Deposit Insurance Design and Contingent Bank Capital: A Reassessment

George Pennacchi

Department of Finance
University of Illinois

ETH Risk Center Conference on
Alternative Financial and Monetary Architectures
Zürich Switzerland, 13 June 2016

Financial System Design

- Historically banks, defined as institutions that primarily make loans financed substantially with short-term deposits, dominated the financial systems in most countries.

- Yet with changes in information technology, different types of financial institutions and markets might improve upon the financial system's efficiency and stability.

- My talk will focus on the regulation of banks, but with the recognition that they are only one piece of the financial system.

Outline of Talk

1. Risk-based bank regulation: asset limits, deposit insurance, and capital requirements.

2. Deposit insurance that minimizes distortions to risk-taking.

3. Capital requirements and the effects of corporate taxes.

4. Designing contingent capital to improve bank stability.

Risk-Based Banking Regulation

- Explicit or implicit government guarantees of bank deposits creates potential moral hazard whereby banks take excess risk.

- Risk-based regulation is needed to control banks' risk-taking incentives and can be implemented through:
  1. Restrictions on bank assets and activities
  2. Deposit insurance premiums
  3. Capital standards

Restrictions on Bank Assets and Activities

- Some examples of recent asset and activity restrictions are:
  1. Volcker Rule and Liikanen Report restrictions on proprietary trading.
  2. Vickers Report ring-fencing of retail activities from investment banking activities.
  3. Basel III liquidity requirements (Liquidity Coverage Ratio).

- These restrictions narrow banking activities, and many prominent financial economists have recommended very narrow banking where deposits must be backed by very safe, short-term assets.*

- Riskier financial activities would need to be carried out by different, non-deposit issuing entities.

* For a survey and an analysis see Pennacchi, G. (2012) "Narrow Banking," *Annual Review of Financial Economics*

Deposit Insurance

- Since 1988 with the first Basel Accord, risk-based capital standards have overshadowed risk-based deposit insurance premiums as a tool for dealing with bank risk.

- Yet when bank risk is measured with error it is optimal to set both risk-based deposit insurance premiums and capital standards.*

- Moreover, risk-based deposit insurance premiums have less detrimental procyclical effects compared to risk-based capital standards:**
  - Banks tend to meet higher required capital ratios by reducing lending and deposits, thereby shrinking their balance sheet.
  - Banks paying a higher required deposit insurance premiums have less funds for lending, but the reduction is less.

* Flannery, M. (1991) "Pricing Deposit Insurance when the Insurer Measures Bank Risk with Error," *Journal of Banking and Finance.*

** Pennacchi, G. (2005) "Risk-Based Capital Standards, Deposit Insurance, and Procyclicality," *Journal of Financial Intermediation.*

Challenges with Risk-Based Deposit Insurance

- As with risk-based capital standards, setting risk-based insurance premiums necessitates a government's evaluation of bank risk that may be hindered by political pressures:

  Government inevitably has to employ relatively simple rules in assessing risk-rules that almost certainly do not capture all of the relevant information, since political considerations will not allow government to differentiate on bases that the market would almost surely employ.

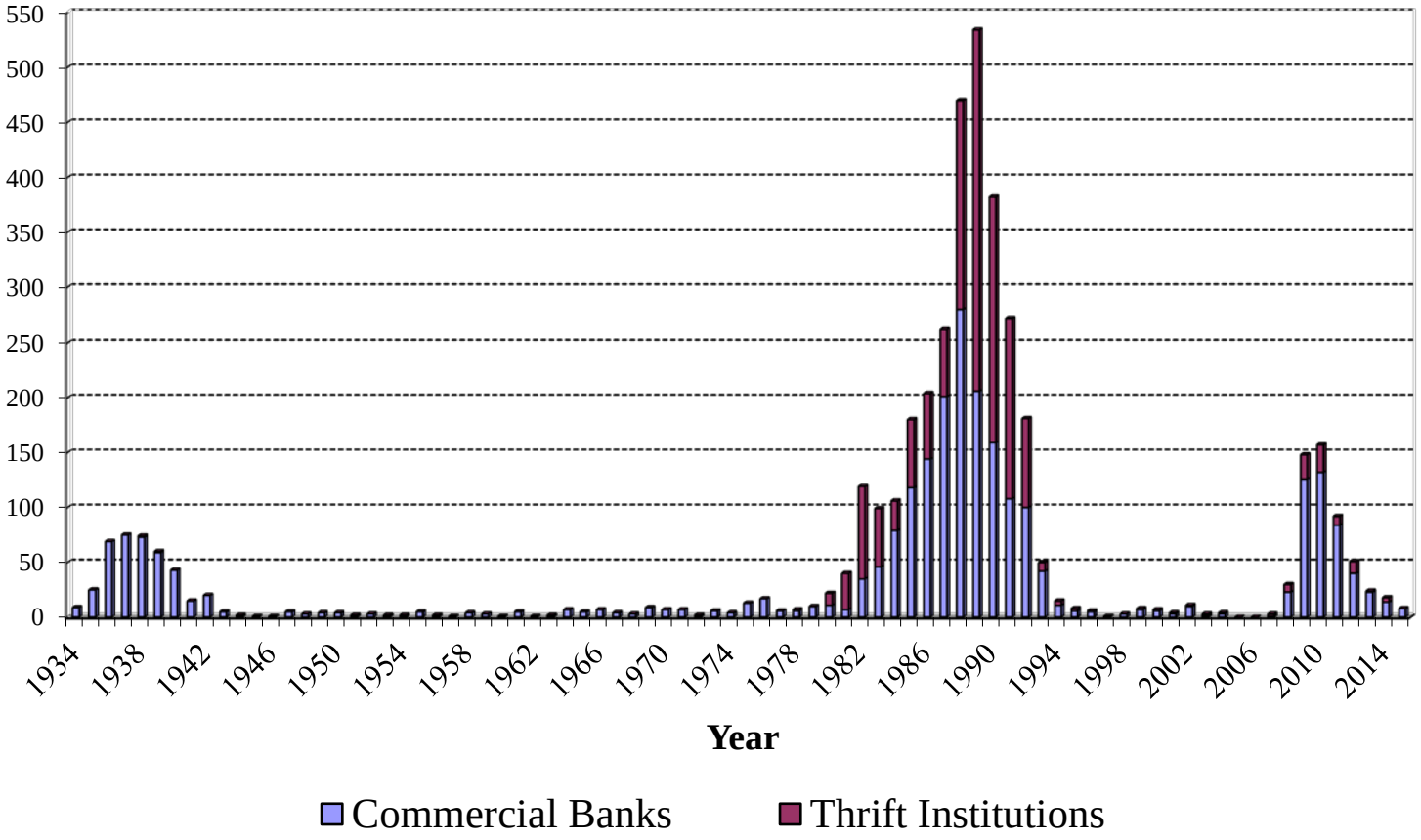
  The difficulties government has in assessing risk, and that citizens face in evaluating the government's performance on this score, provide an opportunity for granting huge hidden subsidies.*

- One area where a government's risk assessment underperforms is in its failure to recognize and price *systematic risk*.

* Stiglitz, J. (1986) "Perspectives on the Role of Government Risk-Bearing within the Financial Sector," in *Government Risk Bearing*, ed. M. Sniderman, Kluwer

Number of U.S. Bank Failures, 1934 to 2015

- Bank failures are systematic.



Source: Federal Deposit Insurance Corporation

Fairly-Priced Deposit Insurance

- Deposit insurance is very similar to a Credit Default Swap (CDS) contract but where the insured bank pays the premium to the insurer (e.g., FDIC) on behalf of the depositor.

