New structures have emerged recently in the sub insurance market

European insurers have started to develop a complete capital curve in the last few years by issuing Upper Tier 2 and Tier 1 bonds (UK insurers in particular have led the way in this domain due to the FSA's interpretation of Solvency II, the insurance industry's equivalent for Basel II). These new issues represent a challenge in terms of pricing since they have an innovative structure taken from the bank capital market, including specific coupon deferral mechanisms and deep subordination.

The market compares the structures by applying rules of thumb

For the time being, the market seems to price insurance subordinated issues by using a "rule of thumb" similar to the one used in the bank capital market. A popular way to compare LT2, UT2 and T1 issues is in particular to add spread pick-ups to senior spreads in order to obtain subordinated spreads. These pick-ups account for the differences in subordination and deferral mechanisms. Valuing the options embedded in the product does not seem to be the way most people look at these issues and these rules of thumbs are probably alright in the current tight spread environment. Nevertheless, some market players might feel the need to understand the risks embedded in sub insurance structures more precisely because they believe that more importance will be attached to structures in a more testing environment.

The new quantitative model developed by SG enables to take into account all risks embedded in subordinated issues

Our new quantitative model for pricing sub insurance issues answers this question. It enables to price all the risks embedded in subordinated issues (extension risk, deferral risk, subordination risk...). The model is based on a replication argument between subordinated issues and CDS. We simulate all possible scenarios on spreads and given a set of assumptions on the behaviour of the company, we determine which decision the company makes in terms of coupon deferral, debt call, etc... The model then factors in the probability of each scenario and gives a theoretical price which is consistent with the environment in the CDS market.

The model is adapted from SG's model on corporate hybrids

The model was first developed for corporate hybrid issues (see our October 05 article "*Do corporate hybrids offer value?*" for more details on this model), which are very similar to sub insurance issues. Therefore, in the present report, we do not discuss in great details the framework and numerical methodology we use. Readers should refer to the October 05 article for further details and formulas used in the model. A summary of the methodology we use to analyse corporate hybrids can be found in Appendix A.

In the first part, we present the philosophy behind the model and the adjustments we made to apply it to the sub insurance market. In the second part, we show the results of the model in terms of relative value between euro-denominated subordinated issues and compare them to the corporate hybrid market. We also compute the value of each option embedded in the sub insurance issues.

A summary of the methodology we use to analyse corporate hybrids can be found in Appendix A. In Appendix B we stress test our model assumptions to see how robust the model is to changes in our assumptions. A summary of the characteristics of European sub insurance bonds can be found in Appendix C.

Applying the corporate hybrid framework to sub insurance issues

The philosophy behind our quantitative model

SG's model analyses the relative value between sub issues and sub CDS

Our quantitative model is based on a replication argument between CDS and subordinated bonds. It is therefore relevant to look at the relative value between sub issues and CDS although one obviously needs a credit opinion on the company before deciding whether to invest or not in a given subordinated security.

The model simulates all possible spread scenarios...

The model uses the CDS curve of the issuer and assumptions on its long-term credit curve to determine a base case scenario on spreads. Using a spread volatility which is derived from spread options, we simulate all possible deviations from this base case scenario.

... and determines the behaviour of the company in each of these scenarios

Then, given a set of assumptions on the behaviour of the company, we can determine the company's decision in terms of coupon deferral, debt extension, etc. Therefore, in each spread scenario, we can compute the issue price. Lastly, a numerical scheme (a partial differential equation) enables us to give a probability to each of these scenarios and to compute the theoretical price of the subordinated issue.

The model prices all the risks together, therefore taking into account their close relationship

One of the main advantages of the model is that it prices all the risks together while other models price a subordinated spread as the sum of senior spreads and premiums for subordination risk, extension risk, coupon risk, etc. In our view, adding up these risks as if they were independent does not make sense as they are strongly linked. For example, if a coupon deferral clause is activated then the company has a greater incentive to extend the debt.

The model has a very concrete interpretation in terms of trading sub issues against CDS

If the model highlights a security as a cheap asset, then in theory an arbitrageur should be able to lock in a premium by buying the security and hedging it with a portfolio of sub CDS and spread options. As not all risks can be hedged, the premium should compensate for non-hedgeable risks plus a risk premium. As a result, the model has a very concrete interpretation in terms of trading subordinated issues against CDS.

