The HANDBOOK of HYBRID SECURITIES

Convertible Bonds, CoCo Bonds and Bail-In

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The Handbook of Hybrid Securities

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WILEY

This edition first published 2014
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Registered office
John Wiley & Sons Ltd, The Atrium, Southern Gate, Chichester, West Sussex, PO19 8SQ, United Kingdom

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Library of Congress Cataloging-in-Publication Data

Spiegeleer, Jan de.
The handbook of hybrid securities : convertible bonds, coco bonds, and bail-in / Jan De Spiegeleer, Wim Schoutens, Cynthia Van Hulle.
pages cm—(The Wiley finance series)
Includes bibliographical references and index.
ISBN 978-1-118-44999-8 (hardback)
1. Convertible securities—Handbooks, manuals, etc. 2. Convertible bonds—Handbooks, manuals, etc. I. Schoutens, Wim. II. Van Hulle, Cynthia, III. Title.
HG4652.S67 2014
332.63′2044—dc23

2013046701

A catalogue record for this book is available from the British Library.

ISBN 978-1-118-44999-8 (hardback) ISBN 978-1-118-45000-0 (ebk)
ISBN 978-1-118-45002-4 (ebk) ISBN 978-1-118-86265-0 (obk)

Cover image: Shutterstock.com

Set in 10/12pt Times by Aptara, Inc., New Delhi, India
Printed in Great Britain by CPI Group (UK) Ltd, Croydon, CR0 4YY

To Klaartje, Charlotte, Pieter-Jan and Willem
Jan

To Ethel, Jente and Maitzanne
Wim

To my mother
Cynthia

Contents

Reading this Book

The target audience for this work on hybrid securities is very broad. The absolute beginner will find in it a sufficient course to become familiar with this asset class. More advanced users working in areas such as trading, portfolio, or risk management will be introduced in detail to the latest advances in numerical techniques to value and hedge these instruments. Hybrid financial instruments combine properties of both shares and corporate bonds into one, but mastering their price dynamics is far from a walk in the park. Blending the properties of two easy-to-understand asset classes such as equity and bonds into a hybrid does not leave us with an instrument having straightforward properties. Hybrids are therefore often misunderstood and mis-sold: what for some looks like an equity instrument with bond-like risk could turn out to deliver a bond-like return with equity volatility. The reality is hence very different from the perceived risk and results in an asset that can have multiple sources of risk: market risk, default risk, different levels of equity and interest rate convexity, etc. In the case of contingent convertibles, the newest category in hybrid debt, there are phenomena such as the "death spiral" that deserve our attention. These are situations where a forced conversion of a bond into shares would trigger a wave of sell orders on the underlying share. This book devotes different chapters to CoCo bonds, including the newly developed pricing models, taking into account different features of these special instruments.

Preferreds or preference shares are on first sight the easiest member of the hybrid family to be understood and fully mastered. The reality is far different, and many investors dealing with this instrument that looks like a bond were confronted with equity-like volatility. This became very clear in the spring of 2008, when US banks chose to strengthen their balance sheet massively through the issuance of preferreds. Traders, portfolio managers, and even retail investors loaded up on these instruments and had to deal with a complete implosion of their portfolio in the heat of the credit crunch. This destructive process was speeded up by the default of Lehman Brothers.

Mastering hybrids is not constrained to financial calculus only. Proposals and regulations such as, for example, Basel III and the Dodd–Frank Act dramatically changed the financial landscape from 2010 onwards. Some hybrid securities are not going to be allowed anymore as regulatory capital. National regulators are now putting the emphasis on instruments that in principle have the capacity to be really loss absorbing through their design. This is where contingent convertibles started to play an important role in 2010. Regulation has clearly been driving innovation and regulators became financial engineers! This is not a book on financial regulation, but it nevertheless covers the big overhauls that reshaped the financial landscape.

A handbook can never be of any value to a practitioner if there is no mention at all of what the regulatory implications of each of the different instruments are.

The quantitative part of this book is very pragmatic. The first steps into the landscape of hybrid instruments will take place in a perfect Black–Scholes world. Later on, when using, for example, constant elasticity of variance, the stochastic processes simulating the share price movements become more look-alikes of the real world. Subsequently, we link the default probability of an issuer of hybrid debt to its share price level. In a final step, hybrids are priced as derivative instruments with multiple sources of risk: equity, interest rate, and credit. This multi-factor approach deals with the exact nature of hybrid instruments, where several state variables are at work. The valuation model turns into a blend of debt and equity. The more advanced quantitative audience, consisting of arbitrageurs, portfolio managers, or quantitative analysts, will be introduced to methods such as the American Monte Carlo simulation. All of these techniques are mainstream methods in exotic equity derivative pricing but have not made their landing on the hybrid desks yet. As many numerical examples as possible have been added to enrich this book.

