Design of Contingent Capital for Banks & Financial Institutions

Suresh Sundaresan
Columbia University
Zhenyu Wang
Federal Reserve Bank of New York

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The views expressed in this paper and seminar are those of the authors and do not necessarily reflect the position of the Federal Reserve Bank of New York or the Federal Reserve System.

Broad policy question
The Dodd-Frank Act

The Dodd-Frank financial reforms bill passed by the United States Congress has called for a "**study of the feasibility, benefits, costs, and structure of a contingent capital requirement for non-bank financial companies supervised by the Board of Governors and bank holding companies**."

In particular, the bill has called for a **study of the characteristics and amounts of contingent capital that should be required, and the potential prudential standards that should be used to determine whether the contingent capital (CC) would be converted to equity in times of financial distress**.

Broad policy interest
IMF

1. Contingent capital instruments could be considered as part of a comprehensive and consistent crisis-management framework.

2. Policies that support contingent capital should be squarely geared toward reducing the risk and cost of systemic crises.

(i) Enable automatic conversion of debt into equity when market access is difficult; and

(ii) Disincentivize excessive risk taking by financial institutions.

3. Contingent capital instruments could be used to meet more stringent capital buffers, including additional loss-absorbing capital requirements for SIFIs.

4. Contingent capital instruments are untested and need careful scrutiny in order to avoid potentially adverse effects on market dynamics.

Broad academic interest

There has been considerable interest in designing debt securities for banks that are forced into equity via mandatory conversion in periods of distress when the bank's capitalization is low. **Such a design may mitigate the "too big to fail" problem as automatic conversion relieves the banks of servicing their debt obligations in bad states of the world, and the losses to bond holders are internalized.**

It has also been argued that the potential for a **"punitively dilutive" conversion of contingent debt may set the right incentives for managers to avoid excessive risk taking, and encourage them to maintain higher capital ratios**.

Squam Lake Working Group on Financial Regulation (2010).

What is Contingent Capital (CC)?

The main idea behind CC

- Get capital in (good?) current state
- Return capital in good future state
- Convert to common equity *before/in* bad future state

The main function as capital

- Works as debt in healthy firms
- Works as equity in weak firms

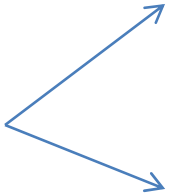
The main purpose in regulation

- Overcome the reluctance of raising equity
- Reduce the incentive for taking excessive risk
- Reduce the possibility of costly bankruptcy
- Remove the need for public bail out of large banks

CC Design - Hybrid securities

1. Debt with write-down of principal:

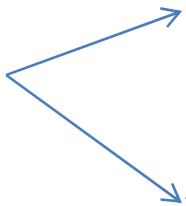
   (Rabobank 10-year note: if equity capital ratio drops below 7% principal is written down by 75% and the rest is paid in cash. €1.25 billion)



Trigger event causes principal to be written down.

Absence of a trigger event causes the promised principal to be paid.

2. Debt with write-down /write-up of principal:

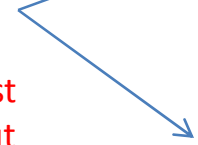


Trigger event causes principal to be written down. When the state reverts to “normal” principal is written up.

Absence of a trigger event causes the promised principal to be paid.

CC Design - Hybrid securities

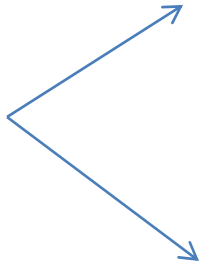
3. Rights issues (mandatory or negotiated exchange offers):
   (Exchange offers exchange into common stock. On July 27, 2009, **Citigroup** shares lost as much as 6% after the company said about $20.3 billion of publicly held convertible and non-convertible preferred and trust preferred securities were validly tendered in exchange for common stock.)



Trigger event causes issuance of rights. Potential dilution costs. Issues may not succeed.

Absence of a trigger event causes no rights issues.

4. Mandatory convertible debt:
   (Lloyd's 10-year senior note: converts to a fixed number of common shares if Tier 1 common capital ratio falls below 5%.)



Trigger event causes debt to convert to equity.

Absence of a trigger event causes the promised principal to be paid.

CC Design – Putative benefits

1. Conversion "automatically" recapitalizes the banks with minimal disruptions.
2. Banks are relieved of interest burden and potential costs of financial distress.
3. Prospect of conversion and resulting dilution may set the right incentives.
4. "Better" than equity as banks obtain tax shield from interest payments. But the tax treatment is uncertain, and is a transfer to banks.
5. Equity issuance may be "costly" due to the "debt overhang" problem and adverse selection problem.

CC Design – Types of Triggers

1. Market value of equity. (Flannery).
2. Equity price and a "market index" price (McDonald).
3. Supervisory discretion (OFSI - Canada).
4. Tier 1 capital to Risk-weighted-assets (RWA) threshold.
5. Covenant violations *and* supervisory judgment that there is a systemic crisis.
6. Trigger on enterprise value.

Literature Survey – Market price based conversion

Doherty and Harrington (1997) had suggested a reverse convertible note (RCN) whereby the payments to junior debt can be made either in cash or equity at the discretion of the issuer at **predetermined** stock prices.

Flannery (2002) proposed an RCN structure in which the conversion is mandatory and occurs at the **current** market price of equity. Flannery (2009) has More recent papers further elucidating his initial idea.

McDonald (2009) has argued for a “dual” trigger: stock price of the bank as well as a stock index price for mandatory conversion. Stock price process is exogenous.

Literature Survey – Enterprise value based triggers

Raviv (2004) considers a debt-for-equity swap when the value of the bank's capital falls below a regulatory threshold according to terms that are set ahead of time.

Albul, Jaffee and Tchistyi (2010) place triggers on the underlying (unobserved) Asset values. Assuming a perpetual debt, they derive closed-form solutions. Value of the firm is assumed to be exogenous.

Pennacchi (2010) considers a jump-diffusion formulation and shows that managers may have incentives to shift risk, although this incentive is less with a CC structure. Value of the firm is assumed to be exogenous.