Differences between sub insurance and corporate hybrid issues

Adapting the model from corporate hybrids to sub insurance issues requires to address the differences in terms of subordination, reputation and deferral clauses

Subordinated insurance issues have some features that do not exist in corporate hybrids (please refer to Appendix A for further details on the process we use for corporate hybrids). The three differences we address to adapt the framework to subordinated issues are the distinctions in the capital structure between LT2, UT2 and T1, the reputation cost of exercising the options, and the specific mandatory deferral clauses embedded in sub insurance issues.

Accounting for the LT2, UT2 and T1 differences in subordination

The model for corporate hybrids uses senior CDS as an input...

Our model for pricing corporate hybrid securities is based on senior CDS curves, simply because there is no active trading on corporate subordinated CDS. As a result, the differential between senior and subordinated recovery rates is a key factor for gauging relative value between both types of debt. In our previous article we even made the implied senior recovery rate a relative value indicator.

... while the model uses sub CDS for sub insurance issues

In the insurance sector, subordinated CDS are traded even more actively than senior CDS, with AGF being an exception to the rule. It does not make sense to compare hybrid securities issued by insurance companies to senior debt. Subordinated CDS are a natural anchor here, and insurance hybrids are compared to such CDS, not against senior debt. The relevant question is how hybrid recovery compares to recovery rates in most liquid sub CDS, and this depends on the type of reference bond involved in these sub CDS contracts.

Differentiate between different Tiers of debt

Within the subordinated insurance market there is a distinction like in the bank capital market between different Tiers of debt. Lower Tier 2 issues are usually senior to Upper Tier 2 which are senior to Tier 1 issues.

On the one hand, the balance sheet of an insurer is different from the balance sheet of a corporate company. Even its senior debt is subordinated to the policyholders and is therefore deeply subordinated. As a result, LT2, UT2 and T1 may actually give very similar recovery rates in case of a default. And that recovery could be very close to nothing. This suggests taking 0% as the recovery rate assumption for all subordinated insurance issues. On the other hand, historical data provided by rating agencies shows that recovery on defaulted insurance subordinated debt was actually close to 20%.

Each Tier of debt has a specific recovery rate assumption: 20% for LT2 bonds, 10% for UT2 bonds and 0% for T1 issues

The market gives a value to the seniority differential between different Tiers of debt, and it therefore makes sense to use different assumptions for each Tier of debt. To account for this difference in subordination, we use a different recovery rate assumption for each type of subordinated capital (in the corporate hybrid case, we take 0% as the recovery rate for all hybrids). The standard recovery rate assumption used in sub CDS pricers is 20%, so this is the assumption we use in our model. Liquid subordinated CDS usually have a LT2 reference bond and therefore it is logical to take 20% as the recovery rate assumption for LT2 debt. We use a 0% recovery rate for T1 issues which is a realistic assumption since they are the most junior type of outstanding debt. Since UT2 stand between LT2 and T1 in terms of subordination, we take 10% as the recovery rate for LT2.

Recovery rate assumptions

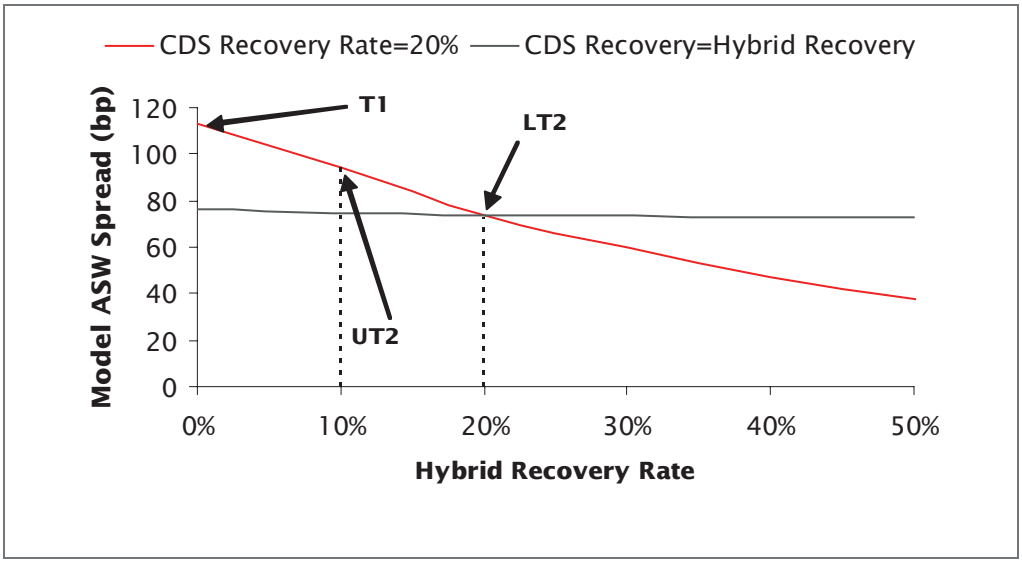
Type of debt	Senior (for AGF only)	LT2	UT2	T1
Recovery rate	38%	20%	10%	0%