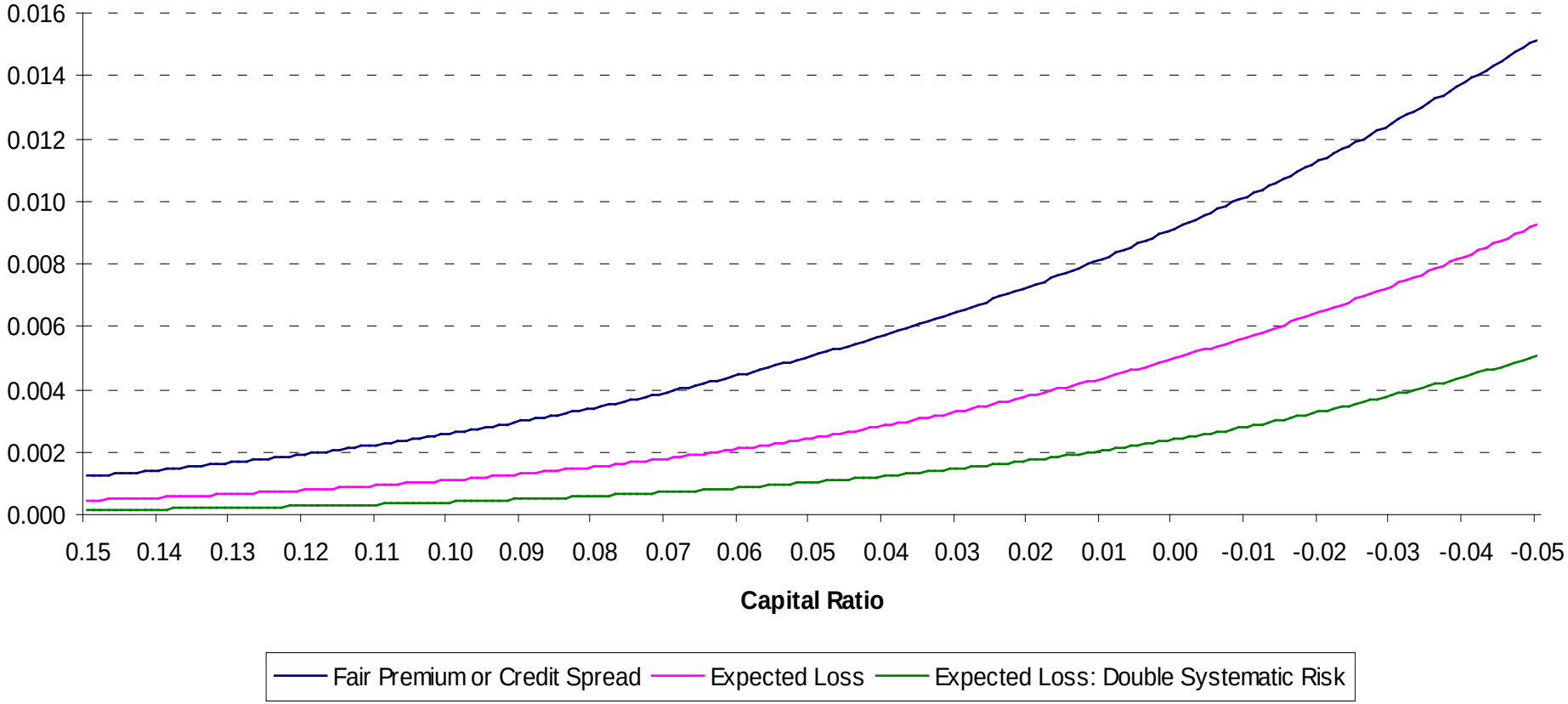
- To compensate the insurer for covering losses during economic downturns (when returns on other assets are also low), fair CDS and deposit insurance premiums must exceed expected insurance losses. (They have a positive CAPM "beta.")

- Contingent claims models imply that fair premiums equal *risk-neutra*l expected losses that empirical studies find are at least twice the size of actual expected losses.*

* Madan, D. and G. Pennacchi (2003) "Special Issue on Pricing the Risks of Deposit Insurance," *Journal of Financial Services Research*.

Comparison of Typical Fair and Expected Loss Premiums

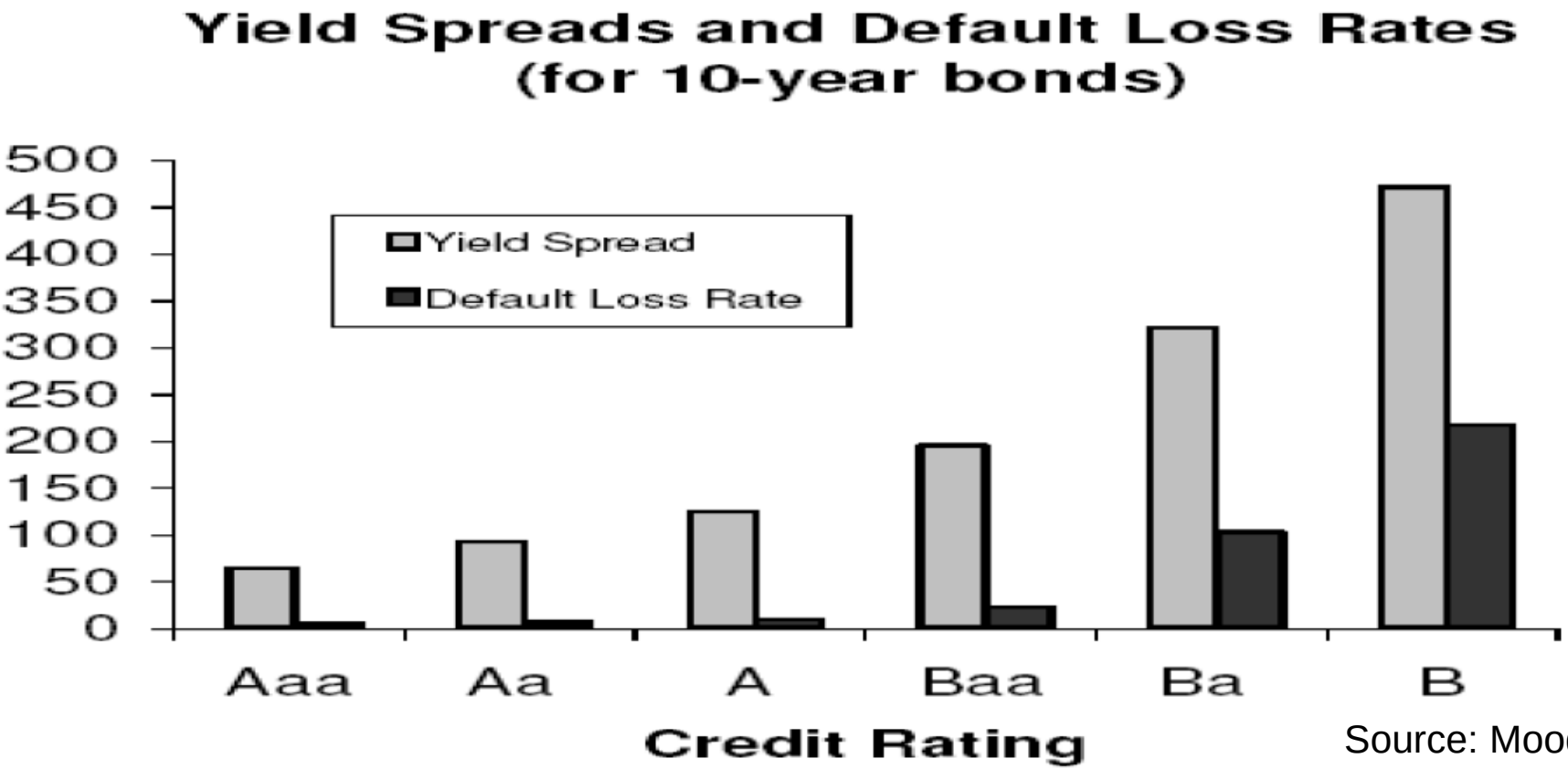
- Greater systematic risk expands the difference between fair premiums and expected losses.