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On our webpage, www.allonhybrids.com, the interested reader can find more examples and reading material as a supplement to this book. The characteristics of most contingent convertible bonds are provided as well. For each of the CoCo bonds the pricing model is embedded in a spreadsheet that is available for download.

Acknowledgments

This book is the work of its authors but without the support of our colleagues, people we met on seminars, and the referees of the papers we published, all of this would not have been possible. We would like to thank explicitly Professor Luc Keuleneer (KPMG), Professor Stefan Poedts (KU Leuven), Professor Theo Vermaelen (INSEAD), Professor Jan Dhaene (KU Leuven), Professor Dilip Madan (University of Maryland), and Professor Jose Manuel Corcuera (Universitat de Barcelona) for their support. Our gratitude goes to Philippe Jabre, Julien-Dumas Pilhou, Romain Cosandey, James Cleary, Jan-Hinnerk Richter, Henry Hale, Philipe Riachi, and Mark Cecil from Jabre Capital Partners (Geneva) for their guidance and advice. Many thanks to Francesca Campolongo, Jessica Cariboni, Francesca Di Girolamo, and Henrik Jonsson from the Joint Research Centre (European Commission), Wim Allegaert (KBC) and Stan Maes (DG Internal Market and Financial Services at the European Commission). We thank David Cox and the staff at London Financial Studies. From Assenagon Asset Management we remember our productive cooperation with Vassilios Pappas, Michael Hunseler, Robert Edwin Van Kleeck, and Stephan Hoecht. Our gratitude and respect also go to Marc Colman, Carole Bernard, and Andrea Mosconi from Bloomberg for the enthusiasm and professionalism with which they embrace the asset class of convertible bonds.

1 Hybrid Assets

1.1 INTRODUCTION

This chapter provides a general introduction to the different categories of hybrid debt and delivers the basic knowledge needed to move deeper into hybrid territory. Hybrid instruments are often misunderstood and hence mismanaged. They are not equity instruments with bond-like risk. Neither are they instruments with bond returns flavored with equity risk. Further, it is also difficult to come up with a standardization when it comes to categorizing hybrid debt. In this introductory chapter we cover the obvious and well-known instruments, such as preferreds and convertible bonds. These are the cornerstones of corporate hybrid debt. The chapter also contains a primer on bail-in capital, contingent convertibles, and financial hybrid debt such as Tier 1 and Tier 2 bonds.

1.2 HYBRID CAPITAL

Hybrid securities are located at the crossroads between debt and equity. This asset class combines properties of common equity and corporate debt. The most outspoken subcategories of hybrid securities are convertible bonds and preference shares (preferreds). Further, in the capital structure of banks and corporates, one can also find quite often hybrid instruments belonging to the category of subordinated debt. These are hybrid bonds and have an equity-like character because of their long (sometimes perpetual) maturity, deep subordination, loss absorption, and the possibility of a coupon deferral. These securities illustrate that the split between debt and equity is a continuum and far from crystal clear. Moody's, Standard & Poor's (S&P), and Fitch have each developed their own proprietary methodologies to determine the equity character to be attributed to a hybrid bond. Needless to say, the outcomes sometimes differ very much between these three rating agencies for one and the same bond.

Hybrids have never received the same amount of attention from investors, the financial press, or researchers as the two main stream asset classes – bonds and equity. Investment banks have typically structured their trading operations in fixed-income and equity departments. The first desk covers corporate debt and senior debt, while the second desk takes care of equity trading. Bond and equity trading also has a much larger scope than hybrids. Equity trading is indeed much broader than just buying or selling shares. The equity derivatives market for listed or exotic options is enormous, and has in turn been given a boost with the rise of the structured product market. The same holds for the fixed-income desks, where trading corporate bonds has received support from the advent of the credit default swap (CDS) market. Credit derivatives offer the owners of corporate debt the possibility to buy protection on these securities. According to ISDA,[1] the gross notional amount of all CDS contracts outstanding was $25.9 tn on December 31, 2011. The size of this CDS market is a multiple of the GDP of

[1] International Swaps and Derivatives Association.

