset market liq 	

Who should do aggregate maturity transformation?



- Essentially done by central bank through lender of last resort policy
- Why not do it all the time?

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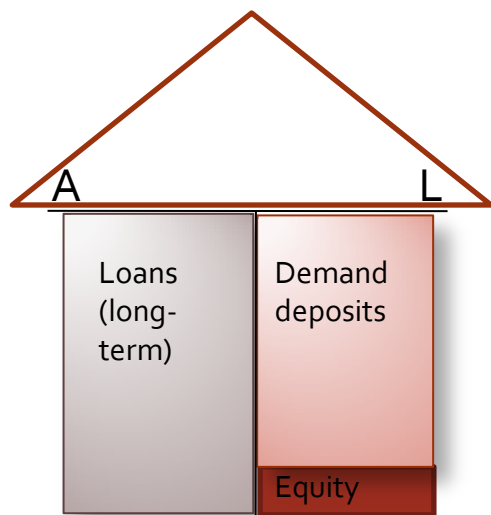
2. **Change of banking landscape**

3. Regulation

- Current regulation + challenges
- Regulating institutions
- Regulating asset trading/markets
- Misc.



■ Traditional Banking



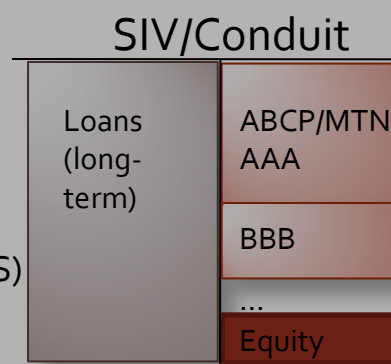
■ Role of banks

Channel funds	Long-run repayment
Maturity transformation	Retail funding
Info-insensitive securities	Demand deposits

SHADOW BANKING SYSTEM

■ Originate & distribute

- Securitization
 - Pooling
 - Tranching
 - Insuring (CDS)
- Dual purpose



- Tradable asset
- Collateral

→ *feeds repo market for leveraging*

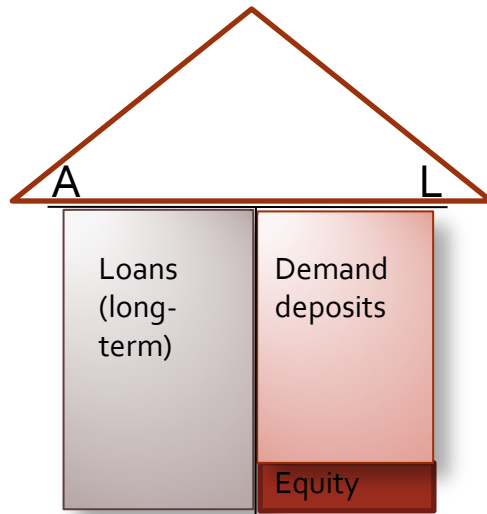
Prospect of selling off

Wholesale funding (money market funds, repo partners, conduits, SIVs, ...)

ABCP, MTN, overnight repos, securities lending

Changing banking landscape

Traditional Banking

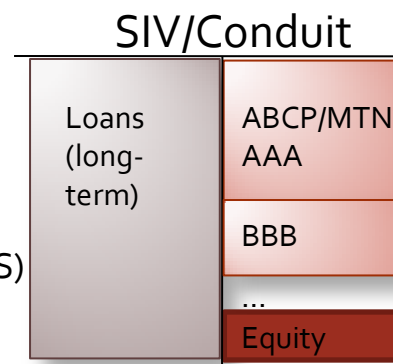


Role of banks

Channel funds	Long-run repayment	Prospect of selling off
Maturity transformation	Retail funding	Wholesale funding (money market funds, repo partners, conduits, SIVs, ...)
Info-insensitive securities	Demand deposits	ABCP, MTN, overnight repos, securities lending

Originate & distribute

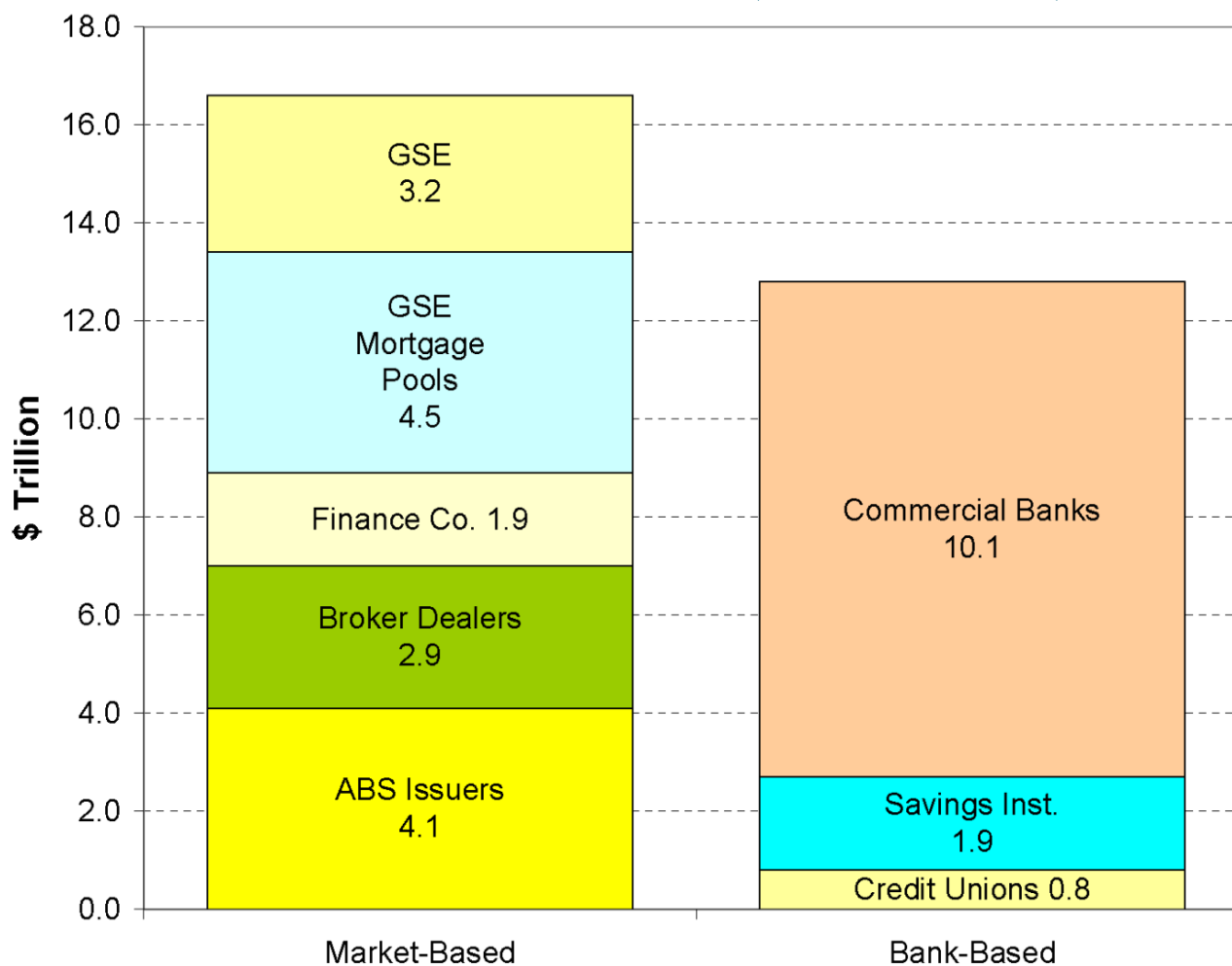
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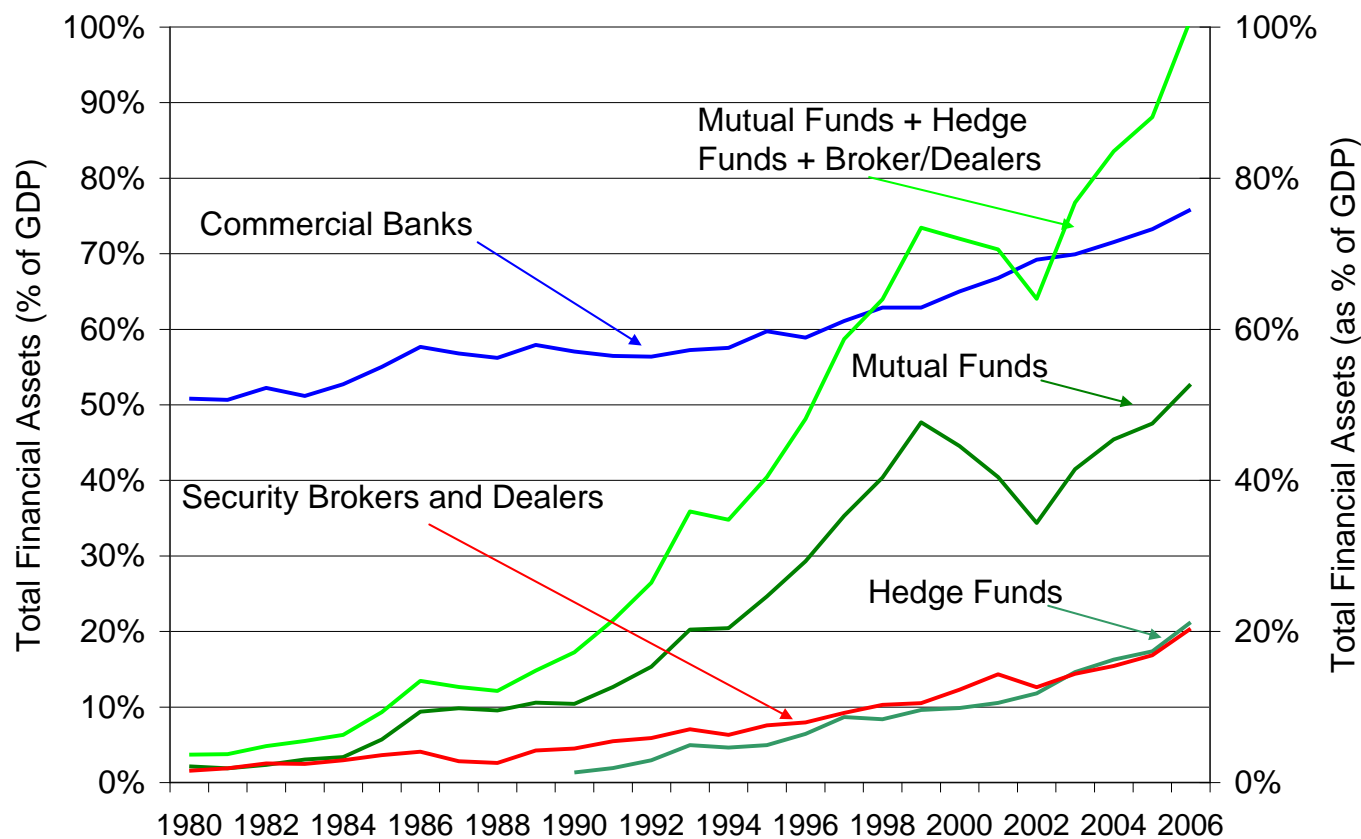
→ *feeds repo market for leveraging*