Source: Pennacchi, G. (2010) "Deposit Insurance Reform" in J. Brown, ed., *Public Insurance and Private Markets*, AEI Press,

Evidence from Credit Spreads

- Fair deposit insurance premiums are analogous to bond credit spreads or CDS spreads.
- Empirical evidence finds these spreads are much larger than expected default losses.



Source: Moody's

Deposit Insurance Premiums and DIF Reserves*

- The U.S. FDIC and the proposed EU Deposit Guarantee Schemes attempt to set risk-based premiums and also target a ratio of Deposit Insurance Fund (DIF) reserves to total insured deposits, called the designated reserve ratio (DRR).

- Suppose that:
  1. The DIF was initially at its target ratio (DRR) and is invested in government securities earning the default-free interest r.
  2. Total insured deposits grow at the rate g.
  3. The insurer sets premiums equal to expected losses from bank failures.

- If $g = r$, DIF reserves are expected to grow at the same rate as deposits, and setting premiums to target the DRR will, on average, equal expected losses.

*For details, see G. Pennacchi (2000) "The Effects of Setting Deposit Insurance Premiums to Target Insurance Fund Reserves." *Journal of Financial Services Research*.

Targeting DIF Reserves

- Instead, if $g < r$ ($g > r$) premiums that target a fixed DRR will be less (*greater*) than expected losses, on average.

- However, setting premiums to target insurance fund reserves creates procyclicality: premiums are higher (*lower*) than average following large (*small*) losses from failures that drain (*replenish*) reserves.

- Is setting fair (no-subsidy) insurance premiums consistent with a stable DRR?

Fair Deposit Insurance Premiums and DIF Reserves

- Suppose that:
  1. The DIF was initially at its target ratio (DRR) and is invested in government securities earning the default-free interest r.
  2. Total insured deposits grow at the rate g.
  3. The insurer sets fair premiums

- Because fair insurance premiums contain a systematic risk component above expected losses:
  - DIF reserves are expected to grow at a rate exceeding r.
  - Unless $g >> r$, the ratio of DIF reserves to deposits is expected to grow without bound.

- As a consequence, targeting a fixed DRR is incompatible with setting fair (no subsidy) deposit insurance premiums.

Subsidized Deposit Insurance?

- Are premiums that target the DRR, and are lower than fair, really a concern?
- One might argue that it is not since the banking industry ultimately pays premiums to cover all losses to the DIF.
- But this argument ignores examples of taxpayer bailouts:
  1. Resolving the S&L crisis cost the thrift industry $29 billion but cost taxpayers $124 billion (in 1999 dollars).*
  2. On 30 Sept 2008, the U.S. Treasury abolished limitations on tax shelters from failed bank acquisitions, reducing the cost of resolving Wachovia and National City by $24 billion.
  3. In 2008-2010, other government assistance was provided to the banking industry (e.g., subsidized debt guarantees).

*T. Curry and L. Shibut (2000) "The Cost of the Savings and Loan Crisis: Truth and Consequnces." *FDIC Banking Review*.

Distortions from Subsidized Insurance

- Even if premiums paid by the banking industry cover most losses, underpriced deposit insurance creates real distortions:
  1. Individual banks will prefer insured deposits versus uninsured debt, especially when in distress, leading to over-issuance of insured deposits and a reduction in market discipline.*
  2. Individual banks will herd into loans, investments, and activities with high systematic risk, leading to greater *systemic* risk.**

*M. Billet, J. Garfinkel, and E. O' Neal (1998) "The Cost of Market vs. Regulatory Discipline in Banking," *Journal of Financial Economics.*
**G. Iannotta and G. Pennacchi (2014) "Ratings-Based Regulation and Systematic Risk Incentives," Working Paper.

Potential Reform: Alternative I

- Set individual banks' premiums fairly and ignore the DIF:
  1. In years when insurance losses are low, positive net premiums are collected by the government.
  2. In years when insurance losses are high, negative net premiums are paid by the government.
- Setting premiums fairly to cover expected losses plus taxpayer compensation for systematic risk implies that net premiums paid to the government will be positive, on average.
- Under this plan, government budget deficits will be smaller, on average.
- A precedent for this plan are central banks' (e.g., Federal Reserve) payment to the government of seigniorage revenue from money creation.

Potential Reform: Alternative II

- Set premiums fairly and operate a separate reserve targeting scheme with non-bank investors:
  1. Fair premiums paid by banks (*insurer's losses*) will continue to augment (*deplete*) DIF reserves.
  2. The insurer charges a separate assessment (*pays a separate rebate*) when the DIF is below (*above*) the DRR.
  3. Claims or shares on the separate assessment/rebate can be purchased by nonbank investors.
- The market price of these claims, similar to a futures contract, is approximately zero when the DIF is at the DRR.
- This derivative contract, which can be centrally cleared on an exchange with margin requirements, transfers targeting risk to nonbank investors.

Potential Reform: Alternative III

- Facilitate a fixed for floating swap market tied to the industry average deposit insurance premium:
  1. The insurer charges banks an individually-fair premium plus a special reserve targeting assessment/rebate.
  2. A swap market allows banks to exchange each quarter a fixed rate for a floating rate equal to the industry average total payment made to the deposit insurer.
- Banks would want to be fixed-rate payers, floating-rate receivers in this swap, with a notional principal approximately equal to their total debt.
- Such a centrally-cleared swap market allows a bank to transfer the procyclical risk of the special reserve targeting assessment/rebate to nonbank investors.

