



BERNACER LECTURE 2008

ON CENTRAL BANKING AND FINANCIAL STABILITY

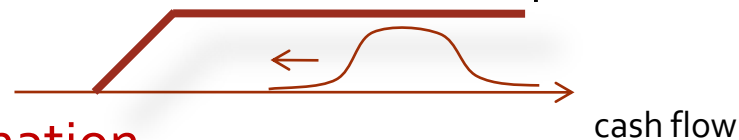
Markus K. Brunnermeier

Overview

- Two world views
 1. No financial frictions ... sticky price
 2. Financial sector + bubbles
- Role of the financial sector
 - Leverage
 - Maturity mismatch – maturity rat race
 - linkage
- Monetary transmission mechanism
- Implications for monetary economics
- Implications for financial regulation

Role of Financial Institutions

- **Project/asset selection/monitoring**
 - Informational advantage (Sharpe, Rajan)
- **Create info-insensitive securities** (Gorton-Pennachi, Duffie-DeMarzo)
 - Pool and tranche in order to reduce lemon's problem



- **Maturity transformation**

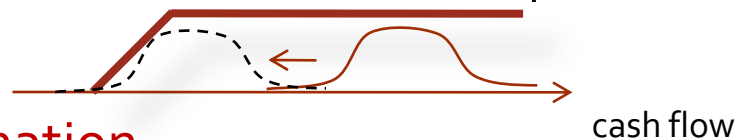
Why short-term (debt) funding?

- Liquidity shock insurance (Diamond-Dybvig)
 - maturity transformation is *good*, but bank run caveat
- Incentivize management (Calomiris-Kahn)
 - For large corporate debt holders, but for demand depositors (?)
 - Maturity mismatch is *good*
- □ **Maturity rat race** (with Martin Oehmke)
 - Maturity mismatch is *bad*