Marked-based vs. Bank-based



Source: Shin

|| Total Financial Assets as % of GDP



Shortening of maturity

- Off-balance sheet: SIVs et al.
 - Buy long-maturity assets
 - Sell and roll over short-term assets (ABCP)
 - + liquidity enhancement (credit line)
 - Traditional business of banks
 - New aspects:
- On-balance sheet: (overnight) Repo

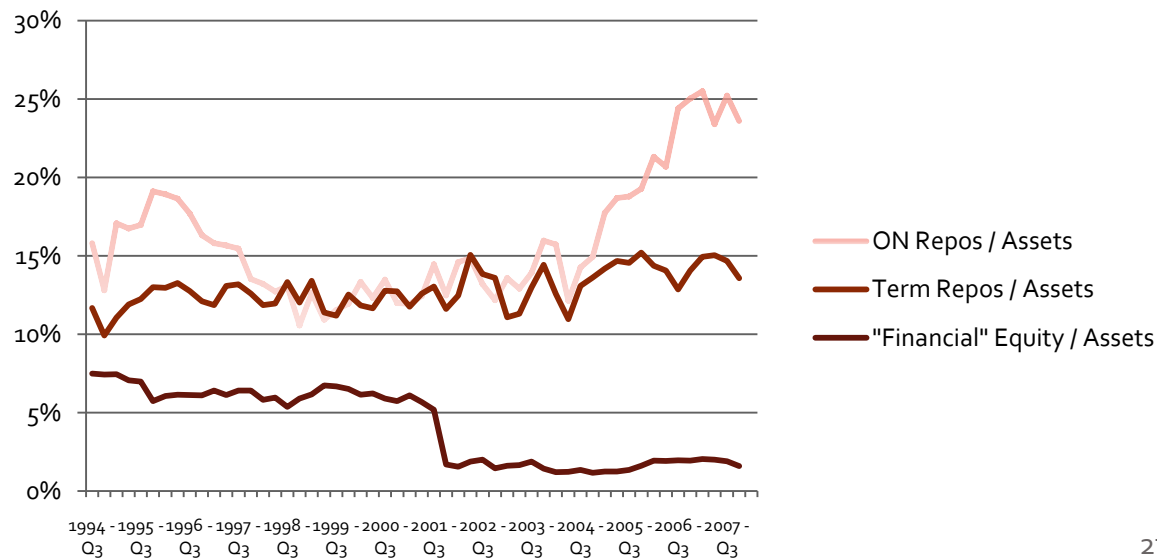
Shortening Maturity: I-Banks

■ Investment banks' main financing in 2007

- Repos 1150.9bn
 - Security credit (subject to Reg T)
 - Margin accounts from HH or non-profit 853.5bn
 - From banks 335.7bn
- "Financial" equity 49.3bn

- Increase in repo is due to overnight repos!

Repos as a Fraction of Broker/Dealers' Assets



Why Structured Products?

■ Good reasons

- Credit risk transfer risk who can best bear it
 - Banks: hold equity tranche to ensure monitoring
 - Pension funds: hold AAA rated assets due to restriction by their charter
 - Hedge funds: focus on more risky pieces
 - *Problem:* risks stayed mostly within banking system
banks held leveraged AAA assets – tail risk

■ Bad reasons - supply

- *Regulatory Arbitrage* – Outmaneuver Basel I (SIVs)
 - esp. reputational liquidity enhancements
- *Rating Arbitrage* – Outmaneuver Basel II
 - Rating doesn't distinguish between idiosyncratic and systematic risk
 - Instead of issuing BBB rated papers
 - transfer pool assets to SIV and issue AAA rated papers + liquidity enhancement
 - + banks' own rating was unaffected by this practice
 - ++ buy back AAA has lower capital charge (Basel II)
- ...

Why Structured Products?

- Bad reasons - demand
 - Naiveté – Reliance on
 - past low correlation among regional housing markets
 - Overestimates value of top tranches
 - explains why even investment banks held many mortgage products on their books
 - rating agencies - rating structured products is different
 - Quant-skills are needed instead of cash flow skills
 - **Rating at the edge** – AAA tranche just made it to be AAA
 - Trick your own fund investors – own firm (in case of UBS)
 - “Enhance” portfolio returns e.g. leveraged AAA positions – extreme tail risk
 - searching for yield (mean)
 - track record building (skewness: picking up nickels before the steamroller)
 - Attraction of illiquidity (no price exists) (fraction of “level 3 assets” went up a lot)
+ difficulty to value CDOs (correlation risk)
 - “mark-to-model”: Mark “up”, but not “down”
 - smooth volatility, increase Sharpe ratio, lower β , increase α
 - Implicit (hidden) leverage

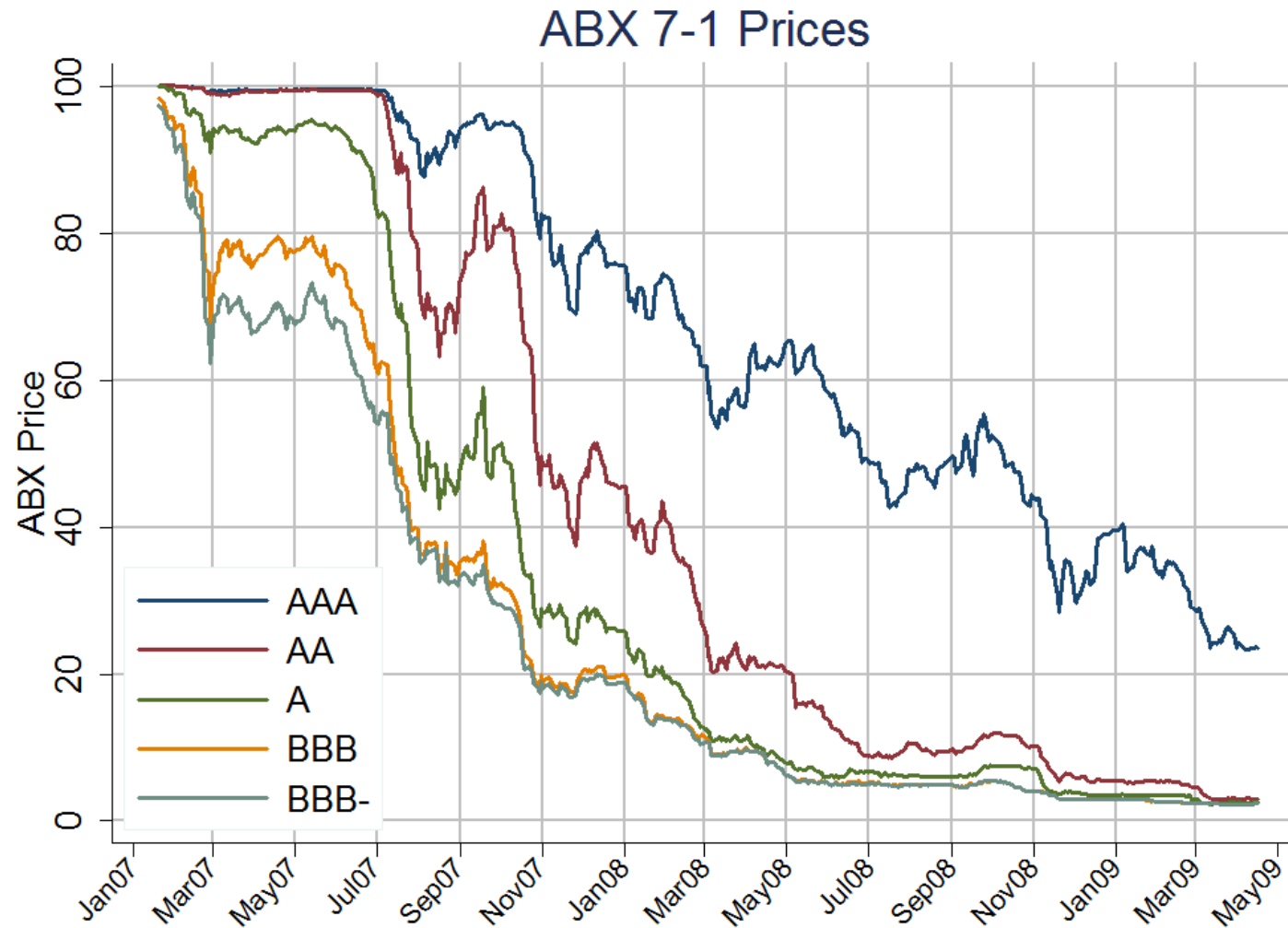


Consequences of

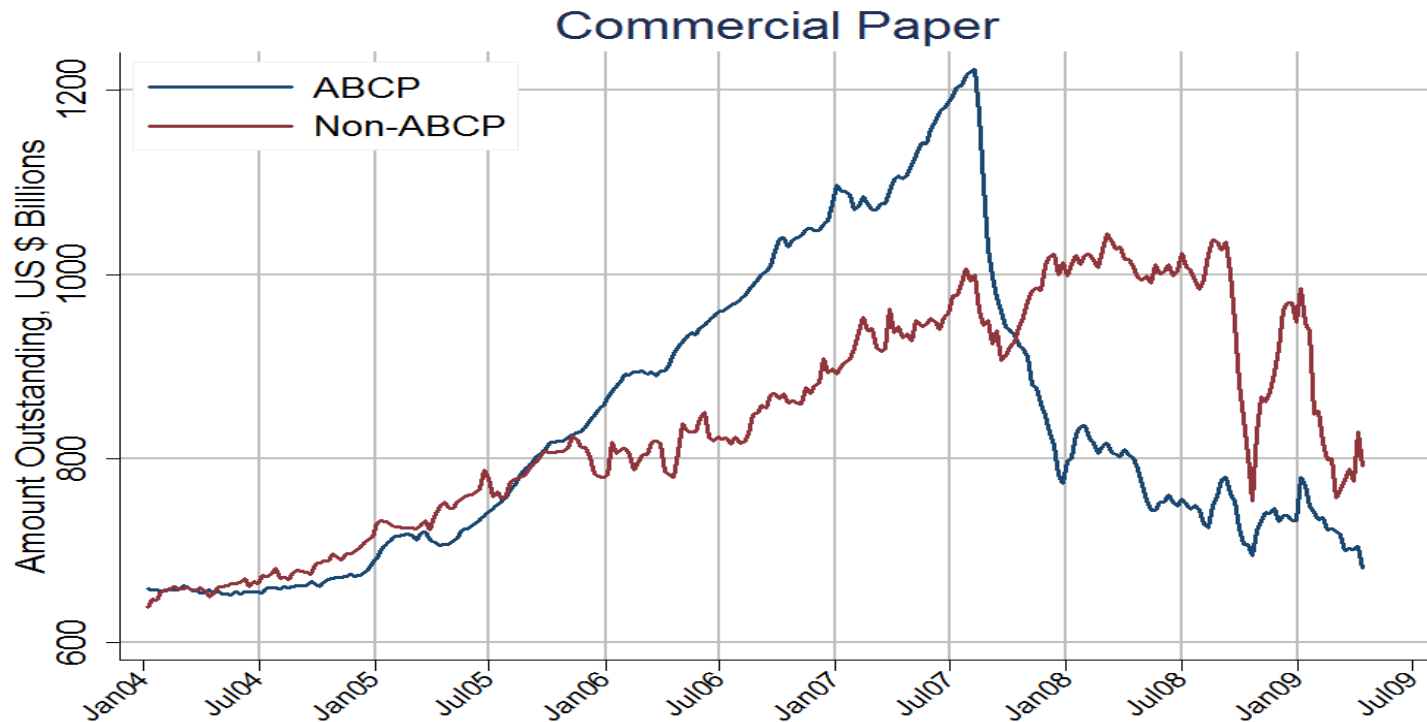
“originate and distribute banking model”