Table 1.1 ALCOA: Structure of the liabilities on the balance sheet (Q4, 2011). The equity component consists of share capital, retained earnings, and minority interests

Liabilities (mn USD)	
Current	6 013
Loans	3 750
Bonds	12 587
Convertible Bonds	575
Preferred	55
Equity	17 140
TOTAL	**40 120**

Source: Bloomberg.

the United States, which was by contrast $15.6 tn. Hybrids do not have a similar firm link with a vast underlying derivatives market. From this perspective, the hybrid market stands more or less on its own feet.

Companies use a wide spectrum of instruments to finance their balance sheet. Here also, equity and standard corporate debt dwarfed the hybrid bonds. Hybrids remain, without doubt, the smallest component on the average corporate balance sheet. ALCOA, an aluminum producer in the United States, has, for example, a $40 bn balance sheet financed through $17 bn of equity, a $3.7 bn loan, and $12.6 bn in bonds. The hybrid component of the liabilities is rather limited and consists of a $55 mn preferred and a $575 mn convertible bond (Table 1.1).

In Figure 1.1, we show an example of a capital structure including a new kid on the block, namely, the contingent convertible or CoCo. This newcomer in the hybrid family is typically issued by a financial institution and contributes to the loss absorbency of the balance sheet. Indeed, in case the regulatory capital of a financial institution fails to meet a predetermined level, these contingent convertibles convert into shares or suffer a write-down. One can consider them as automated measures to swap debt into equity or write down the face value of debt, without causing default.

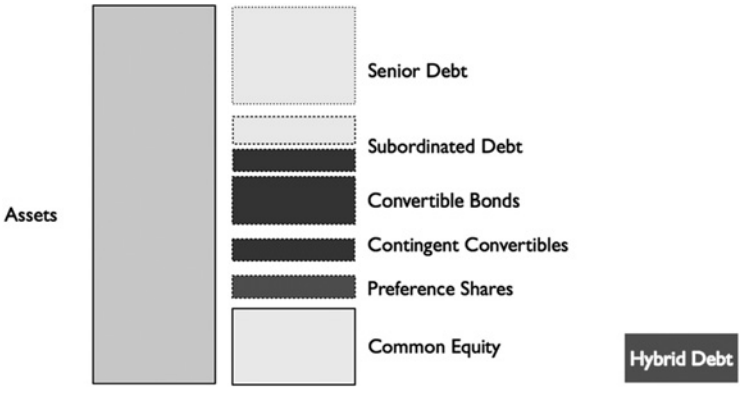


Figure 1.1 Sample balance sheet of a financial institution.

1.3 PREFERREDS

Preferreds are a straightforward mixture between debt and equity. These look at first sight like a combination between equity and bonds. Preferreds offer regular income payments, have no voting rights, and are senior to common stock since they have priority over common equity in dividends payouts. Are preferreds equity investments with bond-like characteristics or should we consider them as bonds with an equity-like behavior? We use the preferred share of ALCOA as a concrete example to develop a possible answer to this question. The ALCOA preferred pays a coupon of 3.75% on a face value of $100. This corresponds to a quarterly payment of $0.9375 every 3 months (January, April, July, and November). A summary of the instrument-specific features of the ALCOA preferred is given in the Table below.

ALCOA 3.75% Preferred			
ISIN	US0138172004	SEDOL	2021786
ISSUE DATE	January 20, 1947	CALL PRICE	100.00
ISSUE SIZE	55 M	FACE VALUE	100
STOCK	ALCOA INC	MATURITY	PERPETUAL
COUPON	3.75%	FREQUENCY	QUARTERLY

The closing price of the ALCOA preferred on April 20, 2012 was $83.56. We apply a yield measure such as a current yield on the ALCOA bond to compare this preferred security against the bonds of the same issuer. The current yield (CY) is given by:

$$\text{Current Yield } (CY) = \frac{\text{Coupon}}{\text{Bond Price}} = \frac{0.0375}{83.56} = 4.49\% \tag{1.1}$$

