Contingent Convertible Bonds and Capital Structure Decisions

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Paper Overview

- This paper develops a formal finance model of contingent convertible bonds (CCBs) as a possible addition to the capital structure of banks and firms.
- CCBs have the unique potential to avoid bank bailouts of the form that arose during the recent banking and financial market crisis.
- While qualitative discussions of CCBs are available in the literature, this paper develops analytic propositions for structuring CCBs to maximize their benefits for prudential bank regulation.

Key Model Assumptions

- Leland-style capital structure model
  - Asset value follows GBM:
    $$dA_t = \mu A_t dt + \sigma A_t dB_t$$
  - Agents are risk-neutral and risk-free rate is r
  - Straight debt pays coupon c_b continually in time
  - Friction 1 : c_b is tax-deductible, tax rate θ
  - Friction 2: α portion of assets is lost at default
- Value-maximization problem of equity holders
  - Endogenous default timing: bankruptcy boundary A_B

Key Contingent Bond Assumptions

- CCB is characterized by three parameters: c_c, A_C, λ
- CCB pays coupon c_c until conversion
  - Tax deductible
- The exogenous CCB conversion trigger is an asset level A_C, or a corresponding equity market value W_C
- At conversion, CCB holders receive a market value of equity $\lambda \frac{c_c}{r}$.
  - $\frac{c_c}{r}$ is the face value of CCB.
  - CCB holders receive a fixed number of shares $\lambda \frac{c_c}{rW_C}$

No Default before CCB Conversion

- We assume Condition 1 always holds: The straight debt and CCB contract terms are such that the firm does not default before or at CCB conversion.
  - Conversion trigger A_C, W_C is sufficiently high.
- Default timing is determined by the straight debt:
  - Optimal default boundary: $A_B = \beta(1-\theta)c_b$.
- We allow only a single class of outstanding CCB, all of which convert when A_C is reached. A sequence of CCB conversions might be preferred.

Q1. Will a firm include CCBs in its capital structure if there are no regulatory conditions?

- A firm will always wish to add at least some CCB to its capital structure, to obtain the tax shield.
- CCB are first added as a CCB for equity swap.
  - Assets A are unaffected by capital changes;
  - Optimal straight debt is unaffected by CCB (as long as Condition 1 holds).
- This is a losing proposition for bank regulation:
  - The default boundary A_B is unchanged.
  - Fiscal deficit is expanded by new CCB tax shield.
  - This may also magnify asset substitution incentive.

Q2. Will firm add CCBs to a *de novo* capital structure, given a CCB for debt constraint?

- Here we impose a regulatory constraint that CCB can be added only as a swap for straight debt.
- A firm will always include at least some CCB as part of a de novo capital structure:
  - The tax shield benefit is reduced (because the CCB convert before the straight debt default);
  - But the reduction in bankruptcy costs dominates.
- This is perfect for prudential banking regulation:
  - Lower tax shield costs, lower bankruptcy costs.
  - There is also generally less risk shifting incentive.

Q3. Will firm add CCBs to an existing capital structure, given a CCB for debt constraint?

- The existing equity holders will not voluntary enter into swap of CCB for existing straight debt (given straight debt ≥ optimal amount).
- While the swap will increase the firm's value (as in Q2), the gain now accrues only to the existing straight debt holders.
  - This is a debt-overhang problem.
  - The problem would be reduced, even eliminated, if short-term debt could be swapped as it matured.

Q4. Can CCBs provide a useful regulatory instrument for banks too big to fail (TBTF)?

- Yes, a CCB for straight debt swap reduces the government subsidy by reducing the expected cost of bondholder bailouts.
  - While the bank's straight debt is risk-free, the amount it can issue is limited.
  - The key is to reduce the amount of straight debt.
  - Taxpayers benefit from such a swap, but bank equity holders would not voluntarily participate.
  - The conclusion requires Condition 1 as before.
  - A mandatory swap might dominate a bank tax (by directly eliminating the bailout costs).

Q5. May CCBs create an incentive for market manipulation?

- CCB may potentially create an incentive for either the CCB holders or bank equity holders to manipulate the bank's stock price to a lower value to force a CCB for equity conversion.
  - CCB holders have incentive to manipulate the equity price only if the ratio of equity conversion value to CCB face value (λ) is sufficiently high to make the conversion profitable for themselves.
  - Bank equity holders have incentive to manipulate the equity price only if λ is sufficiently low to make the forced conversion profitable for themselves.

Q6. May contract restrictions maximize the regulatory benefits of CCB?

- Yes, the CCB regulatory benefits generally depend on the contract and issuance terms.
- Perhaps most importantly, the regulatory benefits vanish if banks simply substitute CCBs for equity.
  - It is thus essential to require CCB issuance to substitute for straight debt (and not for equity).
- Also, the higher the threshold for the conversion trigger, the greater the regulatory benefits.
- The conversion ratio may also determine the incentives for stock price manipulation.

Table 1: Effects of CCB issuance on the capital structure of the firm

Firm	Constraint	Firm Value	Equity Holders' Value	Default Risk	Asset Substitution	Tax Savings	Other Effects	Firm Decision
Unleveraged	Sufficiently small amount of CCB	↑	↑	↔	↑	↑	n/c	Issue CCB on top of optimal amount of SD
Leveraged with SD	Sufficiently small amount of CCB	↑	↑	↔	↑	↑	n/c	Issue CCB on top of existing amount of SD
Unleveraged	Total amount of debt is fixed	↑	↑	↓	↓	∼	n/c	Replace some SD with CCB
Leveraged	Total amount of debt is fixed	↑	↓	↓	↓	∼	Debt overhang	Do not issue CCB
TBTF (Leveraged/ Unleveraged)	Total amount of debt is fixed	↓	↓	↓	n/c	∼	Reduced government subsidy	Do not issue CCB

*SD: straight debt; TBTB: Too-big-to-fail; n/c: not considered; ↑: increase; ↓: decrease; ↔: no change; ∼: no effect or insignificant increase/decrease

Table 2: Incentives of CCB holders and equity holders to manipulate the stock price

Conversion Ratio	Action	Intuition
$0 < \lambda^* < \lambda$	CCB holders want to drive the stock price down to trigger conversion	If λ is high CCB holders receive a large amount of undervalued equity at conversion
$\lambda \leq \lambda^*$	CCB holders do not want to trigger conversion	If λ is low CCB holders are poorly compensated at conversion
$\lambda < 1 - \theta$	Equity holders want to drive the stock price down to trigger conversion	If λ is low equity holders can cheaply get rid of the obligation to pay c_c
$1 - \theta \leq \lambda$	Equity holders do not want to trigger conversion	If λ is high conversion is costly to equity holders

Conclusions and Further Research

- While CCB are highly valuable for prudential bank regulation, efficient implementation will require more detailed modeling:
  - Model should allow CCB to convert in a sequence of triggers and/or the banks to commit to issue new CCBs as existing bonds convert.
  - Finite maturity bonds would reduce the debt overhang costs of CCB for straight debt swaps.
  - Including asset price jumps would likely improve the model's pricing accuracy.
  - Finally, a full capital budgeting solution would allow the bank to buy or sell assets directly.