- Banks focus only on “**pipeline/warehouse risk**”
- Deterioration of lending standards
 - Housing Frenzy
 - Private equity bonanza – “going private trend”
LBO acquisition spree

Subprime Mortgage Crisis

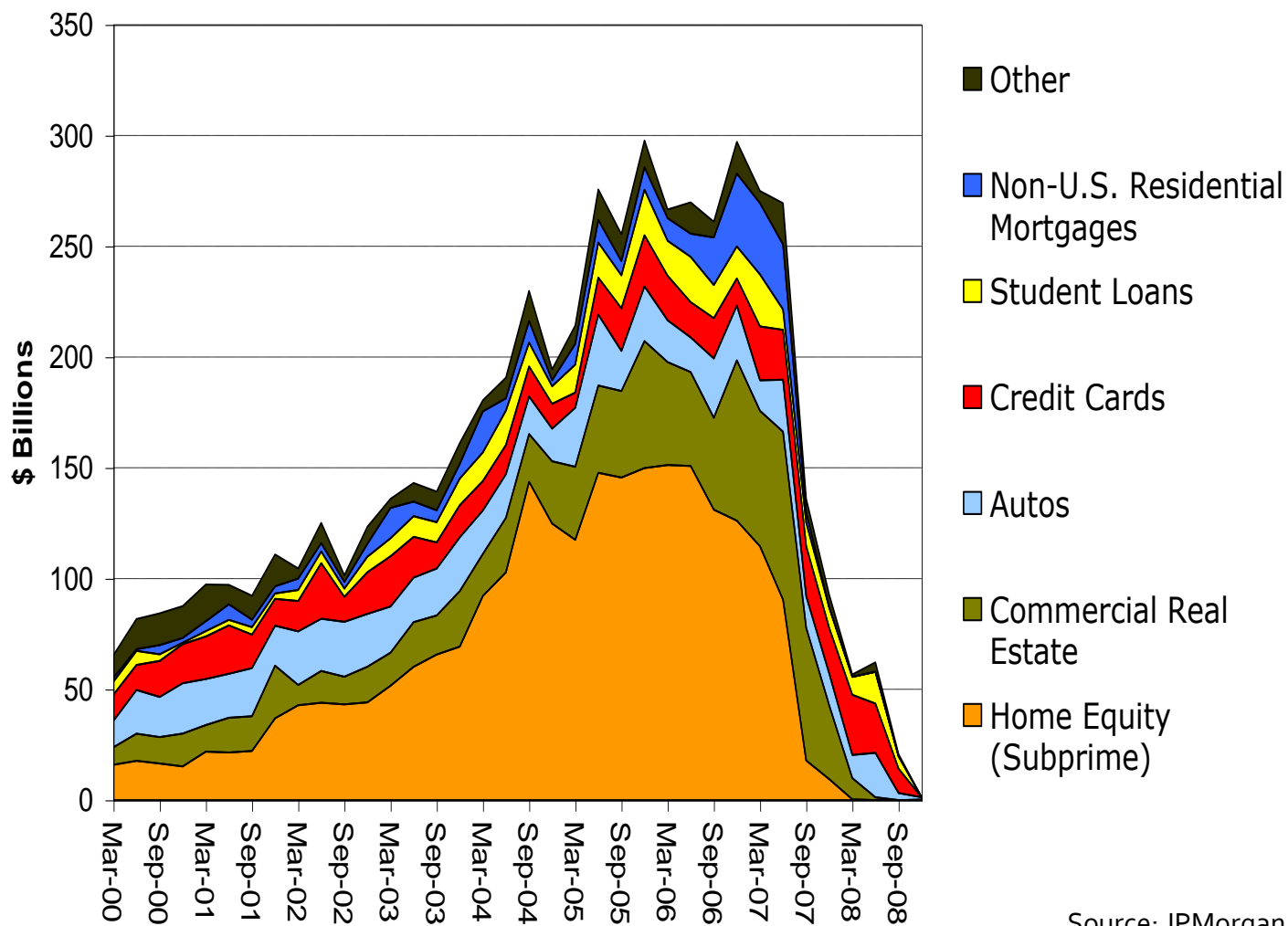


Commercial Paper



- ABCP dries up
 - no rollover, esp. by money market funds ("Break the Buck" Rule 2a-7)
- SIVs draw on credit lines of sponsoring bank
- Banking Crisis: IKB, SachsenLB, Northern Rock, IndyMac, ...

