'Contingent Convertibles'  

The World of CoCos  

Jan De Spiegeleer & Wim Schoutens  

February 2014
Outline

**Introduction** (Wim)
- Contingent Capital
- The life of a CoCo
- Pro's and con's
- Issuers and investors

**Regulatory Aspects** (Jan)
- Basel III and CRD4
- Bail in vs CoCos

**Quantitative Side of CoCos** (Wim)
- Anatomy of CoCos
- Modelling CoCos

**Risk Management of CoCos** (Jan)
- New instruments, new risks.
- The Death-Spiral effect
- Extension Risk
A **Contingent Convertible (CoCo)** bond is a debt instrument that converts into equity or writes down as soon as the banks gets into a life threatening situation.

Conversion/write down happens via a predefined trigger mechanism: e.g. Common Equity Tier-1 (CET1) falling below 7% and is often accompanied with a regulatory trigger.

For CoCos with a conversion feature, this creates dilution for existing shareholders, but protects potentially taxpayers.
What is a CoCo?

In the aftermath of the financial crisis Contingent Capital solutions were proposed to strengthen bank’s Additional Tier 1 (AT1) and Tier 2 (T2) capital levels.

CoCos are such AT1 or T2 instruments and are situated in the hybrids area of the balance sheet in between equity and traditional debt.

Under the new EU Capital Requirements Directive (CRD4), all new AT1 capital needs to have CoCo features.
What is a CoCo?

- CoCos are issued as bonds, but the more the bank is in trouble, the more CoCos start behaving as equity.
- How to model it: as fixed income or as equity?
- How to threat it: as a child or and adult?
What is a CoCo?

- CoCos are issued as bonds, but the more the bank is in trouble, the more CoCos start behaving as equity.
- How to model it: as fixed income or as equity?
- How to threat it: as a child or an adult?

“Like teenagers, they spend many hours in their bedrooms, suspiciously quiet, you never knowing what they are up to, and then suddenly there’s an outburst of sound and fury, the cause of which you never understand.

Hybrid instruments and teenagers are both to be treated with love and understanding.”

Paul Wilmott
The Life of a CoCo

ISSUE

DISTRESS

Regulatory Trigger

Core Tier 1 Trigger

NEW ISSUE

Bondholder becomes Shareholder or Bond is (partially) written down

REDEMPTION

Coupon Payments

Core Tier 1 Trigger
CoCos Payoff Profile

Payoff Profile – small probability of an extreme high loss
Introduction: CoCos Nature

Difference with convertible bonds

- High coupons
- Unlimited Downside (No Bond Floor)
- Limited Upside (Bond Ceiling)
- Negative convexity
## Major Outstanding European CoCos (Feb/2014)

<table>
<thead>
<tr>
<th>Issue</th>
<th>Date</th>
<th>Issuer</th>
<th>Coupon</th>
<th>Maturity</th>
<th>Ranking</th>
<th>CCY</th>
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<td>6.875%</td>
<td>19/03/2020</td>
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<td>-</td>
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<td>CS</td>
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<td>7.00%</td>
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<td>T1</td>
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<td>10/04/2023</td>
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<td>1500</td>
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</table>
CoCo Yield Breakdown

• **Interest component:** in the present low interest rate environment rather small.

• **Liquidity component:** CoCos are new asset class with only relative liquidity and a still a lot of regulatory uncertainty and model uncertainty.

• **Extension risk component:** Most CocCs are callable bonds. However most of the time no step-up is present/allowed.

• **Coupon cancellation risk:** For some CoCos (T1) coupons are cancellable at the discretion of the issuer/regulator. They are typically non cumulative.

• **Conversion component:** compensates for the event that the CoCo bond is converted into equities or reduced in value.

• **Optional Conversion component:** reduces because of the right of the investor to participate in the positive performance of the underlying shares (CoCoCo only).
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On average, CoCos offer a 4 times spread pickup over senior, or over 400 basis points in absolute terms.
Who buys CoCos?

- **Asset Managers:**
  Have the expertise and have previously been exposed to hybrid instruments (pre-2008). Have large existing holdings in T1-T2 products. There have been some recent launches of CoCo funds.

