Discussion of Insurance Capital as a Shared Asset

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Abstract

In his 2005 ASTIN paper (reprinted in the CAS 2006 Fall Forum), Donald Mango's ground-breaking work [1] in developing the concepts of insurance capital as a shared asset and Economic Value Added (EVA) are discussed with special emphasis on the purpose and calculation of the important Capital Call Costs. The EVA approach permits one to charge for risk (capital usage) and measure profitability at any desired level of definition while satisfying the key additivity property for risk charges without needing to allocate capital. Test examples are discussed that illustrate the impact on profitability of rate changes, changes in the distributions of premium written by line of business, inaccurate pricing due to parameter and model risk, correlation between lines of business, alternative reinsurance programs, and alternative selections for the Capital Call Cost function which is central to the EVA approach.

For those who prefer to measure returns as a percentage of invested capital, a Risk Return on Capital model (RROC) is suggested as an alternative way to integrate desirable properties of the EVA approach and the return on risk adjusted capital (RORAC) approach based upon riskiness leverage models. This method measures returns that are a reward for exposing capital to risk of loss after reflecting the cost of required rating agency capital.

Keywords. Capital allocation, cost of capital, enterprise risk management, return on equity, RMK algorithm, risk load.

1. INTRODUCTION

Actuaries frequently allocate capital to line of business or individual risk in an effort to calculate risk loads or evaluate profitability by calculating a risk adjusted return in the form of a return on equity (ROE) metric. Concerns have been expressed about ROE methods [7], especially the fact that the value inherent in the unallocated surplus is ignored (the entire surplus supports each and every risk). In his 2005 ASTIN paper on "Insurance Capital as a Shared Asset" [1], Donald Mango has introduced a method that eliminates the need for allocation of capital which he believes is more grounded in insurer realities.

2. SUMMARY WITH COMMENTS

Donald Mango treats insurance capital as a shared asset, with the insurance contracts having simultaneous rights to access potentially all of that shared capital. Shared assets can be scarce and essential public entities (e.g., reservoirs, fisheries, national forests), or desirable private entities (e.g., hotels, golf courses, beach houses). The access to and use of the assets is controlled and regulated by their owners; this control and regulation is essential to preserve the asset for future use. The aggregation risk is a common characteristic of shared asset usage, since shared assets typically have more members who could potentially use the asset than the asset can safely bear [1].

Mr. Mango differentiates between consumptive and non-consumptive use of an asset. A consumptive use involves the transfer of a portion or share of the asset from the communal asset to an individual, such as in the reservoir water usage and fishery examples. Non-consumptive use involves temporary, limited transfer of control which is intended to be non-depletive in that it is left intact for subsequent users. Examples of non-consumptive use include boating on a reservoir, playing on a golf course or renting a hotel room [1].

While shared assets are typically used in only one of the two manners, some shared assets can be used in either a consumptive or non-consumptive manner, depending on the situation. Mr. Mango gives the example of renting a hotel room. While the intended use is benign occupancy (non-consumptive), there is the risk that a guest may fall asleep with a lit cigarette and burn down a wing of the hotel (clearly consumptive) [1].

Mr. Mango notes that rating agencies use different approaches in establishing ratings, but the key variable is the capital adequacy ratio (CAR) which is the ratio of actual capital to required capital. Typically the rating agency formulas generate required capital from three sources: premiums, reserves, and assets. Current year underwriting activity will generate required premium capital. As that premium ages, reserves will be established that will generate required reserve capital. As the reserves are run off, the amount of required reserve capital will diminish and eventually reach zero when all claims are settled. As there are usually minimum CAR levels associated with each rating level, Mr. Mango points out that a given amount of actual capital corresponds to a maximum amount of rating agency required capital. Given reserve levels, this implies a limit to premium capital and thus to how much business can be written. Mr. Mango summarizes by stating than an insurer's actual capital creates underwriting capacity, while underwriting activity (either past or present) uses up underwriting capacity [1].