Government Guarantees and Bank Capital

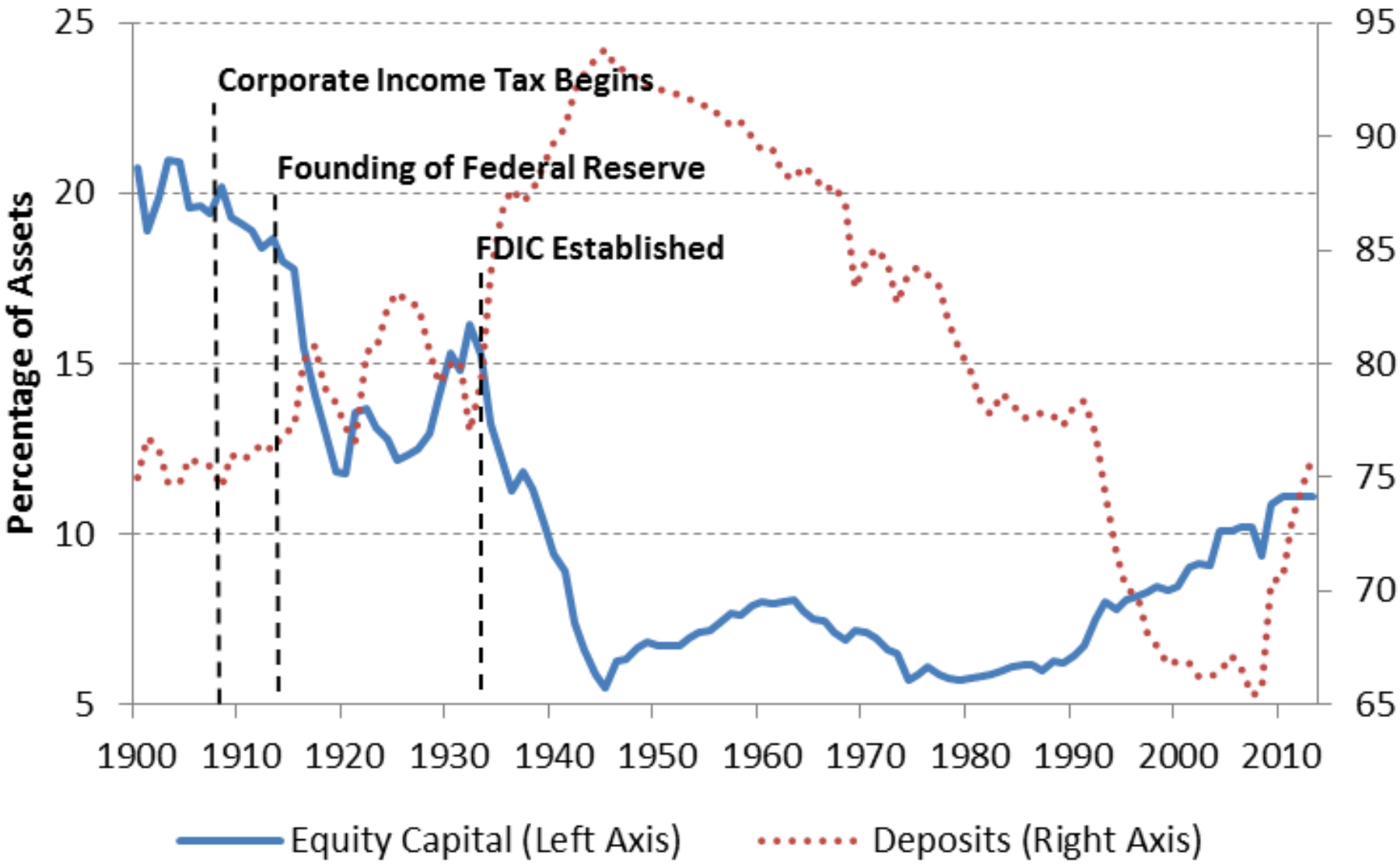
- Ceteris paribus, higher equity capital reduces the likelihood of a bank's failure and the losses to a government deposit insurer.

- One goal of setting minimum risk-based capital standards is to reduce the moral hazard incentive for banks to take excessive risk when governments guarantee bank liabilities (deposits).

- But capital regulation does not seem to be effective since empirical evidence finds that government safety nets are the main historical contributors to rising bank leverage.*

* Calomiris, C. and S. Chen (2016) "The Spread of Deposit Insurance and the Global Rise in Bank Leverage since the 1970s," Columbia University working paper.

Equity Capital and Deposits per Commercial Bank Assets



Source: U.S. Statistical Abstract and FDIC

Corporate Taxes and Bank Capital

- Another deterrent higher equity capital is corporate income taxes that create a tax-disadvantage to funding bank assets with equity:
  - interest on debt and deposits is tax deductible from corporate income but returns or dividends on equity are not.

- Empirical evidence finds:
  - U.S. banks satisfy capital requirements with more subordinated debt and less equity when they face a higher state corporate income tax rate.*
  - In 2006, Belgium implemented a notional interest deduction for equity equal to the 10-year government bond rate that raised Belgium banks' equity ratios by 14% on average.**

* Ashcraft, A. 2008. Does the Market Discipline Banks? New Evidence from Regulatory Capital Mix. *Journal of Financial Intermediation* .

** Schepens, G. 2014. Taxes and Bank Capital Structure. *Journal of Financial Economics* (forthcoming).

Is High Leverage Optimal for Banks?

- In a setting without government guarantees or tax distortions, DeAngelo and Stulz (2015) examine a bank's optimal capital structure when some retail borrowers and depositors lack access to competitive capital markets.*

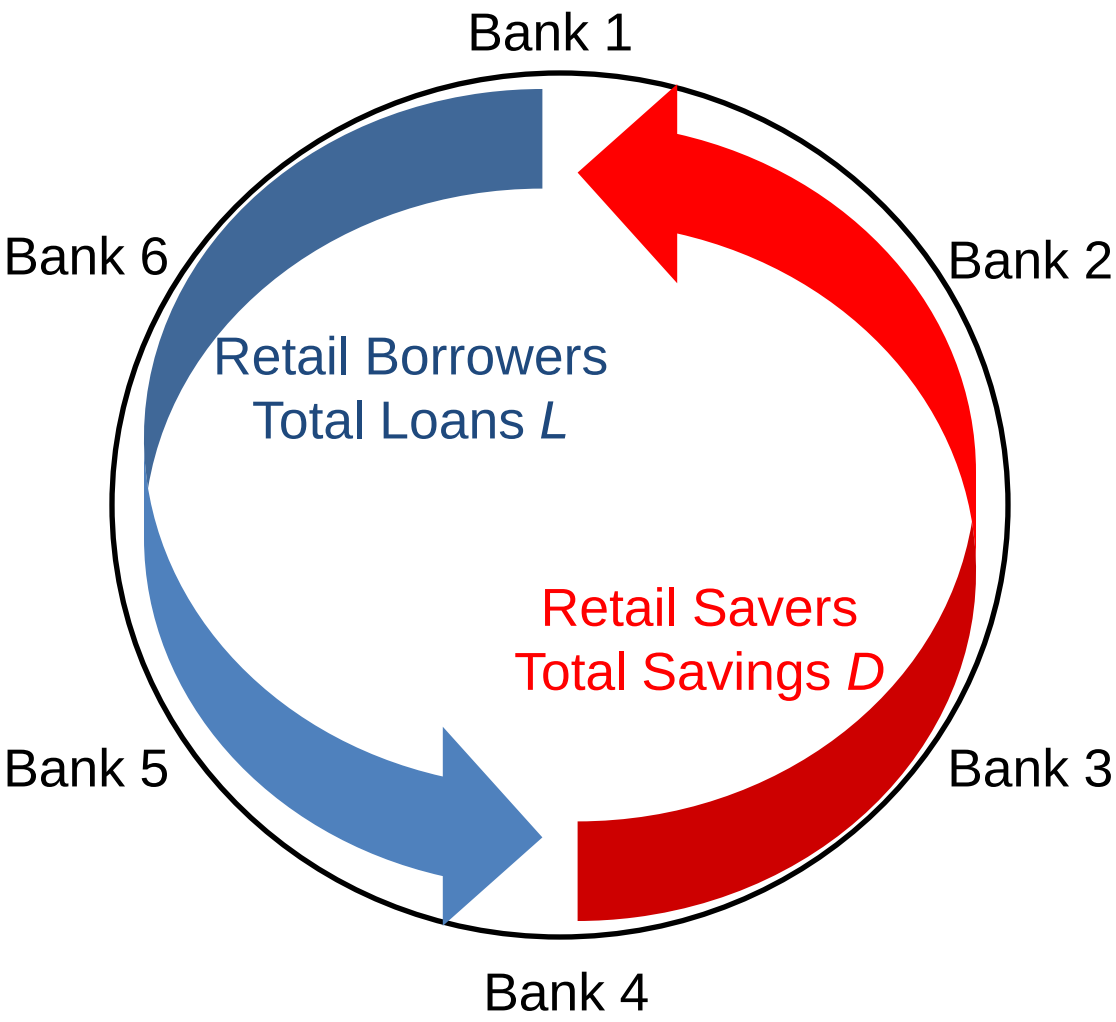
- They find that when a bank is "special" by being able to issue liquid deposits at rates below competitive interest rates, then high leverage is optimal for banks.