The current yield indicates the annual income one earns on an investment in this preferred security if everything else remains unchanged. Under this assumption, the price of the preferred itself does not change. Through the current yield one looks at a preferred as a pure income instrument such as a bond. The theoretical price P of an instrument paying a perpetual cash flow C given an interest rate r is given by:

$$\begin{aligned} P &= \lim_{n\to\infty} \frac{C}{(1+r)} + \frac{C}{(1+r)^2} + \frac{C}{(1+r)^3} + \cdots + \frac{C}{(1+r)^n} \\ &= C \sum_{i=1}^{\infty} \frac{1}{(1+r)^i} = C \sum_{i=1}^{\infty} x^i \end{aligned}$$

Using the convergence of series $\sum_{i=0}^{\infty} x^i$ to $\frac{1}{1-x}$ we obtain:

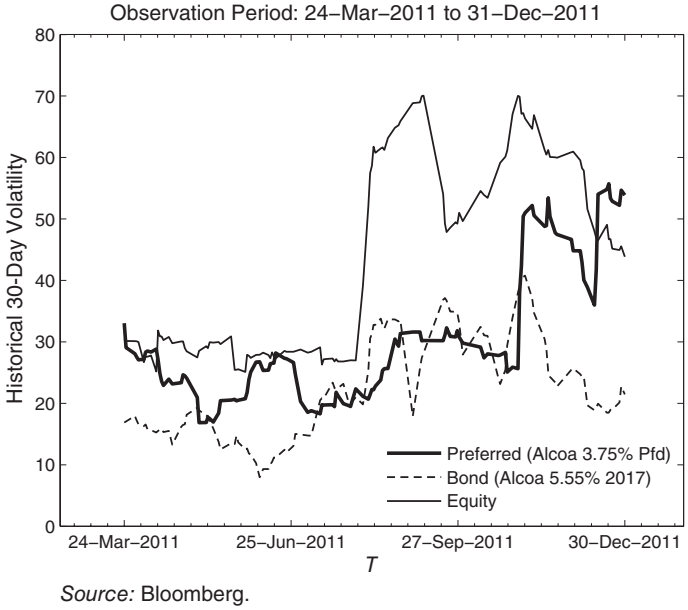
$$P = \frac{C}{r}$$

Given a 30-year US government bond rate of 3.12% on April 20, 2012, the theoretical price of the ALCOA preferred would hence be equal to $120.19 = ($3.75/0.0312). This value is considerably higher than the actual closing price of the preferred on that day. The difference is explained by the financial risk of the preferred. The income stream generated by a preferred is indeed not risk free. The dividend or coupon payments can be canceled by the issuer without

triggering an immediate default event as would be the case for a bond. For preferreds, a failure to pay the dividend does not invoke a default on the issuing company. As a result, investors demand a higher yield. The ALCOA preferred is yielding 137 bps more than a risk-free security such as a US government bond of a similar maturity. This yield difference is the compensation for the dividend-suspension risk of the ALCOA preferred.

Further, there is a cumulative dividend right attached to the ALCOA preferred. This implies that the unpaid accumulated preferred stock dividends must be paid before any dividends are paid out to the common stock holders. Hence, if there was a suspension in the dividend stream of the preferred security, the share holders would rank after the preferred bond holders. In such a situation, ALCOA would only be allowed to start paying out dividends to the share holders after the holders of this preferred stock had received all the dividends canceled earlier.

It is tempting to categorize an instrument such as a preferred, that distributes on a timely basis a fixed cash flow, as a bond. The fact that this instrument ranks just above common equity on the balance sheet, however, signals a different message. From that perspective one could indeed imagine that preferreds are shares in disguise and carry the same volatility as equity. In Figure 1.2, the historical 30-day volatility of the ALCOA preferred is plotted against the price volatility of the shares and a corporate bond issued by ALCOA. This graph illustrates how early 2011, the preferred demonstrated a volatility close to bond volatility, whereas in the final months of 2011, the opposite is true. The preferred then became as volatile as the listed shares of the same issuer. The graph in Figure 1.2 compares the volatility of preferreds, bonds, and equity using the annualized realized volatility over a 1-month period. This 1-month period is a rolling window for which a realized volatility number is calculated. A similar graph can be constructed for a different rolling window (3-month, 6-month, etc.). Doing this for a lot of different time periods allows us to construct a volatility cone as explained in [46]. To



Source: Bloomberg.

Figure 1.2 Historical 30-day volatility of some of the asset classes funding the ALCOA balance sheet: equity, bonds, and preferreds.