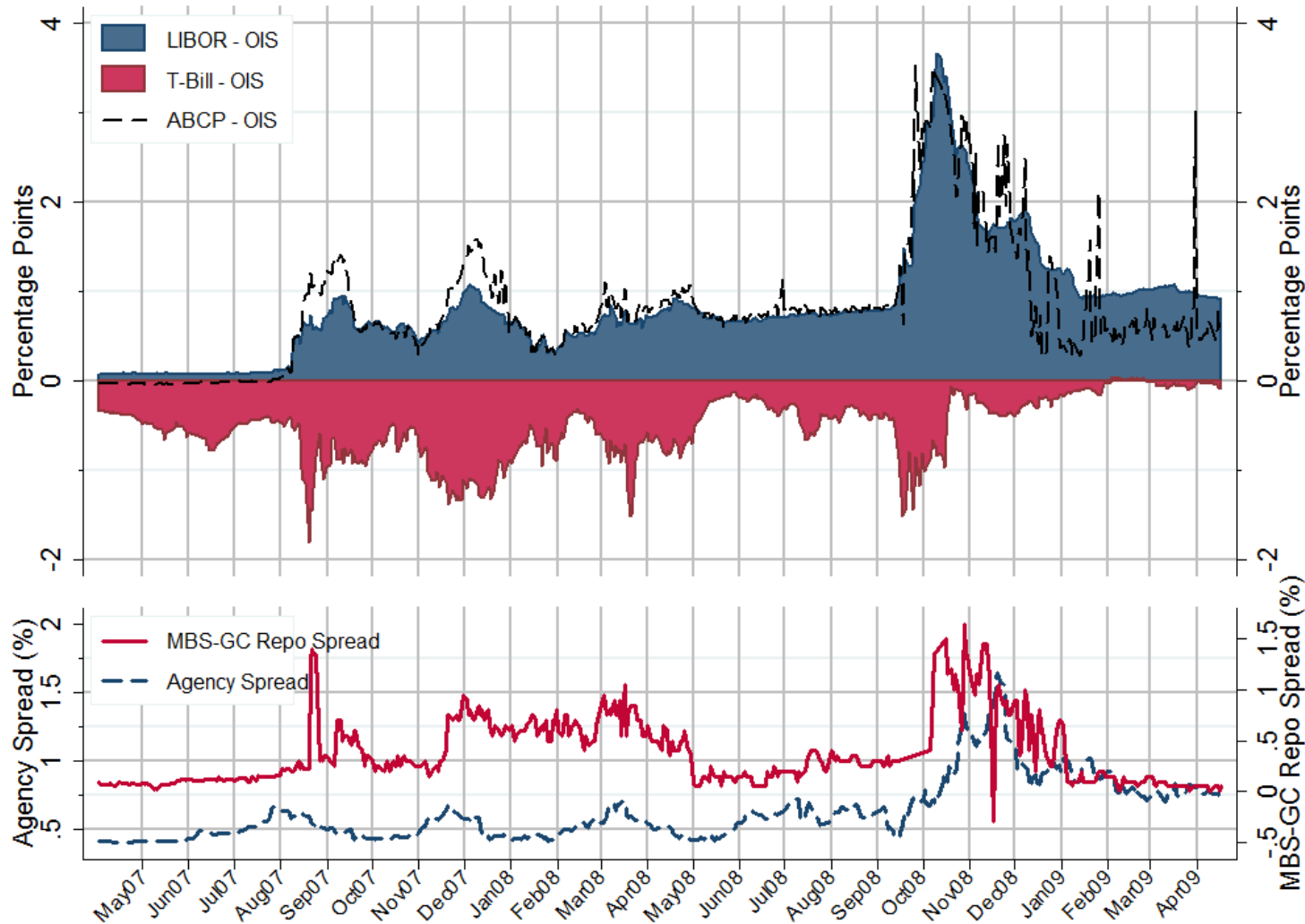
Drop in ABS issuance



Source: JPMorgan



The Waves



Default risk

Treasury special

T-Bill - OIS
Repo spread

Agency spread
leads TED

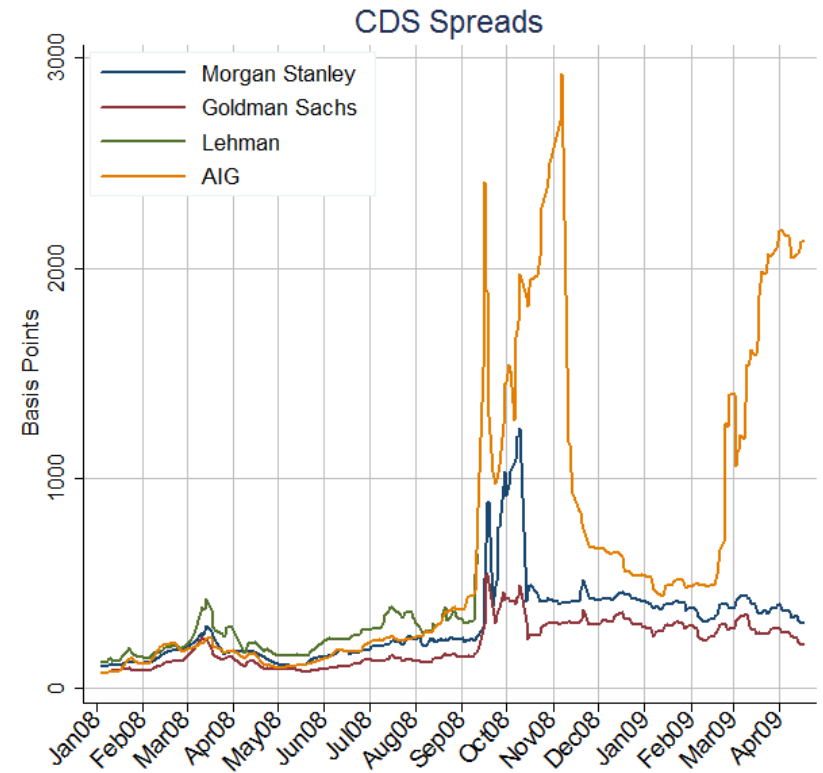
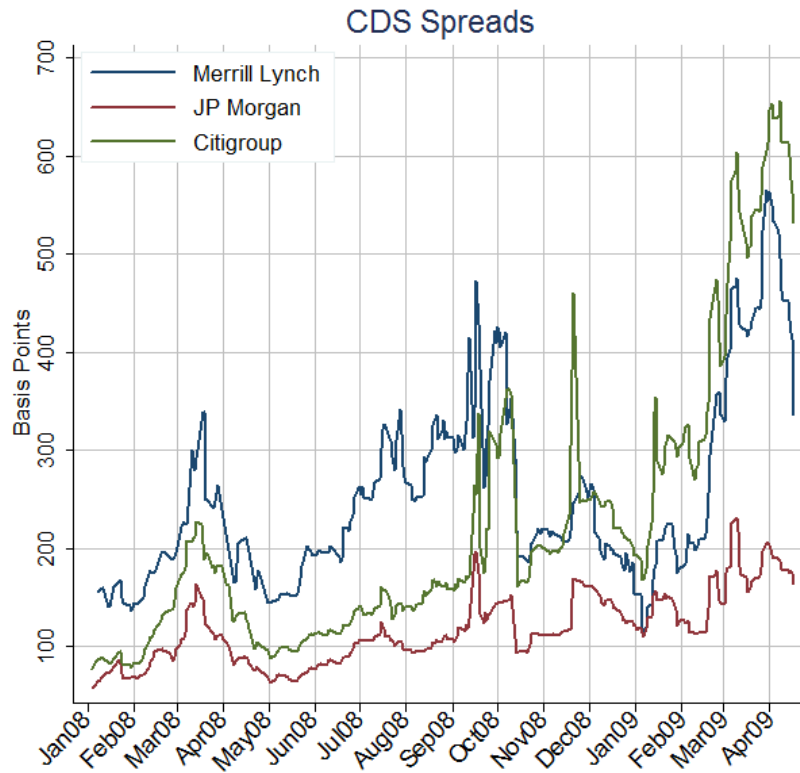
New lending
facilities

08/17 TermDW
12/12 TAF + Swap
03/16 PDCF
03/27 TSLF

Interest rate cuts

08/17 -.5 (DW)
09/18 -.5
10/31 -.25,
12/11 -.25,
01/22 -.75
01/30 -.5

CDS spreads



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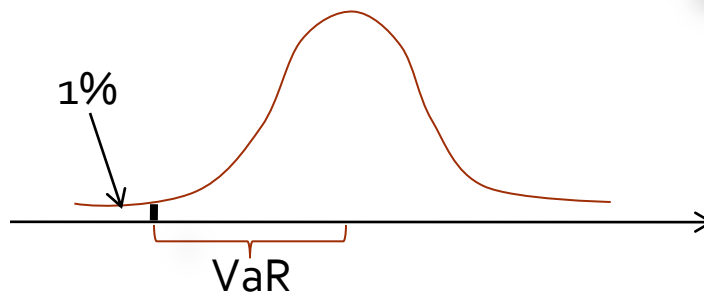
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Current regulation

1. Risk of each **institution in isolation** → Value at Risk



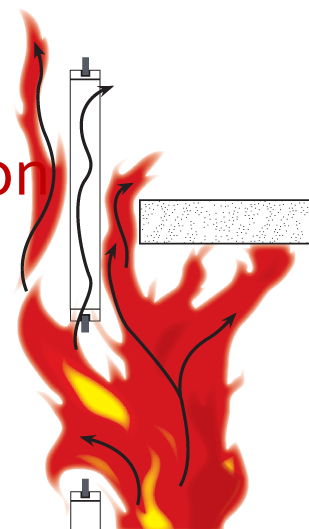
2. Procyclical capital requirements
 - VaR and ratings are countercyclical
3. Focus on **asset side** of the balance sheet
4. Differential capital treatment across industries.

Response to current regulation: “take positions that drag others down when you are in trouble” (maximize bailout probability)

become big, interconnected, hold similar positions

Challenges

1. Focus on externalities – systemic risk contribution
 - Internalize externalities (... just like pollution)
 - Fire-code analogy: fire-protection wall
 - $\text{CoVaR}^i = \text{VaR}^{\text{system}} | i \text{ in distress}$
2. Countercyclical regulation
 - Regulate based on characteristics that give rise to *future* systemic risk contributions
3. Incorporate funding structure
 - asset-liability interaction, debt maturity, liquidity risk
4. Objective regulatory criteria across financial institutions
 - Banks, broker-dealers, insurance companies, hedge funds,...
- Bankruptcy procedure, living will, (see Geneva Report)



Macro-prudential regulation

1. Externality – cross-section

- Measure contribution of institution to systemic risk: **CoVaR**
- Response to current regulation
“hang on to others and take positions that drag others down when you are in trouble”
(maximize bailout probability → **Moral Hazard**)
 - become big
 - hold similar position as others
 - become interconnected

2. Procyclicality – time-series

- Lean against “credit bubbles” – laddered response
 - Bubble + maturity mismatch impair financial system (vs. NASDAQ bubble)
- Impose Capital requirements/Pigouvian tax/Private insurance scheme
 - *not directly* on ΔCoVaR , but on
 - frequently observed factors, like maturity mismatch, leverage, B/M, *crowdedness* of trades/credit, ...

3. Funding: Asset-Liability Maturity Match

Overview – next steps

- Who should be regulated?
 - Micro-prudential
 - Macro-prudential
 - ➡ Objective risk contribution measure – like CoVaR, BSMD
- How much?
 - Based on contribution to systemic risk (externalities)
 - ➡ CoVaR^{contri}
- Countercyclicality
 - Predict future CoVaR with high frequency variables
 - Laddered response
- How?
 - Caps: capital ratio requirements
 - Pigouvian tax
 - Private insurance scheme

Regulate

■ Financial institutions

- Based on objective criteria across all financial institutions
- “Boundary problem”
- Shadow banking system
- Style
 - Top-down
 - bottom-up
 - Assets by asset....

■ Financial instruments/ markets


- ... get handle on shadow banking system
- Margins/haircuts
 - Limit change to enforce higher initial margin

Macro- vs. Micro-prudential regulation

■ Fallacy of the Composition:

what's micro-prudent need not be macro-prudent

Balance sheet	action	micro-prudent	macro-prudent
Asset side	(fire) sell assets	Yes	Not feasible in the aggregate
	no new loans/assets	Yes	Forces others to fire-sell + credit crunch
Liability side	(raise long-term debt)		
	raise equity	Yes	Yes



- Micro: based on risk in isolation
- Macro: Classification on systemic risk contribution measure, e.g. CoVaR or BSMD (Segoviano-Goodhart 2009)
- Jeremy Stein's words: Ratios versus Dollars

Who should be regulated?

group	examples	micro-prudential	macro-prudential
"individually systemic"	International banks (national champions)	Yes	Yes
"systemic as part of a herd"	Leveraged hedge funds	No	Yes
non-systemic large	Pension funds	Yes	No
"tinies"	unlevered	No	No

- Includes shadow banking system
- **Clone property:** split i in n identical clones,
 $\text{CoVaR}^i = n\text{CoVaR}^c$

How to regulate?

- **Size limits:**

- **Problem 1:** “too big to fail” \neq “too systemic to fail”
 - split “individually systemic” institution into 10 clones
 - (clones perfectly comove with each other)
- “systemic as part of a herd”



Lessons:

- Regulation should provide incentive to be heterogeneous
- Spillover risk measure should satisfy “clone property”
- **Problem 2:**
 - one-dimensional threshold
 - “bunching” below threshold



Lesson: Smooth transition -- “have to pay” in leverage ...

- **Mix of size, leverage, maturity mismatch, connectedness, risk pockets, crowded trades, business model, ...**
.... but what weights?

CoVaR method

1. Find **optimal mix**/trade-offs between size, leverage,, across institutions **objective weights**
2. **Countercyclical** implementation **forward-looking weights**

Method:

- *Predict* ΔCoVaR using frequently observed characteristics
 - Size, maturity mismatch, leverage,
 - special data only bank supervisors have
(e.g. crowdedness , interconnectedness measures)
- Step-procedure:
 1. Form portfolios
 2. Time-varying CoVaR (linked to lagged macro variables: VIX, Repo spread, term spread, credit spread, market return, housing)
 3. Predict future CoVaR using size, leverage ,...

How to measure externalities: CoVaR

- VaR_q^i is implicitly defined as quantile

$$\Pr(X^i \leq \text{VaR}_q^i) = q$$

- $\text{CoVaR}_q^{j|i}$ is the VaR_q^j conditional on institute i (index) being in distress (i.e., at its VaR level)

$$\Pr(X^j \leq \text{CoVaR}_q^{j|i} \mid \underbrace{X^i = \text{VaR}_q^i}_{\text{q-prob. event}}) = q$$