- I consider a similar setting where banks provide loans and liquid deposits to retail customers and use the Salop (1979) circular city framework to solve for the market equilibrium loan and deposit rates as well as banks' choice of capital structure.

*DeAngelo, H., and R. Stulz (2015) "Liquid-claim Production, Risk Management, and Bank Capital Structure: Why High Leverage is Optimal for Banks," *Journal of Financial Economics.*

** Pennacchi, G. (2015) "Banks, Taxes, and Nonbank Competition," University of Illinois working paper.

Market with *n* = Six Banks



Market Equilibrium

- In a “loan poor, deposit rich” market where retail lending opportunities are low relative to retail savings:
  1. banks use excess retail deposits to invest in competitively-priced securities.
  2. banks issue no wholesale debt and minimize their issuance of equity capital.

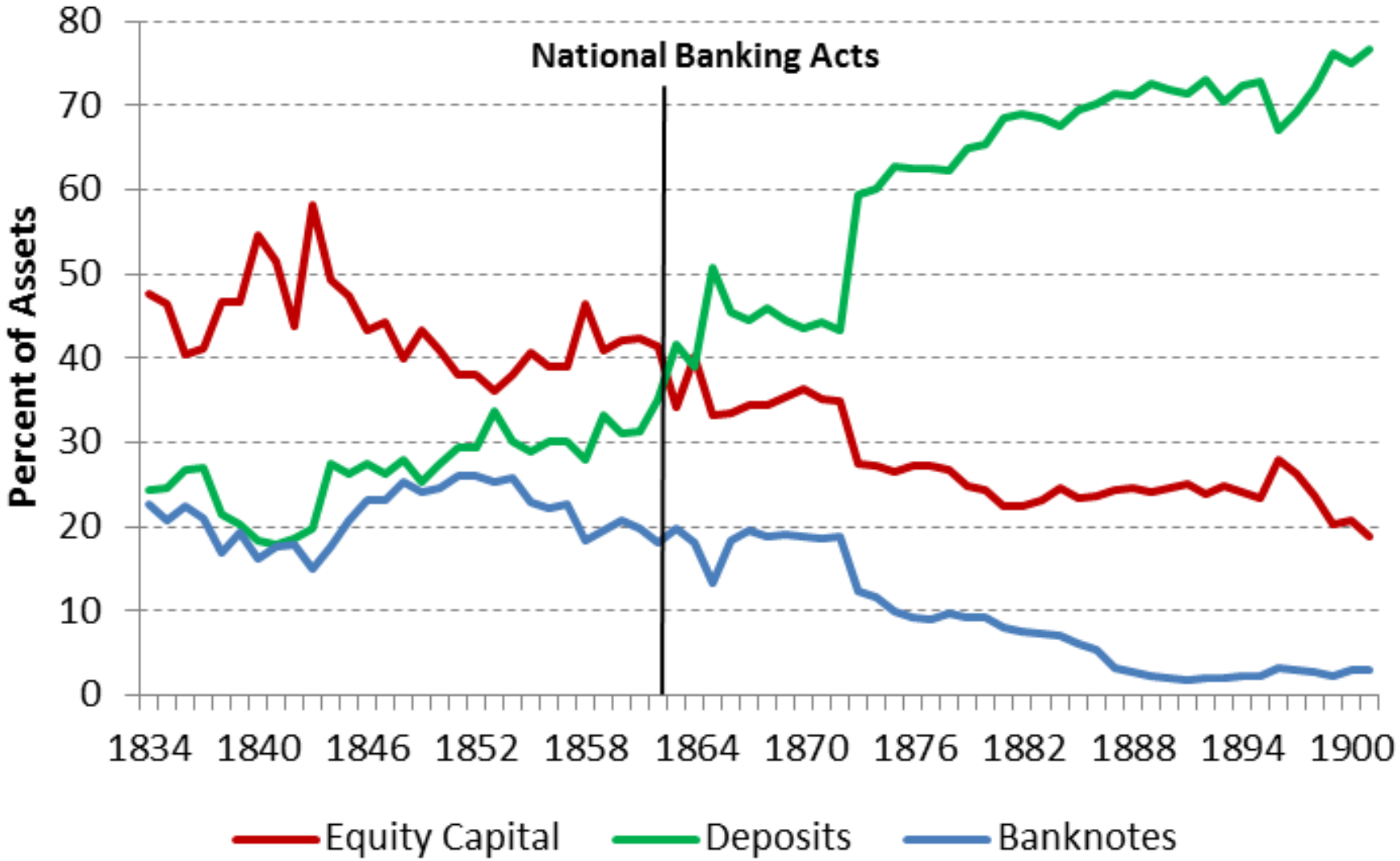
- In a “loan rich, deposit poor” market where retail lending opportunities are high relative to retail savings:
  1. banks issue wholesale debt and equity to fund the excess retail lending and the marginal cost of retail deposits equals the competitive wholesale debt rate.
  2. banks are indifferent to issuing wholesale debt or equity.

- The “loan rich, deposit poor” equilibrium is inconsistent with contention that high leverage is optimal.

Nineteenth Century U.S. Banking

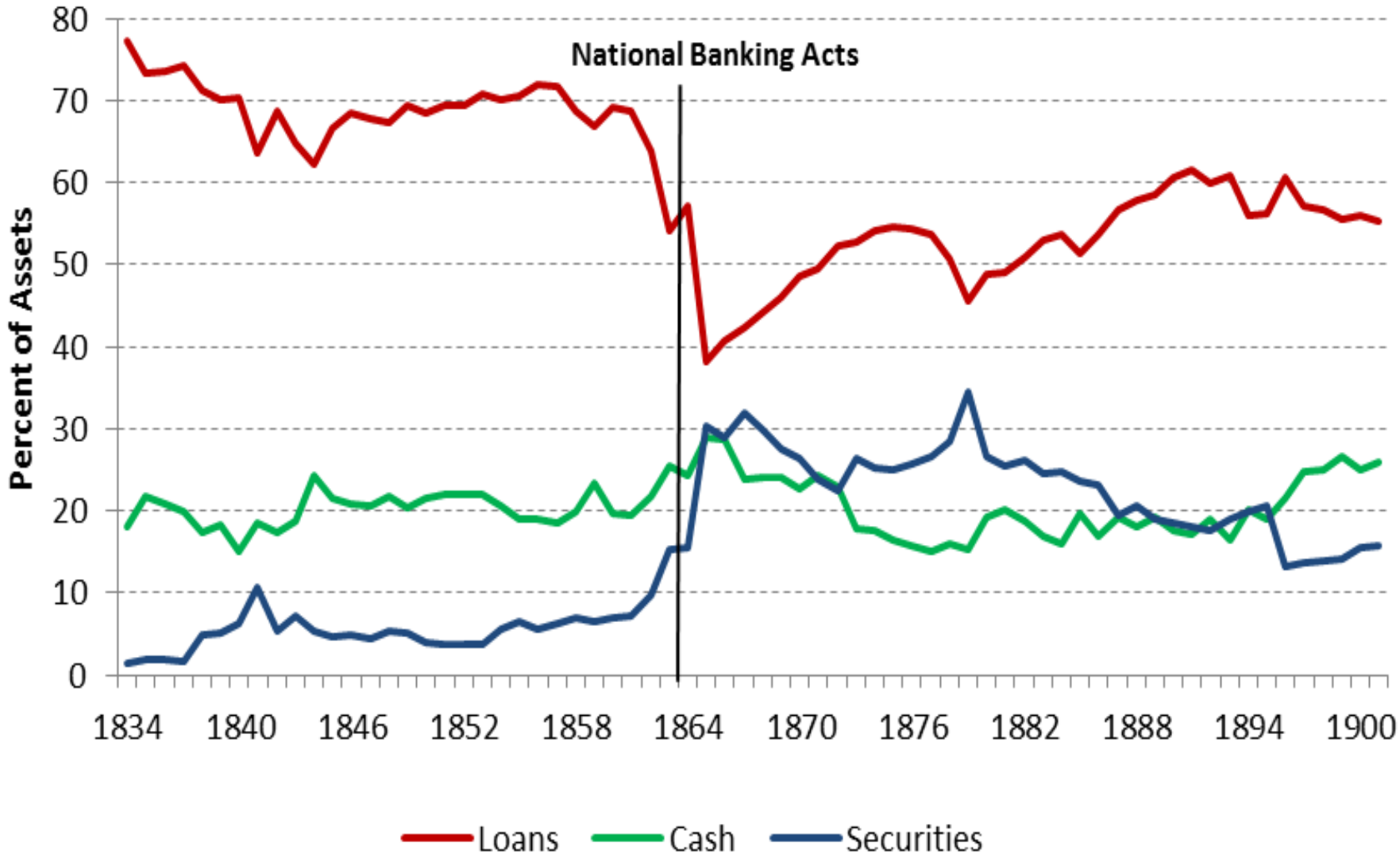
- A “loan rich and deposit poor” equilibrium may have characterized the U.S. “Free Banking” era prior to the 1860s.
- The investment needs of the U.S. emerging market economy led to retail loan demand that exceeded retail savings, and excess funding for loans was provided by shareholders’ equity.
- Consistent with this loan rich and deposit poor equilibrium, banks funded over 40% of their assets with equity and invested relatively little in cash and securities.
- Later, the 1863-1864 National Banking Acts required banks to hold Treasury bonds to back their issuance of national bank notes, thereby artificially raising banks’ demand for securities.

