contingent convertible bonds

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introduction

Contingent convertible bonds, known as "*CoCos*" or "*CoCo bonds*", are bonds issued by a bank or an insurance company that convert into common equity, or are subject to a write-down, at pre-specified trigger levels as soon as the bank enters a life-threatening situation. Conversion, or the write-down, happens via a predefined trigger mechanism, e.g., when core Tier-1 capital (CT1) falls below five percent.

Contingent capital can be viewed as a form of catastrophe insurance. When the bank is in a stressed situation, with a high risk of default, investors provide automatic loss-absorbing capital with the debt being partially cancelled or converted into common equity.

Conversion into common equity creates dilution for existing shareholders, but helps to protect taxpayers from a costly bailout if a conversion event occurs. From a bank perspective, these securities can help fulfill post-crisis capital requirements without diluting common equity holders, as long as conversion does not occur.

CoCos and regulation

The primary function of capital is to absorb losses as they arise and help preserve the bank as a going concern. However, bank hybrid Tier-1 capital, such as trust preferreds, was found to be ineffective in practice during the 2007-2009 financial crisis. Banks continued to pay interest on their hybrid debt to avoid being shut out of the market in the future. Tier 2 capital instruments also failed to perform their loss absorbing function, beyond occasional coupon deferrals and voluntary exchanges, because institutions were often not permitted to fail.

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1 / Material is substantially drawn from M. Crouhy, D. Galai and R. Mark, *The Esssentials of Risk Mangement*, Second Edition, McGraw Hill, 2014.

Basel III specifically mentions the potential role for CoCos in meeting capital requirements[2]. According to Basel III, the new capital requirements are: a minimum CT1 of 4.5% with a minimum tier 1 capital ratio of 6%, and a minimum total capital ratio of 8%. Since September 2010, Basel III requires banks to constitute, in addition to these minima, a capital conservation buffer (CCB) of 2.5% over the period 2016-2019. It follows that banks are permitted under Basel III to hold 1.5% of their risk-weighted assets in non-core tier 1 (6% tier 1 – 4.5% CT1) plus 2% in tier 2 capital. This 3.5% bucket of non-core tier-1 capital could be met by using CoCos.

In addition, banks may use CoCos to meet capital requirements imposed by national regulators that are above the minimum tier 1 set by Basel III. In October 2010, the Swiss government asked Swiss banks to hold 19% of their risk-weighted assets as tier 1 capital, of which 9% could be held in the form of CoCos; of the 9%, 3% must trigger if CT1 falls below 7% and the other 6% must trigger if CT1 falls below 5%. Swedish and Danish regulators have said banks may be able to use CoCos to meet additional capital requirements.[3]

The European Commission's new Basel III directive (CRD 4) explicitly refers to CoCos as a way of meeting additional tier 1 capital, with a trigger event occurring when CT1 falls below 5.125 % (or at a higher level set by the institution).

Tax laws in Europe allow banks to deduct the coupon on CoCos from their taxable income, whether the CoCos are of the convertible or write-down variety. However, the U.S. Internal Revenue Service treats CoCos as equity so issuers' interest payments are not tax deductible – making CoCos much less attractive for U.S. banks.

features of CoCos

There are various kinds of CoCo, differentiated by the timing of the cash infusion (funded versus unfunded), the type of trigger, and the conversion amount.

Funded vs. unfunded CoCos

So far, we've mainly discussed funded CoCos, which allow an institution to raise capital in the good times and, potentially, to meet regulatory capital requirements.

By contrast, unfunded CoCos provide cash only when the conversion is triggered, offering loss-absorbing capital and liquidity during times of crisis. The institution pays a premium for this option: a commitment fee. Typically, the commitment is of finite duration.[4] Unfunded CoCos create counterparty risk because the bank only receives the cash when conversion is triggered, typically at a time of systemic stress that may also affect the counterparty.

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2 / The Basel Committee ruled against the use of CoCos to meet the capital surcharge for SIFIs. Only common equity will be eligible for that purpose.

3 / European Directive CRD, European Commission 2011, p. 74-77. The European Directive CRD 4 translates the Basel III rules into law for European banks.