- **Hedge Funds**
  Have more risk-appetite and have the experience to hedge to some extend the unwanted risks away.

- **Insurance Industry**
  Solvency II favors short dated, high rated debt. This is opposite to what CoCos stand for. However the extra yield is often attractive.

- **Employees**
  Some investment banks (Barcap, CS) pay CoCo bonuses to their top-management.
CoCo Issuance

European Contingent Convertible Issuance

- CoCo Bonds
- CoCo Bonds (Write Down)
- CoCo Bonds (Equity Conversion)

USD (bn)

Dec–09 Dec–10 Jan–12 Jan–13 Feb–14
CoCo Issuance: Lloyds (December 2009)

European Contingent Convertible Issuance

- CoCo Bonds
- CoCo Bonds (Write Down)
- CoCo Bonds (Equity Conversion)

"...its worth a try..."

Mervin King
Governor Bank of England
CoCo Issuance: “Swiss Finish”

“A finishing school (or charm school) is a private school for girls that emphasizes training in cultural and social activities. The name reflects that it follows on from ordinary school and is intended to complete the educational experience, with and emphasis on etiquette….”

CoCos are the finishing touch in the strengthening of the capital of the Swiss banks.
CoCo Issuance: Lloyds (December 2009)

European Contingent Convertible Issuance

- CoCo Bonds
- CoCo Bonds (Write Down)
- CoCo Bonds (Equity Conversion)

Write Down CoCo bonds outnumber Equity Conversion CoCos
CoCos Pros and Cons

Can they save the banking system?

- extra buffer
- clear upfront conditions
- no taxpayer money at stake
- coco-bonus
- ...

Caveats:
- if held by financial institutions, no reduction of systemic risk
- death spiral
- can work too slow
- ...

Reacfin — Know How to Risk
Regulatory Aspects
Avoiding the use of tax payers’ money

- Make bank failure less disruptive
  - Resolution Authority
  - Living Wills
- Make bank failure less likely
  - Make banks less volatile
  - Contingent Capital
  - Bail-In Capital
- Make bank debt loss absorbing
  - Dodd Frank
  - Ring Fencing
  - Central Clearing
 Basel III world: CoCo Friendly

- Regulatory Capital needs to be loss absorbing
- CoCo Bonds are allowed in the capital structure
  - 2% Tier 2
  - 1.5% Additional Tier 1
    - 5.125% Trigger
    - Discretionary Coupons
    - Perpetual with no incentive to redeem early
    - Callable after 5 year
    - Subordinated
    - Regulatory trigger (Point-of non-viability)

- Leverage Ratio Calculations
- ECB’s comprehensive assessment (2014)
CoCos and the ECB’s comprehensive assessment (2014)

Risk Assessment
- Liquidity
- Funding
- Leverage

Asset Quality Review

Stress test
- Baseline Scenario
- Adverse Scenario
CoCos can be used to offset the capital shortfall. The caveat is here the fact that the AT1 CoCo bonds have their trigger set at 5.125%. They therefore cannot be put at work in the stress tests.
The main focus of the European banks since Q3-2013 was on the issuance of AT1-CoCo Bonds.
Basel III world : CoCo Un-Friendly

- CoCo Bonds are **not-allowed** to deal with the extra capital imposed on globally systematic important institutions (G-Sibs)

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**Coco Bond Market Dealt Blow By Regulators**

*First Published Monday, 27 June 2011 12:55 pm - © 2011 Dow Jones*

LONDON -(Dow Jones)- An innovative type of bond that may shift the bank funding market in Europe has been dealt a severe blow, as the debt may no longer receive a crucial go-ahead from international
Will CoCo’s Trigger?

- Counter Cyclical Buffer
- Capital Conservation Buffer
- Core Equity
Will CoCo’s Trigger?

7% CoCo Trigger will recapitalize the bank automatically.

Bank is insolvent in Basel III (CET1<4.5%)
Will CoCo’s Trigger?

7% CoCo Trigger will recapitalize the bank automatically.

As soon as the bank “eats” into its buffers, it will no longer have the initiative: coupon payments, bonus payments are under regulatory scrutiny.