Mr. Mango notes that the generation of required capital, whether by premiums or reserves, temporarily reduces the amount of capacity available for other underwriting. Being

temporary, it is similar to capacity occupancy, a non-consumptive use of the shared asset. Capacity consumption occurs when reserves must be increased beyond planned levels. Mr. Mango points out that this involves a transfer of funds from the capital account to the reserve account, and eventually out of the firm. Mr. Mango summarizes by stating that the two distinct impacts of underwriting an insurance portfolio are as follows [1]:

(1) Certain occupation of underwriting capacity for a period of time.

(2) Possible consumption of capital.

He notes that this "bi-polar" capital usage is structurally similar to a bank issuing a letter of credit (LOC). The dual impacts of a bank issuing a LOC are as follows [1]:

(1) Certain occupation of capacity to issue LOC's, for the term of the LOC.

(2) Possible loan to the LOC holder.

Mr. Mango notes that banks receive income for the issuance of LOC's in two ways [1]:

(1) An access fee (i.e., option fee) for the right to draw upon the credit line.

(2) Loan payback with interest.

Mr. Mango notes that every insurance contract in an insurer's portfolio receives a parental guarantee: Should it be unable to pay for its own claims, the contract can draw upon the available funds of the company. He states that the cost of this guarantee has two pieces [1]:

(1) A Capacity Occupation Cost, similar to the LOC access fee.

(2) A Capital Call Cost, similar to the payback costs of accessing an LOC, but adjusted for the facts that the call is not for a loan but for a permanent transfer, and that the call destroys future underwriting capacity.

Mr. Mango states that a capacity occupation cost is an opportunity cost, and thinks of it as a minimum risk adjusted hurdle rate. He computes it as the product of an opportunity cost rate and the amount of required rating agency capital generated over the active life of the contract. However, he does not explicitly credit interest on supporting surplus in his formula or in his examples, but usually interprets the opportunity cost of capital as a spread above investment returns on capital. In the examples discussed below, I show that this can be a significant factor. I think it reasonable to credit the mean interest earned over all simulations on required rating agency capital using a risk free rate, as we are already recognizing the opportunity cost of earmarking this capital to support the business written.

Mr. Mango also develops a formula for computing capital call costs which are his true

risk loads, and defines the expected capital usage cost to be the sum of the capacity occupation cost and the expected capital call cost. He defines his key decision metric Economic Value Added (EVA) to be the NPV Return less the expected cost of capital [1]:

EVA = NPV Return – Capacity Occupation Cost – Capital Call Cost

Mr. Mango calculates capital call costs using the following algorithm:

(1) For each iteration (loss scenario) in the simulation, calculate the deviation of the loss for each segment (line of business or individual risk) from the expected loss. If the deviation from the mean is positive, there is no capital call and therefore no capital call cost. If the deviation from the mean is negative, the capital call cost equals the product of the magnitude of the deviation and the Capital Call Cost Factor. Calculate each segment's share of the portfolio capital call cost as the ratio of the segment cost to the total of these costs across all segments.

(2) Use the same procedure to calculate the portfolio capital call cost that was used to calculate segment capital call costs.

(3) Multiply the portfolio capital call cost by the segment shares calculated in (1) to calculate each segment's share of the capital call cost for that scenario.

(4) Each segment's expected capital call cost is the average of (3) over all scenarios.

The allocation procedure in the above algorithm was developed jointly by Mr. Mango, Mr. Rodney Kreps and Mr. David Ruhm [6]. It is a conditional risk allocation method which has become known as the RMK algorithm. Mr. Mango points out that the method extends risk valuation from the aggregate portfolio level down to the segments that comprise the portfolio, reflecting each segment's contribution to the total portfolio risk. The result is an internally consistent allocation of diversification benefits for which risk charges (costs of capital) are additive in any combination.

Mr. Mango notes that any capital cost function should at least equal the amount of the call (payback of the capital grant). It should also compensate for lost opportunity cost (inability to write as much business for several years until capital is replenished). Thus, Mr. Mango suggests the following form for the Capital Call Cost Factor: $1+n*r_{Opp}$.

He suggests that the determination of n could be based on the volatility of a product's pricing cycles (i.e., the likelihood that temporary capital impairment would lead to missed opportunities to write business at higher price levels). The opportunity cost of capacity r_{Opp} selected by Mr. Mango in his examples for the computation of the Capital Call Cost Factor is the same opportunity cost rate used to calculate the Capacity Occupation Cost.

