CoCos
The New Kid around the Block

Wim Schoutens
(joint work with Jan De Spiegeleer)

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Contingent Capital and Contingent Convertibles

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CoCos

Who is this new kid around the block?

A Contingent Convertible (CoCo) is a bond that will convert into equity as soon as the banks get into a life threatening situation.

This creates dilution for existing shareholders, but protects potentially taxpayers.

The structure and pricing of a CoCo is still a topic of a lively debate between regulators, issuers, rating agencies and investors.
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Who is this new kid around the block?

Possible Triggers:

• Accounting triggers: Core Tier 1 – ratio
• Market-Based triggers: barrier on stock price
• Discretionary trigger: regulator decides
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Is it a good boy or a bad boy?

Payoff Profile – small probability of extreme high loss

Risk profile of a Coco: High negative impact can occur with a low probability versus a small gain with a high probability.
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Is it a good boy or a bad boy?
Can they save the banking system?

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

- if held by financial institutions,
  no reduction of systemic risk
- death spiral – hedge effects
- contagion and domino effects
- management’s game theory
- can work too slow
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What is this boy dealing? – CoCos in the market

<table>
<thead>
<tr>
<th></th>
<th>Lloyds</th>
<th>Rabobank</th>
<th>Credit Suisse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>GBP 7bn</td>
<td>EUR 2.25bn</td>
<td>CHF 12bn</td>
</tr>
<tr>
<td>Trigger</td>
<td>CT1</td>
<td>Equity Capital Ratio</td>
<td>CT1 &amp; Regulatory</td>
</tr>
<tr>
<td>Trigger Level</td>
<td>5%</td>
<td>7%</td>
<td>7%</td>
</tr>
<tr>
<td>Nbr Issues</td>
<td>32</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Date</td>
<td>2009</td>
<td>2010</td>
<td>2011</td>
</tr>
<tr>
<td>Event</td>
<td>Conversion</td>
<td>Write Down</td>
<td>Conversion</td>
</tr>
</tbody>
</table>
## CoCos

### What is this boy dealing? – CoCos in the market

<table>
<thead>
<tr>
<th></th>
<th>LBG ECNs</th>
<th>Rabobank SCNs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Issuer</strong></td>
<td>Lloyds Banking Group</td>
<td>Rabobank</td>
</tr>
<tr>
<td><strong>Full name</strong></td>
<td>Enhanced capital notes</td>
<td>Senior contingent notes</td>
</tr>
<tr>
<td><strong>Issue size</strong></td>
<td>£7bn (32 Series)</td>
<td>€1.25bn</td>
</tr>
<tr>
<td><strong>Issue type</strong></td>
<td>Exchange</td>
<td>New issue</td>
</tr>
<tr>
<td><strong>Issue rating</strong></td>
<td>BB</td>
<td>–</td>
</tr>
<tr>
<td><strong>Issue date</strong></td>
<td>December 1 2009</td>
<td>March 12 2010</td>
</tr>
<tr>
<td><strong>Subordination</strong></td>
<td>Lower Tier 2</td>
<td>Senior</td>
</tr>
<tr>
<td><strong>Maturity</strong></td>
<td>10 – 20 year</td>
<td>10 year</td>
</tr>
<tr>
<td><strong>Yield at Issue</strong></td>
<td>Libor + 7–8%</td>
<td>Libor + 3.5%</td>
</tr>
<tr>
<td><strong>Coupon</strong></td>
<td>1.5–2.5% increase of the coupon of the hybrid capital, the bond was exchanged for.</td>
<td>6.875%</td>
</tr>
<tr>
<td><strong>Coupon deferral</strong></td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td><strong>Trigger contingency</strong></td>
<td>Conversion into a fixed number of ordinary shares</td>
<td>Write-down where the issuer will automatically redeem at 25% of par</td>
</tr>
<tr>
<td><strong>Conversion price</strong></td>
<td>59 pence (= Share price at issue of the ECN)</td>
<td>–</td>
</tr>
<tr>
<td><strong>Trigger type</strong></td>
<td>Accounting trigger</td>
<td>Accounting trigger</td>
</tr>
<tr>
<td><strong>Trigger</strong></td>
<td>Core Tier 1 ratio</td>
<td>Equity capital/RWA</td>
</tr>
<tr>
<td><strong>Trigger level</strong></td>
<td>5%</td>
<td>7%</td>
</tr>
<tr>
<td><strong>Trigger source</strong></td>
<td>Semi-annual accounts or an ad hoc disclosure</td>
<td>Certified by two executive board members</td>
</tr>
<tr>
<td><strong>Early redemption options</strong></td>
<td>Tax and capital disqualification calls</td>
<td>Tax call</td>
</tr>
</tbody>
</table>
What is this boy dealing? – CoCos in the market