Literature Survey – Other suggestions

Kashyap, Rajan and Stein (2008) suggest that banks obtain insurance from an insurer who would receive a premium for agreeing to provide capital to banks In case of systemic crisis. The insurer would be required to hold the full insured Amount, to be released back to the insurer once the policy matures.

U.K. HM Treasury (December 2009) has discussed the pros and cons of Government-provided capital insurance, where for up-front fees, Government agrees to deliver capital to banks in a systemic crisis – not unlike charging a fee for standing facilities

-Pros:
- -Greater certainty
- -Fees for access to emergency capital

-Cons:
- -Creditors of banks may benefit from Government insurance.
- -Less flexible.

Literature Survey – Other suggestions

Capital Insurance by Government: The case of Royal Bank of Scotland

"Part of the support package for RBS announced in November is a form of government-owned capital insurance. The Government has committed to take up to £8 billion of equity should RBS' Core Tier 1 ratio fall to 5 per cent, and in turn receives an annual fee of 4 percent.

This can be seen as unfunded contingent equity held by Government. This is useful in giving the Treasury a fee for an element of the risk insurance it supplies to RBS."

Source: "Risk, reward and responsibility: the financial sector and society", December 2009, HM Treasury.

Literature Survey – Other suggestions

Caballero and Kurlat (2009) have suggested that the central bank should issue tradable insurance credit, which would permit banks to attach a central bank guarantee to assets on their balance sheet during a systemic event.

Regulators can set the trigger – in essence, central bank creates a CDS market in which it sells protection to banks.

Admati and Pfleiderer (2010) have argued for increasing the liability of owners (equity holders) and suggest that such a structure will mitigate the conflicts of interests between equity and debt holders and may help reduce the need for bailouts.

Subjecting equity holders to "double liability" has also been discussed by Goodhart (2010) – equity holders will be forced to put up more capital equal to initial par value of shares.

U.S. Treasury's CAP (February, 2009)

Issuer: Qualified Financial Institutions (QFI)

Initial holder: U.S. Treasury (UST)

Par value: $1,000.

Conversion: Mandatorily converts to common stock after 7 years. Convertible in whole or in part at the option of the QFI at any time.

Conversion price: 90% of the average closing price for the common stock for the 20 trading day period ending February 9, 2009.

Ranking: Senior to common stock and pari passu with existing preferred shares.

Dividend: Pay cumulative dividends at a rate of 9% per annum, compounding quarterly.

Redemption: Within the first two years of issuance, will be redeemable at par, plus any accrued and unpaid dividends.

Warrants: The UST will receive warrants to purchase a number of shares of common stock of the QFI having a market value equal to 20% of the Convertible Preferred.

Term: 10 years

Exercisability: Immediately exercisable whole or part

Lloyds TSB ECN (November, 2009)

Issuer: Lloyds TSB Group

Security: Exchange offering, £9.1 billion in total

Maturity: 10 year, bullet fixed rate

Conversion trigger: Core Tier 1 capital ratio drops to 5%

Conversion: Convert into common equity at fixed conversion ratio

Coupon: approximately 1.5-2.5% additional yield

Ranking: Subordinated LT2 debt

Rating agency treatment: Moody's B Basket

Rating at Issuance: Ba2 / BB

Rabobank SCN (Mar 2010)

Issuer: Rabobank

Security: Stand alone, €1.25 billion total

Maturity: 10 year, bullet fixed rate

Conversion trigger: 7% equity capital ratio

Conversion: Permanent write-down of 75% of principle. Residual 25% of principal to be paid in cash immediately.

Coupon: 6.875%

Ranking: Senior unsecured

Rating agency treatment: Moody's A Basket

Rating at Issuance: Non-rated

Term Sheet of CC with Market Trigger

Issuer: systemically-important financial institutions

Security: preferred equity or debt convertible to common equity

Maturity: [10] years, bullet fixed rate

Trigger: market value of equity falls to [4%] of RWA

Conversion: full principal amount convert to [100%] of par value at trigger price

Coupon: [?%] (Need to price CC at the par value.)

Transferability: no restriction

Regulatory treatment: may not qualify Tier 1 but counts towards the supervisory buffer

Why Market Trigger?

Disadvantages of accounting triggers

- Accounting values are less forward looking
- Accounting values are subject to manipulation

Disadvantages of regulator triggers

- Regulator's information & monitoring are limited
- Regulatory discretion can cause panic
- Regulator is subject to political pressure
    - Regulator tends to act late

Advantages of market trigger

- Aggregate up-to-date information in the markets
- Timely market info (not obsolete accounting data)
- Objective market view (not subjective regulator opinion)

Practical Questions

Does it provide the right incentives to managers?

- Does it discourage CEO from taking too much risk?
- Does it constrain CEO from taking good projects?
- Does it reward managers for keeping firm in good state?
- Does it punish managers for running firm into bad state?
  - Reward managers before conversion
  - Punish managers at conversion
    - Transfer value away from equity at conversion

Is it subjective market manipulation?

- Does it give arbitrage opportunities?
- Does it give some party advantage in pricing?
- Will it cause death spiral in pricing?

Overview of Main Results

1. CC that converts into common equity when the bank's stock price falls below a specified threshold, or ``trigger,'' does ***not*** in general lead to a unique equilibrium in equity and contingent capital prices.

2. Multiple or no equilibrium arises because alternative beliefs about conversion can either lead to internally consistent multiple equilibria or no equilibrium.

3. Multiple equilibrium produces diametrically opposite incentives for equity holders (who prefer a “no conversion'' equilibrium) and CC holders (who prefer an “early conversion'' equilibrium). This introduces the potential for market manipulation, especially when the stock prices approach the trigger.

Overview of Main Results

4. For a unique equilibrium to exist, we prove that mandatory conversion cannot result in any value transfers between equity holders and CC investors. This result is robust for both smooth diffusion processes as well as for more realistic processes in which the bank value may undergo discontinuous jumps.

5. From a policy perspective, the no-value-transfer condition, which assures a unique equilibrium, may preclude the CC from generating the desired incentives for bank managers to avoid excessive risk taking.