Hence, if n=4 and r_{Opp} = 25%, then the Capital Call Cost Factor is 200%.

If pricing is accurate, this reviewer would theoretically expect capital grants in some years to be offset by redundancies in other years, averaging to the plan loss ratio which would equal the true Expected Loss Ratio (ELR). Hence, this reviewer believes the purpose of the capital call cost is to compensate for lost profits while capital is being replenished. Pricing errors or excessively competitive behavior may lead to market dislocations that permit risk loads of a magnitude that would be viewed by many as "payback," but this would appear in this methodology as a very healthy EVA.

Thus we have an asymmetric dynamic, where the additional capacity from upside scenarios rarely compensates for the lost capacity of downside scenarios. This is particularly true after the occurrence of extreme events, when pricing can become excessive for a limited period of time. Thus, capital call costs are intended to compensate for these missed opportunities.

Seminar notes from the 2005 Seminar on Reinsurance session on "Risk Load, Profitability Measures, and Enterprise Risk Management" may be downloaded from the CAS web site and illustrate the flexibility which this approach permits management in quantifying risk preferences. In Mr. Mango's seminar notes entitled "Insurance Capital as a Shared Asset – Theory and Practice," he points out that rating agency required capital can provide a convenient means to introduce a tail penalty. Rating agency required capital can be calculated at any level of detail, and so an additional charge can be assessed for exceeding allocated rating agency capital (this would be analogous to burning down a wing of the hotel in our illustrative example). In computing the Capital Call Cost, he assesses a moderate charge for damage within a segment's allocation (drawdown on allocated capital), and a much more severe charge for damage beyond a segment's allocation (drawdown of other segments' capital).

Assuming that correlations between segments are estimated with reasonable accuracy, it appears to this reviewer that this two step approach has the advantage of discouraging company threatening accumulations of risk, which is the central goal for an enterprise risk management system. For those willing to allocate capital as an intermediate step in allocating the cost of capital ([2], [4]), the Tail Value at Risk and Semi-Variance metrics [2] would also serve this function.

3. COMPARISON TO OTHER APPROACHES

This reviewer compared the EVA approach to the return on risk adjusted capital (RORAC) approach based upon riskiness leverage models [2] and to a modified RORAC approach which shall be referred to as a risk return on capital (RROC) model. RORAC based upon riskiness leverage models does not reflect rating agency capital requirements, particularly the requirement to hold capital to support reserves until all claims are settled. This is especially important for long tailed Casualty lines. A mean rating agency capital is computed by averaging rating agency required capital from the simulation (capital needed to support premium writings is added to the net present value, NPV, of the capital needed to support reserves on each iteration of the simulation). The mean rental cost of rating agency capital is calculated by multiplying the mean rating agency capital by the selected rental fee, which is an opportunity cost of capacity. Expected underwriting return is computed by adding the mean NPV of interest on reserves and interest on rating agency capital to expected underwriting return (profit and overhead). The expected underwriting return after rental cost of capital is computed by subtracting the mean rental cost of rating agency capital.

In my comparisons of EVA with RORAC and RROC, risk capital is a selected multiple of Excess Tail Value at Risk (XTVAR). XTVAR is defined to be the average value of $X-\mu$ when $X > x_q$, where the quantile x_q is the value of x where the cumulative distribution of X is q. Capital is allocated to line of business based upon Co-Excess Tail Values at Risk (Co-XTVAR) [4]. The same desirable properties hold for TVAR and co-TVAR as well as XTVAR and co-XTVAR [2], [3]:

(1) They can allocate risk down to any desired level of definition.

(2) They satisfy the additivity property (risk load or capital allocated to components of the portfolio sum to the total risk load or capital need for the portfolio).

(3) They are coherent measures of risk. Unlike Value at Risk, they satisfy the subadditivity axiom (the risk of a combination of exposures should not exceed the sum of the risks of the components) [5].