Source: SG Credit Research

There is no subordination risk between LT2 issues and sub CDS

Covering LT2 bonds with subordinated CDS eliminates the subordination risk since LT2 bonds are deliverable in the CDS contract in case of default. Therefore the recovery rate assumptions have a negligible impact on our pricer for LT2 bonds. On the contrary, when the bond is UT2 or T1 then subordination risk remains between sub CDS and the bond as the bond is not deliverable in the CDS contract in case of default. The graph below shows the impact of the recovery rate on the model ASW spread of a subordinated bond.

Subordinated bond spreads depend on their Tier of debt



Source: SG Credit Research

The black curve (which was plotted by moving the sub CDS and sub bond recoveries together) shows that when the CDS and the bond have the same subordination, then the recovery rate assumption has a negligible impact on the model spread of the bond.

On the other hand, the red curve shows that when we set the recovery rate assumption of the sub CDS to 20%, the recovery rate assumption has a significant impact on the model spread. In particular, this spread moves from 113bp with a 0% assumption (T1) to 78bp with a 20% assumption (LT2).

What about reputation cost?

Our model on corporate hybrids incorporates a reputation cost as a percentage of the issue's nominal

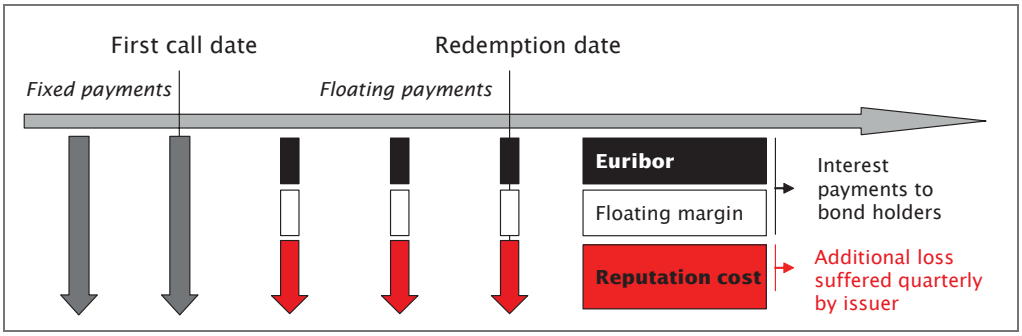
To model the decision of the company to extend or redeem the security after the first call date, we introduce a parameter called the cost of reputation that accounts for the potential impact of such a decision on the future access of the company to debt capital markets. In our article about corporate hybrids, this parameter is set to 10% of the issue's nominal for corporate hybrids which means that a company will not extend a hybrid issue if the gain is not greater than 10% of the issue's nominal (€50m for a €500m issue for example, see Appendix A for more details on this).

For the sub insurance issues, the reputation cost is an additional step-up paid in case of extension

We realised that this reputation cost expressed as a percentage of nominal is not a very intuitive parameter so we decided to look at the reputation cost in a slightly different way, that is, in terms of reputation step-up. Namely, we assume that extending the security means incurring a certain cost of reputation which is equivalent to an additional step-up in bp paid as long as the security is extended. This step-up is costly for the issuer but is actually lost. Investors do not receive any benefit from it. We believe that measuring reputation cost in bp instead of figures makes it easier to interpret that key variable. This change is mostly cosmetic and does not affect the impact of reputation cost in the model.