19th Century Capital, Deposits, and Banknotes (% of Assets)



Source: U.S. Statistical Abstract

19th Century Loans, Cash, and Securities (% of Assets)



Source: U.S. Statistical Abstract

Another Factor Determining High Equity Capital

- Prior to the National Banking Acts, banks were well-capitalized, in part, to prevent “runs” by holders of the bank’s notes.

- These private banknotes often traded at a discount from their face value due to default risk.

National Banking Acts of 1863 and 1865: Collateralized Banking

- Allowed national-chartered banks to issue notes collateralized by Treasury bonds. A 10% tax on private banknotes eliminated them.

- Two motives for this legislation:
  1. Lower the Federal government's cost of financing the Civil War.
  2. Prevent runs by banknote holders.

The Model with Corporate Taxes and Nonbank Competition

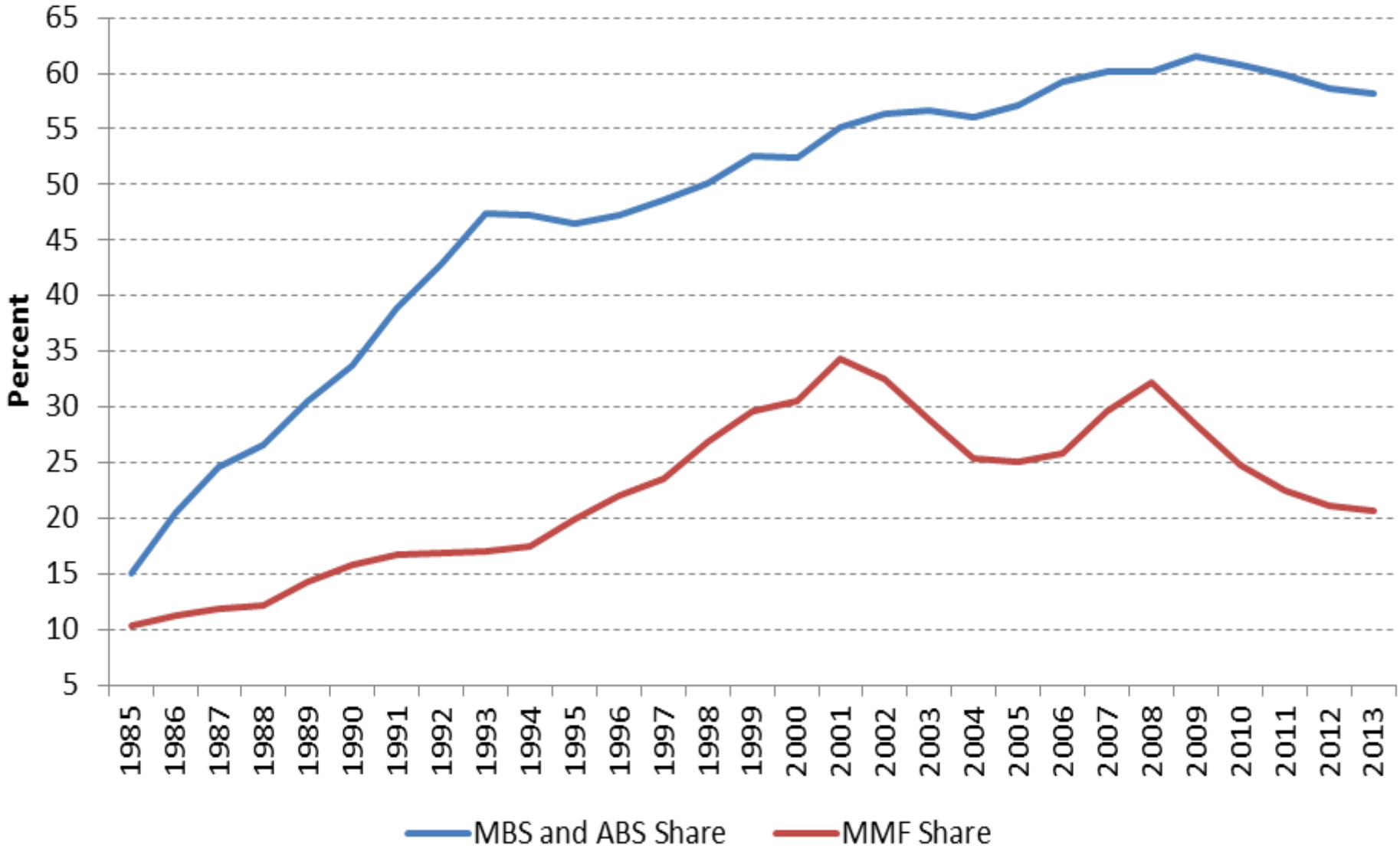
- When banks pay corporate income taxes, they always minimize equity capital. In addition, the equilibria are:
  1. in a “loan poor, deposit rich” market, retail depositors bear a tax burden by way of lower retail deposit rates.
  2. in a “loan rich, deposit poor” market, retail borrowers bear a tax burden by way of higher retail loan rates.

- Nonbank competitors (a.k.a. “shadow banks”) are usually exempt from corporate taxes. They include
  1. money market funds (MMF) that compete for savings.
  2. special purpose vehicles that hold securitized loans and issue mortgage- and asset-backed securities (MBS, ABS).

- MMF competition causes “disintermediation” leading to “loan rich, deposit poor” banking market.

- But then retail loan rates rise to reflect banks’ corporate tax burden and incentives for securitization (MBS and ABS) rise.

MBS and ABS Share of All Loans



Source: Securities Industry and Financial Markets Association and FDIC

Implications for Higher Capital Requirements

- Higher equity capital requirements (or tax rates) increase banks' tax disadvantage relative to tax-exempt nonbanks.
- Empirical evidence finds that more loans are securitized when this tax burden on banks rises.*
- Tax-motivated securitization may not be welfare enhancing if securitized loans are less efficiently credit screened and monitored.
- Ideally, abolishing corporate taxes would eliminate this distortion, but doing so may be politically difficult.