Summarised description of the Credit Suisse contingent convertibles issued in February 2011[1]

<table>
<thead>
<tr>
<th>Issuer</th>
<th>Credit Suisse</th>
<th>Credit Suisse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full name</td>
<td>Buffer capital notes</td>
<td>Buffer capital notes</td>
</tr>
<tr>
<td>Issue size</td>
<td>$3.5bn and CHF2.5bn</td>
<td>$2bn</td>
</tr>
<tr>
<td>Issue type</td>
<td>Exchange</td>
<td>New issue</td>
</tr>
<tr>
<td>Issue date</td>
<td>February 14 2011</td>
<td>February 17 2011</td>
</tr>
<tr>
<td>Subordination</td>
<td>Tier 1</td>
<td>Tier 2</td>
</tr>
<tr>
<td>Maturity</td>
<td>Tier 1</td>
<td>30 year – callable after 5 years</td>
</tr>
<tr>
<td>Coupon</td>
<td>9.5% for $ tranche and 9% for CHF tranche</td>
<td>7.875%</td>
</tr>
<tr>
<td>Coupon deferral</td>
<td>Cancellable</td>
<td>No</td>
</tr>
<tr>
<td>Trigger contingency</td>
<td>Conversion into a fixed number of ordinary shares</td>
<td>Conversion into a fixed number of ordinary shares</td>
</tr>
<tr>
<td>Conversion price</td>
<td>max($20,CHF20,S)</td>
<td>max($20,CHF20,S)</td>
</tr>
<tr>
<td>Trigger type</td>
<td>Accounting and regulatory</td>
<td>Accounting and regulatory</td>
</tr>
<tr>
<td>Accounting trigger</td>
<td>Core Tier 1 ratio</td>
<td>Core Tier 1 ratio</td>
</tr>
<tr>
<td>Accounting trigger level</td>
<td>7%</td>
<td>7%</td>
</tr>
<tr>
<td>Regulatory trigger</td>
<td>The Swiss regulator determines that the Credit Suisse Group requires public sector support to prevent it from becoming insolvent</td>
<td></td>
</tr>
</tbody>
</table>

S is the weighted average price of the Credit Suisse shares in a 30 day period prior to conversion.
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What does the stuff costs?

STRUCTURAL/BALANCE SHEET APPROACH

firm value valuation

CREDIT APPROACH

intensity based modelling

EQUITY APPROACH

barrier option pricing theory
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What does the stuff costs? - BALANCE SHEET APPROACH

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What does the stuff costs? – CREDIT APPROACH

Credit Triangle:

\[
\frac{CS}{1-R} = \lambda.
\]

CoCo Spread:

\[
CS_{Coco} = (1 - R_{Coco}) \times \lambda_{\text{Trigger}}
\]

\[
\lambda_{\text{Trigger}} > \lambda
\]
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What does the stuff costs? – CREDIT APPROACH
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What does the stuff costs? – CREDIT-EQUITY APPROACH

Trigger probability:

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

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

\[
q : \text{Continuous dividend yield}
\]

\[
r : \text{Continuous interest rate}
\]

\[
\sigma : \text{Volatility}
\]

\[
T : \text{Maturity of the contingent convertible}
\]