- **Why leverage? Why maturity mismatch?**

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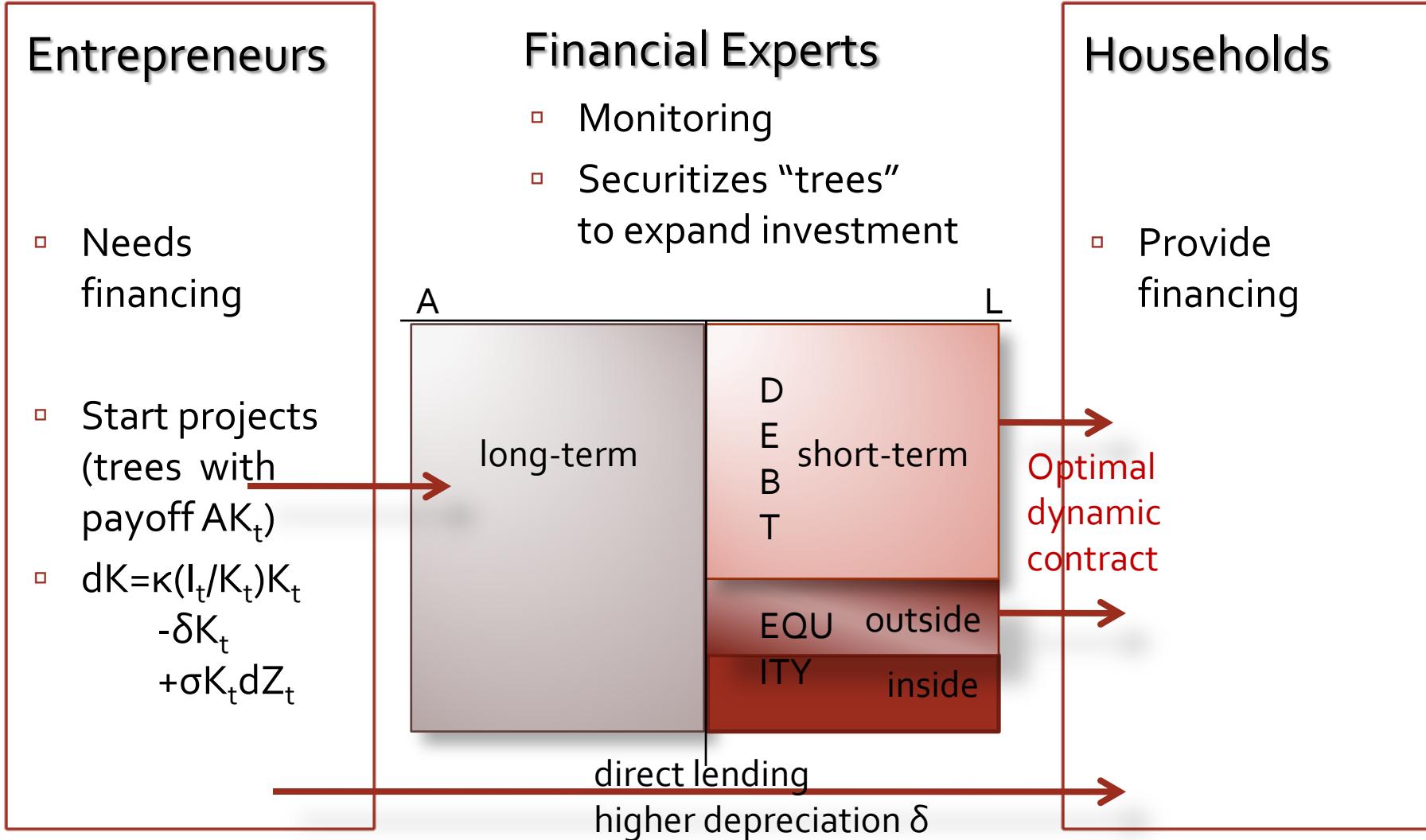