*Han, J. K. Park, and G. Pennacchi (2015) "Corporate Taxes and Securitization," *Journal of Finance.*

The Potential of Contingent Convertibles (CoCos)

- CoCos or “contingent capital” are debt issued by banks that convert to shareholders’ equity or write down principal when a triggering event occurs.

- As envisioned by Flannery (2005), CoCos would convert to a pre-specified number of new equity shares when the bank’s stock price declines to a pre-specified level.

- CoCos are potentially valuable for stabilizing individual banks and the financial system. They have the advantages of
  - debt during normal times (tax advantages, possible lower agency costs).
  - equity during times of stress by reducing the costs of financial distress and bankruptcy.

* Flannery, M. (2005) “No Pain, No Gain: Effecting Market Discipline via Reverse Convertible Debentures, in H. Scott (ed.), *Capital Adequacy beyond Basel: Banking, Securities, and Insurance*, Oxford University Press.

“Going-Concern” CoCos versus Bail-in Debt

- Bail-in debt is subordinated debt that would absorb losses after the bank is a “gone-concern.”
- Relative to bail-in debt, academic research shows that appropriately designed CoCos can reduce a bank’s risk-shifting incentives and mitigate debt overhang (the disincentive to replenish capital following losses).*
- To do this, CoCos should not be risky! Indeed, equityholders incentives are improved when CoCo investors receive a value of new equity equal to or exceeding their CoCo’s par value.
- In other words, conversion terms should favor CoCo investors, not the bank’s initial shareholders.
- But shareholders benefit ex-ante via lower CoCo yields.

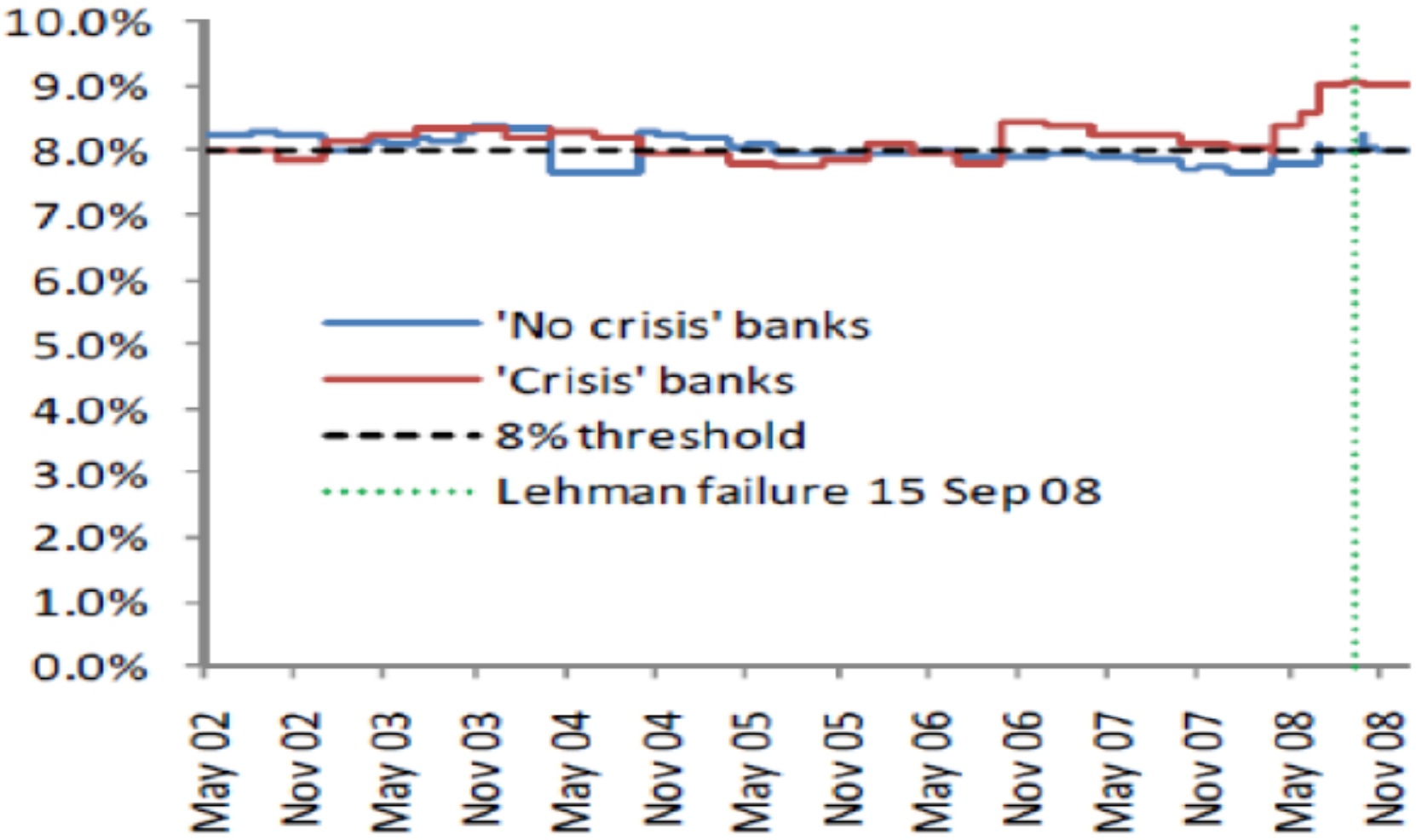
* E.g., C. Calomiris and R. Herring (2013) “How to Design a Contingent Convertible Debt Requirement that Helps Solve our Too-big-to-fail Problem,” *Journal of Applied Corporate Finance*

Time of Conversion

- For CoCos to be effective in stabilizing banks as going concerns, they need to convert to new equity at the onset of a bank's financial distress.
- All CoCos issued thus far have conversion triggers linked to a regulatory (book value) capital ration, typically a core Tier 1 capital to risk-weighted asset ratio of 7%.
- However, regulatory capital ratios fail to signal distress in a timely manner and tend to be manipulated upward when banks face stress.*