- $\Delta \text{CoVaR}_q^{j|i} = \text{CoVaR}_q^{j|i} - \text{VaR}_q^j$

q-prob. event

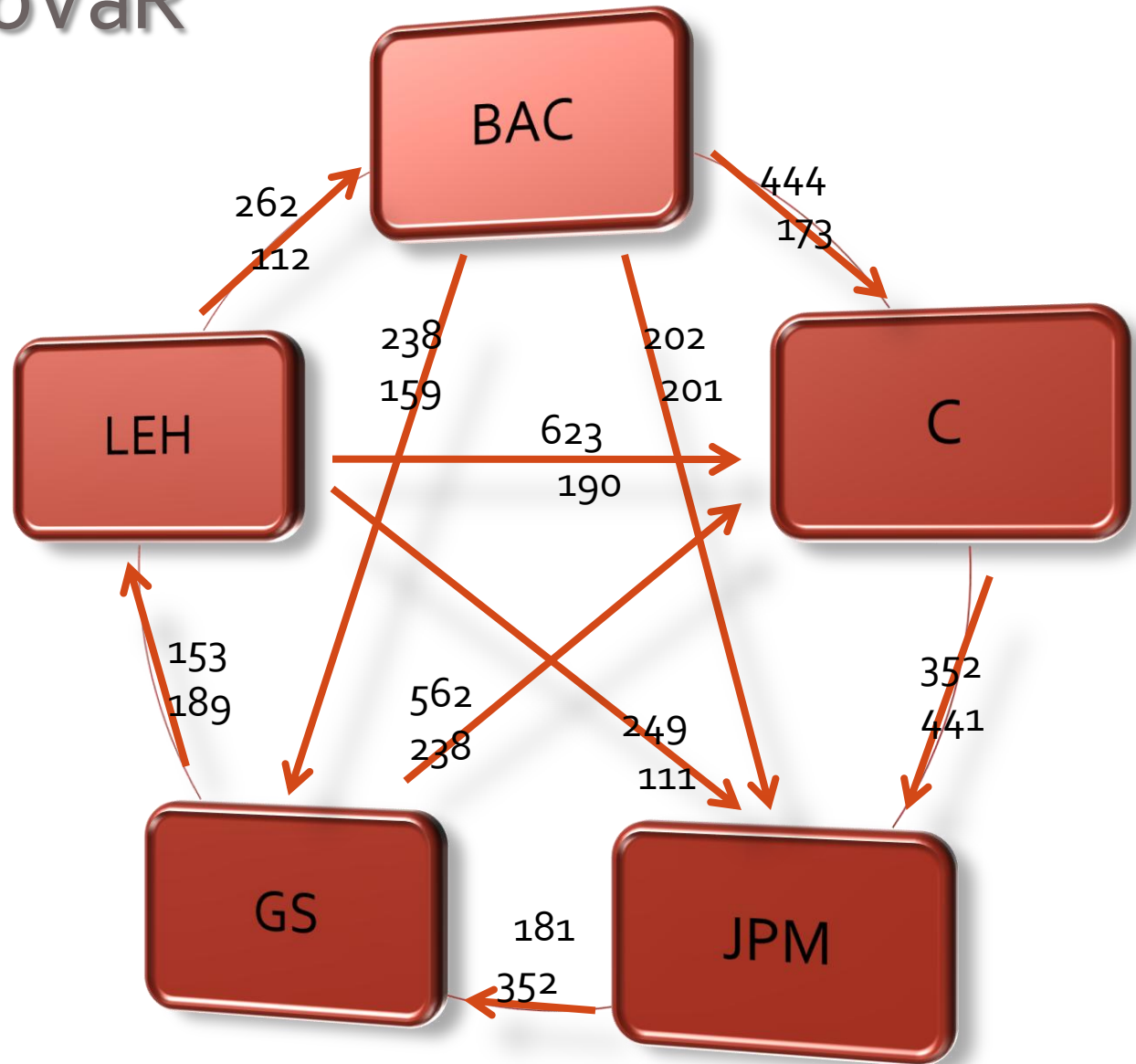
- Various conditionings? (direction matters!)



ΔCoVaR

- **Q1:** Which institutions move system (in a non-causal sense)
- $\text{VaR}^{\text{system}} \mid \text{institution } i \text{ in distress}$
- **Exposure ΔCoVaR**
 - **Q2:** Which institutions are most exposed if there is a systemic crisis?
 - $\text{VaR}^i \mid \text{system in distress}$
- **Network ΔCoVaR**
 - VaR of institution j conditional on i in non-causal sense!

Network CoVaR



- conditional on origin of arrow

Quantile Regressions: A Refresher

- **OLS Regression:** min sum of squared residuals

$$\beta^{OLS} = \arg \min_{\beta} \sum_t (y_t - \alpha - \beta x_t)^2$$

- *Predicted value:* $E[y | x] = \alpha + \beta x$

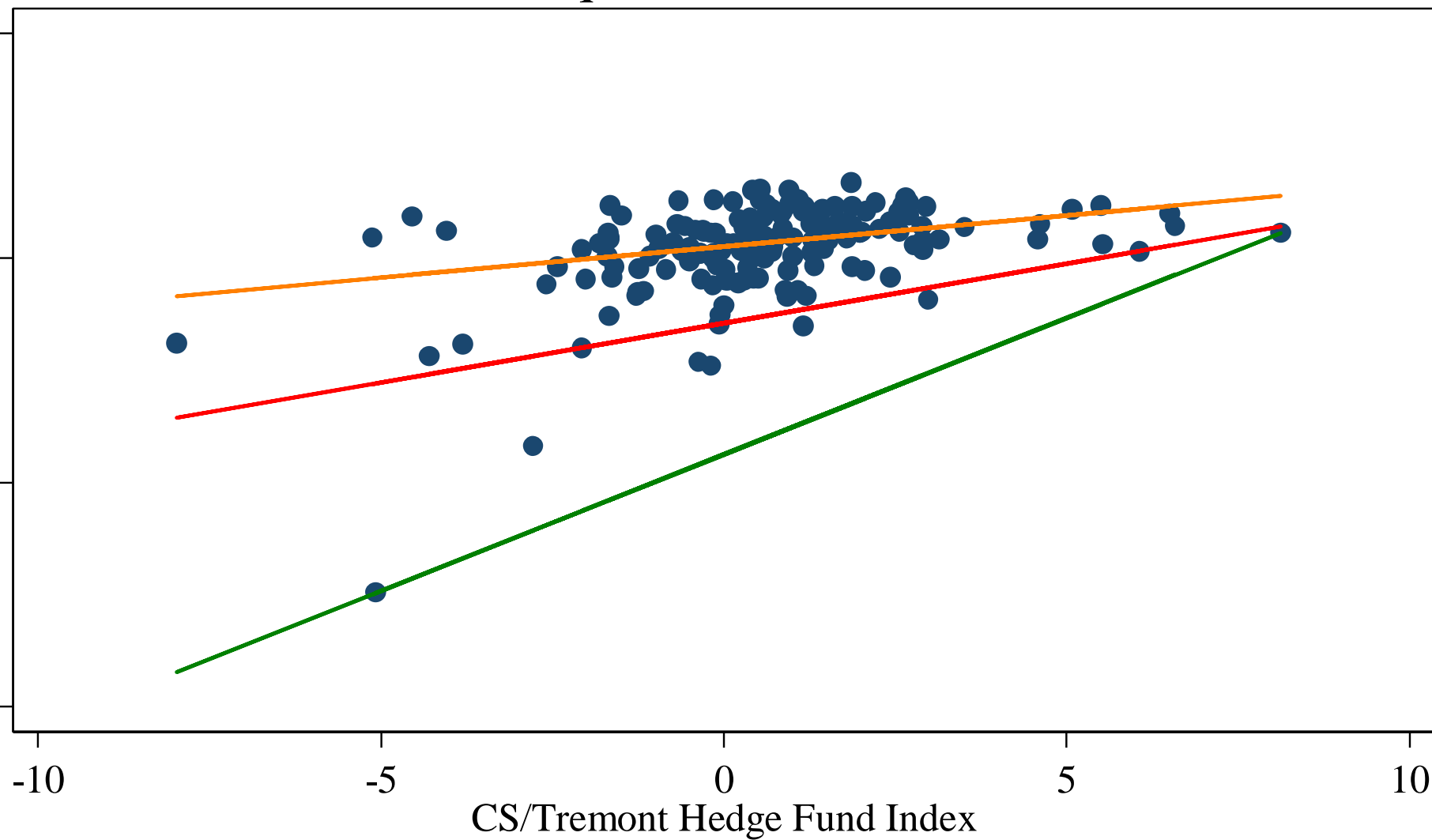
- **Quantile Regression:** min weighted absolute values

$$\beta^q = \arg \min_{\beta} \sum_t \begin{cases} q |y_t - \alpha - \beta x_t| & \text{if } y_t - \alpha - \beta x_t \geq 0 \\ 1 - q |y_t - \alpha - \beta x_t| & \text{if } y_t - \alpha - \beta x_t < 0 \end{cases}$$

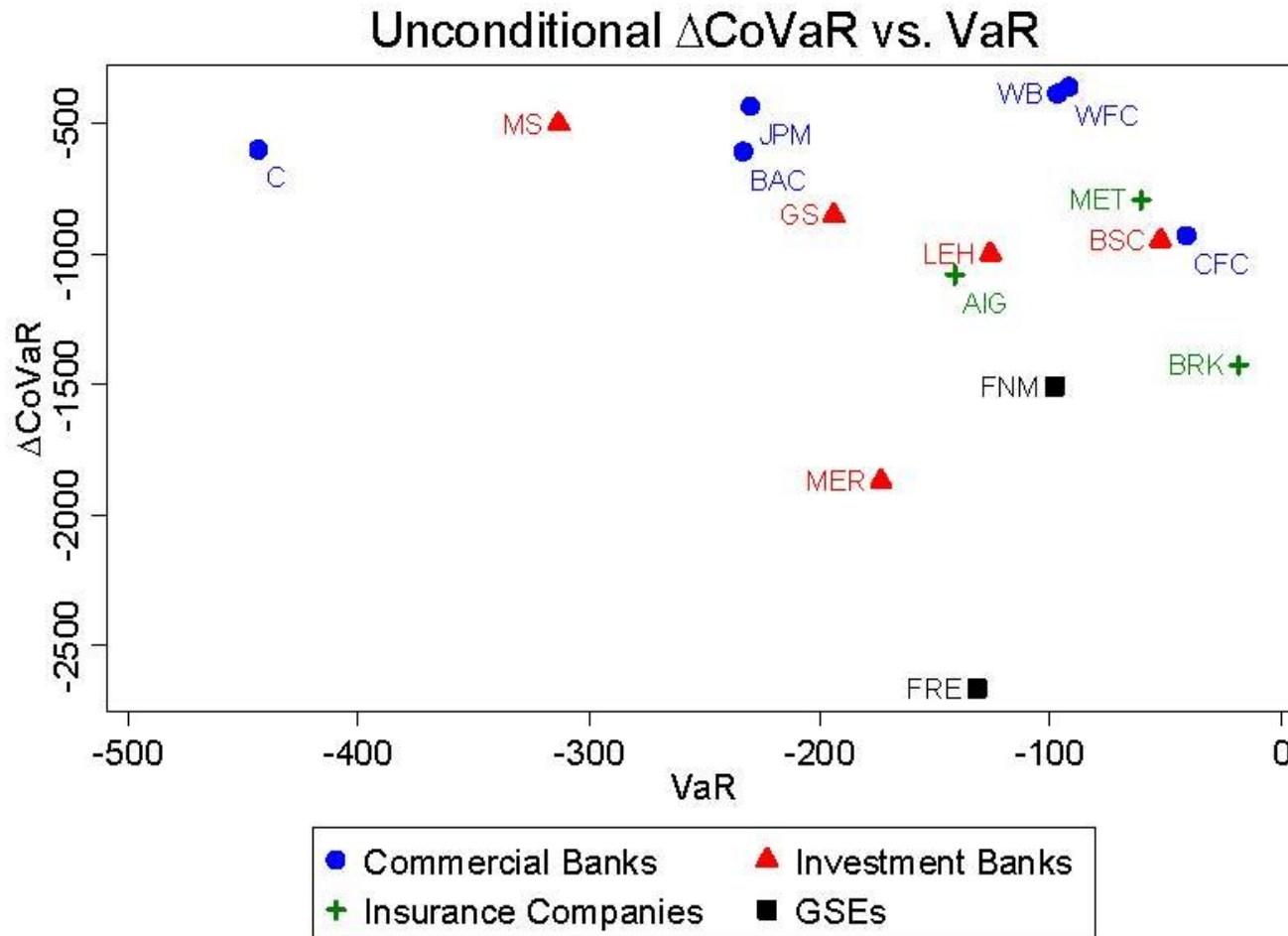
- *Predicted value:* $VaR_q | x = F_y^{-1}(q | x) = \alpha_q + \beta_q x$

Note out (non-traditional) sign convention!

q-Sensitivities



|| ΔCoVaR and VaR unrelated in cross-section




- VaR does not capture systemic risk contribution $\Delta\text{CoVaR}_{\text{contri}}$
- Data up to 2007/12

Data

- $$X_t^i = \frac{ME_t^i \cdot LEV_t^i - ME_{t-1}^i \cdot LEV_{t-1}^i}{ME_{t-1}^i \cdot LEV_{t-1}^i} = \frac{A_t^i - A_{t-1}^i}{A_{t-1}^i}$$
 - ME_t^i : market value of equity
 - LEV_t^i : leverage ratio of total assets to book equity
- Publicly traded financial intermediaries 1986-2008.
- Commercial banks, security broker-dealers, insurance companies, real estate companies
- Weekly market equity data from CRSP
quarterly balance sheet data from COMPUSTAT
- State variables:
VIX level, 3m Treasury yield change, Repo/Treasury spread, BAA/10y Treasury spread change, 10y-3m Treasury spread change, one year cumulative real estate index return, market return

|| Step 1: Portfolios Sorted on Characteristics

- Individual financial institutions have changed the nature of their business over time
 - Institutional characteristics matter
 - Form quintile portfolios on
 - Size
 - Leverage
 - Maturity Mismatch
 - *"Excessive" Credit growth*  *countercyclical*
 - Equity volatility
... each quarter, based on last quarter's values
- for each of the following 4 "industries"
- Banks, Security broker-dealers, Insurance companies, Real Estate companies.