\[
S : \text{Current share price}
\]
## CoCos

What does the stuff costs? – CREDIT-EQUITY APPROACH

### Implied Trigger Level:

<table>
<thead>
<tr>
<th>ISIN</th>
<th>Coupon</th>
<th>Frequency</th>
<th>Maturity</th>
<th>$CS_{CoCo}$</th>
<th>$\overline{S}_T^*$</th>
</tr>
</thead>
<tbody>
<tr>
<td>XS0459089255</td>
<td>15.00</td>
<td>SA</td>
<td>12/21/2019</td>
<td>563.98</td>
<td>40.14%</td>
</tr>
<tr>
<td>XS0459088877</td>
<td>11.04</td>
<td>SA</td>
<td>3/19/2020</td>
<td>582.29</td>
<td>40.53%</td>
</tr>
<tr>
<td>XS0459086582</td>
<td>7.59</td>
<td>SA</td>
<td>5/12/2020</td>
<td>510.25</td>
<td>40.05%</td>
</tr>
<tr>
<td>XS0459093364</td>
<td>7.87</td>
<td>SA</td>
<td>8/25/2020</td>
<td>527.00</td>
<td>40.50%</td>
</tr>
<tr>
<td>XS0459086749</td>
<td>7.87</td>
<td>A</td>
<td>12/17/2019</td>
<td>523.43</td>
<td>39.74%</td>
</tr>
<tr>
<td>XS0459088109</td>
<td>9.33</td>
<td>A</td>
<td>2/7/2020</td>
<td>575.11</td>
<td>40.37%</td>
</tr>
<tr>
<td>XS0459091582</td>
<td>7.63</td>
<td>A</td>
<td>12/9/2019</td>
<td>559.86</td>
<td>40.07%</td>
</tr>
<tr>
<td>XS0459090188</td>
<td>9.13</td>
<td>A</td>
<td>7/15/2020</td>
<td>569.02</td>
<td>40.72%</td>
</tr>
<tr>
<td>XS0459092804</td>
<td>9.00</td>
<td>A</td>
<td>7/15/2029</td>
<td>575.89</td>
<td>43.86%</td>
</tr>
<tr>
<td>XS0459092986</td>
<td>8.50</td>
<td>A</td>
<td>6/7/2032</td>
<td>569.38</td>
<td>44.08%</td>
</tr>
</tbody>
</table>

Implied trigger level $\overline{S}_T^*$ calculated on February 17 2011 for a set of different CoCos issued by Lloyds. The price is expressed as a percentage of the current share price.
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What does the stuff costs? – EQUITY APPROACH

ZC Coco = ZCB + Knock-In-Forward

\[
\left\{ \begin{array}{ll}
P = (1 - \alpha)N + C_p S_T & \text{if triggered} \\
P = N & \text{if not triggered} 
\end{array} \right.
\]

Zero Coupon Coco = \[N \exp(-rT) + C_p \times [S \exp(-qT)(S^* / S)^{2\lambda} N(y1) - K \exp(-rT)(S^* / S)^{2\lambda-2} N(y1 - \sigma \sqrt{T}) - K \exp(-rT)N(-x1 + \sigma \sqrt{T}) + S \exp(-qT)N(-x1)]\]

with

\[K = C_p\]
\[C_r = \frac{\alpha N}{C_p}\]
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What does the stuff costs? – EQUITY APPROACH

Coupon CoCo = Corporate Bond (with coupons)
+ Knock-in-Forward (= DIC - DIP)
- series of Binary Down-and-In Barrier Options

\[
P = A + B + C
\]

\[
A = N \exp(-rT) + \sum_{i=1}^{k} c_i \exp(-rt_i)
\]

\[
B = C_r \times \left[ S \exp(-qT) \left( \frac{S^*}{S} \right)^{2\lambda} N(y_1) - K \exp(-rT) \left( \frac{S^*}{S} \right)^{2\lambda-2} N(y_1 - \sigma\sqrt{T}) - K \exp(-rT) N(-x_1 + \sigma\sqrt{T}) + S \exp(-qT) N(-x_1) \right]
\]

\[
C = -\alpha \sum_{i=1}^{k} c_i \exp(-rt_i) \left[ N(-x_{1i} + \sigma\sqrt{t_i}) + \left( \frac{S^*}{S} \right)^{2\lambda-2} N(y_{1i} - \sigma\sqrt{t_i}) \right]
\]
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Ready for a heavy ride?
Delta increases closer to trigger and T

Price profile $P(S, T)$ for a Coco with a trigger on the share price $S=35$.
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Ready for a heavy ride?
Negative Convexity

![Graph showing CoCos behavior over time with two curves for different time periods (T=1 and T=4).]
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Ready for a heavy ride?
- Hedging under negative convexity
- The more investors hedge the more stock will drop
- Triggering becomes a self-fulfilling prophecy
- Most likely, vol will increase near trigger, which makes things even worse.

* POTENTIAL DEATH SPIRAL
* FREE FLOAT MUST BE ABLE OF ABSORBING THE COCO DELTA HEDGE
CONCLUSION

“‘Be careful!’ All you can tell me is ‘be careful’?”

CONTACT:  Wim Schoutens
Email:  wim@schoutens.be
More info on:  www.contingentcapital.eu and on  www.schoutens.be
ONE DAY COURSE

CONTINGENT CAPITAL EXPLAINED

Concepts - Structuring - Pro & Cons - Regulation - Pricing - Dynamics

Brussels, 1st of June 2011 - Brussels Marriott Hotel
Course Leaders : Jan De Spiegeleer and Wim Schoutens
MORE INFO ON : www.contingentcapital.eu

BOOK

Contingent Convertible CoCo-Notes: Structuring & Pricing

Jan De Spiegeleer & Wim Schoutens