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NEWSLETTER OF THE REINSURANCE SECTION

Embedded Derivatives and Financial Reinsurance

by Larry Carson

Disclaimer

The following paper sets out the approach being used by Reinsurance Group of America (RGA) to apply SFAS 133 Implementation Issue B36 to coinsurance funds-withheld and modified coinsurance transactions that are classified as "financial reinsurance." The information in this paper is provided only for information purposes and is not intended and should not be construed as accounting, auditing, legal or tax advice with respect to any specific facts or circumstances, as the facts and circumstances at other companies may be different materially from those at RGA and may result in different conclusions. RGA makes no representation or warranty as to the accuracy or completeness of the information provided herein, and you may not rely for any purpose on any ideas, judgments, opinions or analyses provided in this paper. You are encouraged to consult with your accountants, auditors, legal and other professional advisors to determine the proper course of action for your company in connection with the matters discussed in this paper.

Abstract

Financial reinsurance transactions contain two embedded derivatives as defined under B36: one within the funds-withheld asset and the other within the experience refund provision. The net of these two embedded derivatives, which is what must be placed at market value on the GAAP balance sheet, is zero at all points in time at which the transaction continues to be considered financial reinsurance.

Background

This white paper sets out a proposed application of SFAS 133 Implementation Issue B36 to coinsurance funds-withheld and modified coinsurance transactions that are classified as "financial reinsurance."

B36 requires the identification, bifurcation and valu-

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Implications of a Consolidating Marketplace

A report from an ACLI Annual Conference Session

by Hank Ramsey

What will be left of the reinsurance marketplace when the consolidations are over? That question and others were addressed by a session featuring an S&P analyst, a pricing actuary and a reinsurance executive on October 14, 2003 in Miami when the American Council of Life Insurers held their annual conference. The consensus was that direct writers have become "hooked on reinsurance" in recent years, and are feeling some pain as reinsurers consolidate. The remaining reinsurers are not bidding as aggressively, particularly for business that is not as profitable as they would like it to be.

Rodney Clark, a director at S&P, led off with his assessment of the market. He showed how the market has become much more concentrated in the last six years. In 1997, 16 reinsurers wrote 90 percent of the market. Today, that number is down to 11 reinsurers, and he estimated that we may be down to six to eight reinsurers by the end of 2005. Mergers and acquisitions account for most of the decline in reinsurers. Mr. Clark recited a quick list of transactions, based on 1997 rankings:

- #1 ERC bought #8 Phoenix Re, and then #11 AUL Re
- #3 RGA Re bought #10 Allianz Re
- #5 Swiss Re bought #6 Life Re, and then #7 Lincoln Re
- #9 Guardian has put their reinsurance business in runoff
- #15 Munich Re bought #16 CNA Re

[Subsequent to the conference, ERC announced that it was selling the old Phoenix Re business and placing their remaining life reinsurance operations in run-off.]

Mr. Clark said there are many reasons for the consolidation. Some companies have exited reinsurance as a line of business; others have succumbed to financial distress, capital strain or lack of scale. With the attractive margins available in the current hard P&C reinsurance market, access to capital has been limited for life reinsurers that are part of multi-line reinsur-

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ation in all coinsurance funds-withheld and modified coinsurance transactions of embedded derivatives contained within those agreements. While there is considerable disagreement as to what risks these embedded derivatives encompass, what is the "host contract" (in the parlance of SFAS 133) and other related issues, there is little doubt that B36 applies equally to all funds-withheld and modified coinsurance transactions, whether or not they are classified as "financial reinsurance."

Having said that, the application of B36 to financial reinsurance transactions is problematic at best. Taken literally, B36 requires the identification, bifurcation and valuation of an embedded derivative within the funds-withheld or modco asset, which, for a financial reinsurance transaction, does not even appear on the GAAP balance sheet! A blind application of B36 would not take into account the specialized nature of financial reinsurance transactions, which current GAAP accounting recognizes as having little to no economic impact outside of the reinsurance fees collected. It is doubtful whether this would create greater transparency on a company's GAAP financials or lead to greater understanding of the economic results of such transactions.

As we will argue below, however, a proper application of B36 to financial reinsurance transactions results in no net balance sheet or income statement impact, as there are two completely offsetting embedded derivatives to be found in such transactions.

Note that while the following analysis is from a reinsurer's perspective, we believe that a ceding company's perspective should follow a similar logic.

