Design of Contingent Capital with Stock Price Trigger for Conversion

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The views expressed in this paper 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.
Section 115. Enhanced supervision and prudential standards for nonbank financial companies supervised by the Board of Governors and certain bank holding companies.

(b) Development of prudential standards.—

(1) In general.—The recommendations of the Council under subsection (a) may include—

(B) a contingent capital requirement.

(c) Contingent Capital.—

(1) Study required.—The Council shall conduct a study of the feasibility, benefits, costs, and structure of a contingent capital requirement for nonbank financial companies supervised by the Board of Governors and bank holding companies described in subsection (a), which study shall include—
What Does D-F Want Us to Study?

(A) The degree to which such requirement would enhance the safety and soundness of companies subject to the requirement;

(B) The characteristics and amounts of contingent capital that should be required;

(C) Potential prudential standards that should be used to determine whether the contingent capital would be converted to equity in times of financial stress;

(D) The costs to companies, the effects on the structure and operation of credit and other financial markets;

(E) The effects of such requirement on the international competitiveness;

(F) Recommendations for implementing regulations.
What is Contingent Capital (CoCo)?

The main idea in CoCo

• 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
Design of Contingent Capital

The capital is a debt before conversion
  • It has a par value.
  • It pays interest regularly.
  • The interest payments may or may not be deductible.

The capital is equity shares after conversion
  • It stops paying interest.
  • It is equivalent to \( m (=?) \) shares of common equity.

What triggers conversion?
  • Accounting ratio: Squam Lake (2009)
  • Regulator discretion: GS (2010), OSFI (2010)
  • Borrower option: Bolton & Samama (2010)
**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
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
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 CoCo 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 CoCo 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?
Literature on Pricing CoCo

Albul, Dwight & Tchistyi (2010):
• Assuming the firm value is exogenous
• Setting trigger on the firm value
• Claiming that it’s equivalent to setting trigger on stock price

Pennacchi (2010); Pennacchi, Vermaelen & Wolf (2010):
• Assuming firm value is exogenous
• Assuming the firm’s senior bond value is exogenous
• Setting trigger on the ratio of firm and senior bond values

McDonald (2010):
• Assuming a broad stock index is exogenous
• Assuming the firm’s stock price is exogenous
• Setting trigger on both stock price and broad index
Example: a simple firm with CoCo

- 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 CoCo will not convert,
    - Stock Price = $(100 - 80 - 10)/1 = 10$
    - CoCo Price = Par Value = 10
  - If all believe CoCo will convert,
    - Stock Price = $(100 - 80)/(1 + 3) = 5$
    - CoCo Price = $3 \times 5 = 15$
- Two possible pairs of stock and CoCo values
- Observations
  - CoCo 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 CoCo will not convert,
    - Stock Price = $(95 - 80 - 10)/1 = 5$
    - CoCo Price = $10$
  - If all believe CoCo will convert,
    - Stock Price = $(95 - 80)/(1 + 1) = 7.5$
    - CoCo Price = $1 \times 7.5 = 7.5$
- No stock and CoCo values are rational
- Observations
  - CoCo 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: \( \text{Stock} = (95 - 80 - 10)/1 = 5 \)
  - Conversion: \( \text{Stock} = (95 - 80)/(1 + 2) = 5 \)
  - CoCo expected to convert; value at \( 2 \times 5 = 10 \)
- In case asset value = $100
  - No conversion: \( \text{Stock} = (100 - 80 - 10)/1 = 10 \)
  - Conversion: \( \text{Stock} = (100 - 80)/(1 + 2) = 6.66 \)
  - CoCo 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.

\begin{itemize}
  \item \textit{Asset value}:
    \begin{itemize}
      \item $92$ with probability $= 0.3$
      \item $95$ with probability $= 0.4$
      \item $70$ with probability $= 0.3$
    \end{itemize}
  \item \textit{Bond value}:
    \begin{itemize}
      \item $77$ (bank doesn't default)
      \item $80$ (bank doesn't default)
      \item $70$ (bank default)
    \end{itemize}
\end{itemize}
Multiple prices before maturity

**CoCo value**

Not convert: $C = 7$
- 10: no conversion
- 10: convert to 2 shares
- 0: bank defaults

Convert: $C = 10$
- 20: $2 \times $10
- 10: $2 \times $5
- 0: $2 \times $0

**Stock Price**

Not convert: $S = 8$
- 20: above trigger
- 5: hits trigger
- 0: bank defaults

Convert: $S = 5$
- 10: $(110 - 80)/3$
- 5: $(95 - 80)/3$
- 0: bank defaults
Why Unique Equilibrium Price?