The extension cost is a loss suffered quarterly by issuer until redemption date

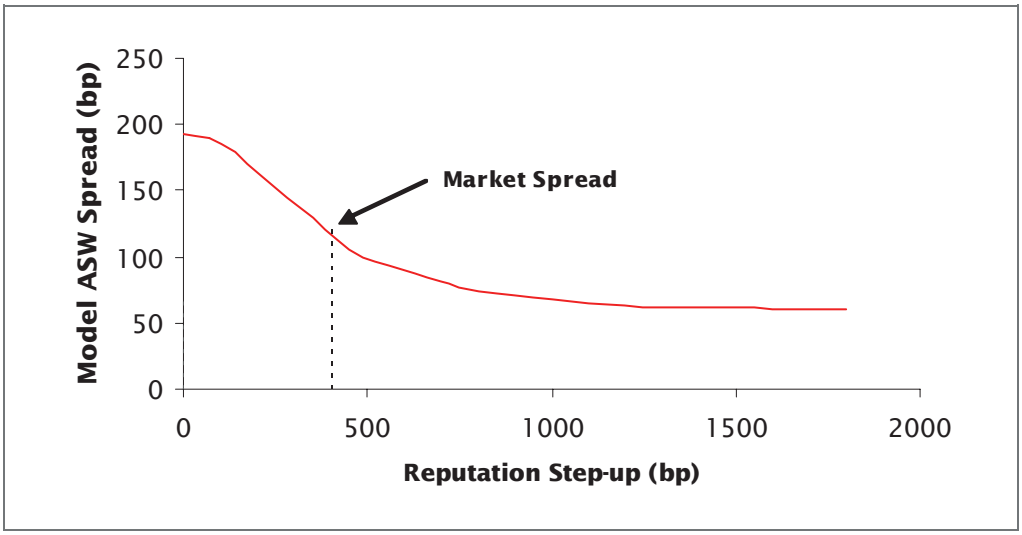
Reputation cost in basis points



Source: SG Credit Research

Below is the sensitivity analysis of the Standard Life 5.314% perp-15 ASW spread to the reputation step-up assumption. The graph shows that the reputation cost has a significant impact on our model spread (the ASW spread ranges from 60 to 195bp).

The cost of reputation has a significant impact on the Standard Life 5.314% perp-15 ASW spread



Source: SG Credit Research

Coupon deferral clauses

Subordinated insurance issues have specific deferral clauses which differ from the clauses embedded in corporate hybrids. In this section, we go through these differences by detailing the assumptions we made in each case.

Deferral indexed on solvency ratios

Many sub insurance issues have a deferral clause indexed on solvency ratios

The first type of deferral that is specific to sub insurance issues is the deferral indexed on solvency ratios. A lot of securities have a coupon deferral option which states that coupons can be deferred when solvency ratios are breached and dividends are stopped (this is the case in particular for the Aviva 5.75% 21-11, Aviva 5.25% 23-13, Aviva 5.7% perp-15, Axa 6.75% 20-10, CNP 5.75% 21-11, CNP 5.25% 23-13 and Groupama 4.675% perp-15). Some other securities have a mandatory deferral clause in case of a solvency ratio breach: this is the case for the Aviva 4.7291% perp-14, Clerical Medical 6.45% 23-13, Clerical Medical 4.25 perp, Eureko 5.125% perp, Hannover Re 5% perp-15, ING 4.175% perp-15, Standard Life 5.314% perp-15 and Standard Life 6.375% 22-12. All these deferral options are cumulative except the Hannover Re perp-15.