Introduction

For purposes of this discussion, "financial reinsurance" transactions are defined as reinsurance transactions (and related transactions) that fail to meet the SFAS 113 test to be accounted for as reinsurance under GAAP accounting[1]. In essence, financial reinsurance transactions are those where the likelihood of realizing a material, long-term economic loss is low.

We distinguish between two types of financial reinsurance transactions:

1. A "non-cash" financial reinsurance transaction is one in which the net cash flow to the ceding company either at treaty inception or upon new business being added is equal to zero. Under current GAAP accounting, there are no assets or liabilities on the GAAP balance sheet, and the GAAP income consists of the fees earned under the reinsurance transaction. If net cash other than the fees changes hands under such a transaction—typically, this would happen if a loss develops on the underlying reinsurance, such that a loss carryforward is established (a fairly rare occurrence)—then such cash is accounted for the same way as cash ceding commissions under a "cash" financial reinsurance transaction.

2. A "cash" financial reinsurance transaction is one in which the net cash flow to the ceding company either at treaty inception or upon new business being added is positive. The GAAP balance sheet shows an asset equal to the cash outstanding—and nothing else—while GAAP income consists of the interest and fees earned on the cash outstanding.

Non-Cash Financial Reinsurance Transactions

We will assume that we are working with a generic coinsurance funds-withheld financial reinsurance transaction (the treatment for a combination coinsurance-modified coinsurance transaction would be substantially the same).

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[1] This determination is made on an ongoing basis. If a financial reinsurance transaction experiences a significant change to its risk profile, then this discussion may no longer apply, i.e., SFAS 133 DIG B36 might need to be applied to such a transaction.

For an accounting period t, we define the following terms:

$PRG_t = P - B - E - \Delta V + r_t \bullet FW_{t-1}$

where PRG = preliminary reinsurance gain
P = premiums
B = benefits
E = commission and expense allowances
V = statutory reserve
r_t = funds-withheld interest rate applicable to period t
FW = funds-withheld balance.

Next, we define an experience refund for accounting period t as follows:

$ER_t = \max \{ 0, PRG_t - F_t - LCF_{t-1} \bullet (1 + i_t) \}$

where F = reinsurance fees
LCF = loss carryforward
i_t = loss carryforward interest rate applicable at time t
= 3-month $LIBOR_t$ + j
j = spread over LIBOR

with the further provision that ER may be set to 0 at the option of the reinsurer after a certain point in time and/or upon other specified conditions[2].

We also define the loss carryforward at time t as

$LCF_t = \max \{ 0, LCF_{t-1} \bullet (1 + i_t) + F_t - PRG_t \}$.

Then, at any given point in time, the reinsurance cash settlement is defined as:

$CS = PRG - ER$.

At the point in time that experience refunds are set to 0 by the reinsurer, the ceding company is allowed to recapture the treaty by repaying any current loss carryforward.

Application of B36

We are assuming, for purposes of this discussion, that this reinsurance transaction has been determined to be financial reinsurance, i.e., there is a low probability of realizing a material, long-term economic loss. Put another way, sensitivity testing has indicated that, with high likelihood, the ceding company will recapture this transaction at the appropriate time. Since recapture entails the repayment of any loss carryforward, which, by its very definition accumulates any fees that were previously not collected out of statutory profits, it follows that non-cash financial reinsurance transactions are those with a high degree of likelihood that the reinsurer will collect the reinsurance fees and nothing more. [3]

In other words, with a high degree of likelihood, the present value at treaty inception of the cash settlements (discounted at the short-term series of interest rates i_t) will be equal to the present value of the reinsurance fees, i.e., PV (CS) = PV (F). More broadly, under the assumption that we are testing the financial reinsurance transaction on an ongoing basis to ensure that it still qualifies as financial reinsurance, we may say that, at any given point in time t,

$PV_t (CS) = PV_t (F) + LCF_t$.

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[2] Actually, what we are calling the experience refund may be thought of as consisting of two pieces: a decrease in the relief balance and a true refund of "excess" profits. In other words, what we are calculating above as ER is the amount of profits available, and these may either (a) be used to amortize the relief (by increasing the funds-withheld balance); or (b) be returned to the ceding company. In either case, the impact on the current accounting period's cash settlement is the same, since both the increase in the funds-withheld balance and an experience refund are items that the reinsurer pays in cash to the ceding company. However, the division of this amount into these two components does impact the reinsurance settlement items in future accounting periods, as it determines the beginning-of-period funds-withheld balance for the next accounting period.