Overview of Main Results

6. When there are financial distress costs (in addition to liquidation costs), we show that ``early conversion'' equilibrium may result in less dead-weight losses than the ``no conversion'' equilibrium. It is however difficult to ensure, ex-ante, that the equilibrium with lower dead-weight losses will be selected in the market, ex-post.

Example: a simple firm with CC

- Risky asset
  - any value (e.g., \$100, \$95, or \$70) tomorrow
- Senior bond
  - par value = \$80, mature tomorrow
- Contingent capital
  - par value = \$10, mature tomorrow
  - conversion trigger: stock price ≤ \$5
  - conversion ratio: m
- One (n = 1) share of common equity
  - If not converted: Price = (Asset – Bond – CoCo)/n
  - If converted: Price = (Asset – Bond)/(n + m)

If conversion ratio is too high: $m = 3$

- Suppose asset value turns out to be \$100
  - If all believe CC will not convert,
    - Stock Price = (100 – 80 – 10)/1 = 10
    - CC Price = Par Value = 10
  - If all believe CC will convert,
    - Stock Price = (100 – 80)/(1 + 3) = 5
    - CoCo Price = 3×5 = 15
  - Two possible pairs of stock and CoCo values
- Observations
  - CC holders gain \$5 from conversion
  - Market will have multiple equilibrium.

If conversion ratio is too low: $m = 1$

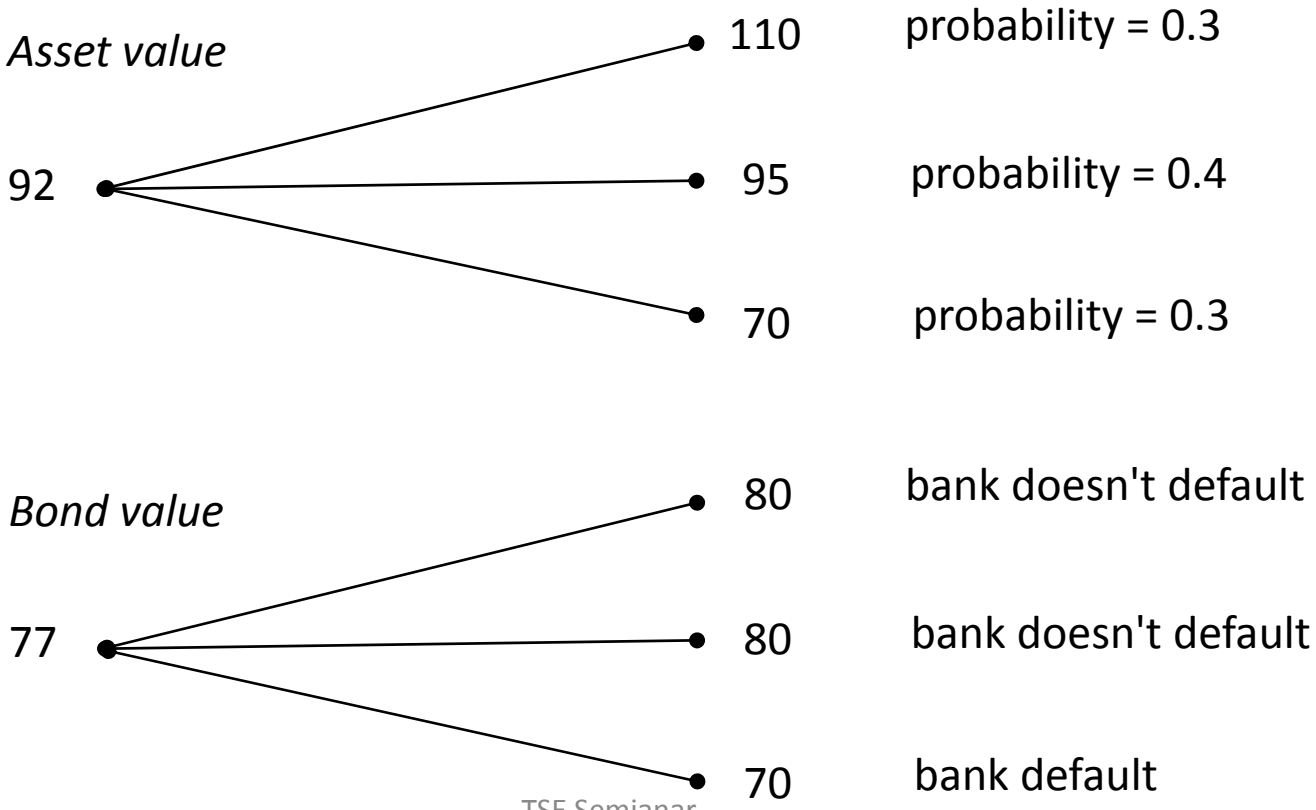
- Suppose asset value turns out to be \$95
  - If all believe CC will not convert,
    - Stock Price = (95 – 80 – 10)/1 = 5
    - CC Price = 10
  - If all believe CC will convert,
    - Stock Price = (95 – 80)/(1 + 1) = 7.5
    - CC Price = 1×7.5 = 7.5
  - No stock and CC values are rational
- Observations
  - CC holders lose \$2.5 from conversion
  - No rational expectations equilibrium