Banks could strengthen their capital base before a trigger occurs!
Quantitative Aspects of CoCos
CoCos Anatomy

All CoCos are different

• Maturity (> 5y)
• Coupon (7-10 % ?)
• Trigger Event
  ▪ Accounting: e.g. CET1 <7%
  ▪ Regulatory Trigger
  ▪ Market Trigger (not implemented)

• Loss Absorbing Mechanism
  ▪ Conversion
    • Conversion Price = Issue Price (Lloyds)
      CP = S_0
    • Conversion Price = fraction of Issue Price (BarCap)
      CP = \alpha S_0
    • Conversion Price = Trigger Price
      CP = S^*
    • Floored Conversion Price (CS, BBVA, …)
      CP = \max (Floor, S^*)
  ▪ Write-Down
    • Partially (Rabo (75%))
    • Full (Barclays, KBC, CS,… )
    • Staggered (ZKB,…)

Conversion/Write-Down Mechanism determines the Recovery Rate of the CoCo
CoCo Pricing

CoCos Pricing Methodologies

- Credit Model (Rule of Thumb)
- Equity Derivatives Model (Barrier Option Pricing)
- Others (academic/hard to calibrate):
  - firm value valuation
  - jump models
  - stochastic vol models
  - …

- EXPECTED YIELD CALCULATION (8-10% Coupons)
- (PROXY) HEDGING and RISK MANAGEMENT (death spiral effect)
- ISSUE SIZE DETERMINATION (free-float vs short sales)
- RELATIVE PRICING (investment strategies) …
CoCo Pricing

Rule of Thumb Pricing for a CDS:
Credit Spread = Expected Loss x Default Intensity
\[ \text{cs} = (1 - R_{\text{CDS}}) \times \lambda_{\text{default}} \]

**Example 1:** The Rabobank cds spread (senior) is 65bp. For an expected recovery rate of 40%, this corresponds to an estimate of \( \lambda_{\text{default}} = 0.65/(1-0.4) = 1.09\% \).

**Example:** When will the Rabobank CoCo trigger: \( \lambda_{\text{trigger}} = ? \)
On the trigger event, there is a haircut of 75%. The recovery is hence 25% \( (R_{\text{CoCo}} = 25\%) \).
Suppose, the CoCo spread of the Rabobank CoCo is 304 bp.\[ \lambda_{\text{trigger}} = 3.04\% / (1-0.25) = 4.05\% \]
Note that conversion happens before default: \( \lambda_{\text{trigger}} > \lambda_{\text{default}} \).
CoCo Pricing: Equity Derivatives Approach

Barclays CoCo Bond – US06740L8C27

- Non-Callable CoCo [S1]
- Callable 10Yr NC5 (priced till call date)
Risk Management of CoCos
Past Performance doesn’t tell us anything…
Past Performance doesn’t tell us anything…

![Graph showing realized volatility and annualized return](image)


- CoCo (Total Return)
- MSCI
- JPM Gvt Bond Index
- JP Morgan High Yield Index

**Volatility**

**Tail Risk**
The existence of the death-spiral puts a cap on the maximum amount of CoCos a bank can issue.
Death Spiral Risk

Death Spiral Risk increases over time
Combing with convertible bonds? No!

- Convertible bonds have a positive convexity in normal market circumstances
  \[
  \frac{\partial^2 P}{\partial S^2} > 0
  \]
- In distressed market circumstances, the opposite is true
The increased issuance of AT1 CoCo bonds emphasizes the extension risk.
Extension Risk

- The increased issuance of AT1 CoCo bonds emphasizes the extension risk
- Companies do not necessarily call back their bonds on the first call date
- Example: Deutsche Bank did not call back a bond in Dec 2008. The market price of the bond dropped 10%
Extension Risk

Extending a bond creates no longer a reputational issue

Source: Barclays Capital
CoCo bonds cannot be considered to expire on the first call date

The extension risk has been embedded into our two approaches:
  – Credit Derivatives Method
  – Equity Derivatives Method

New Concepts
  – Expected Maturity Date
  – Expected Extension Period
  – Call Probability
  – …

Explanation is available for downloading:
**Extension Risk: Example**

**Implied Trigger level for Barclays**

*Implied Trigger Levels should not be different?*

\[ S^*_{\text{Callable}} > S^*_{\text{Non-Callable}} \]

*The higher trigger level materializes the extension risk. The bond does not expire on the first call date*
Extension Risk: Example

Implied Trigger level for Barclays

Adjusting the model for a possible Extension risk creates a better fit between $S^*_{\text{Callable}}$ and $S^*_{\text{Non-Callable}}$ for the CoCo Bond.
Questions?