[3] Of course, while experience refunds are being paid, the reinsurer cannot collect any more income than the reinsurance fees.

Substituting terms, we see that, with a high degree of likelihood,

$$\begin{aligned} PV_t(F) + LCF_t &= PV_t(CS) \\ &= PV_t(PRG - ER) \\ &= PV_t(PRG) - PV_t(ER) \end{aligned}$$

or, rearranging terms,

$PV_t(ER) = PV_t(PRG) - PV_t(F) - LCF_t$.

To be more specific,

(1) $$PV_t(ER) = \sum_{k=t+1}^{w} \frac{d_k}{d_t} \bullet ER_k = \sum_{k=t+1}^{w} \frac{d_k}{d_t} \bullet PRG_k - \sum_{k=t+1}^{w} \frac{d_k}{d_t} \bullet F_k - LCF_t$$, where

$$d_k = \prod_{m=1}^{k} (1+i_m)^{-1} = \prod_{m=1}^{k} (1+LIBOR_m+j)^{-1}$$

and w = time of recapture.[4]

Now, for any period t,

$$\begin{aligned} PRG_t &= P - B - E - \Delta V + r_t \bullet FW_{t-1} \\ &= P - B - E - \Delta V + h_t \bullet FW_{t-1} + (r_t - h_t) \bullet FW_{t-1} \\ &= L_t + H_t + ED_t \end{aligned}$$

where
- h_t = interest rate for period t on host contract
- L_t = liability cash flows for period t = $P - B - E - \Delta V$
- H_t = host contract interest for period t = $h_t \bullet FW_{t-1}$
- ED_t = embedded derivative cash flows for period t = $(r_t - h_t) \bullet FW_{t-1}$

Substituting into equation (1) above, we get equation (2):

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[4] One may question what is the proper set of discount rates to be used in computing present values. As the following analysis will show, using the discount rates LIBOR + j, where j is the spread over LIBOR used in calculating the treaty loss carryforward, leads to a value of 0 for the embedded derivative at treaty inception (indeed, at all times for as long as the treaty is still sufficiently profitable to be considered financial reinsurance). This is because, under most scenarios, the present value of future cash flows associated with the embedded derivative, discounting at LIBOR + j, will be 0. Since the embedded derivative needs to have a value of 0 at treaty inception, this implies that discounting at LIBOR + j is correct.

(2)
$$PV_t(ER) = \sum_{k=t+1}^{w} \frac{d_k}{d_t} \bullet (L_k + H_k + ED_k) - \sum_{k=t+1}^{w} \frac{d_k}{d_t} \bullet F_k - LCF_t$$
$$= \sum_{k=t+1}^{w} \frac{d_k}{d_t} \bullet (L_k + H_k + ED_k - F_k) - LCF_t$$

Next, we note that

$ER_t = \max\{0, PRG_t - F_t - LCF_{t-1} \bullet (1+i_t)\}$
$= \max\{0, L_t + H_t + ED_t - F_t - LCF_{t-1} \bullet (1+i_t)\}.$

Given that any existing loss carryforward is paid at the time of recapture[5], we know that $LCF_w = 0$.

Thus,
$$LCF_t = LCF_{(t+1)-1} \bullet \frac{d_{(t+1)-1}}{d_t} - LCF_w \bullet \frac{d_w}{d_t}$$
$$= \sum_{k=t+1}^{w} \left(LCF_{k-1} \bullet \frac{d_{k-1}}{d_t} - LCF_k \bullet \frac{d_k}{d_t} \right)$$
$$= \sum_{k=t+1}^{w} \frac{d_k}{d_t} \bullet (LCF_{k-1} \bullet (1+i_k) - LCF_k)$$

Substituting into equation (2) above, we get equation (3), for any point in time t:

(3)
$$PV_t(ER) = \sum_{k=t+1}^{w} \frac{d_k}{d_t} \bullet (L_k + H_k + ED_k - F_k) - LCF_t$$
$$= \sum_{k=t+1}^{w} \frac{d_k}{d_t} \bullet (L_k + H_k + ED_k - F_k) - \sum_{k=t+1}^{w} \frac{d_k}{d_t} \bullet (LCF_{k-1} \bullet (1+i_k) - LCF_k)$$
$$= \sum_{k=t+1}^{w} \frac{d_k}{d_t} \bullet (L_k + H_k + ED_k - F_k - LCF_{k-1} \bullet (1+i_k) + LCF_k)$$