If conversion ratio is just right: $m = 2$

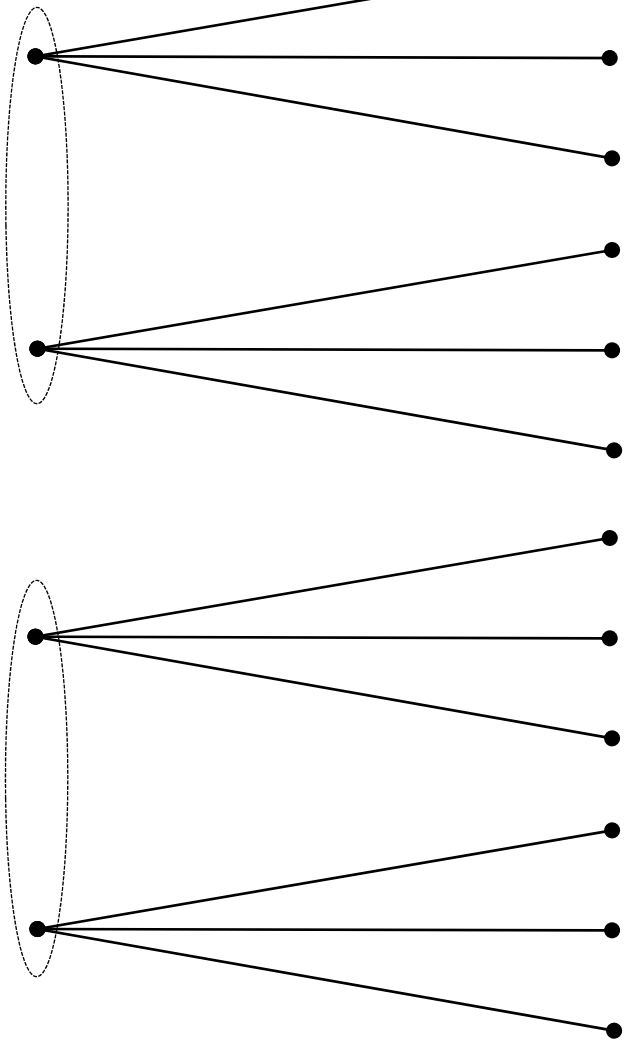
- In case asset value = \$95
  - No conversion: Stock = (95 – 80 – 10)/1 = 5
  - Conversion: Stock = (95 – 80)/(1 + 2) = 5
  - CC expected to convert; value at 2×5 = 10
- In case asset value = \$100
  - No conversion: Stock = (100 – 80 – 10)/1 = 10
  - Conversion: Stock = (100 – 80)/(1 + 2) = 6.66
  - CC expected not to convert; value at 10
- Observations:
  - No ambiguity about conversion
  - Market settles to unique equilibrium

Pricing before maturity

- Conversion ratio *m* = 2 guarantees unique equilibrium at maturity,
- but it cannot guarantee this before maturity.



Multiple prices before maturity



Multiple prices before maturity

1. Note that the CC holders prefer the "early conversion" equilibrium. They would have an incentive to push the stock prices down towards the trigger.

2. Stockholders prefer the "no conversion" equilibrium. They would like to keep the stock price above the trigger.

3. This can potentially lead to manipulation of stock prices near the trigger level.

Case: During 1994-1995, "knock-in" barrier options on Venezuelan Brady bonds, which payoff when the underlying bonds reach a high enough level experienced manipulation: the fund owning the option attempted to push the price up by buying the bond, and the investment bank which sold the option attempted to keep the prices down. During the height of manipulation, about 20% of the outstanding bonds exchanged hands, and the prices went up by 10%.

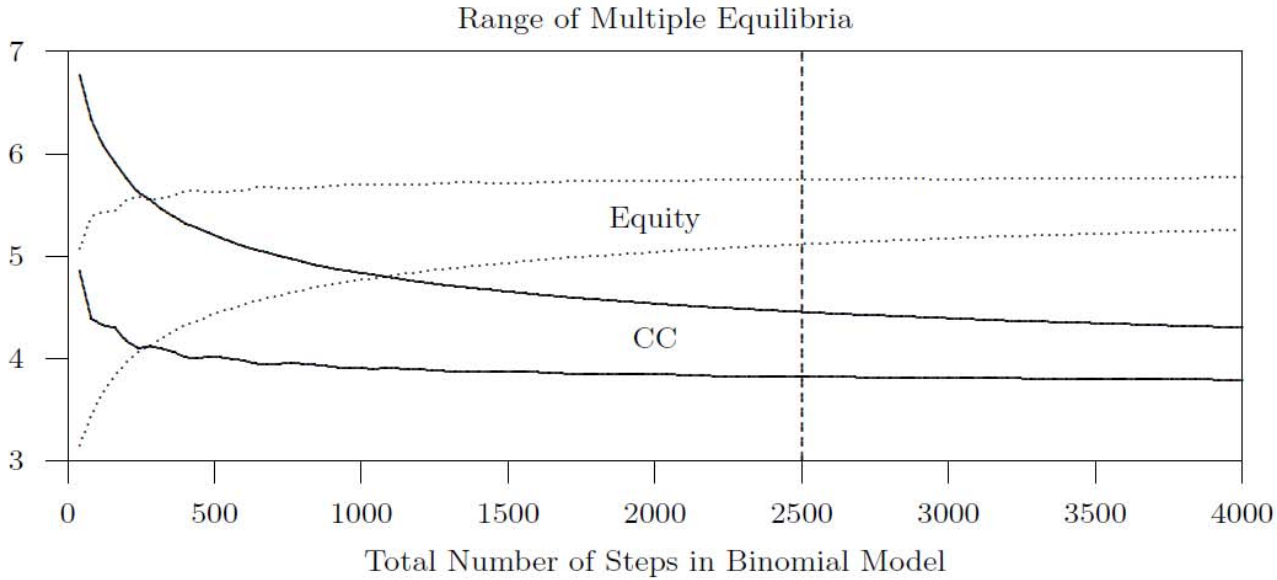
Multiple prices before maturity

Table 1: A Numerical Example for the Range of Multiple Equilibria

Name	Notation	Value
Parameters		
Asset value	A_0	100
Volatility	σ	6%
Senior bond value	B_0	90.43
Riskless rate	r	2%
Par value of CC	$\bar{C}$	6
Shares of common equity	n	1
equilibria		
Stock price	S_0	[3.83 , 4.45]
CC value	C_0	[5.12 , 5.74]