Step 2: Time-varying ΔCoVaR

- Derive time-varying VaR_t

- For institution i :

$$X_t^i = \alpha_q^i + \beta_q^i M_{t-1} + \varepsilon_t^i$$

- For financial system:

$$X_t^{\text{system}} = \alpha_q^{\text{system}} + \beta_q^{\text{system}} M_{t-1} + \varepsilon_t^{\text{system}}$$

- Derive time-varying CoVaR_t

$$X_t^{\text{system}} = \alpha_q^{\text{system}|i} + \beta_q^{\text{system}|i} M_{t-1} + \gamma X_t^i + \varepsilon_t^{\text{system}|i}$$

- $\Delta\text{CoVaR}_t = \text{CoVaR}_t - \text{VaR}_t$

Step 2: Time-varying CoVaR

- Relate to macro factors, M_t
 - VIX Level
 - Repo – 3 month Treasury
 - 3 month yield
 - 10Year – 3 month Treasury
 - Moody's BAA – 10 year Treasury
 - Equity market risk
 - Real estate index

interpretation

“Volatility”

“Flight to Liquidity”

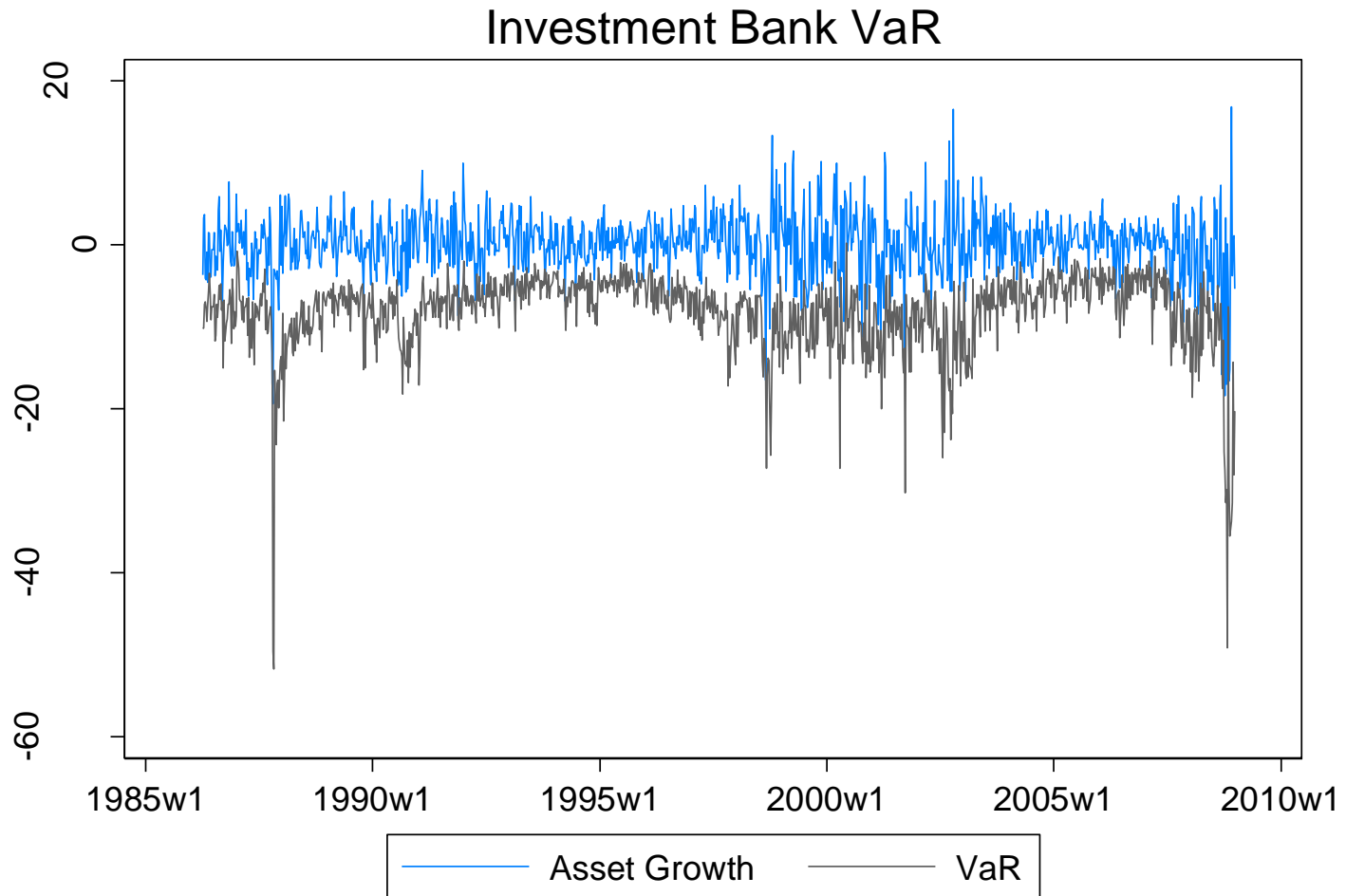
“Business Cycle”

“Credit indicator”

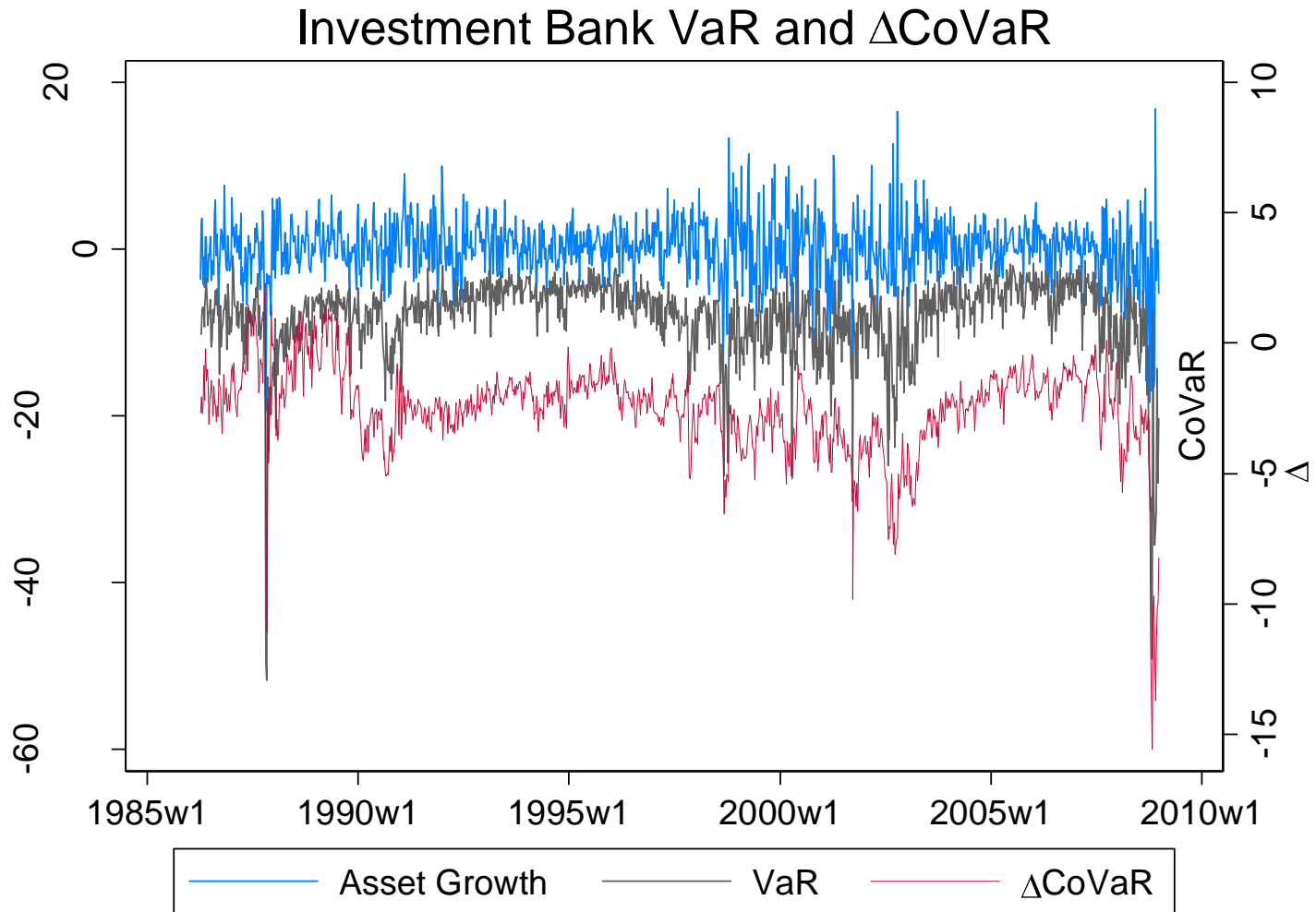
“Housing”

 Obtain Panel data of CoVaR

Time-varying VaR



Time-varying VaR and ΔCoVaR



Step 3: ΔCoVaR Forecasts: 1% (quarterly) (Table 3A)

COEFFICIENT	2 Years	1 Year	1 Quarter
VaR (lagged)	0.013**	0.026***	0.059***
Leverage (lagged)	-0.124***	-0.126***	-0.097***
Maturity mismatch (lagged)	-2.995***	-1.889**	-1.422
Relative size (lagged)	-1.841***	-1.947***	-1.889***
2-year asset growth (lagged)	-0.294***	-0.257**	-0.334***
Foreign	-3.022**	-3.468**	-3.379**
Investment Bank FE	-6.407***	-5.748***	-4.407***
Insurance Company FE	-14.356***	-14.307***	-14.337***
Real Estate FE	-1.282*	-0.745	0.619
Constant	-12.072***	-11.022***	-8.537***
Observations	7420	7809	8113
R ²	0.388	0.405	0.425