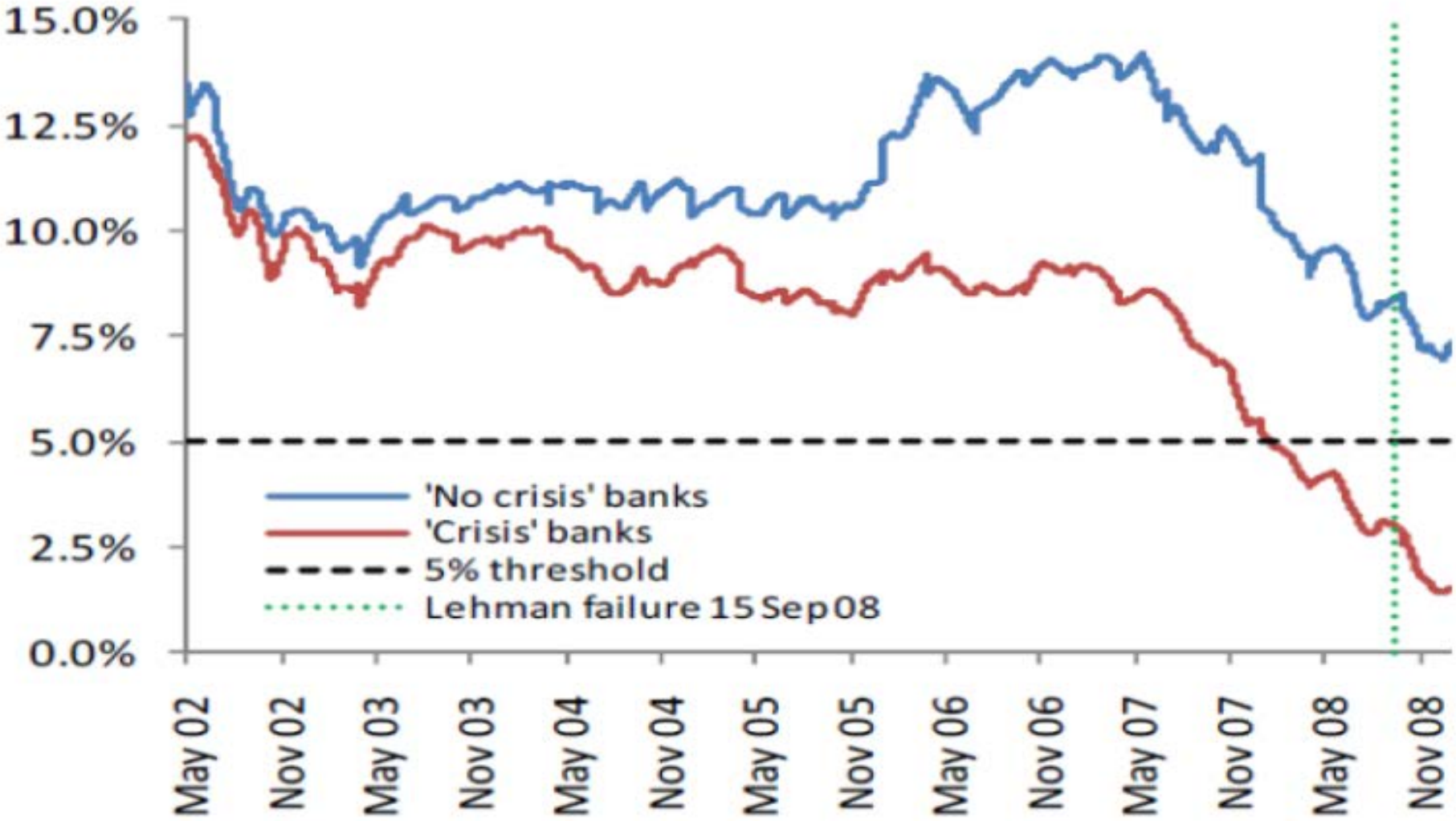
* Mariathasan, M. and Merrouche, O. (2014) "The Manipulation of Basel Risk-Weights," *Journal of Financial Intermediation* , Begley, T., Purnanandam, A. and Zheng, K. (2015) "The Strategic Under-Reporting of Bank Risk," working paper, and Plosser, M. and Santos, J. (2015) "Banks' Incentives and the Quality of Internal Risk Models," Federal Reserve of New York working paper.

Tier 1 Capital to Debt Ratios Prior to Lehman Failure*



* From Haldane, A. (2011) "Capital Discipline," Paper presented at the 2011 American Economic Association Meetings, available at www.bis.org/review/r110325a.pdf.

Market Value of Equity to Debt Ratios Prior to Lehman Failure*



* From Haldane, A. (2011) "Capital Discipline," Paper presented at the 2011 American Economic Association Meetings, available at www.bis.org/review/r110325a.pdf.

Research on CoCos with Market Triggers

- Sundaresan and Wang (SW) cast doubt on CoCos with stock price triggers by finding that they would leads to:*
  1. multiple stock price equilibria when conversion terms favor CoCo investors (receive new equity > CoCo par value).
  2. No stock price equilibrium in opposite case when conversion terms favor the bank's initial shareholders.

- Glasserman and Nouri (GN) agree with 2. but disagree with 1. by showing that in a continuous-time setting the bank's stock price has a unique equilibrium when conversion terms favor CoCo investors.

* Sundaresan, S. and Wang, Z. (2015) "On the Design of Contingent Capital with a Market Trigger," *Journal of Finance*.

** Glasserman, P. and Nouri, B. (2015) "Market-Triggered Changes in Capital Structure: Equilibrium Price Dynamics," Columbia University working paper.

Finite-Maturity versus Perpetual CoCos

- SW and GN focus on CoCos with a finite-maturity while Pennacchi and Tchistyi (PT) assume the same model framework but also allow CoCos to have a perpetual maturity.*

- PT find there is:
  1. a unique stock price equilibrium when conversion terms favor CoCo investors, confirming GN.
  2. never a stock price equilibrium when conversion terms favor shareholders and CoCos have a finite maturity.
  3. for realistic parameter values, a unique stock price equilibrium when conversion terms favor shareholders and CoCos are perpetuities.**

- Thus, whether a CoCo has a perpetual versus finite maturity is critical for a well-defined stock price equilibrium.

* Pennacchi, G. and A. Tchistyi (2015) "A Reexamination of Contingent Convertibles with Stock Price Triggers," University of Illinois working paper.
** Bank asset risk needs to be unrealistically low for there to be no stock price equilibrium.

Importance of the Result

- In practice, almost all CoCos have conversion terms that favor the bank's initial shareholders, which would imply no equilibrium stock price *unless* CoCos are perpetuities.*

- Empirical evidence also documents that the majority of CoCos issued thus far are perpetuities.

- In part this is due to the Basel III requirement that CoCos be perpetuities to qualify as "Additional Tier 1" capital.

* Berg, T. and Kaserer, C. (2015) "Does Contingent Capital Induce Excessive Risk-Taking?," *Journal of Financial Intermediation*.

** Avdjiev, S., Bolton, P., Jiang, W., Kartasheva, A. and Bogdanova, B.(2015), Coco Bond Issuance and Bank Funding Costs," BIS and Columbia University working paper.

Other Concerns with CoCos Having Stock Price Triggers

- At least three other concerns have been expressed regarding CoCos with stock price triggers:
  1. Manipulation: speculators buy CoCos and short the bank's stock to drive its price below fundamentals and trigger a conversion that dilutes shareholders and benefits CoCo investors.
  2. Panic or death spirals: imperfect information or irrationality that drives market values below fundamentals can also trigger a conversion that dilutes shareholders.
  3. Market segmentation: there would be little demand for CoCos because fixed-income investors do not want bonds that convert to equity.

COERCs: A CoCo that Addresses These Concerns

- A Call Option Enhanced Reverse Convertible (COERC) is a CoCo with the following properties:*
  1. has a high market value capital ratio or a stock price trigger.
  2. if triggered, requires the bank to issue a large proportion of new shares to COERC bondholders (conversion terms favor COERC investors).
  3. Gives shareholders the right to repurchase these shares for the bond's par value to prevent dilution.

- The effect of these provisions is to coerce shareholders to raise new equity and repay the bondholders in cash at the onset of bank stress.

* Pennacchi, G., Vermaelen, T. and Wolff, C. (2014) "Contingent Capital: The Case of COERCs," *Journal of Financial and Quantitative* Analysis.

Benefits of COERCs

- COERCs allow shareholders to undo excess dilution due to manipulation, panic or “death spirals” by repurchasing underpriced shares for cash.

- Since COERC investors are almost always repaid in cash, concerns of market segmentation are alleviated.

- The bank’s shareholders can sell their repurchase rights to any deep-pocketed investor, reducing liquidity concerns.

- Since COERC are nearly risk-free, fundamental downside risk resides with the bank’s initial shareholders, giving them similar incentives as would occur with unlimited liability and reducing:
  1. risk-shifting incentives
  2. debt overhang

- A 2013 Barclays CoCo gave “shareholders the opportunity to purchase the ordinary shares created on conversion.”

Conclusions

- There are many areas of risk-based bank regulation that could be better designed.
- This is a rich area for research with important policy implications.
- While there may be resistance from both bankers and regulators, the gradual accumulation of evidence supporting reform should eventually yield results.