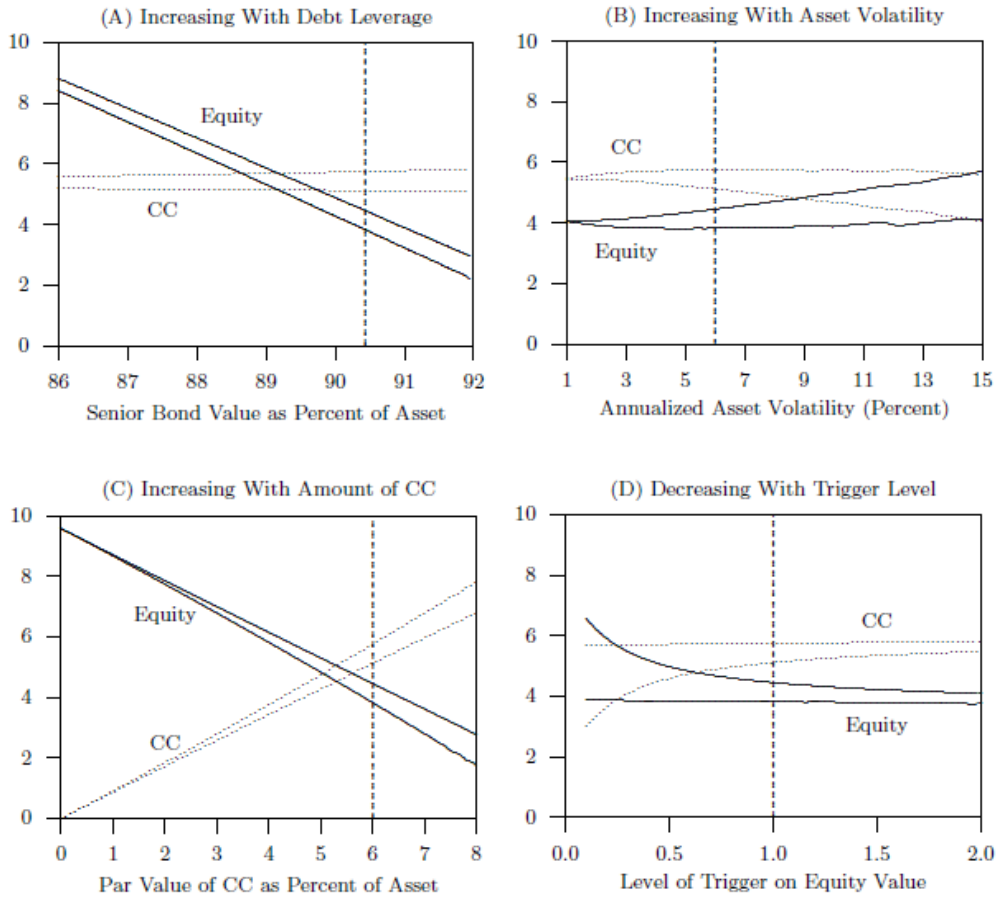
Multiple prices before maturity

Figure 2: The range of multiple equity and CC prices converges to a fixed width as the number of steps in the binomial tree increases. The solid lines represent the upper and lower bounds of multiple equity prices and dot lines represent the bounds of CC values. The parameters used for the figure are the same as those in Table 1, except the number of steps. For the number of steps, its value in Table 1 is indicated by the vertical dash line.



Multiple prices before maturity

Figure 3: The range of multiple equity and CC prices depend on bank characteristics and CC contracts. The solid lines represent the upper and lower bounds of multiple equity prices and dot lines represent the bounds of CC values. The parameters used for the figure are the same as those in Table 1, except the one that varies in a range indicated by the horizontal axis. For the varying parameter, its value in Table 1 is indicated by the vertical dash line.



Why Multiple Equilibria may be bad?

Why is unique equilibrium desired?

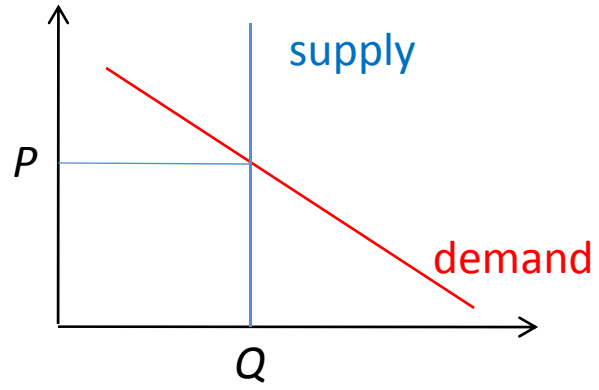
- market forces price to a single point
- difficult to manipulate market
- reward good business insights/predictions

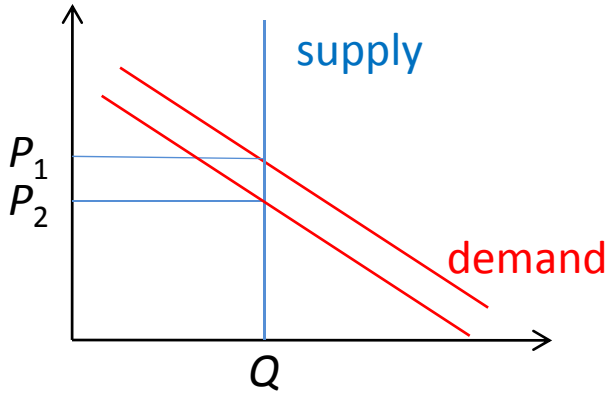
Why are multiple equilibriums bad?

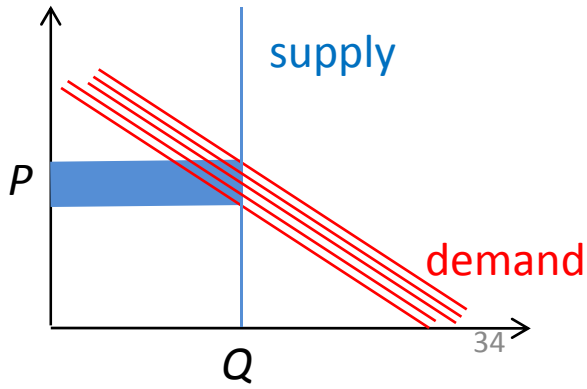
- lose market force on price
  - facilitate market manipulation
- reward powerful players
  - no reward for good business

Why is no equilibrium bad?