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

\[
\text{CoCo value} = \text{Conversion ratio} \times \text{Trigger Price}
\]

\[
\text{Conversion ratio} = \frac{\text{CoCo Value}}{\text{Trigger Price}}
\]

• Conversion ratio is tied to trigger price and CoCo value.
• We cannot punish managers by diluting firm into more shares at conversion.
• CoCo cannot provide incentives for managers to take less risk.
Under the Cost of Financial Distress

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

<table>
<thead>
<tr>
<th>Interest rate</th>
<th>1%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asset Return</td>
<td>± 6.0%</td>
</tr>
<tr>
<td>Up Prob</td>
<td>0.58</td>
</tr>
<tr>
<td>Dn Prob</td>
<td>0.42</td>
</tr>
<tr>
<td>Bond Face</td>
<td>85.00</td>
</tr>
<tr>
<td>Rate</td>
<td>2.0%</td>
</tr>
<tr>
<td>Loss</td>
<td>10%</td>
</tr>
<tr>
<td>CoCo Face</td>
<td>6.00</td>
</tr>
<tr>
<td>Rate</td>
<td>4.0%</td>
</tr>
<tr>
<td>Trigger</td>
<td>1.00</td>
</tr>
<tr>
<td>Ratio</td>
<td>6</td>
</tr>
<tr>
<td>Equity Share</td>
<td>1</td>
</tr>
</tbody>
</table>
No Early Conversion Is an Equilibrium

<table>
<thead>
<tr>
<th>Asset</th>
<th>106.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm</td>
<td>106.00</td>
</tr>
<tr>
<td>Bond</td>
<td>87.54</td>
</tr>
<tr>
<td>CoCo</td>
<td>6.42</td>
</tr>
<tr>
<td>Stock</td>
<td>12.04</td>
</tr>
</tbody>
</table>

Asset = 100*(1±6%)

Bond = expected value
CoCo = expected value
Stock = (Firm-CoCo-Stock)/1

<table>
<thead>
<tr>
<th>Asset</th>
<th>110.30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm</td>
<td>110.30</td>
</tr>
</tbody>
</table>

= (106 - 2%*85 - 4%*6)*(1+6%)

<table>
<thead>
<tr>
<th>Asset</th>
<th>97.82</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm</td>
<td>97.82</td>
</tr>
<tr>
<td>Bond</td>
<td>86.70</td>
</tr>
<tr>
<td>CoCo</td>
<td>6.24</td>
</tr>
<tr>
<td>Stock</td>
<td>17.36</td>
</tr>
</tbody>
</table>

= 85*(1+2%)
= 6*(1+4%)
= (110.3-86.7-6.24)/1

<table>
<thead>
<tr>
<th>Asset</th>
<th>97.58</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm</td>
<td>97.58</td>
</tr>
<tr>
<td>Bond</td>
<td>86.70</td>
</tr>
<tr>
<td>CoCo</td>
<td>6.24</td>
</tr>
<tr>
<td>Stock</td>
<td>4.64</td>
</tr>
</tbody>
</table>

= (94 - 2%*85 - 4%*6)*(1-6%)
= (1-10%)*86.54

<table>
<thead>
<tr>
<th>Asset</th>
<th>86.54</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm</td>
<td>77.88</td>
</tr>
<tr>
<td>Bond</td>
<td>77.88</td>
</tr>
<tr>
<td>CoCo</td>
<td>0.00</td>
</tr>
<tr>
<td>Stock</td>
<td>0.00</td>
</tr>
</tbody>
</table>

= default
= no value left to CoCo
= no value left to equity
Early Conversion Is Another Equilibrium

Asset = 100*(1±6%)

<table>
<thead>
<tr>
<th>Asset</th>
<th>106.00</th>
<th>94.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm</td>
<td>106.00</td>
<td>94.00</td>
</tr>
</tbody>
</table>

Bond = expected value
CoCo = 6*Stock
Stock = (Firm-Bond)/(1+6)
Compare the Two Equilibriums

<table>
<thead>
<tr>
<th>Equilibrium</th>
<th>Firm</th>
<th>Bond</th>
<th>CoCo</th>
<th>Stock</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earlier</td>
<td>100.00</td>
<td>86.67</td>
<td>5.99</td>
<td>7.33</td>
</tr>
<tr>
<td>Later</td>
<td>98.53</td>
<td>85.17</td>
<td>5.29</td>
<td>8.06</td>
</tr>
<tr>
<td>Difference</td>
<td>1.47</td>
<td>1.50</td>
<td>0.70</td>
<td>-0.73</td>
</tr>
</tbody>
</table>

- The equilibrium with earlier conversion
  - gives higher firm value.
    - This is not true if CoCo is zero-coupon.
  - Regulator should prefer this equilibrium.
    - How to design CoCo 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

The graph illustrates the relationship between Bankruptcy Cost and the Difference in the Two Equilibrium Values for various financial instruments. The graph shows data points for Firm, Bond, CoCo, and Stock, indicating how each category behaves as the Bankruptcy Cost increases. The trend lines for each category demonstrate a positive correlation between Bankruptcy Cost and the difference in equilibrium values.
Conclusion

Without financial distress costs,

• CoCo in general leads to multiple/no equilibrium prices of CoCo and stock.

With financial distress costs,

• CoCo can also lead to multiple equilibrium values of firm and senior bond.
• Firm, bond and CoCo 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 CoCo introduce instability into the market system?
• Should we introduce a requirement that puts powerful market players in advantage?