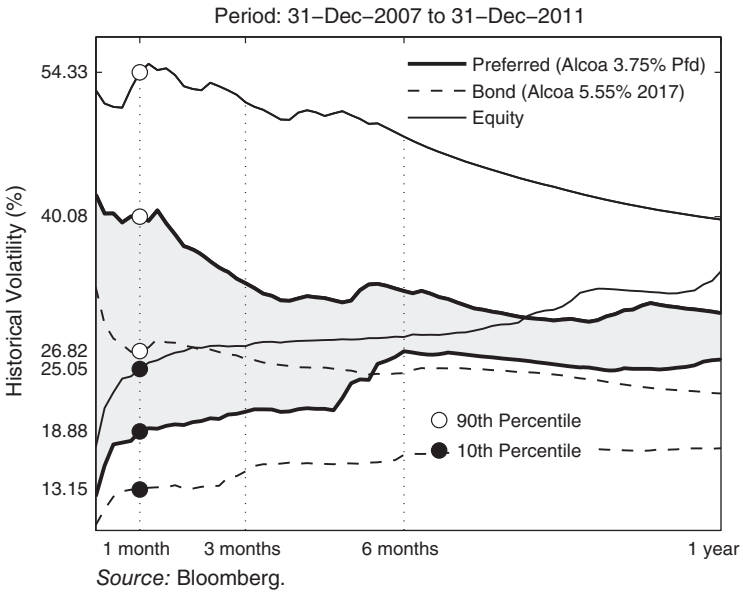


Figure 1.3 Volatility cone of a preferred, the equity, and a corporate bond issued by ALCOA. Period 2003–2013.

achieve this result, both the 90th and the 10th percentiles for each of these rolling windows are connected on a graph. The volatility cone for ALCOA for the period 2003–2013 can be found in Figure 1.3. A volatility cone is an interesting graphical snapshot view of the historical volatility of an asset.

From the sample volatility cone of ALCOA, we learn that the cone and therefore the risk of the preferred share is at an intermediate level between the cone of the shares and the volatility cone of a corporate bond. For the 1-month time horizon, the 90th percentile of the realized volatility is 54.33% for shares, 26.82% for bonds, and 40.08% for preferred shares. This illustrates the higher risk of the preferred compared with a standard corporate bond from the same issuer. With the help of the volatility cone, one can look under the hood of this bond-like instrument and discover a higher level of embedded risk.

1.4 CONVERTIBLE BONDS

Another instrument within the hybrid family is the convertible bond. The total amount of outstanding convertible bonds at the writing of this book equals $469 bn spread across 1960 different issues.[2] Basically, these instruments can be regarded as corporate bonds where the investor has the right to convert the bond into shares. This conversion right is restricted to the investor only. It is not an obligation and hence remains at the discretion of the investor. Therefore, conversion is labeled as optional. The number of shares received upon conversion is typically outlined in the prospectus and is called the conversion ratio (C_r). After conversion, the investor forgoes the remaining coupons (c) and the final cash redemption of the face value

[2] *Source:* UBS.

(N) of the convertible bond. The conversion price (C_P) is the embedded purchase price of the shares obtained through conversion:

$$C_P = \frac{N}{C_r} \tag{1.2}$$

ALCOA 5.25% March 15, 2014			
ISIN	US013817AT86	SEDOL	B65YPD6
ISSUE DATE	March 24, 2009	ISSUE PRICE	100%
ISSUE SIZE	575 mn	FACE VALUE	1000
STOCK	ALCOA INC	MATURITY	March 15, 2014
CONVERSION RATIO	155.4908	FREQUENCY	SEMI-ANNUAL
REDEMPTION	100.00%	RANKING	SENIOR UNSECURED
COUPON	5.25%		

In March 2009 ALCOA issued a $575 mn convertible bond distributing a semi-annual 5.25% coupon. A summary of the structure of this convertible can be found in the Table above. The bond expires on March 15, 2014. The owner of the bond has an opportunity up till this final maturity date to convert the bond into shares. If the investor skips this conversion, the final payout will be $1000 plus the final coupon of $26.25. By contrast, if the investor opts for the conversion, he receives 155.4908 shares of ALCOA with value S_T. A rational investor maximizes his final payout P_T at the expiration date T:

$$P_T = \max(C_r \times S_T, \$1026.25) \tag{1.3}$$

Similar to preferreds, this asset class blends bonds and equity into one structure. The extent to which a convertible bond behaves like a bond depends on the level of the share price. A low share price at time $t < T$ makes conversion unlikely; the investor is better off receiving coupons instead of converting the bond in cheap shares. The convertible bond has in such a case the price dynamics of a corporate bond and is sensitive to changes in interest rate and credit spread levels. The value of the convertible P_t is said "to trade close to the bond floor" (B_F). The bond floor is the corporate bond component of the convertible. It is calculated as the present value of all the cash flows embedded in the convertible bond while neglecting any possible conversion into shares. This is also often called the investment value of the convertible.