4 / Unfunded CoCos are somewhat similar to a CDS except that when triggered new equity is exchanged for cash

Trigger events

Trigger events can be either accounting-based, or market-based, although so far only accounting-based triggers have been proposed.

Accounting-based triggers

Accounting triggers are in the form of tier 1 capital or equity capital thresholds, e.g., when tier 1 capital falls below say 5%. One problem here is that tier 1 ratios are not directly observable by market participants. They are reported on a quarterly basis by most banks, or at the discretion of the banks, though regulators and supervisors have access to this information and can require the bank to make it public.

A second problem is that, in the run-up to the 2007-2009 financial crisis, there was little difference between the tier 1 ratios of "crisis banks", i.e., those that eventually failed or were bailed-out by their governments, and banks that survived.[5] On a related note, regulators have become concerned about variations in the risk weights assigned to similar assets by different banks, which may reflect an intention by some banks to underplay risk.[6] This kind of variation means that capital ratios may not be easy to compare.

The worry that capital triggers lack transparency, can be manipulated, and may be triggered far too late, explains why regulators often retain the option to force conversion if they judge that the bank is close to default.

Market-based triggers

Potentially, market-based triggers can be used to circumvent the limitations of accounting-based triggers. They could take various forms, for example:

- Pre-agreed minimum price level for bank shares

- Ratio of market capitalization to book value of assets

- Credit default swap spread on the debt issued by the bank

Market-based triggers are relatively objective and transparent and can be verified in real time by regulators and market participants. They could also help in enhancing supervisory discretion and market discipline.

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5 / Indeed, many banks that failed in 2008 were better capitalized before the crisis than those that did not fail. Five U.S. financial institutions that either failed or were forced into government-assisted mergers in 2008, i.e., Bear Stearns, Washington Mutual, Lehman Brothers, Wachovia and Merrill Lynch, had regulatory capital ratios 50 to 100% above the regulatory minimum of 8%. Citibank had a Tier 1 capital ratio that never fell below 7% during the course of the financial crisis and stood at 11.8% in December 2008 when the bank's stock market capitalisation reached its lowest level. (Kuritzkes, A. and H. Scott, "Markets are the Best Judge of Bank Capital," *Financial Times*, September 23, 2009)

6 / Risk Magazine, 2011, A Weight on Their Minds, July, pp. 36-39

There are some potential issues to overcome. For example, during the "Flash Crash" of May 6, 2010 almost all the stocks traded in the United States suffered a huge downward price correction, only to recover minutes later. A share price trigger might have forced a CoCo conversion for no good reason. However, most of these practical concerns, including manipulation by short sellers, can be overcome quite easily, e.g., by basing the trigger on a rolling average of stock prices over the preceding 20 or 30 days.

Conversion amount

Most CoCo issues are converted into shares of common equity either acccording to a pre-determined number of shares (or equivalently at a pre-determined share price), which affects the extent of the dilution to existing shareholders, or at a share price defined in reference to the share price prevailing when conversion is triggered.

CoCos that have the conversion strike set at the spot level prevailing at issuance imply a significant risk for the CoCo holders, potentially increasing the risk premium to potentially uneconomical levels for the issuer. By contrast, if the new shares are issued at the share price prevailing when conversion is triggered, then there is no dilution and no loss of value for the CoCo holders. It is expected that the regulator will oblige the holders of CoCos to participate in losses, so the trigger will be probably set at around 50 percent of the stock price at issuance.

An alternative to conversion into shares of common equity is a partial, or total, write-down of the nominal of the CoCos. This is more natural than conversion into new shares for a non-public institution.

pros and cons of CoCos

CoCos provide leverage in good times and a buffer to absorb losses and relief from debt servicing obligations in bad times. They can help to reduce the risk to the taxpayer from implicit "too-big-to-fail" government guarantees. Both the funded and unfunded versions incentivise financial institutions to engage in conservative and prudent risk management because the cost of diluting incumbent shareholders and management (through their holding of company shares) is substantial.