- Might give arbitrage profits
- Might send market to chaos







Condition for Unique Equilibrium

Theorem: For any given trigger level, par value and conversion ratio in a CC with stock price trigger, the necessary and sufficient condition for the existence of unique pair of equilibrium stock and CC prices is that *conversion never transfers value between equity and CC holders.*

$$\text{CC value} = \text{Coversion ratio} \times \text{Trigger Price}$$

$$\text{Conversion ratio} = \frac{\text{CC Value}}{\text{Trigger Price}}$$

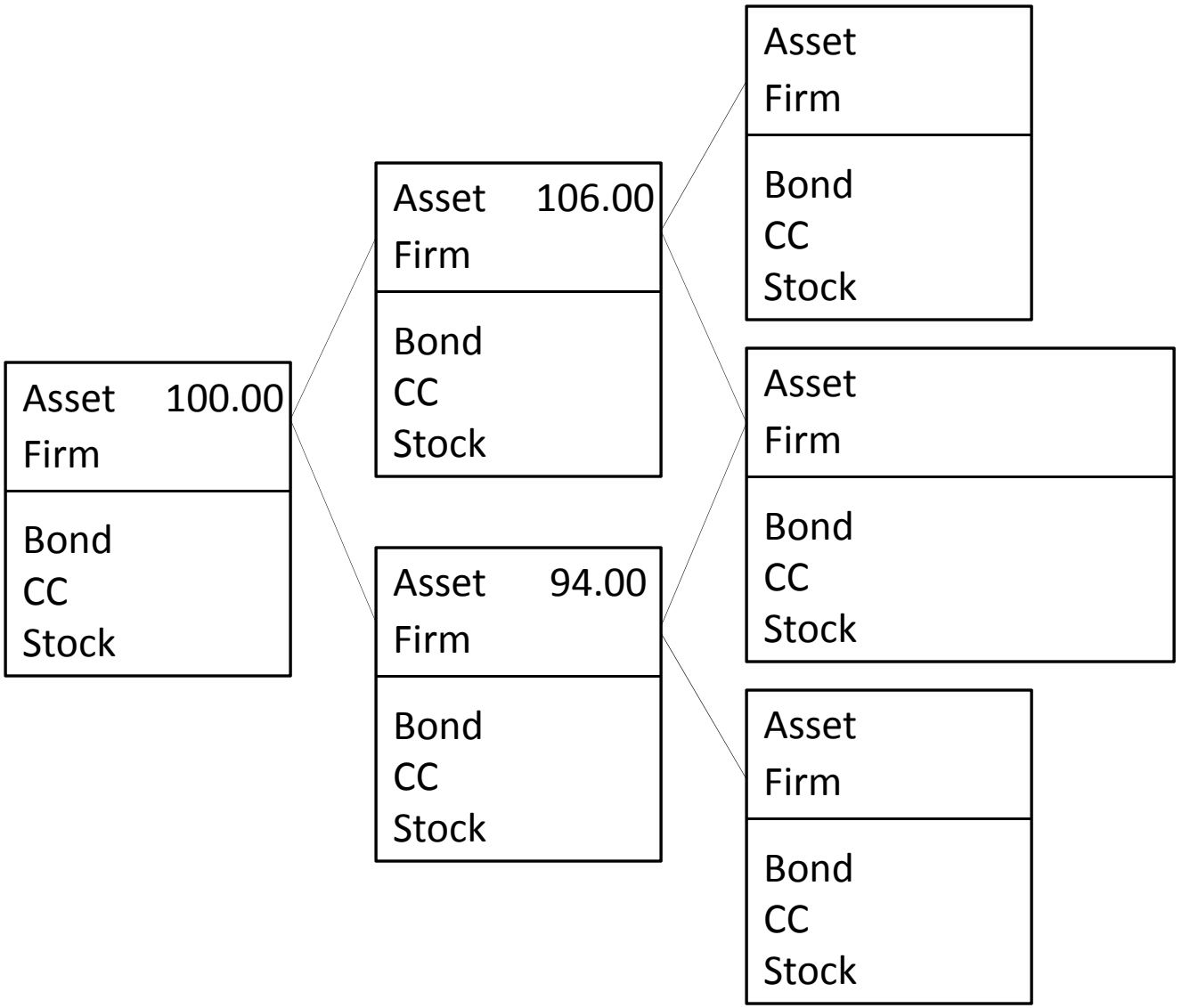
- Conversion ratio is tied to trigger price and CC value.
- We cannot punish managers by diluting firm into more shares at conversion.
- CC cannot provide incentives for managers to take less risk.