High prices of the underlying share lead to high conversion probabilities and the value of the convertible is then close to parity (P_a). Under such circumstances, the value of a convertible is definitively more a share than a bond:

$$P_t \approx P_a = \frac{C_r S_t}{N} \tag{1.4}$$

The parity or conversion value of a convertible represents the value of the amount of underlying shares received upon conversion per bond.

The convertible bond market is far from standardized. Bond structures are quite different across issues. They differ not only in basic features such as coupon structure, conversion ratio, or maturity. There is more, since each convertible bond comes with additional features

impacting its price and properties. In Chapter 2, features such as calls, puts, refixes, dividend protection, etc. will be discussed in detail.

1.5 CONTINGENT CONVERTIBLES

Contingent convertibles, contingent capital, CoCos, buffer convertible capital securities, enhanced capital notes, etc. are all different names for the same kind of capital instrument issued by a financial institution. Having different names for one and the same instrument clearly adds to the confusion surrounding this new asset class. The contingent convertible market is in its infancy and lacks standardization. There is no such thing as a typical CoCo structure. In a nutshell, a contingent convertible comes down to a standard corporate bond issued by a bank that can absorb losses without triggering a default for the issuing bank. The loss absorbency is obtained by writing down a predetermined fraction of the face value of the bond or by converting the bond into shares of the underlying bank.

The market for contingent convertibles kicked off in December 2009 when the Lloyds Banking Group launched its $13.7 bn issue of enhanced capital notes. This issue was spread over a number of bonds with maturities ranging from 10 to 22 years. This first CoCo issue was set up as an exchange for existing hybrid securities issued by Lloyds. Next in line was Rabobank, which made its first entry in the market for contingent debt with a €1.25 bn issue early 2010. After this, things turned quiet until February 2011, when Credit Suisse launched its so-called buffer capital notes. This issue ($2 bn) turned out to be quite popular and was more than 12 times oversubscribed. Yield-hungry investors were lining themselves up to include this new asset class in their portfolios. The Credit Suisse issue took place against the background of the new regulatory regime in Switzerland that requires large banks to hold loss-absorbing capital up to 19% of their risk-weighted assets [58]. This capital has to consist of at least 10% in common equity and up to 9% in contingent capital.

The start of this new asset class was met with significant skepticism from market practitioners, regulators, and scholars, involving heated debates. However, the CoCo issuance in the first quarter of 2012 equaled $3.7 bn, which corresponded more or less to 30% of the convertible bond issuance over the same period. The dust is clearly settling and regulatory initiatives throughout the financial world have helped CoCo bonds to earn an accepted position in the capital structure of banks. In Europe, during the period 2009–2013, approximately $40 bn was issued of this new category of debt. In Chapter 3, the concept of contingent convertibles, their valuation, and market risks will be covered in detail.

1.6 OTHER TYPES OF HYBRID DEBT

1.6.1 Hybrid Bank Capital

Innovative Tier 1

The financial industry is quite unique as it has to adhere to restrictions and regulations when it comes to capital structure. Corporates in other sectors of the economy are free to decide to what extent they want to use leverage. When such a company over-extends its debt and runs an unhealthy balance between the amount of equity and debt, it becomes vulnerable to economic shocks. An over-leveraged company may not be able to deal with disappointing

earnings following a slow-down in its business. This could possibly lead to a bankruptcy and could create some ripples within the economy if the company is large enough.

A failure of a bank, on the other hand, may easily send a real shock wave through the economic system, thereby bringing other financial institutions to the brink of collapse. The Basel Committee of the Bank of International Settlements (BIS) develops guidelines and supervisory standards in banking supervision. This committee has a clear focus on banking stability. In July 1988, the committee published its first work "international convergence of capital measurement and capital standard" [17], subsequently better known as Basel I or the Basel Capital Accord. Basel I came with two novelties: it defined the two basic building blocks of banking or regulatory capital and it laid out a minimum requirement for these components.