However, the triggering of a CoCo might itself trigger a wider stress scenario if it signals to investors that other banks might also be in a stressed situation. There is also the risk of contagion if the bank's CoCos have been mainly invested in by other financial institutions, who are forced to absorb large losses. Also, as the trigger point comes closer, some investors may protect their investment by short selling shares against their long position in the CoCos – potentially setting off a "death spiral" for the bank. Furthermore, as the trigger comes closer, banks might be tempted to take additional excessive risks to force conversion – wiping out their outstanding CoCo debt.

Finally, it is possible that contingent capital will introduce market inefficiencies because conversion will eliminate or postpone a default event, which is often the moment that inefficient businesses are restructured and poor managers replaced.[7]

CoCo issuers

Principal examples

CoCo issuance has got off to a relatively slow start. Five banks were early issuers of CoCos in Europe (Lloyds in December 2009, Rabobank in March 2010, Credit Suisse in February 2011, UBS in Feb 2012 and Bank of Cyprus in Nov 2012). One insurance company (Allianz in July 2011) and one reinsurance company (Swiss Re in March 2013) were also early issuers of CoCos.[8] Banks have stepped up issuance of CoCos in Europe as shown in Figure 1. Observe that $64 billion were issued in in 2014 through mid Sept. At the time of writing, no CoCos has been converted or written down.

Provisionally popular
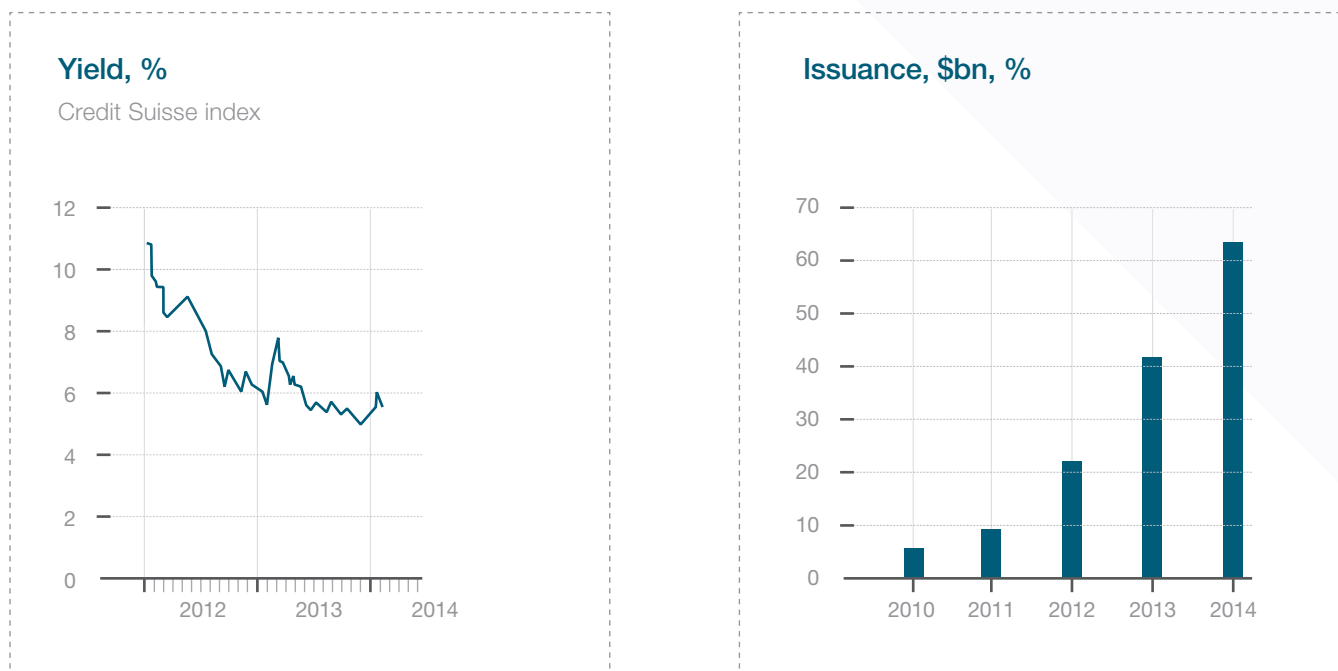Contingent convertible bonds

Yield, %
Credit Suisse index

Issuance, $bn, %

Figure 1 - Yields and Issuance of CoCos

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7 / O. Hart, and L. Zingales, "A New Capital Regulation for Large Financial Institutions", working paper, April 2009

8 / For a detailed analysis of these CoCo bonds consult J. De Spiegeleer and W. Schoutens, Contingent Convertible (CoCo) Notes: Structure and Pricing, Euromoney Books, 2011.