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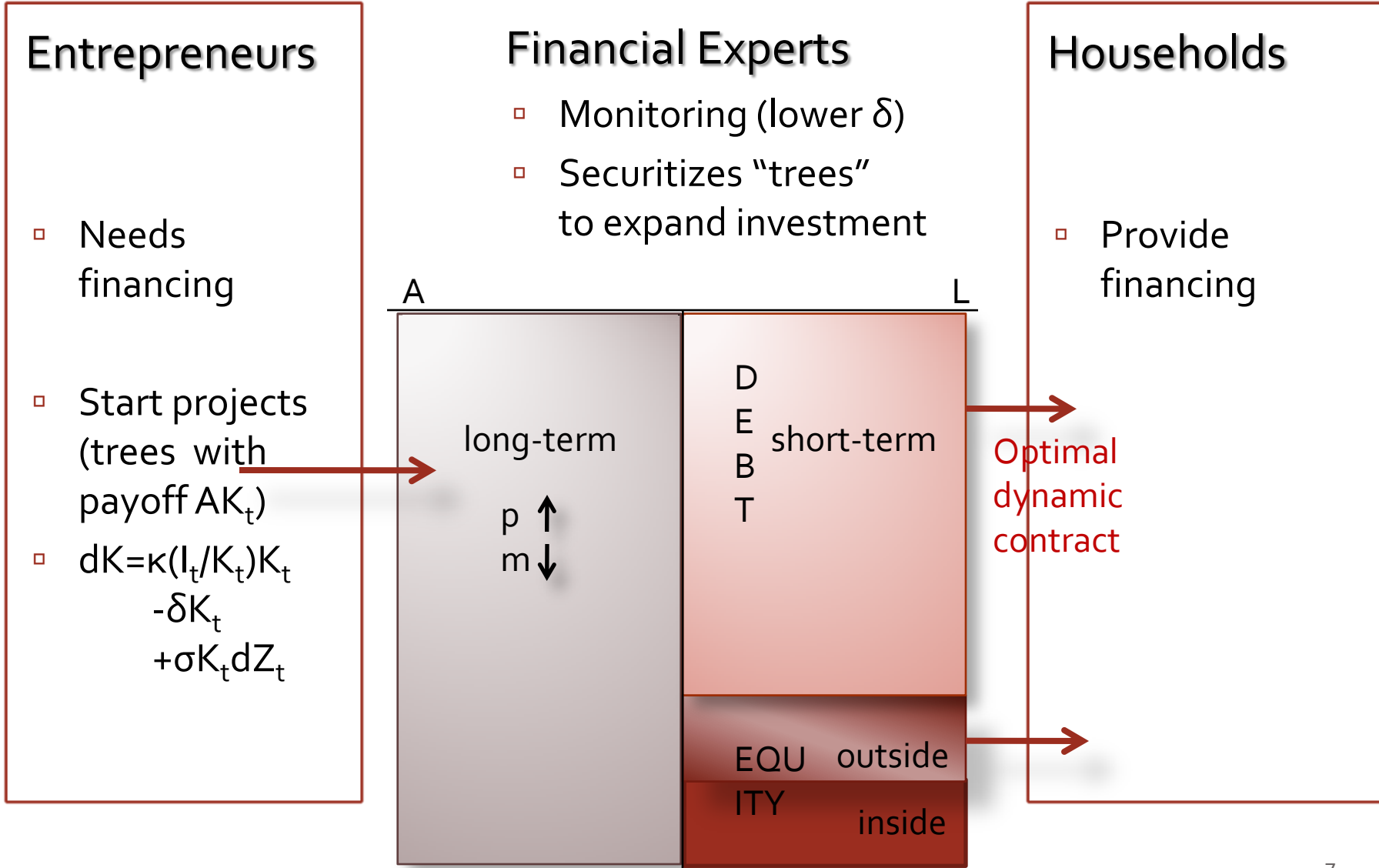
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- **Why leverage? Why maturity mismatch?**