Mr. Venter notes that if capital is set by XTVAR, it would cover average losses in excess of expected losses for those years where the portfolio losses X exceed the q^{th} quantile x_q. It is assumed that expected losses have been fully reflected in pricing and in loss reserves. The capital allocated by co-XTVAR to a line would be the line's average losses above its mean losses in those same adverse years. Mr. Venter notes that there should be some probability

level q for which XTVAR or a multiple of it makes sense as a capital standard [4].

RROC is computed as the ratio of expected underwriting return after rental cost of capital to allocated risk capital. RROC represents the expected return for exposing capital to risk of loss, as the cost of benign rental of capital has already been reflected [3]. (It is assumed that expense items like overhead and taxes, as well as returns from any capital excess the rating agency required capital or from riskier investments that would require additional rating agency capital, would be handled at the corporate planning level.)

RROC is analogous to the Capital Call Cost in the EVA approach, here expressed as a return on capital rather than applied as a cost. In his discussion of Tail Value at Risk, Mr. Venter has noted that co-XTVAR may not allocate capital to a line of business that didn't contribute significantly to adverse outcomes [4]. In such a situation, the traditional RORAC calculation may show the line to be highly profitable, whereas RROC may show that the line is unprofitable because it did not cover the mean rental cost of rating agency capital [3].

In the EVA approach, risk preferences are reflected in the function selected and parameterized in computing the Capital Call Cost. In the RORAC and RROC approaches, risk preferences are specified in the selection of the statistic used to measure risk [2], [3]. In practice, the RORAC and RROC approaches would be parameterized to allocate the total capital of the company, which would be maintained to at least cover rating agency capital required for its desired rating. All three approaches utilize the RMK algorithm for allocating risk (measured as a Capital Call Cost in EVA and as risk capital in RORAC and RROC) to line of business [1], [2], [3].

These models were tested and results summarized in the tables below. Table 1 summarizes the test examples, while Table 2 compares simulation results. In the base case, Example 2, all lines are uncorrelated and no reinsurance is purchased. Equal amounts of premium are written in the three lines, and pricing is accurate with the plan loss ratio equaling the true Expected Loss Ratio (ELR) of 80% for each line. Aggregate losses are assumed to be modeled accurately by lognormal distributions with coefficients of variation of 80%, 20% and 40% for lines of business (LOB) 1-3, respectively.

Payout Patterns were generated based upon an exponential settlement lag distribution with mean lags to settlement of one year, five years and ten years for lines of business (LOB) 1-3, respectively. Thus, the payout patterns for LOB 1-3 can be characterized as Fast, Average, and Slow, respectively. Interest is credited on supporting surplus using risk free rates for bonds of duration equal to the average settlement lag in each line of business. In this example, interest rates of 3%, 4% and 5% for LOB 1-3, respectively, were assumed.

These are the same rates that are used to calculate Net Present Value (NPV) reserves and the NPV Reserves Capital component of Required Rating Agency Capital. For simplicity, interest rates and payment patterns are assumed to be deterministic.

Required Rating Agency Capital is computed based upon rating agency premium and reserves capital charge factors assumed appropriate for the Company's desired rating. Somewhat smaller factors were selected for the reinsurance line (LOB 4) under the assumption that the Company would not receive full credit for ceded premium and reserves because a charge for potential uncollectibility would be applied. Capital needed to support reserves for a calendar year is the product of the reserves factors and the previous year-end reserves. Capital needed to support reserves must be calculated for all future calendar years until reserves run off. Required capital to support reserves is the NPV of these capital amounts. Required Rating Agency Capital is computed by adding the products of the plan premiums and the premium capital charge factors to the required capital to support reserves.

For both RORAC and RROC models, capital needed to support the portfolio risk is calculated as 200% of XTVAR. That is, the Company wants twice the capital needed to support average 1 in 50 year or worse deviations from plan. Capital needed to support the portfolio risk is allocated to line of business based upon Co-XTVAR.

Interest is credited on supporting surplus for Example 2, but not for Example 1. In the base example, Example 2, profitability is satisfactory overall, but inadequate for LOB 1 and redundant for LOB 2 and LOB 3. Comparison of Example 1 and 2 test results demonstrates that not crediting interest on supporting surplus can have a significant impact on all three profitability measures.