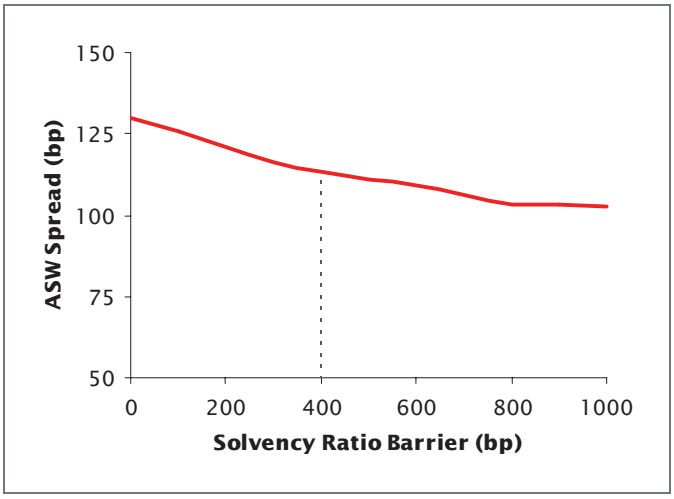
We assume that the solvency ratio would be breached if short-term spreads reach 400bp

Solvency ratio history for insurers is available only for the last few years and is insufficient to help us perform a statistical analysis of the risks for each issuer to breach the ratio. We therefore decided to use a threshold on CDS spreads as the trigger for solvency ratio breach. On the basis of empirical evidence on spreads of stressed European financial institutions, we have assumed that short-term CDS spread levels of 400bp or more would mean breached solvency ratios. This assumption is challenged in Appendix B: a 500bp barrier does not change the results significantly for most issues.

The solvency ratio assumption has a dramatic impact on non cumulative deferral issues but a moderate one on cumulative deferral issues

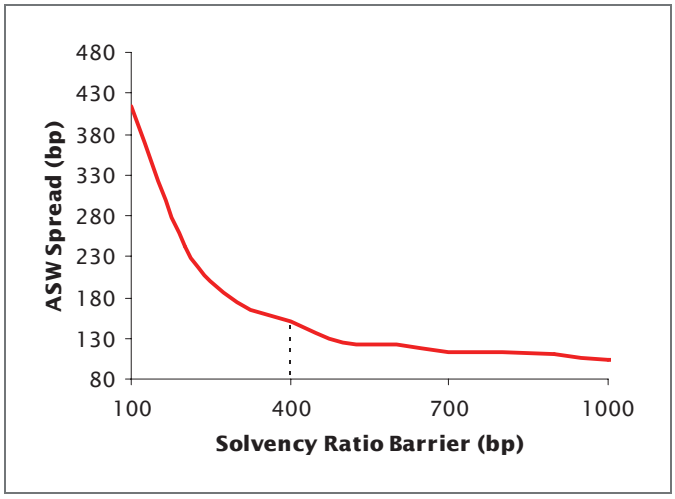
The graph below shows the impact of this assumption on the ASW spread of the Standard Life 5.314% perp-15 (cumulative deferral) and of the Hannover Re perp-15 (non cumulative deferral). It shows that the impact is limited on the Standard Life issue since it is cumulative while it is significant on the Hannover Re 5% perp-15 issue since coupons are cancelled as soon as the German solvency ratio is breached. The Hannover Re 5% perp-15 is the only sub issue with a non cumulative deferral indexed on the solvency ratio.

The solvency breach threshold has a limited impact on Standard Life 5.314% perp-15 (cumulative deferral)...



Source: SG Credit Research

... but a significant impact on Hannover Re 5% perp-15 (non cumulative deferral)



Source: SG Credit Research

We also used 400bp as the threshold on CDS spreads above which dividends were stopped. It is lower than the 700bp threshold that we used for corporates but it reflects the fact that a 400bp spread for an insurer corresponds to a more stressed financial situation than a 400bp spread for a corporate.

The Allianz 5.5% perp-14 and AGF 4.625% perp cases

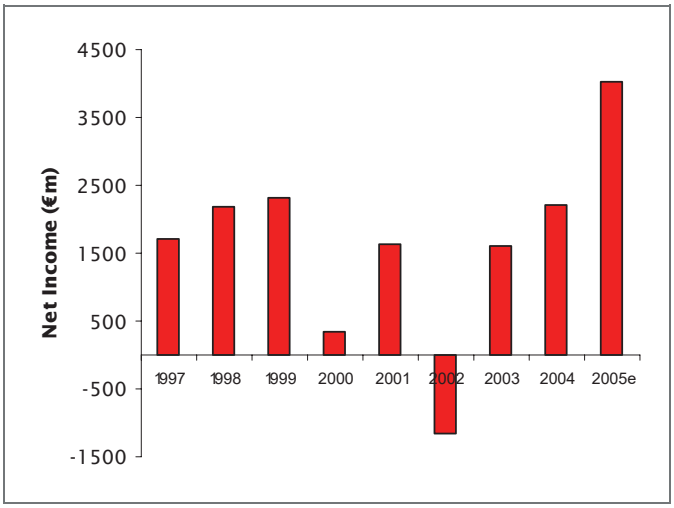
Two euro-denominated issues have a mandatory deferral clause indexed on an earnings ratio: the Allianz 5.5% perp-14 and the AGF perp. For these issues, deferral is non cumulative in some cases, which means that missed coupon payments will not be paid back to investors. This language involves potentially more risk than the cumulative options embedded in most other insurance subordinated securities.