Principal examples

An example of an unfunded CoCo is the contingent capital solution provided in 2009 by the U.K. government to the Royal Bank of Scotland (RBS). The U.K. government is committed to providing RBS with £8 billion of capital if its CT1 falls below 5%.

Another example of an unfunded guarantee akin to a CoCo is the deal brokered by Royal Bank of Canada (RBC) in 2001 with Swiss Re. Swiss Re will inject C$200 million into RBC in exchange for preferred shares if a high loss-low probability event happens to lower a large portion of RBC's reserves.

In the same insurance context, in 2010, SCOR, a Paris-based insurance and re-insurance company entered into a three-year contingent capital deal with UBS. If the amount of net catastrophe losses experienced by SCOR reaches a certain trigger, UBS is committed to inject €150 million into SCOR in exchange for shares of common equity at a pre-set price.

CoCo bonuses

The bonus culture in investment banks has been blamed for encouraging disproportionately risky behavior, which in turn helped to lead to the financial crisis. New compensation schemes are needed that better align compensation with long-term shareholder interests,[9] and perhaps also with the interests of other bank stakeholders.

So far, the schemes that have been suggested are largely based on equity. However, the trouble with equity incentives is that equity is the equivalent of a call option on the assets of the bank – the holder enjoys all of the upside of a share price rise, but only a limited amount of the downside. Given this limited liability, executives paid in equity have a powerful incentive to take excessive risks. And when the bank is in trouble they may be tempted to bet the bank, in the knowledge that they can only lose their residual near-valueless equity; bond holders and creditors have much more at stake if the bank fails.

The G20 meeting of September 2009 recommended that bankers should be exposed to downside risk by deferring compensation and through mechanisms that could claw back bonuses.

CoCos offer an interesting way to achieve this. Bonuses paid in the form of a CoCo bond have a value that is closely tied to the health and actual performance of banks. They increase exposure to downside risk, and they do not incentivize strategies that would ramp-up the share price in the short-term (as equity can).[10]

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9 / However, a substantial portion of the equity at both Lehman Brothers and Bear Stearns was in the hands of the CEOs and the top executives, who probably believed that their interests were aligned with those of outside shareholders. This suggests that shareholder alignment may offer only a part-solution to the problem.

10 / There is "unlimited" upside only after conversion, when the bank becomes closely monitored by the regulator.

With CoCo bonuses, there should be no risk of a "death spiral", as banks and regulators can enforce rules against employee short selling and hedging CoCo exposures.[11]

In 2010, the European Parliament gave banks the green light to use CoCos as part of their compensation packages.

- Upfront cash bonuses will be capped at 30% of the total bonus and at 20% for particularly high bonuses

- Between 40 and 60% of any bonus must be deferred for at least three years

- Moreover, at least 50% of the total bonus will be paid as contingent capital and shares

Barclays Capital was the first bank to say publicly, in January 2011, that it will issue CoCos and use them as bonus payments to employees (as part of their deferred compensation). These CoCo bonds would become worthless should Barclays' CT1 fall below 7%. Barclays' preferred version of CoCos takes the form of a loss-absorbing bond, e.g., possibly one that loses its coupons or has a haircut in value, rather than a bond that converts into equity.

A key challenge is to price the risks for Cocos. CoCos are new instruments and pricing methodologies are still work in progress. The Appendix gives a friendly illustration of two approaches to price CoCos.