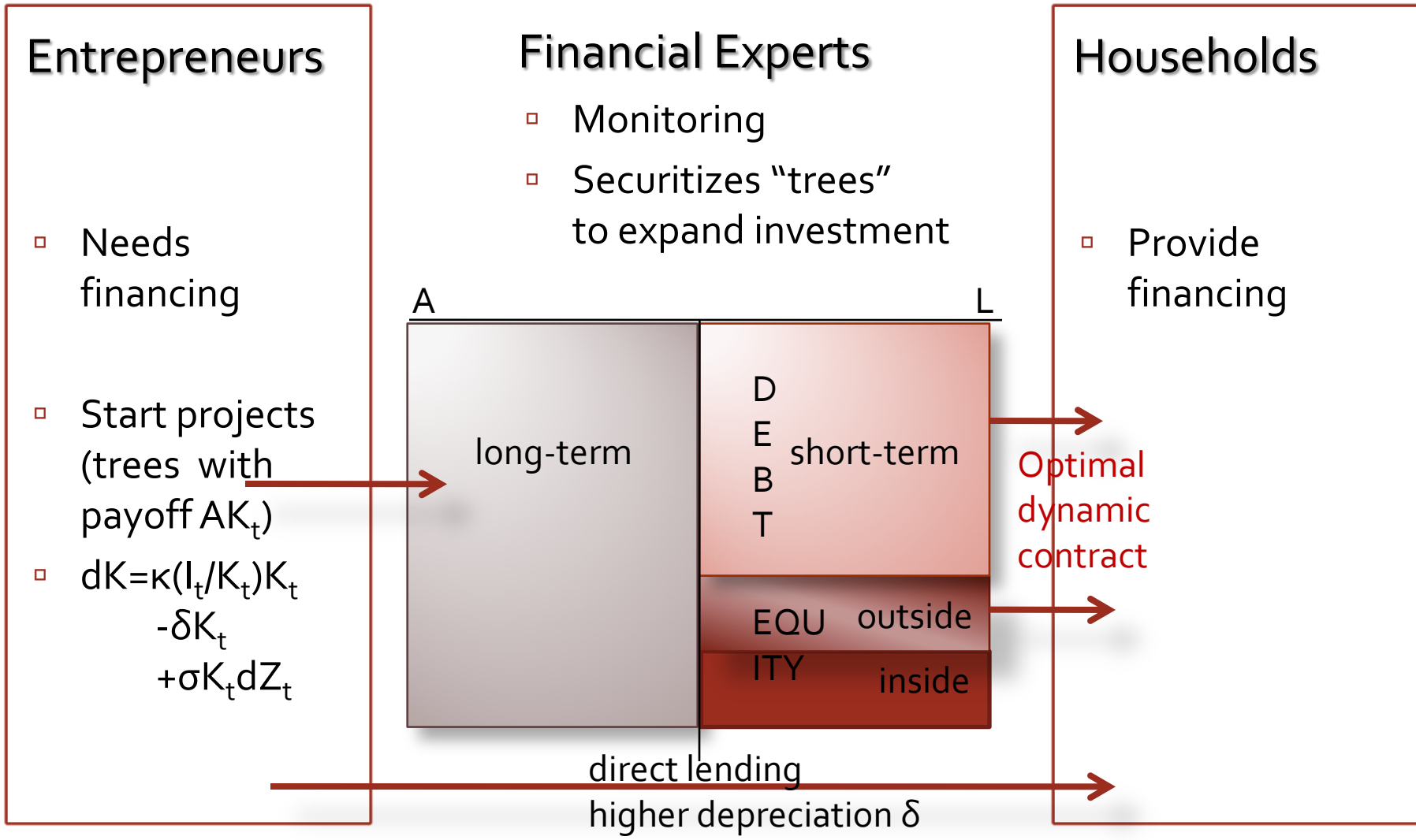
Brunnermeier-Sannikov (new)