Step 3: Δ CoVaR Forecasts: 1-Year Horizon (Table 3B)

COEFFICIENT	1%	5%	10%
VaR (lagged)	0.026***	0.017***	-0.021***
Leverage (lagged)	-0.126***	-0.086***	-0.053***
Maturity mismatch (lagged)	-1.889**	0.008	-0.285
Relative size (lagged)	-1.947***	-1.094***	-0.510***
2-year asset growth (lagged)	-0.257**	-0.142**	-0.127***
Foreign	-3.468**	-2.351***	-1.475***
Investment Bank FE	-5.748***	-3.083***	-2.777***
Insurance Company FE	-14.307***	-4.612***	-3.527***
Real Estate FE	-0.745	1.544***	1.125***
Constant	-11.022***	-7.955***	-10.730***
Observations	7809	7809	7809
R ²	0.405	0.302	0.440

Result 1: Size-Leverage tradeoff

- Suppose
 - 8 % microprudential capital requirement = leverage < 12.5 : 1
 - Focus on 1% CoVaR, 1 year in the future
- Coefficient on size is -1.947, on leverage -0.126
- An increase in size, say from 1% to 21 % market share (measured in total assets) requires
- Decrease in leverage by
 $(1.947/0.126) * (21\% - 1\%) = 12 * 20\% = 3.1$ to 9.4
or
increase in capital requirements from 8% to roughly 11%

Result 2: MMM-Leverage tradeoff

- Coefficient on MMM is -1.889, on leverage -0.126
- An increase in MMM (short-term debt – cash, normalized by total assets), from 20% to 30% requires
- Decrease in leverage by
 $(1.889/0.126) * (0.1) = 1.499$ to 11.0
or
increase in capital requirements from 8% to 9.1%

Results 1: Summary based on US data

- Suppose
 - 8 % microprudential capital requirement = leverage < 12.5 : 1
 - Focus on 1% CoVaR, 1 year in the future
- Size-leverage tradeoff
 - Small bank with 1% market share has 8% capital requirement
 - Large bank with 21% market share has 11% capital requirement
- Maturity mismatch-leverage tradeoff
 - Bank with 20% MMM has 8% capital requirement
 - Bank with 30% MMM has 9.1% capital requirement,
where $MMM = (\text{short-term debt} - \text{cash}) / \text{total assets}$

|| Step 3b: Forecasting with Market Variables

- CDS spread and equity implied volatility for 10 largest US commercial and investment banks (from Bloomberg)
- Betas:
 - Extract principal component from CDS spread changes/implied vol changes within each quarter from daily data
 - Regress each CDS spread change/ implied vol change on first principal component

Step 3B: Δ CoVaR Forecasts by Market Variables

Cross Section, Portfolios, 1%

COEFFICIENT	2 Years	1 Year	1 Quarter
Δ CoVaR (lagged)	0.60***	0.79***	0.94***
VaR (lagged)	-1.84	0.05	-0.08
CDS beta (lagged)	-1.727**	787.92	95.37
CDS (lagged)	1.320	-2.211	-40.26
Implied Vol beta (lagged)	-8.30	-590.28**	-85.78
Implied Vol (lagged)	-144.60	111.02	234.56***
Constant	-335.30	-147.72	-114.07*
Observations	114	154	184
R ²	0.36	0.57	0.77

short data-span (2004-2008)!

1) beta w.r.t. first principal component on changes in CDS spreads within quarter

2) panel regression with FE – (no findings with FE+TE)

Extension to our Analysis

- Co-Expected Shortfall (“Co-ES”)
 - Average over CoVaRs – with same conditioning event
 - Advantage: coherent risk measure
 - Disadvantage: any estimate “in” the tail is very noisy
- Conditioning event with inequality sign
- Inclusion of additional information
 - derivative positions
 - off-balance sheet exposure
 - Crowdedness measure
 - Interdependence measures
 - Bank supervision information

Countercyclical Regulation

- *When market is relaxed*

Strict Laddered Response

- **Step 1:** supervision enhanced
- **Step 2:** forbidden to pay out dividends
 - See connection to debt-overhang problem)
- **Step 3:** No Bonus for CEOs
- **Step 4:** Recapitalization within two months + debt/equity swap

- *When market is strict*

Relax regulatory requirement

Macro-prudential instruments

- Lean against credit bubbles/buildup of risk + capture externalities
 - Time-varying capital/liquidity requirements – Loan-to-Value (systemic risk surcharge)
 - Dynamic provisioning
 - Pigouvian tax/private insurance scheme
 - Lending criteria
 - Communication policy – warnings of risk buildup
 - Coordinate/synchronize investors to go against a bubble
 - use financial stability reports.
 - Interest rate policy
 - SIV financing would have been much less attractive

Independence of a political pressure!

Accounting: Mark-to-Funding

- Dual role of accounting
 - Transparency
 - Constrain business decision (for capital requirements)

two balance sheets
creditor protection
economy-wide concern
- **Main objective:** Incentivize long-term funding
Unify current hold-to-maturity accounting and mark-to-market accounting
- Current asymmetry
 - Mark-to-market in booms
 - Mark-to-maturity in downturn
- Devil is in the details:
 - **Effective maturity** of funding
 - Demand deposits are overnight, but they are relatively sticky compared to wholesale funding
 - Market liquidity of assets (in time)
 - Time it takes to sell the asset
 - Used as collateral at central banks (without significant haircut)
 - Maturity mismatch for whole balance sheet, asset-by-asset or subpools

Overview

1. Theoretical background

- Role of financial institutions
 - Channeling funds – project selection
 - Monitoring
 - Maturity transformation – why so much?
 - Info insensitive securities/money creation
- Capital (leverage) versus liquidity (maturity mismatch)

2. Changing of the banking landscape

3. Regulation

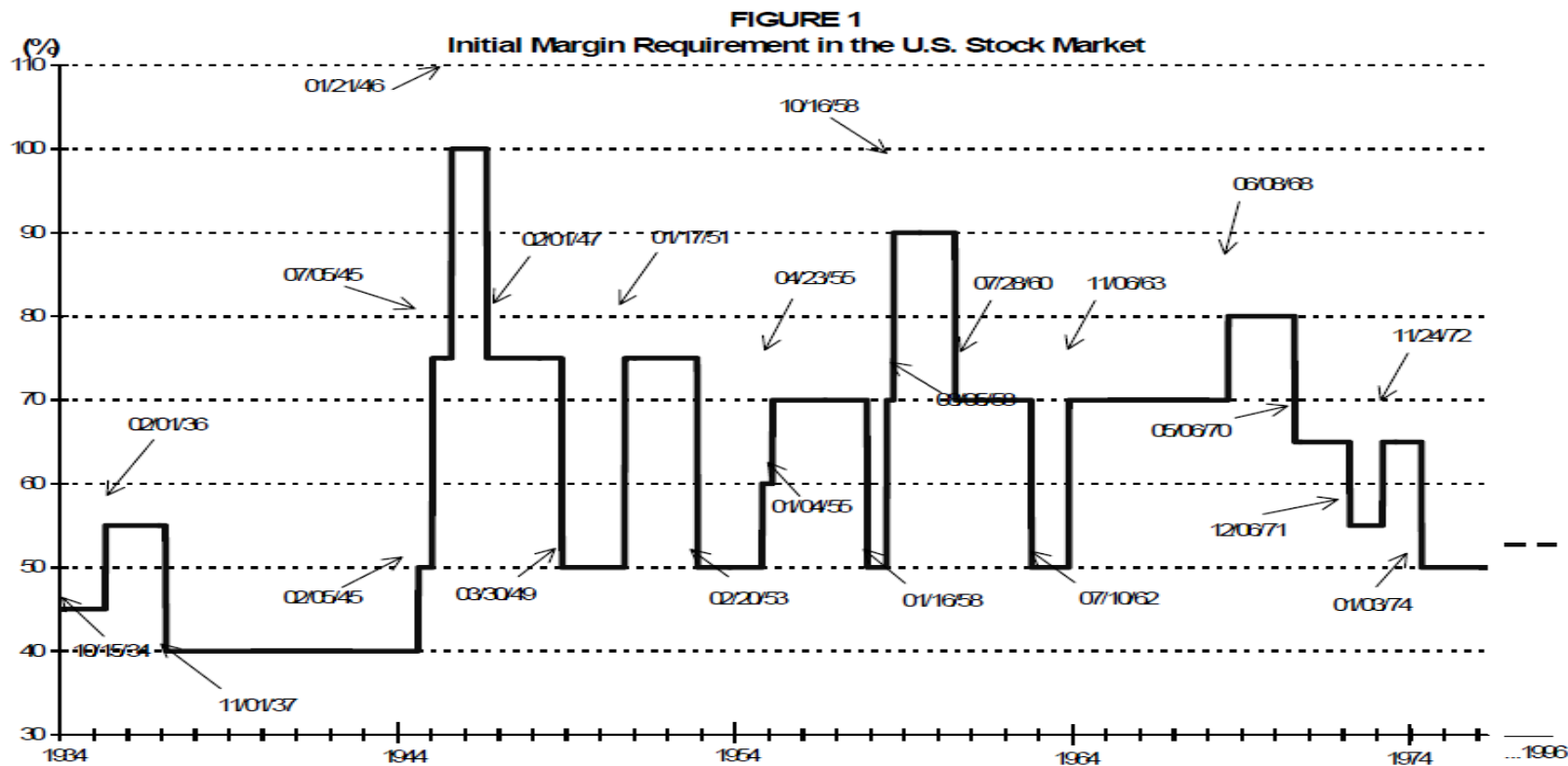
- Current regulation + challenges
- Regulating institutions
- Regulating asset trading/markets
- Misc.

Margin/haircuts on asset

- Problem: haircut/margin spiral
- Proposal:
 - Allow lenders to **adjust margin only infrequently**
 - = long-term loans (instead of short-term loans)
 - Less (funding) liquidity risk due to maturity mismatch
 - Endogenous response:
 - Margins/haircuts will be higher
 - Leverage will be lower
 - FED can reinstate policy is requiring margins
 - Has to be extended to many financial instruments
 - Easy to get around it

Regulation T

- The Fed decided the initial margins in US stock market, which kept unchanged since 1974.