Appendix: Pricing of CoCos

Two relatively standard approaches, however, can be used to price CoCos: The credit derivatives approach and the equity derivatives approach.[12]

The credit derivatives approach

In the following we give a simplified version of this approach based on the rule of thumb used to price CDSs.

A credit spread is an add-on to the existing risk-free curve, r (usually the Libor or the swap curve) in order to discount expected cash flows. According to the "credit triangle" rule of thumb:

$$CS = (1-R)\,\lambda$$

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11 / There may still be a "perception" problem here. CoCos usually pay a high coupon to compensate for the conversion risk. Public opinion may regard this as a "double bonus", i.e., a high coupon plus a cash payment at maturity. Therefore, CoCo bonuses should be structured so that they don't pay any coupon or pay very low interest.

12 / De Spiegeleer and Win Schoutens cover in depth available pricing models for CoCos and apply these methodologies to the pricing of the Lloyds and Credit Suisse CoCo issues.

With:

CS   = credit spread

R: = recovery rate

λ: = default intensity, so that the probability of default in the time interval [t, t+dt] conditional on surviving up to time t is: dt, and the default probability over the time horizon [0,t] is $1 - \exp(-\lambda t)$[13]

We can apply the same methodology to CoCos by modelling the trigger event where a CoCo is converted into shares as an extreme event similar to default for a CDS. Hitting the trigger is considered as a special case of default event with its trigger intensity: trigger. Since the CoCos trigger before default happens, we have:

$$\lambda_{trigger} > \lambda$$

Using the credit triangle rule of thumb, we obtain:

$$CS_{CoCo} = (1-R_{CoCo}) \times \lambda_{trigger}$$

$$R_{CoCo} = S_T^* / C_P \text{ with}$$

C_P = conversion price = N / n with N the face value of the bond and n the number of shares received at conversion

S_T^* = expected share price when the bond is converted so that the loss from conversion to the CoCo holder is:

$$LOSS_{CoCo} = N - n\, S_T^* = N\,(1-S_T^* / C_P) = N\,(1- R_{CoCo})$$

To estimate the trigger probability $\lambda_{trigger}$ we rely on the Black and Scholes model applied to the pricing of barrier options. If we denote by p* the probability of the first time the trigger S_T^* is hit:

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

with:

$\mu = r - q - \sigma^2/2$

q = continuous dividend yield

r = continuous interest rate

σ = stock return volatility

T = maturity of the CoCo

S = current share price

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13 / In practice, we extract the term structure of default intensities from the CDS term structure.

Since

$$p^* = 1 - \exp(-\lambda_{trigger} T)$$

then,

$$\lambda_{trigger} = - \log (1 - p^*)/T$$

Example:

CoCo:
10 year maturity
Conversion trigger: share price half of the current share price
Conversion price = $100

Stock:
Current price: S = $100 ($S_T^* = \$50$)
$\sigma = 30\%$
$q = 0$ (no dividend)

Interest rate:
r = 4%

1. Probability of hitting the trigger: $p^* = 48.3\%$
2. Trigger intensity: $\lambda_{trigger} = - \log (1 - 0.4830) /10 = 0.066 = 6.6\%$
3. Recovery rate: $R_{CoCo} = S_T^* / C_P = 50/100 = 50\%$
4. $CS_{CoCo} = 6.6\% \times 50\% = 330$ bps
5. Total yield: 4% + 3.30% = 7.30%

Equity derivatives approach

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

- Long a bond: Face value at maturity + coupons;

- Long a down-and-in-forward ST at strike CP: conversion into shares at trigger point;

- Short a series of binary down-and-in barriers: cancellation of the coupons and principal after the CoCo is forced to conversion.

Under Black and Scholes type assumptions closed-form solutions exist for these three components of the CoCo bond price. The pricing formula needs only two inputs:

- σ = deep-out-of-the-money stock implied volatility derived from the implied volatility surface in order to capture the smile;

- S* = the trigger level

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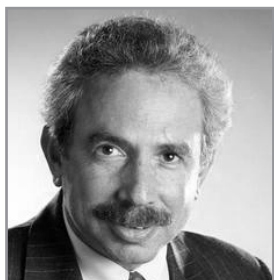
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