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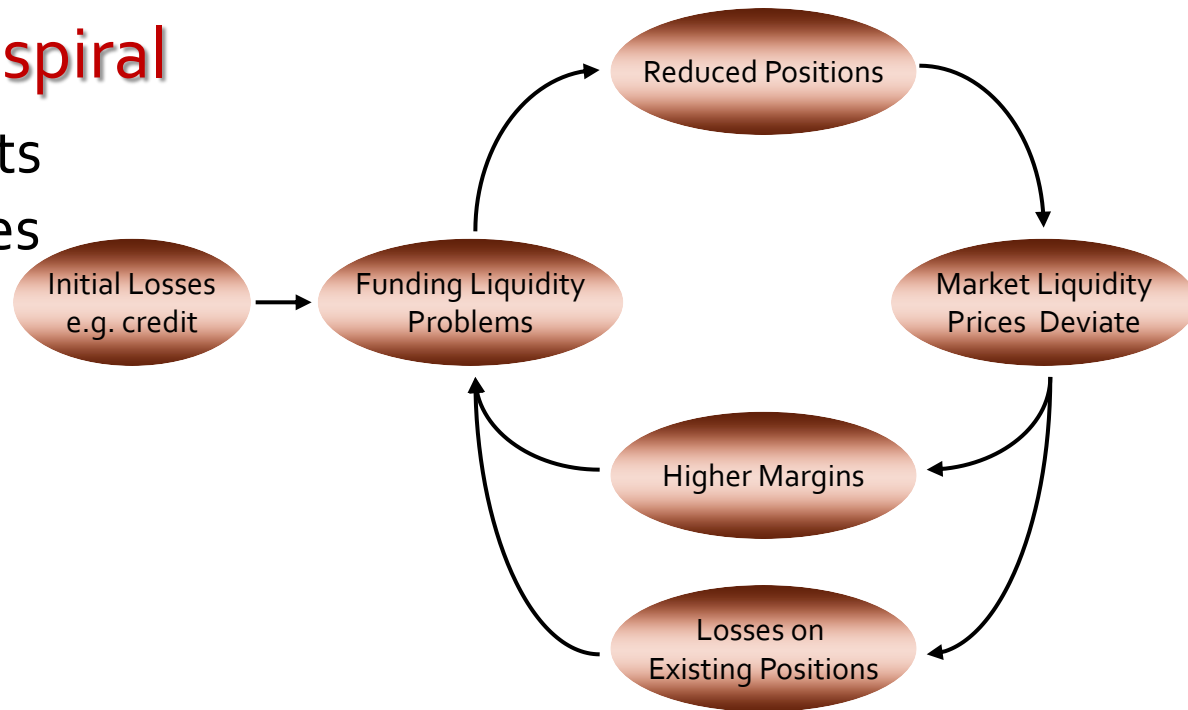
Procyclicality - Liquidity Spirals