Finally, when considering the present value of future cash settlements at any point in time t, we arrive at equation (4):

(4)
$$PV_t(CS) = PV_t(PRG - ER)$$
$$= PV_t(PRG) - PV_t(ER)$$
$$= \sum_{k=t+1}^{w} \frac{d_k}{d_t} \bullet (L_k + H_k + ED_k) - \sum_{k=t+1}^{w} \frac{d_k}{d_t} \bullet (L_k + H_k + ED_k - F_k - LCF_{k-1} \bullet (1+i_k) + LCF_k)$$
$$= \sum_{k=t+1}^{w} \frac{d_k}{d_t} \bullet (F_k - (LCF_k - LCF_{k-1} \bullet (1+i_k)))$$

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[5] Note that this analysis does not require the ceding company to recapture the reinsurance agreement at the time at which it is most advantageous to do so. It merely assumes that, with very high likelihood, the ceding company will recapture at some point in the future. In other words, even if the ceding company does not recapture the transaction at the point in time when economic analysis would suggest that it is in its best interest to do so, sensitivity testing would still show that, with very high likelihood, we expect them to do so in the future.

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In other words, with a high degree of likelihood, the only items that matter in terms of the cash settlements are the reinsurance fees, as well as the change in any loss carryforward balance, with interest.

What we then see, is:

1. There is an embedded derivative in both the liabilities (i.e., within the preliminary reinsurance gain) as well as in the experience refunds.
2. On a present value basis, these embedded derivative cash flows precisely cancel each other out, with a high degree of likelihood.

We therefore conclude that, taking into account both embedded derivatives, the market value of the single, net embedded derivative is 0 at any given point in time[6].

Cash Financial Reinsurance Transactions

For the purpose of this discussion, we will assume that we are working with a coinsurance funds-withheld financial reinsurance transaction (the treatment for a combination coinsurance-modified coinsurance transaction would be substantially the same).

For an accounting period t, we define the following terms:

$$PRG_t = P - B - E - \Delta V + r_t \bullet FW_{t-1}$$

where
- PRG = preliminary reinsurance gain
- P = premiums
- B = benefits
- E = expense allowances
- V = statutory reserve
- r_t = funds-withheld interest rate applicable to period t
- FW = funds-withheld balance.

Next, we define an experience refund for accounting period t as follows:

$$ER_t = \max \{0, PRG_t - EA_{t-1} \bullet (1+i_t)\}$$

where
- EA = cash experience account
- i_t = cash experience account interest rate applicable at time t = 3-month $LIBOR_{t+j}$
- j = spread over LIBOR (which includes both an interest component and a fee component)

with the further proviso that ER may be set to 0 at the option of the reinsurer after a certain point in time and/or upon other specified conditions[7].

We also define the cash experience account at time t as

$$EA_t = \max \{ 0, EA_{t-1} \bullet (1 + i_t) - PRG_t \} .$$

Then, at any given point in time, the reinsurance cash settlement is defined as:

$$CS = PRG - ER .$$

At the point in time that experience refunds are set to 0 by the reinsurer, the ceding company is allowed to recapture the treaty by repaying any unamortized cash experience account.

Application of B36

We are assuming, for purposes of this discussion, that this reinsurance transaction has been determined to be financial reinsurance, i.e., there is a low probability of realizing a material, long-term economic loss. Put another way, sensitivity testing has indicated that, with high

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[6]Note that, per SFAS 133 Implementation Issue B15, there can be only one embedded derivative per hybrid instrument. In other words, a reporting entity is required to net these two embedded derivatives against each other.

[7]Here, since cash is changing hands—which is being kept track of via the experience account—an experience refund would not be payable until the experience account had reached 0. This is what is commonly referred to as "full amortization," since all of the reinsurance gains are being used to amortize the experience account. Some transactions instead feature "scheduled amortization," where, assuming specified conditions are met, the amount of amortization of the experience account each accounting period is limited by some pre-defined formula, and any profits in excess of those being used to amortize the experience account are returned to the ceding company as an experience refund.

likelihood, the ceding company will recapture this transaction at the appropriate time. Since recapture entails the repayment of any cash experience account, which, by its very definition, accumulates any cash and fees on that cash relief that were previously not collected out of statutory profits, it follows that cash financial reinsurance transactions are those with a high degree of likelihood that the reinsurer will collect its cash investment, interest and reinsurance fees on that cash, and nothing more.