The Allianz perp-14 mandatory deferral clause is triggered by an "IFRS event". An IFRS event is triggered when average reported net income after taxes and minority interests over the prior four quarters is below zero (under IFRS accounting or any other accounting principles adopted by the issuer in preparing its consolidated accounts). If there is an IFRS event and no dividends are paid, the coupon is cancelled. If dividends are paid, the coupon is deferred and paid later via an ACSM (Alternative Coupon Satisfaction Mechanism) process.

Whilst we have no reason to believe that Allianz will report an average net loss in the coming quarters, going back to 2002 and 2003 shows that the IFRS event would have been triggered if the bond had been outstanding then. On the other hand, no dividend payment has been missed by Allianz since 1951, so in 2002, coupons wouldn't have been cancelled but deferred and paid a few months later.

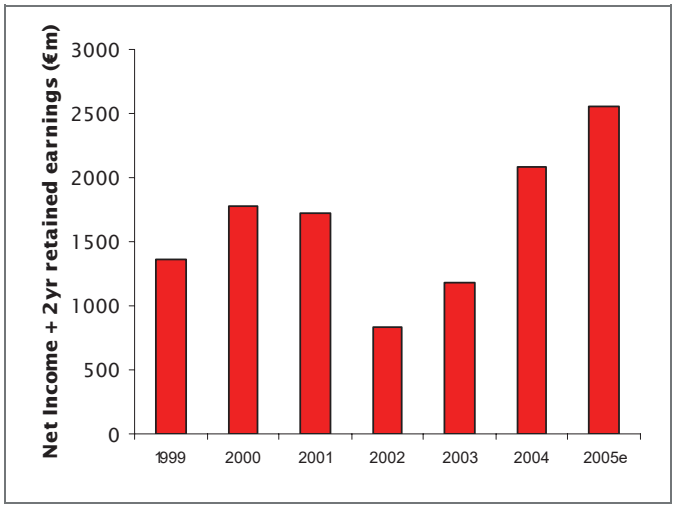
Like for corporate hybrids with similar mandatory deferral clauses, we perform a statistical analysis of past profits (see the left-hand graph below). With a long-term value for profits equal to our 2005 equity analysts' forecasts (€4.1bn), this analysis gives us a 6% probability for profits to be negative in 10 years time. This probability is then adjusted by the risk premium of the current credit market (please refer to the October 05 article for more details on this). According to our computations, the value of the option is 49bp. This is due to the non cumulative feature of the deferral option when dividends are omitted (which occurs when short-term spreads reach 400bp in our framework).

Allianz profit history



Source: SG Equity Research

AGF net income + 2yr retained earnings history



Source: SG Equity Research

The AGF perp-15 case is also interesting. Like the Allianz bond, the AGF undated subordinated bond has an earnings-related mandatory deferral trigger. In the case of the AGF bond, mandatory deferral is triggered by the insurer reporting a loss which is greater than the cumulative retained earnings in the prior two years. The actual deferral trigger looks slightly less severe than is the case for the Allianz T1 which is only triggered by reporting a bottom line loss (see the right-hand graph above for the history of the deferral trigger). However, unlike the Allianz structure, the coupon is immediately cancelled for the AGF bond without the need to meet further criteria on dividends. Given the current conditions in the sub insurance market, we value the option at 71bp in ASW spread. The mandatory deferral itself is worth only 14bp because the probability of a mandatory deferral trigger is small in our model. This shows specific features of each hybrid issue deserve attention.