■ Loss spiral

- same leverage
- mark-to-market

■ Margin/haircut spiral

- Margins/haircuts increase in times of crisis
- Margin/haircut max leverage
- **delever!**
- mark-to-model



Brunnermeier-Pedersen (2009)

Some Results

1. **Procyclical leverage** due to margin/haircut spiral

- Margin/haircut increase forces delevering process

low **FUNDING LIQUIDITY** (*rollover risk*)

(haircut/margin/collateral value)

- Depresses price

low **MARKET LIQUIDITY**

Note that funding constraint need not be binding – just the threat that it might be binding can lead to delevering

2. **Linkage between leverage and maturity mismatch**

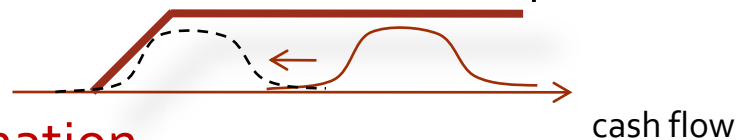
- $\text{Margin} = f(\text{volatility of collateral until debt expires})$

3. **Fire-sale externality**

- When leveraging up, institution i does not take into account that its fire-sales depress price of others
- Inefficient pecuniary externality in incomplete market setting

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|| The Maturity Rat Race (with Martin Oehmke)

- 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)

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Monetary transmission mechanism

- Monetary Transmission
 - Target rate (short-term)
 - Effective rate (short-term)
 - Corporate lending rate
 - Long-term (term premium)
 - Credit risk
- Two roles
 - Term risk + liquidity risk
 - Credit risk
- Helps to define “liquidity policy”



Implications for monetary policy

- Tinbergen Principle

Objectives	Instruments
Price stability	Target rate (money supply)
Financial stability	Liquidity policy

- Liquidity policy

- *Narrow*: Hold short-term rate close to target Separation principle
 - Reduce term risk premium
- *Broad*: financial stability
to ensure monetary transmission mechanism
 - Reduce term and credit risk premium
 - Lean against bubbles

||| Overturning “benign neglect bubble policy”

- Arguments brought forward

1. Bubbles are **difficult to identify/measure**

➔ ... but so is inflation

2. Bubbles are **unimpressed** by a interest rate increase

➔ but not for credit bubbles
searching for yield based on short-term financing,
increase i by .25% and many SIVs unprofitable

3. Interest rate is **too blunt** an instrument to prick bubble

➔ ... but credit bubble affected whole economy
(housing, corporate takeovers, etc.)

|| A new rationale for monetary aggregates

- Traditional rationale: quantity theory

$$M V(i) = P Y$$

... but

- empirical: policy relevant horizon
 - theoretical: not in New Keynesian models without financial sector
- New rationale in models with financial frictions
- Money aggregate: measure lending activity
(build-up of credit bubbles)
- ... but money aggregates need to be modified
 - drawn vs. extended new credit lines
 - incorporate shadow banking system



Refocusing the rationale of ECB's second pillar

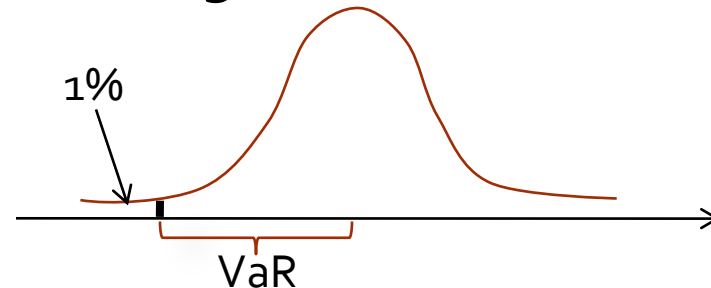
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Implications for financial regulation