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References


CoCos Anatomy (APPENDIX)

Inconsistency in how the conversion to equity takes place

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<th>Security</th>
<th>Trigger</th>
<th>Conversion Terms</th>
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<td>8.25%</td>
<td>To ordinary shares at price of 30 day VWAP, floored at EUR 0.05</td>
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<td>XS0810846817</td>
<td>CS 9 1/2 07/29/49</td>
<td>7.00%</td>
<td>To ordinary shares at price of 30 day VWAP, floored at USD 20.00.</td>
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<tr>
<td>Multiple</td>
<td>LLOYDS ECNs</td>
<td>5.00%</td>
<td>To ordinary shares at price of GBP 59.20</td>
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<tr>
<td>XS0979444402</td>
<td>POPSM 11 1/2 10/29/49</td>
<td>5.00%</td>
<td>Higher of current market price, an adjustable floor price or EUR 0.50</td>
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CoCo Pricing (APPENDIX)

- For Equity Conversion CoCos, the expected loss is determined by the value of the shares (S*) when conversion takes place: The CoCo investor pays Cp for each share with value S*: Recovery Rate (%) = R_{CoCo} = S* / Cp

ASSUME: Triggering happens when the stock prices hit a certain barrier. We replace the "CET1 falling below X%" event by "Stocks hits the a low barrier H".

Rule of Thumb Pricing:
CoCo spread = (1 – S* / Cp) x \lambda_{trigger}

Equity Model:
Smile Adjusted Black-Scholes

\[ p^* = N\left( \frac{\log(S^*/S) - \mu T}{\sigma \sqrt{T}} \right) + \left( \frac{S^*}{S} \right)^{\frac{2\mu \sigma^2}{2}} N\left( \frac{\log(S^*/S) + \mu T}{\sigma \sqrt{T}} \right) \]

\[ \lambda_{Trigger} = -\frac{\log(1 - p^*)}{T} \]

\[ \mu = r - q - \frac{\sigma^2}{2} \]

- Continuous dividend yield
- Continuous interest rate
- Volatility
- Maturity of the contingent convertible
- Current share price

\[ q \]

\[ r \]
CoCo Pricing: Equity Derivatives Approach (APPENDIX)

- We break down a CoCo bond into different derivative instruments:

  A. Face Value + Coupons: BOND (long)
  B. Conversion into stock: DOWN-AND-IN-FORWARD (long)
  Write-down: BINARY DOWN-AND-IN-BARRIER (short)
  C. Cancellation of Coupons: BINARY DOWN-AND-IN BARRIERS (short)

\[
\text{CoCo Price} = \text{A (Bond Part)} + \text{B (Loss Absorption)} + \text{C (Coupon Loss)}
\]

\[
\begin{align*}
\text{A} & = N \exp(-rT) + \sum_{i=1}^{k} c_i \exp(-rt_i) \\
\text{B} & = C_r \times \left[ S \exp(-qT)(S^*/S)^{2\lambda}N(y_1) \\
& \quad - K \exp(-rT)(S^*/S)^{2\lambda-2}N(y_1 - \sigma\sqrt{T}) \\
& \quad - K \exp(-rT)N(-x_1 + \sigma\sqrt{T}) + S \exp(-qT)N(-x_1) \right] \\
\text{C} & = -\alpha \sum_{i=1}^{k} c_i \exp(-rt_i)[N(-x_{1i} + \sigma\sqrt{t_i}) + (S^*/S)^{2\lambda-2}N(y_{1i} - \sigma\sqrt{t_i})]
\end{align*}
\]

Pricing formula needs essentially two inputs: Volatility $\sigma$ and implied trigger level $S^*$