In Example 3, the margins are adjusted to reflect results in the base case. The ELR's for LOB 1-3 are 60%, 88%, and 85%, respectively. The test results show that overall profitability has increased significantly and is now marginally adequate even for LOB 1 assuming the implied rate change can be achieved. Note that EVA was negative for LOB 1 in the base Example 2, but is now positive with the improved rate adequacy. A negative EVA implies that the line should not be written unless the company is required to do so for regulatory reasons or it is necessary to support other lines with positive EVA (e.g., package policies). The required rating agency capital increases slightly from the base case, but the capital needed to support the portfolio under the ROE measures (RROC and RORAC) decreases by over 22% compared to the base case.

In Example 4, premiums written by line are adjusted to reflect the base example results. Premium written in LOB 1 is reduced by $250,000, while premium written in LOB 2 and in

LOB 3 are both increased by $125,000. The portfolio profitability increases significantly as a result, but remains inadequate for LOB 1. The required rating agency capital increases modestly from the base case, but the capital needed to support the portfolio under the ROE measures decreases by nearly 18% compared to the base case.

In Example 5, a new version of the company's catastrophe model is released right after the renewal season is over. The revised model implies a reduction in the ELR for LOB 1 from 80% to 70%. The test results show that EVA improves dramatically for LOB 1 (EVA is now positive) and for the entire portfolio. The ROE measures (RROC and RORAC) improve significantly for LOB 1 and the entire portfolio. Required rating agency capital is not significantly different compared to the base case, while the capital needed to support the portfolio under the ROE measures decreases by 15%.

In Example 6, a Supreme Court decision declared recent tort reforms to be unconstitutional. The ELR for LOB 3 is revised from 80% to 100%. The EVA deteriorates dramatically for LOB 3 and for the entire portfolio. Similarly, the ROE measures deteriorate dramatically for LOB 3, while deteriorating significantly for the entire portfolio. Because LOB 3 is a long tailed line, RROC declines much more dramatically than RORAC because the mean rental cost of rating agency capital has gone up significantly due to the increased reserves that must be held for a long period of time. In the base case, LOB 3 was viewed as highly profitable by all three measures. In Example 6, LOB 3 is viewed as unprofitable by the EVA approach, marginally profitable by the RROC approach, and highly profitable by the RORAC approach. The required rating agency capital increases by over 9% from the base case, while the capital needed to support the portfolio under the ROE measures increases by over 8% compared to the base case.

Both Examples 5 and 6 demonstrate that inaccurate pricing due to parameter and model risk can significantly impact profitability estimates when those errors are discovered.

In Example 7, LOB 1 and LOB 2 losses are 50% correlated, while losses for both lines are uncorrelated with LOB 3 losses. The EVA deteriorates significantly for LOB 1, LOB 2, and for the entire portfolio. For the ROE measures (RROC and RORAC), profitability has decreased dramatically for LOB 2 because LOB 2 losses now contribute more significantly to adverse scenarios created by LOB 1. Required rating agency capital is not significantly different compared to the base case, while the capital required to support the portfolio under the ROE approaches has increased by 6.5%.

In Example 8, a stop loss reinsurance treaty is purchased for LOB 1 covering a 30% excess 90% loss ratio layer for a 10% rate. The test results show that this program modestly

improves all three profitability measures. The required rating agency capital decreases slightly from the base case, while the capital needed to support the net portfolio under the ROE measures decreases by 8.5%.

In Example 9, a 40% quota share is purchased for LOB 1 with commissions just covering variable costs. The test results show that this program had a major positive impact on all three profitability measures. The required rating agency capital decreases by nearly 6% from the base case, while the capital needed to support the net portfolio under the ROE measures decreases by over 35%.

On a technical note, when a reinsurance program is in place for a particular line of business and is invoked by a loss scenario, the average capital call cost factor for the line of business (ratio of the computed capital call charge to the deviation of the simulated loss from the mean) is applied to the deviation of the simulated reinsurance loss from the mean reinsured loss. This generates a credit capital call cost in the reinsurance line which reduces the average capital call cost for the line of business when combined with the reinsurance line.