1. Risk of each **bank in isolation**, e.g. Value at Risk

- Capital requirements
- Haircuts/margins
- Ratings



➔ *focus on externalities*

2. Procyclical of capital requirements, haircuts, ratings

➔ *countercyclical regulation* (break leverage cycle)

3. Focus on **asset side** of the balance sheet

➔ *incorporate funding structure*

4. shadow banking system gets little attention

➔ *objective criterion for regulation*

Macro-prudential regulation

1. Externality:

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

2. Procyclicality:

- 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, ...
- Lean against “credit bubbles”
 - Bubble + maturity mismatch impair financial system (vs. NASDAQ bubble)

3. Funding: Asset-Liability Maturity Match

Who should be regulated?

- Based on functions – not name
- Micro-prudential: based on risk in isolation
- Macro-prudential: Classification on systemic risk contribution measure, e.g. CoVaR

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

CoVaR

- VaR_q^i is implicitly defined as quantile

$$\Pr(X^i \leq VaR_q^i) = q$$

- $CoVaR_q^{j|i}$ is the VaR conditional on institute i (index) is in distress (at it's VaR level)

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

- $\Delta CoVaR_q^{j|i} = CoVaR_q^{j|i} - VaR_q^j$

q-prob. event

- Various conditionings? (direction matters!)



Contribution $\Delta CoVaR$

- Q1: Which institutions contribute (in a non-causal sense)
- $VaR^{system} \mid$ institution i in distress

- Exposure $\Delta CoVaR$

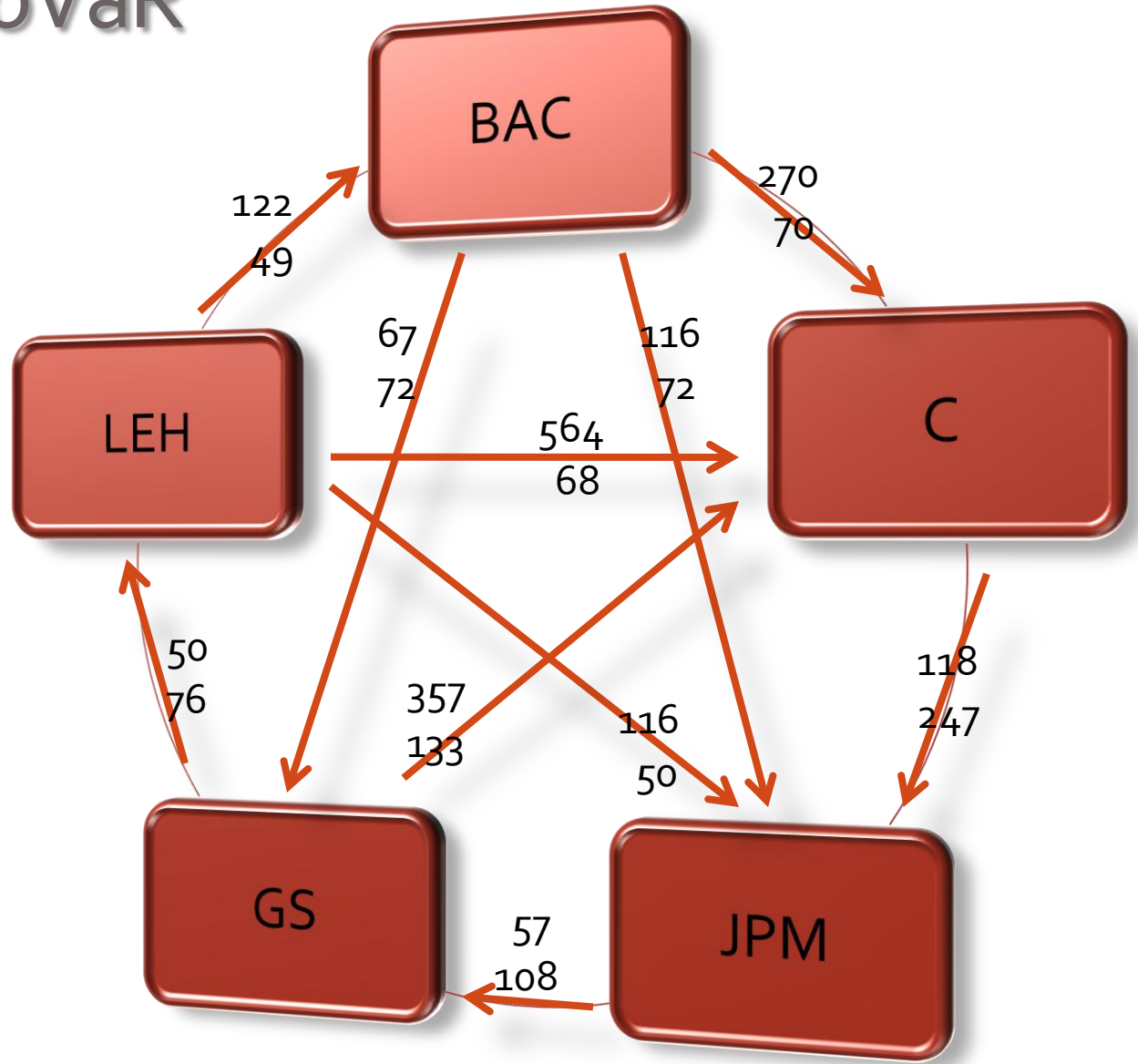
- Q2: Which institutions are most exposed if there is a systemic crisis?
- $VaR^i \mid$ system in distress