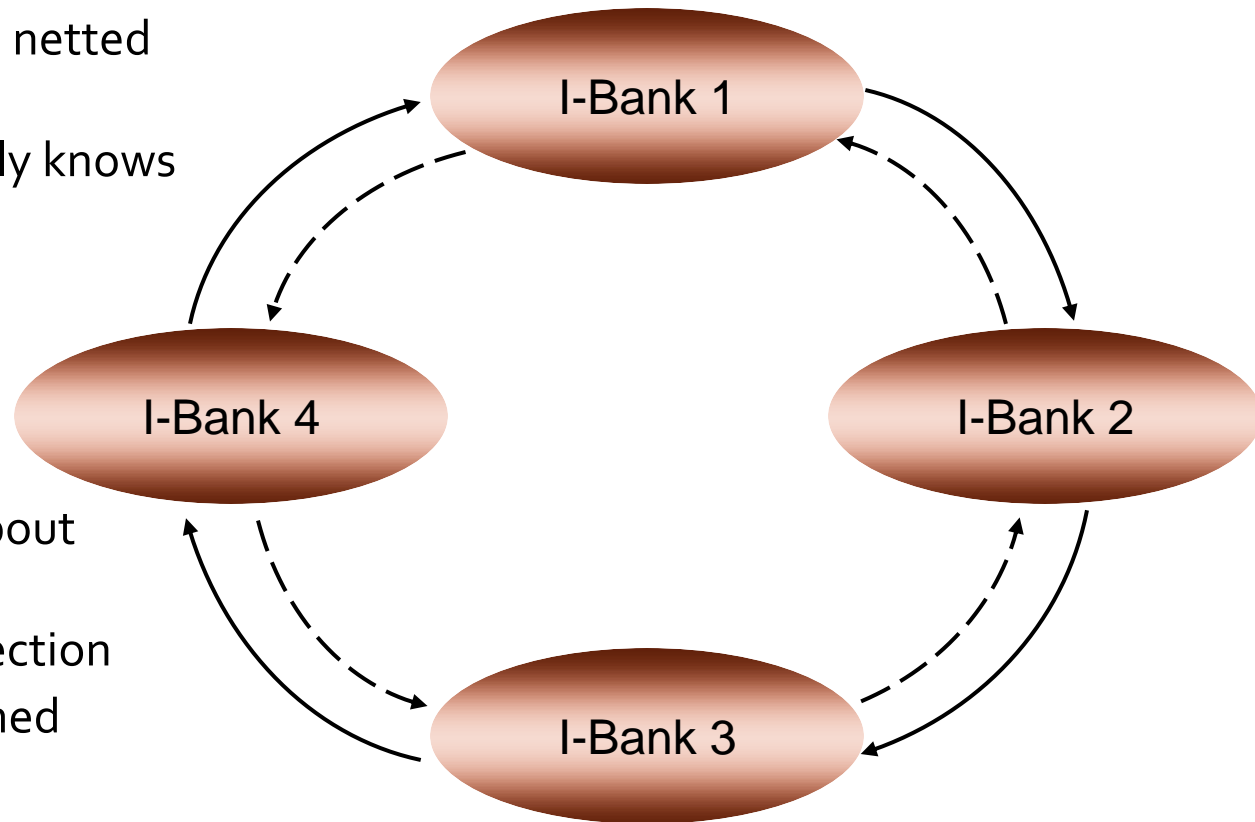
Counterparty Credit Risk – Info Externality

■ CDS Example

- Everything can be netted out
- But each party only knows his obligations

■ CDS spiral

- Banks' concern about CPCR
- Bought CDS protection
- CDS spread widened
- Rating agencies downgraded
- Hurts bank's cash flow



|| Counterparty Credit Risk – Info Externality

- Move to **Clearing House arrangement**

- Would allow netting
- Reduces counterparty credit risk
- Frees up funds

 Impose higher capital charge on OTC contracts

- Move to net exposure in Swap agreements





Overview

1. Theoretical background

- ...

2. Change of banking landscape

3. Regulation

- Current regulation + challenges
- Regulating institutions
- Regulating asset trading/markets
- Misc.

|| Encourage long-term funding

1. Liquidity charge based on

- Maturity mismatch

2. Capital ratio requirement is based on

- Mark-to-funding accounting rule +
- mark-to-market is still maintained

- Dual role of accounting
 - Transparency
 - Constrain business decision
(for capital requirements)

two balance sheets

creditor protection

economy-wide concern

Mark-to-Funding

- **Main objective:** Incentivize long-term funding
- Unify current hold-to-maturity accounting and mark-to-market accounting
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Recall Roadmap

1. Focus on externalities – systemic risk contribution
2. Countercyclical regulation
3. CoVaR Method: quantify optimal policy mix across various measures
4. Regulating institutions and assets/markets (top down, bottom up)
5. **Misc - Other issues**
 - Prompt resolution for bank holding corporation and debt-equity swaps
 - Living will – prepackaged bankruptcy
 - Remuneration
 - Big banks-small countries problem
 - Loan-to-Value Ratio limitations
 - Credit Rating Agencies
 - Own bankruptcy contingency plan for individually systemic financial institutions
 - Year-end spikes

|| Prompt resolution bankruptcy for holdings

- *Problem:* Bankruptcy resolution is too slow for financial institutions.
 - Shareholder approval is needed for “forced merger” (bailout)
 - Prompt resolution framework that was introduced only for commercial banks (and executed by FDIC) after the S&L crisis
- *Debt-overhang problem*
 - ➔ Extend prompt resolution framework to all financial institutions (worldwide) (include bank holding companies and investment banks)
 - ➔ Convert long-term debt in equity if needed
 - Based on aggregate state of the economy

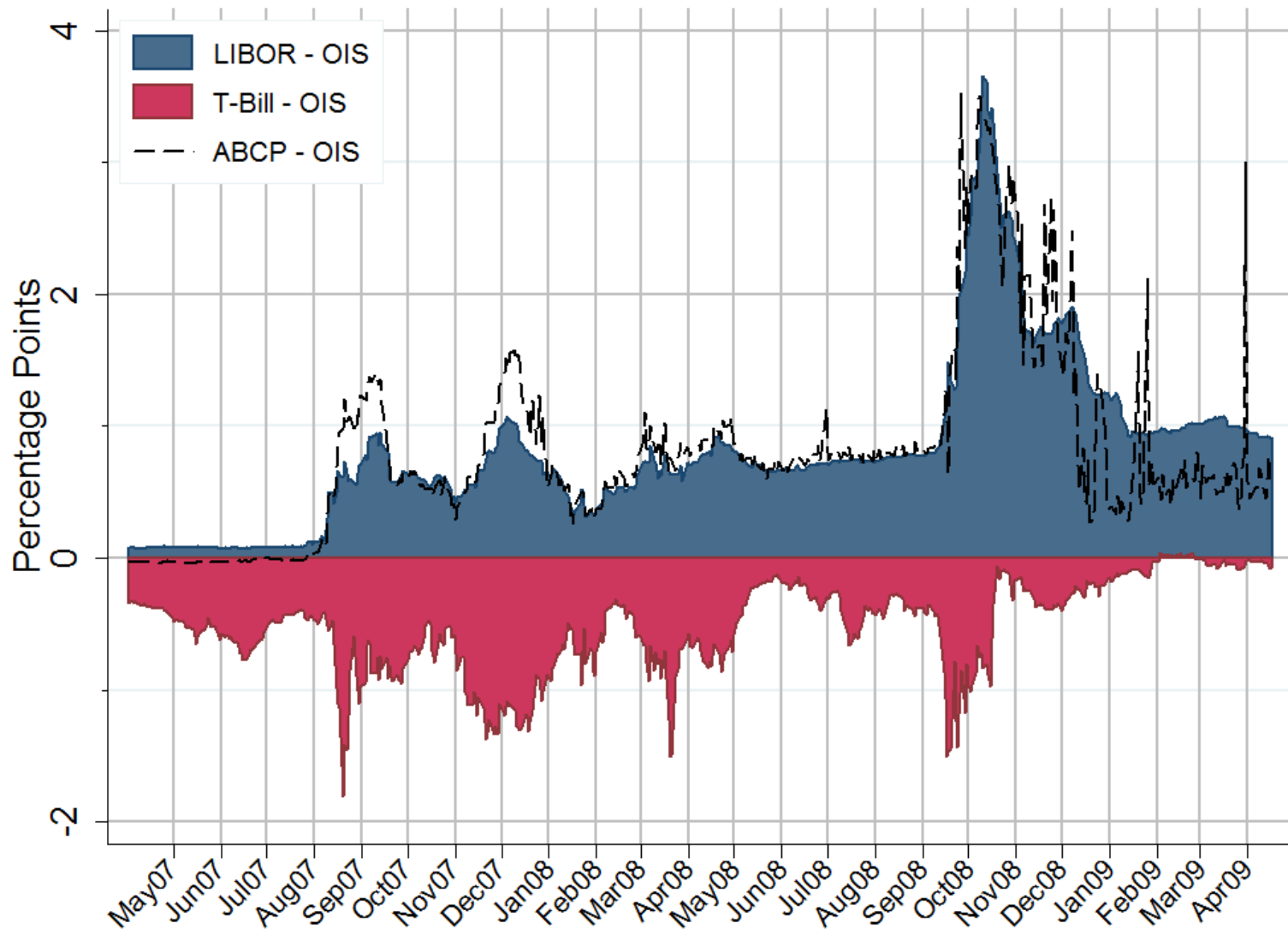
Remuneration

- In interest of shareholders – monitoring free riding
 - Strengthen corporate governance
 - Independent directors on compensation committee
 - Transparency
(members of compensation committee, salaries, compensation consultants' advice)
 -  ▪ Formulation of **guidelines** by supervision authorities + annual compliance assessment
 - Focus on long-run with escrow accounts
(claw back provisions, pay in stocks with long vesting periods)
 - Problem: switching jobs
 - Focus on risk-adjusted compensation
- In interest of other stakeholders
- Externalities
 - Take systemic risk into account – via charges of firm
- Caps will lead to pecuniary compensations

|| Credit Rating Agencies

- Legal separation of advisory arm of CRA
- Divorce CRA from regulatory process (as much as possible)
- Focus on systematic risk (and not idiosyncratic) risk
- (Regulating CRA would not improve their forecasts)
 - Conflict of interest since governments are large scale issuers of debt

Quarter/year-end spikes



Observation:
Worsens
towards
the end
of a quarter

Problem:
Snapshot
reporting

Way forward:
Report
averages
instead of
snapshots

|| Quarter/year-end spikes

- Avoid window dressing

➔ Report **averages** of a quarter **instead of snapshots**
(eliminates trades due to window dressing)

- Like for reserve requirements
- (also for hedge funds SEC 13F filing)



|| Big Banks – Small Countries Problem

- *Problem:* Small countries (like Switzerland) will not be able to bail out “big” banks (like UBS).
- *Way forward:*
 - ➔ Provide a new role for IMF/BIS to arrange burden-sharing across countries.
 - (**Attention:** distorts incentives for supervision
small country has not incentive to be strict if
bailout is paid by neighboring large country)
 - Move to subsidiary system instead of branch system

|| Limit Predatory Short-selling

- Short-selling is important to avoid bubbles
(Note: shorting is impossible in housing market)
 - *Problem:* Predatory short selling at times of crisis if regulatory action is based on market price
 - Sell stocks short to induce liquidity spiral (modern run)
 - Fire-sales reduce fundamental value + since it triggers regulatory intervention
 - Most pronounced for financial firms
 - Prohibit shorts at times of crisis, for stocks with severe maturity mismatch
- *Caution:* more maturity mismatch in the future!

Conclusion

1. Focus on externalities – systemic risk contribution
2. Countercyclical regulation
3. CoVaR Method: quantify optimal policy mix across various measures
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