Cost of Financial Distress

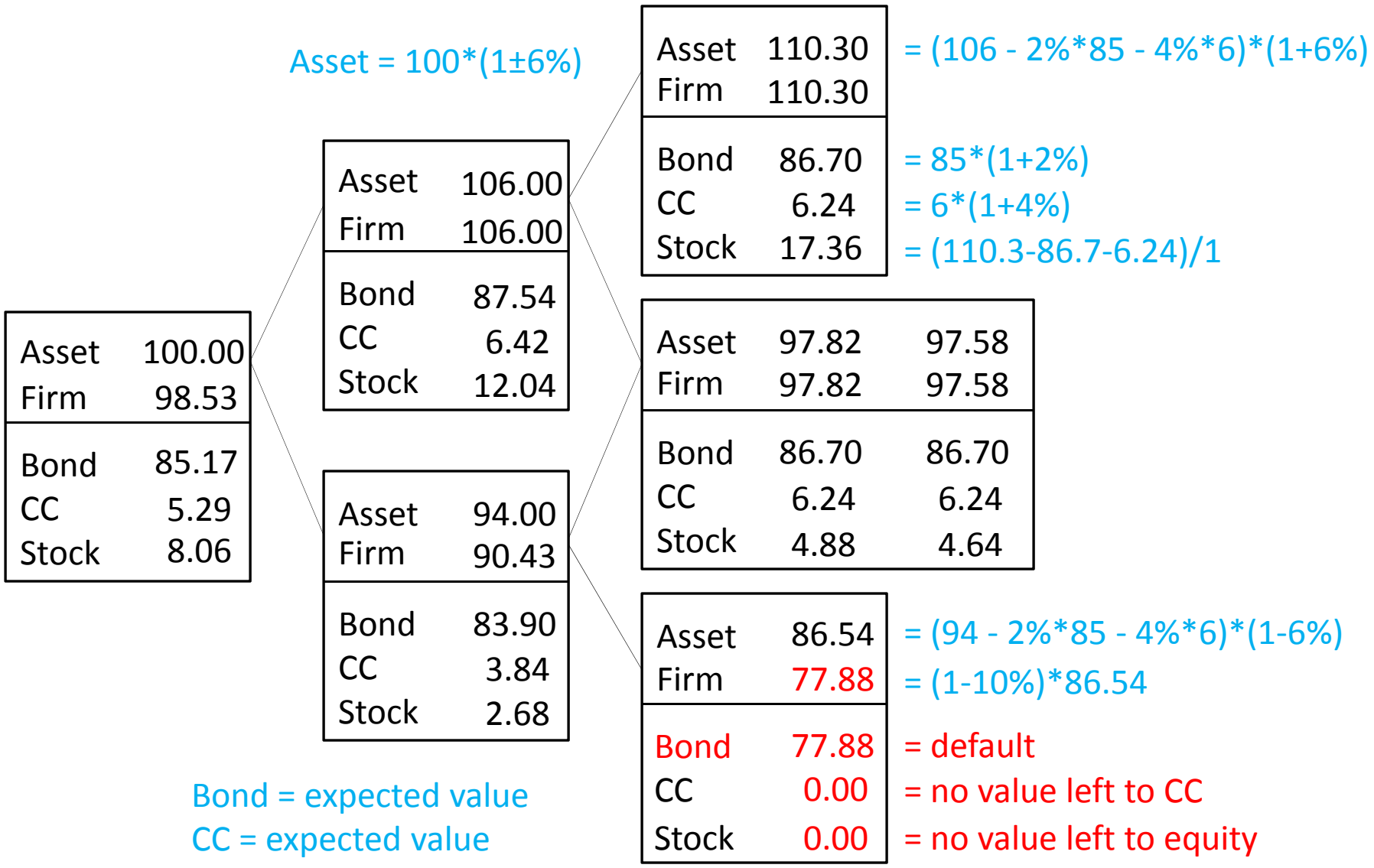
- When bankruptcy is costly
  - Cash outflow cause financial distress.
  - Are there multiple equilibrium?
- CC coupon is cash outflow of firm.
  - In an equilibrium with later conversion
    - Firm pays more CC coupon
    - Reduces asset; Increases chance to default.
    - Increases chance to incur cost; Lowers firm value.
  - In an equilibrium with earlier conversion
    - Firm pays less CC coupon
    - Reserves more asset; Reduces chance to default.
    - Reduces chance to incur cost; Raises firm value.

An Example of a Firm with Coupon CoCo

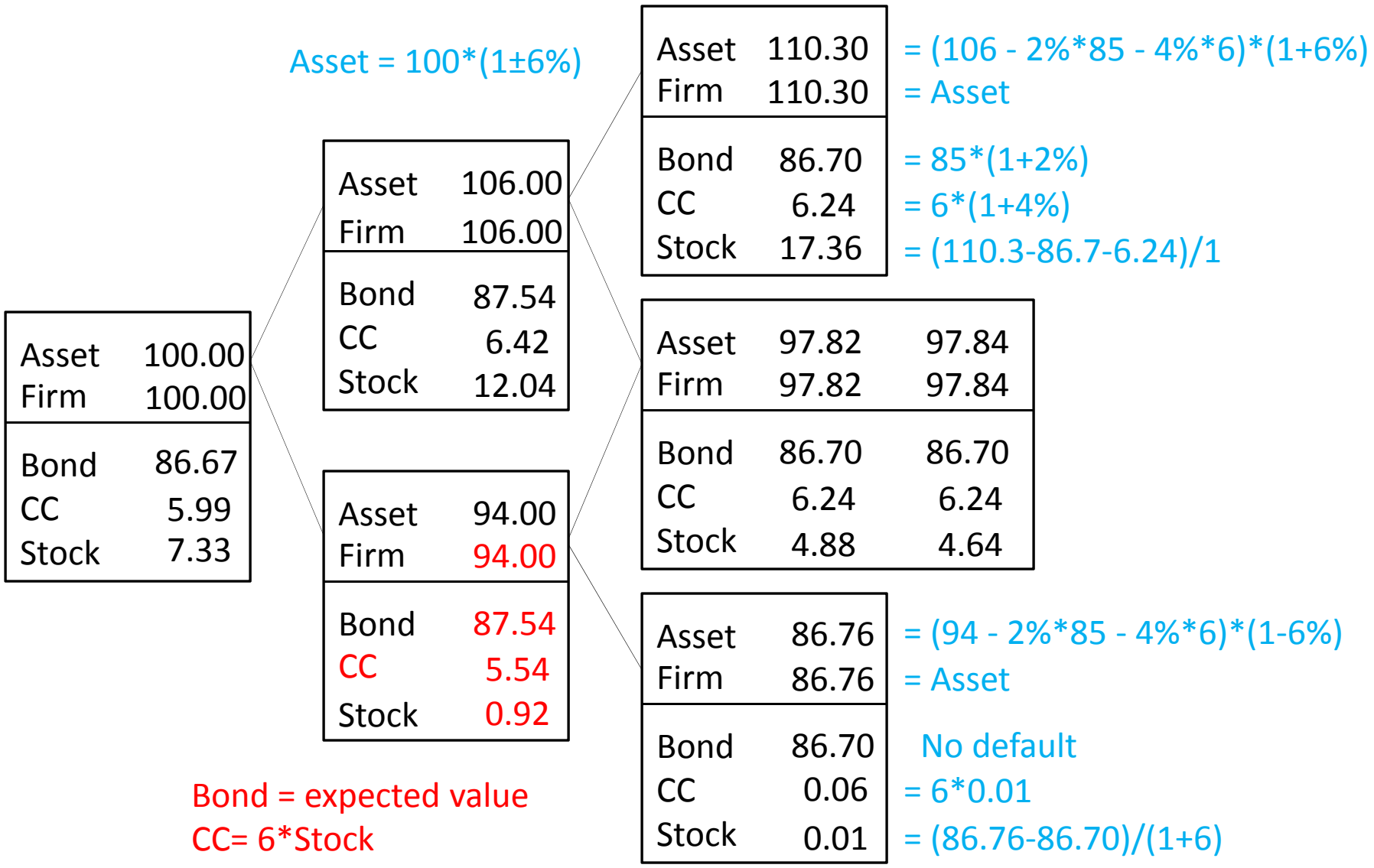
Interest rate	1%
Asset	
Return	± 6.0%
Up Prob	0.58
Dn Prob	0.42
Bond	
Face	85.00
Rate	2.0%
Loss	10%
CC	
Face	6.00%
Rate	4.0%
Trigger	1.00
Ratio	6
Equity	
Share	1