Regulatory capital can be decomposed conceptually into Tier 1 capital and Tier 2 capital.[3] Tier 1 capital should reflect high-quality capital that is able to absorb bank losses in a going-concern context, whereas Tier 2 capital was originally supposed to absorb losses only in a gone-concern context. The concept of regulatory capital has disappointed during the credit crisis of 2008, as its quality, consistency, and transparency showed fundamental flaws [144]. The large bank losses that materialized during the crisis highlighted the important economic differences between the Tier 1 and Tier 2 components of regulatory capital. Because Tier 2 capital (such as subordinated debt) was only loss absorbing after a bank had been declared bankrupt, banks needed to raise new equity to remain solvent notwithstanding their non-negligible stock of Tier 2 capital. Furthermore, banks disposed of surprisingly little capital that was effectively loss absorbing, despite very high reported Tier 1 capital ratios. In the end, so-called Common Equity Tier 1 (CET1) capital, a subcomponent of Tier 1 and solely composed of retained earnings and common equity, turned out to be the only loss-absorbing building block of the capital structure. Equity indeed never has to be paid back and the company has full discretion on how to reward the share holders through the distribution of dividends.

In a speech given at the American Economic Association in 2001, Andrew G. Haldane, Executive Director of the Bank of England, elaborated on the amount of Tier 1 capital and the ability of a bank to withstand a shock on the assets side of its balance sheet. It was shown how, for a group of major financial institutions which in the fall of 2008 either failed or required government support, the Tier 1 ratio[4] was increasing as the credit crunch was about to start. The signaling power of these improving Tier 1 ratios wrong-footed the market as far as these particular banks were concerned [114].

The Tier 1 bucket has never been designed to be filled with hybrid instruments only. However, because interest rate payments are tax deductible while dividend payments are not, financial engineering pushed banks to create innovative Tier 1 instruments. In fact, banks have been relying heavily over the period 1995–2008 on innovative Tier 1. These instruments are quite different from convertible bonds and contingent convertibles. The latter securities have an outspoken hybrid nature because the probability of a conversion into shares is part of the instrument setup. At expiration, the investor in these instruments will either end up with shares or with the face value of the bond. This is not the case for innovative Tier 1 instruments. These typically do not convert into shares but earn their hybrid status from the fact that the nature of these instruments is equity like: permanent character and coupon deferrability being part of these "equity" properties. To illustrate the hybrid nature of the innovative or additional Tier 1 bonds compared with more traditional forms of debt, one can take a look at two particular

[3] The Tier 3 category disappears in Basel III.

[4] The Tier 1 ratio relates the total amount of Tier 1 capital a bank has at its disposal to the value of the risk-weighted assets.

Table 1.2 Characteristics of a hybrid and senior bond issued by Société Générale

	Société Générale	
Bond Type	Tier 1	Senior Unsecured
Issue Date	January 26, 2005	April 20, 2011
S&P Rating	BBB	A
Maturity	Perpetual	April 20, 2016
Coupon (%)	4.196	4
Coupon Frequency	Annual	Annual
Possibile Coupon Deferral	Yes	No
Par Amount	1000	100 000
ISIN	FR0010136382	XS0618909807
Call Date	January 26, 2015	
Call Price	100%	
Step-Up Coupon	3M EURIBOR + 153 bps	
Price (%)	67.500	103.675

Source: Bloomberg. Date: April 27, 2012.

examples. In Table 1.2, there is a short description of a hybrid Tier 1 bond and a senior bond, both denominated in euros and issued by Société Générale, a French bank:

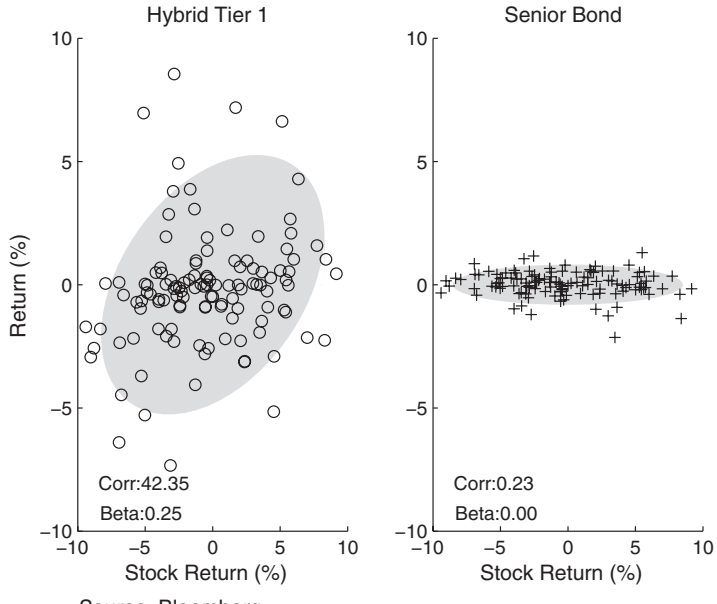
- **Senior bond**
  The senior bond received an A rating from Standard & Poor's, has a 4% annual coupon, and has a remaining maturity of almost 4 years. The coupons have to be paid by the issuer to the bond holder. Failure to do so would trigger a default of this bank.
- **Hybrid Tier 1**
  The Tier 1 bond is perpetual but comes with a first call date 10 years after the issue date. If Société Générale skips the call, the coupon structure changes and the bond turns into a floating rate note where the bank is paying 153 bps over Euribor. The hybrid carries a possibility that in case of unsatisfactory capital ratios, the interest on this debt might not be paid. Such an event does not push the issuing bank into default, however.

Studying the price returns of both bonds of Table 1.2 in the second half of 2011 reveals the equity nature of Tier 1 debt. There is no direct relationship between the Tier 1 bond and the underlying shares according to the prospectus. Nevertheless, the perpetual nature of the bond and its deep subordination make it sensitive to share price movements. In Figure 1.4, the daily log returns[5] of Société Générale's share prices are plotted against the daily log returns in the senior and Tier 1 bond. The beta[6] of the Tier 1 returns versus the share price returns is 0.25. Every percentage move on the stock therefore, on average, implies a 25 bps move on the bond. The correlation between the two time series is 42%. By contrast, the senior bond's price changes are clearly not correlated to share price changes. This example illustrates the equity character of innovative Tier 1 structures and hence also their hybrid nature.

Similar to preferreds, the coupon payments on these innovative instruments can sometimes be deferred in times of financial distress. This will act as a loss-absorbing buffer. Similar to our Société Générale example, Tier 1 hybrids often come with a call option and a corresponding

[5] A log return or logarithmic return of a variable X between two different dates t_0 and t_1 is given by $\log(X_{t_1}) - \log(X_{t_0})$ with $t_0 < t_1$.

[6] The beta (β) of a bond, stock, or portfolio is a number describing the volatility of this asset in relation to the volatility of a reference asset. Beta measures the sensitivity of the returns of the asset with respect to changes in the price of the reference asset.



Source: Bloomberg.

Figure 1.4 Daily log returns of the share price of Société Générale versus the return of a Tier 1 hybrid and a senior unsecured bond. Observation period: June 30, 2011 to December 30, 2011.

step-up clause. If the bank does not buy back the bond on the call date, the coupon is increased with a predetermined step up. This step-up penalty would indeed create an incentive for the bank to redeem this hybrid Tier 1 on the call date. This early redemption possibility, however, is against the nature of Tier 1 instruments which should have a perpetual character. On top of this, such bonds failed to absorb losses in the 2008–2009 credit crisis. It is, therefore, no surprise that similar Tier 1 instruments with a step-up coupon have been outlawed in Basel III and lose their top-notch capital status. This has prompted financial institutions in 2012 to start buying back these hybrids and replacing them with new Basel III-compliant regulatory capital. The phasing out of this kind of hybrid debt by Basel III is going to take place gradually up to the full implementation of these new capital adequacy rules on January 1, 2019.

Tier 2

Tier 2 bonds rank above equity and Tier 1 bonds. These bonds are subordinated to senior debt and are loss absorbing on a gone-concern basis. Tier 2 has also been impacted by the August 2010 proposal of the Basel Committee regarding the loss absorbency of regulatory capital [26]. All non-common Tier 1 and Tier 2 instruments at internationally active banks must have a clause in their terms and conditions that requires them to be written off or converted into shares on the occurrence of a non-viability event. This non-viability event is the earlier of (1) the decision to make a public-sector injection of capital, without which the bank would become non-viable and (2) a decision of the national regulator to write off the debt, without which the firm would become non-viable.

A hybrid Tier 1 – such as the one we used as an example in Figure 1.4 – creates for the investor an undesired loss-absorption risk. The interest payments can indeed be canceled by