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# The Risk Management of Contingent Convertible (CoCo) Bonds

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# Preface

The financial crisis of 2007–2008 triggered an avalanche of financial worries for financial institutions worldwide. Governments intervened and bailed out banks using taxpayers' money. Preventing such bailouts in the future and designing a more stable banking sector, in general, requires both higher capital levels and regulatory capital of a higher quality. In the new banking regulations, created in the aftermath of the crisis, the financial instruments called contingent convertible (CoCo) bonds play an important role.

The CoCo market was launched in December 2009 by the exchange of old-style hybrids into new CoCo bonds by Lloyds Banking Group. In 2010, Rabobank followed with an issue size of €125 bn. This issue was twice oversubscribed. The CoCo market experienced an exponential growth in 2013. Currently, the outstanding amount in European CoCos is above €140 bn.

CoCos are hybrid financial instruments that convert into equity or suffer a write-down of the face value upon the appearance of a trigger event. The loss-absorbing mechanism is automatically enforced either via the breaching of a particular accounting ratio, typically in terms of the Common Equity Tier 1 (CET1) ratio, or via a regulator forcing to trigger the bond. CoCos are non-standardised instruments with different loss absorption and trigger mechanisms and might also contain additional features such as the cancellation of the coupon payments.

We provide the reader an overview of the risk components of a CoCo bond and created more insights into the instruments' sensitivities. Different pricing models provided valuable information on the CoCo bond. In this book, three market-implied models are derived in detail. These models use market data such as share prices, CDS levels and implied volatility in order to calculate the theoretical price of a CoCo bond.

The sensitivity analysis of the theoretical CoCo price resulted in estimates for the sensitivity parameters with respect to the underlying stock price, the interest rate and the credit spread. These sensitivities, called the Greeks, provide the investor with insides to hedge from adverse changes in the market conditions. A performance study of the model CoCo price derived with the Greeks compared

with a simple regression model indicates the importance of the credit risk in non-stress situations and the equity risk in a stress situation.

The pricing models for CoCo bonds are introduced in a market-implied Black–Scholes stock price context. Clearly, this has a drawback of assuming a constant volatility. A more advanced setting indicates the impact of this assumption. In the Heston model, a more realistic stochastic volatility context, the skew in the implied volatility surface resulted in a significant impact on the CoCo price. Hence, stochastic volatility models which incorporate smile and skew, like the Heston model, are appropriate in the context of pricing CoCos.

Furthermore, to some extent CoCo bonds can also be seen as derivative instruments with as underlying some capital ratio (CET1). In this perspective, a CoCo market price is the price of a derivative and hence contains forward-looking information or at least the market’s anticipated view on the financial health of the institution and the level of the relevant trigger. This setting creates insights into the distance to trigger and enables us to determine the implied CET1 level corresponding to a coupon cancellation.

In the last chapter, a sophisticated data mining technique is applied for early-stage detection of potential risks regarding the stability of institutions by making use of market information of their issued CoCos. This method detects outliers in the CoCo market taking multiple variables into account such as the CoCo market return and the underlying equity return. Based on a robust distance in a multiple dimensional setting, we can detect CoCos that are outlying compared to previous time periods while taking into account extreme moves of the market situation as well. These outliers might require extra hedging or can be seen as trading opportunities. They could as well give regulators an early warning and signal for potential trouble ahead.

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# Chapter 1

## A Primer on Contingent Convertible (CoCo) Bonds



The central theme of this book is one financial instrument called a contingent convertible bond or CoCo. CoCo bonds are issued by financial institutions such as banks and (re-)insurance companies. Due to their loss-absorption mechanism, they play an important role in the new regulation guidelines after the financial crisis of 2007–2008. A CoCo bond contains an automatically loss absorption mechanism in times of crisis. This can avoid the use of taxpayers' money to save a falling financial institution in a crisis.

In this chapter an overview is given to understand the construction and financial background of CoCo bonds. First, the anatomy of the different CoCo bonds and their operating rules is explained. No standard structure has been established yet despite the issuance of CoCos from 38 different banks within European countries with a total amount outstanding closely to €160 bn by mid 2018. This underlines the importance of a detailed analysis of each new CoCo issue. The chapter contains a description of its structure, possible triggers, conversion types and the general loss absorption mechanisms. Next the current outstanding CoCo market is investigated together with the reason for their existence in the financial market and the type of investors. A research study is provided regarding the effectiveness of their loss absorption mechanism. References are De Spiegeleer et al. (2014), Maes and Schoutens (2012) and De Spiegeleer et al. (2012).

### 1.1 What is a CoCo?

A contingent convertible bond, also known as a CoCo bond, is a special hybrid bond issued by a financial institution. In first place, the instrument is identical to a standard corporate bond. This means that the investor receives a frequent payment of fixed coupons and will receive his initial investment back at maturity. However, when the issuing financial institution gets into a life-threatening situation, the CoCo will be written-down or convert to shares depending on the type of CoCo. The mechanism that causes the conversion or write-down is called the trigger. The trigger will as

such automatically make the investor in CoCos bear part of the losses of the financial institution in stress events.

The payout of CoCos is bounded by the stream of coupon payments and the payback of the face value at maturity. This maximum payout is referred to as the bond ceiling. On the other side, the write-down of the CoCo or the conversion can lead to huge losses for the CoCo investor. Most of the time the coupon rate is a fixed level depending heavily on the healthiness of the issuing institution and typically within the range from 5 to 10% of the face value or notional amount. This relatively high rate compensates the risks of the CoCo investor. For a CoCo with a (issuer) call option, the issuer has the right but is not obliged to call back the bond at certain predefined call dates, typically at least 5 years after issuance. At a call date the issuer has the option to payout the investor the market value of the CoCo in order to cancel any future obligations of the contract. After the first call date, when the CoCo is not called, most of the CoCos turn into a floating-rate instrument. The coupon rate will from that point onwards depend on market fluctuations. More detailed information can be found in Sect. 1.3 about the risks of a CoCo.

### ***1.1.1 Write-Down CoCos***

When a (partial) write-down CoCo is triggered, the face value of the bond is written down by a predetermined fraction. The investors' wealth is now suffering a set-back. Part of the future coupons and final redemption will be lost. There is no standardised approach in this mechanism. The terms and conditions specified in the prospectus are different from country to country and from issuer to issuer. In some cases the write-down is limited to a predetermined fraction of the face value, in other cases the bond holders are completely wiped out. In January 2012, Zuercher Kantonalbank (ZKB) issued a staggered write-down CoCo. The investor could apply haircuts in multiples of 25% until the breach on the capital trigger was solved. Some contingent convertibles have a temporary write-down. Here the face value of the bond can be restored when the issuing financial institutions' health has turned positive again driven by positive financial results and adequate capital ratios.

### ***1.1.2 Conversion CoCos***

In case a conversion CoCo is triggered, the instrument will convert to a predetermined number of shares. The bond holder is forced to accept delivery of shares. The total number of outstanding shares of the institution will increase in case of an equity conversion. As a result, the existing shareholders will have a smaller, diluted part of the total outstanding equity. Hence the existing shareholders will also suffer from a conversion of these CoCos. Therefore a high dilution mechanism can create a better incentive for the risk management of a financial institution (Hilscher and Raviv 2014).