No Early Conversion Is an Equilibrium



Early Conversion Is Another Equilibrium

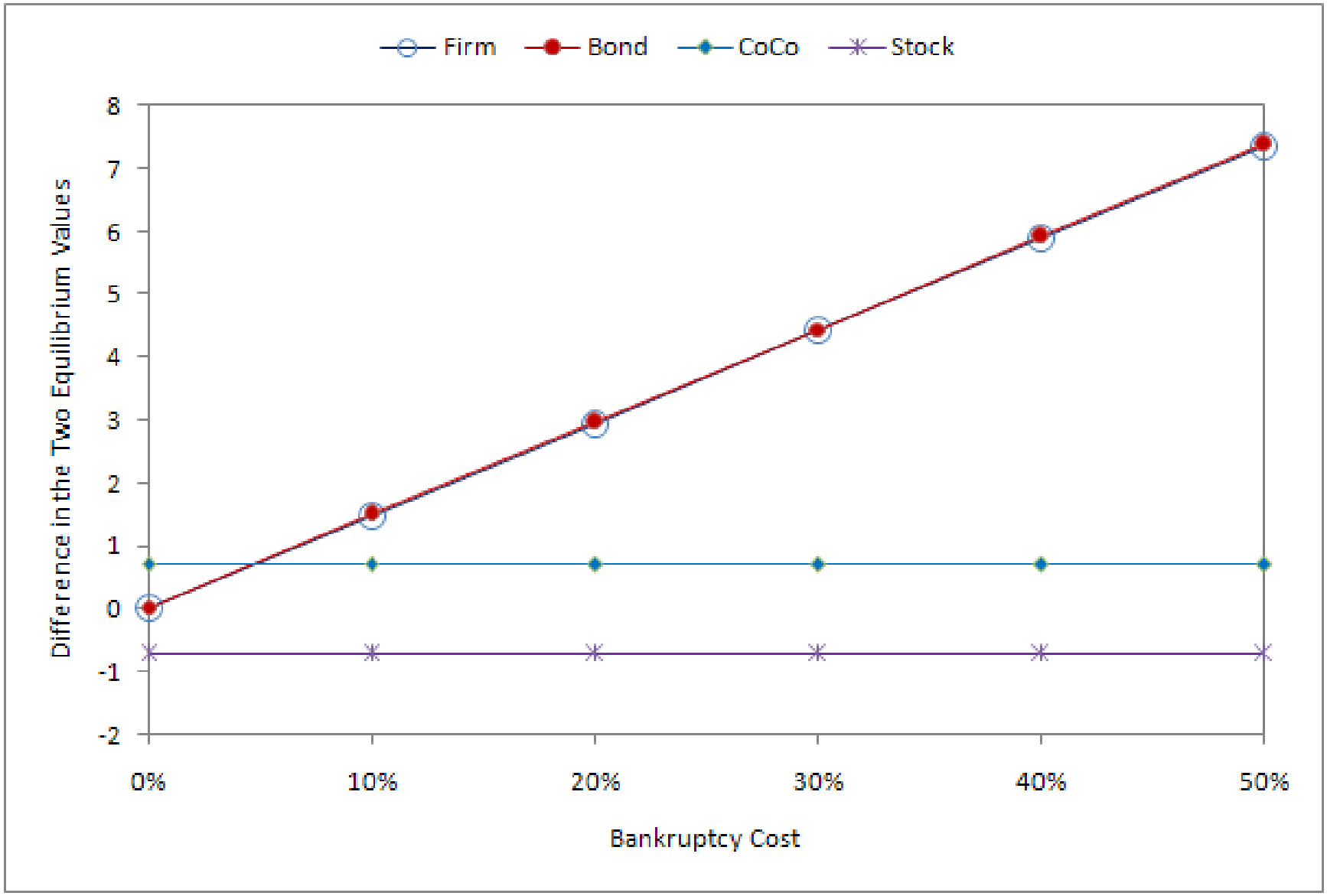


Compare the Two Equilibria

Equilibrium	Firm	Bond	CC	Stock
Earlier	100.00	86.67	5.99	7.33
Later	98.53	85.17	5.29	8.06
Difference	1.47	1.50	0.70	–0.73

- The equilibrium with earlier conversion
  - gives higher firm value.
    - This is not true if CC is zero-coupon.
  - Regulator should prefer this equilibrium.
    - How to design CC to pick this equilibrium?
- The equilibrium with earlier conversion
  - benefits bond and CC holders but hurt equity holders.
    - Equity holders would avoid this equilibrium.

Relation to Bankruptcy Cost



Conclusion

Without financial distress costs,

- CC in general leads to multiple/no equilibrium prices of CC and stock.

With financial distress costs,

- CC in can also lead to multiple equilibrium values of firm and senior bond.
- Firm, bond and CC values are higher in the equilibrium with earlier conversion.
- Equity value is higher in the equilibrium with later conversion, which is associated with lower firm value.

Questions for regulator:

- Does CC introduce instability into the market system?
- Should we introduce a requirement that puts powerful market players in advantage?