In other words, with a high degree of likelihood, the present value at treaty inception of the cash settlements (discounted at the short-term series of interest rates i_t) will be equal to the initial cash ceding commission. More broadly, under the assumption that we are testing the financial reinsurance transaction on an ongoing basis to ensure that it still qualifies as financial reinsurance, we may say that, at any given point in time *t*,

$PV_t\,(CS) = EA_t$.

In other words, at time *t*,

$EA_t = PV_t(CS) = PV_t(PRG - ER) = PV_t(PRG) - PV_t(ER)$

and thus

$PV_t\,(ER) = PV_t\,(PRG) - EA_t$. In other words, we arrive at equation (5):

$$PV_t(ER) = \sum_{k=t+1}^{w} \frac{d_k}{d_t} ER_k = \sum_{k=t+1}^{w} \frac{d_k}{d_t} PRG_k - EA_t \tag{5}$$

where d_k and *w* are defined as before.

As before, we break up PRG_k into its constituent parts: $PRG_k = L_k + H_k + ED_k$.

Substituting into equation (5), we arrive at equation (6):

$$PV_t(ER) = \sum_{k=t+1}^{w} \frac{d_k}{d_t} \bullet (L_k + H_k + ED_k) - EA_t \tag{6}$$

Then, $ER_k = \max\{0, PRG_k - EA_{k-1} \bullet (1+i_k)\}$
$= \max\{0, L_k + H_k + ED_k - EA_{k-1} \bullet (1+i_k)\}$

Given that any existing experience account is paid at the time of recapture, we know that $EA_w = 0$.

Thus,

$$EA_t = EA_{(t+1)-1} \bullet \frac{d_{(t+1)-1}}{dt} - EA_w \bullet \frac{d_w}{d_t}$$

$$= \sum_{k=t+1}^{w} \left(EA_{k-1} \bullet \frac{d_{k-1}}{d_t} - EA_k \bullet \frac{d_k}{d_t} \right)$$

$$= \sum_{k=t+1}^{w} \frac{d_k}{d_t} \bullet (EA_{k-1} \bullet (1 + i_k) - EA_k)$$

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Substituting into equation (6) on the previous page, we get equation (7), for any point in time t:

$$\begin{aligned} PV_t(ER) &= \sum_{k=t+1}^{w} \frac{d_k}{d_t} \bullet (L_k + H_k + ED_k) - EA_t \\ &= \sum_{k=t+1}^{w} \frac{d_k}{d_t} \bullet (L_k + H_k + ED_k) - \sum_{k=t+1}^{w} \frac{d_k}{d_t} \bullet (EA_{k-1} \bullet (1 + i_k) - EA_k) \\ &= \sum_{k=t+1}^{w} \frac{d_k}{d_t} \bullet (L_k + H_k + ED_k - EA_{k-1} \bullet (1 + i_k) + EA_k) \end{aligned}$$

Finally, when considering the present value of future cash settlements at any point in time t, we arrive at equation (8):

$$\begin{aligned} PV_t(CS) &= PV_t(PRG - ER) \\ &= PV_t(PRG) - PV_t(ER) \\ &= \sum_{k=t+1}^{w} \frac{d_k}{d_t} \bullet (L_k + H_k + ED_k) - \sum_{k=t+1}^{w} \frac{d_k}{d_t} \bullet (L_k + H_k + ED_k - EA_{k-1} \bullet (1 + i_k) + EA_k) \\ &= \sum_{k=t+1}^{w} \frac{d_k}{d_t} \bullet (EA_{k-1} \bullet (1 + i_k) - EA_k) \end{aligned}$$

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In other words, with a high degree of likelihood, the only items that matter in terms of the cash settlements is the change in the experience account balance, with interest and fees on that experience account.

What we then see is:

1. There is an embedded derivative in both the liabilities (i.e., within the preliminary reinsurance gain) as well as in the experience refunds.
2. On a present value basis, with a high degree of likelihood, these embedded derivative cash flows precisely cancel each other out.

We therefore conclude that, taking into account both embedded derivatives, the market value of the single, net embedded derivative is 0 at any given point in time for cash financial reinsurance transactions, as well.

Conclusion

Financial reinsurance transactions are structured such that, with a high degree of likelihood, the reinsurer will not experience a material, long-term economic loss. This leads to not one, but two embedded derivatives, one within the funds-withheld asset and the other within the experience refund provision. The high likelihood of no long-term economic loss necessarily implies that the net of these two embedded derivatives will be equal to zero at all times.