- Network $\Delta CoVaR$

- VaR of institution j conditional on i

in non-causal sense!

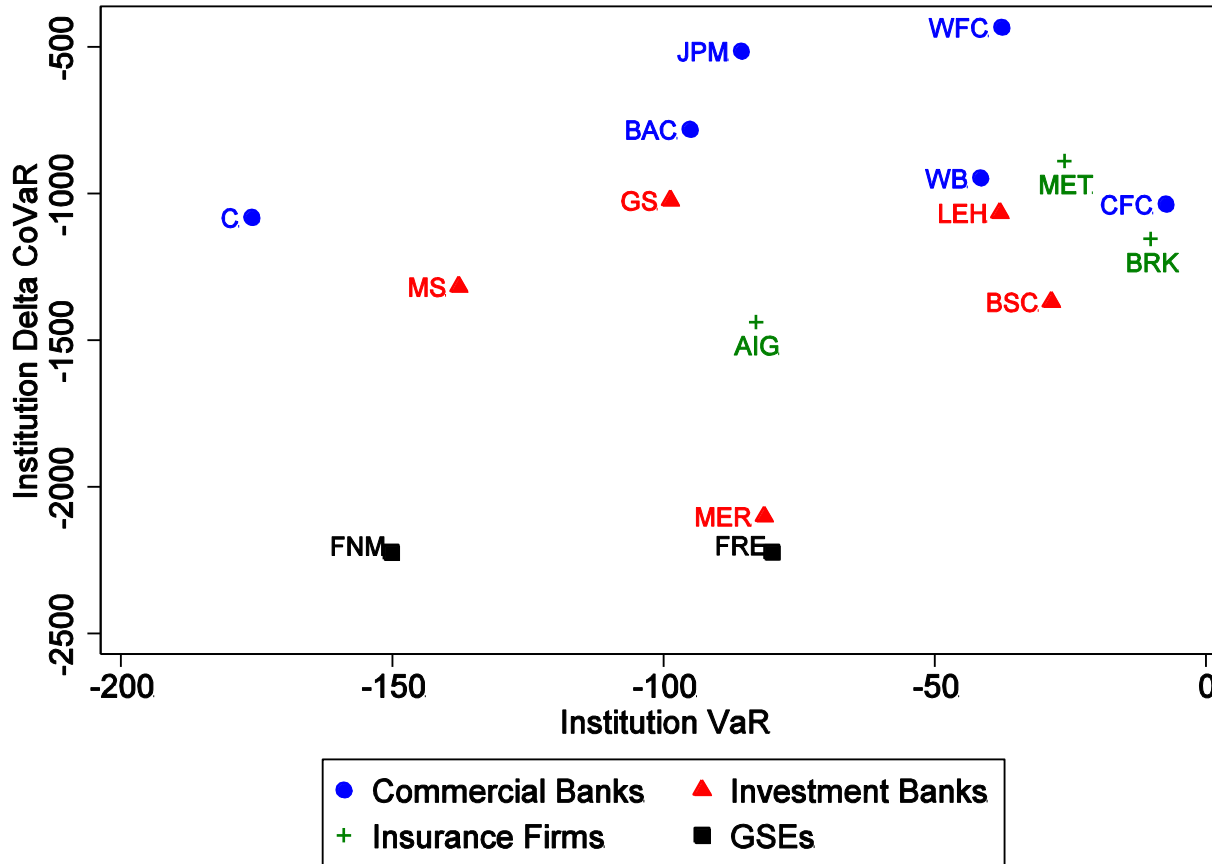
Network CoVaR



- conditional on origin of arrow



ΔCoVaR vs. VaR



- VaR and Δ CoVaR relationship is very weak
- Data up to 12/06

Implications for financial regulation

- Externalities
 - CoVaR – a measure of systemic risk contribution
- Addressing Procyclicality
 - Step 1: Time-varying CoVaRs
 - Step 2: Predict CoVaR using institution characteristics
 - Balance sheet variables
(leverage, maturity mismatch, + interdependence, ...)
 - Market variables (CDS, implied vol.,...)

Step 1: Time-varying CoVaR

- Control for macro factors, M_t
 - VIX Level interpretation "Volatility"
 - 3 month yield "Flight to Liquidity"
 - Repo – 3 month Treasury "Credit indicator"
 - Moody's BAA – 10 year Treasury "Business Cycle"
 - 10Year – 3 month Treasury "Housing"
 - Real estate index
 - Equity market risk

➔ Obtain Panel data of CoVaR

- Next step: Relate to institution specific (panel) data

Step 2a: Portfolios Sorted on Characteristics

- Institutional characteristics matter
- ... but individual financial institutions have changed the nature of their business over time
- Form decile portfolios, each quarter, according to previous quarter's data:
 1. Leverage
 2. Maturity mismatch
 3. Size
 4. Book-to-Market
- Add 4 industry portfolios
 1. Banks
 2. Security broker-dealers
 3. Insurance companies
 4. Real estate companies

Table 3A: Δ CoVaR Forecasts by Characteristics

Cross-section, Portfolios, 1%

COEFFICIENT	2 Years	1 Year	1 Quarter
Δ CoVaR (lagged)	0.71***	0.80***	0.94***
VaR (lagged)	-1.99***	-2.27***	-0.47***
Leverage (lagged)	-9.43***	-10.73***	-2.53**
Maturity mismatch (lagged)	-0.89***	-0.30	-0.14
Relative Size (lagged)	-170.84***	-161.99***	-38.58***
Book-to-Market (lagged)	85.24***	87.65***	31.03**
Constant	-40.92**	-50.04**	-19.93*
Observations	3627	3805	3939
R ²	0.62	0.69	0.89

||| Step 2b: 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

Table 6: 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)!

|| What type of charge?

→ Capital charge

- Strictly binding
- Might stifle competition

→ Pigouvian tax + government insurance

- Generates revenue
- In times of crisis it is cheap to issue government debt
- very salient

■ Private insurance scheme

- (Kashap, Rajan & Stein, 2008 + NYU report)
- Requires lots of regulation

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Conclusion

- Institutional Macro/Finance
 - Financial institutions are not a veil
 - Moving away from representative agent models
- Monetary/Liquidity Policy
 - Role of financial institutions – why short-term funding?
 - Avoid “credit bubbles” since they impair financial system
 - Modified rationale for ECB’s second pillar
- Financial Regulation
 - Macro-prudential has to focus on measuring contribution to systemic risk
 - Countercyclical (to overcome margin/haircut spiral)