In Examples 1-9, EVA is computed using the default assumption that the consumption fee for capital less than the required rating agency capital is 50% of the consumption fee for common capital. In Examples 10 and 11, alternative Capital Call Cost functions are parameterized and tested. In Exhibit 10, it is assumed that the consumption fee for capital less than the required rating agency capital is equal to the fee for capital consumed in excess of rating agency capital. In Exhibit 11, it is assumed that the consumption fee for capital less than the required rating agency capital is 25% of the consumption fee for common capital. Otherwise, Exhibits 10 and 11 are identical to Exhibit 9. EVA is dramatically lower in Example 10 compared to Example 9, while it is significantly improved in Example 11. These examples illustrate the importance of the selected Capital Call Cost function to the EVA approach. (The ROE measures differed slightly between Examples 9-11 due to random variation between simulations of 100,000 iterations.) Details of Examples 1-11 may be reviewed in Exhibits 1-11, respectively.

4. CONCLUSIONS

Donald Mango's very innovative work in developing the concepts of insurance capital as a shared asset and Economic Value Added contribute significantly to understanding the ways capital supports an insurance enterprise and must be financed. The EVA approach permits one to charge for risk (capital usage) and measure profitability at any desired level of definition while satisfying the key additivity property for risk charges without needing to

allocate capital. The test examples demonstrate that it can be used to measure the impact on profitability of rate changes, changes in the distributions of premium written by line of business, inaccurate pricing due to parameter and model risk, correlation between lines of business, and alternative reinsurance programs. Results for alternative Capital Call Cost functions can be compared using these kinds of test examples.

For those who prefer to measure returns as a percentage of invested capital, a Risk Return on Capital model is suggested as an alternative way to integrate desirable properties of the EVA approach and the return on risk adjusted capital approach based upon riskiness leverage models. This method measures returns on capital after reflecting the mean rental cost of rating agency capital. Thus, returns that are a reward for exposing capital to risk of loss are measured after reflecting the cost of carrying capital to support premium written and loss reserves.

Table 1: Summary of Assumptions Underlying Examples

Example	*Exhibit*	*Key Assumptions*
1	*1*	*Same as base example, Example 2, except interest is not credited on surplus.*
2	*2*	*Base example: Write equal amounts of premium in three lines of business. Pricing is accurate, as the Plan Loss Ratios equal the true ELR's. The ELR's are equal to 80% for all three lines. Aggregate losses are assumed to be modeled accurately by lognormal distributions with coefficients of variation of 80%, 20% and 40% for LOB 1-3, respectively. LOB 1-3 losses are uncorrelated. Interest is credited on supporting surplus.*
3	*3*	*Same as base example, except adjust Margins by line to reflect results. ELR's for LOB 1-3 are 60%, 88% and 85%, respectively.*
4	*4*	*Same as base example, except adjust premiums by line to reflect results. Write $0.250m less in LOB 1, and write $0.125m more in LOB 2 and in LOB 3.*
5	*5*	*Base example, where pricing model is updated after renewal. Right after renewal season, a new version of the company's cat model is released which implies a reduction in the ELR for LOB 1 to 70%. The ELR's for LOB 2 and LOB 3 remain at 80%. The Plan Loss Ratios based upon Price Monitoring are all equal to 80%.*
6	*6*	*Base example, where new information is available after renewal. Right after renewal season, a Supreme Court decision declared recent tort reforms to be unconstitutional. The ELR for LOB 3 is revised to 100%, while the ELR's for LOB 1 and LOB 2 remain at 80%. The Plan Loss Ratios based upon Price Monitoring are all equal to 80%.*
7	*7*	*Same as base example, except that LOB 1 and LOB 2 losses are 50% correlated.*
8	*8*	*Same as the base example, except a 30% xs 90% loss ratio Stop Loss Reinsurance program is purchased for LOB 1 at a 10% rate.*

9	*9*	*Same as base example, except a 40% Quota Share is purchased for LOB 1 with commission just covering variable costs.* *The Consumption Fee for Capital Less than Allocation is 120%, while the Consumption Fee for Common Capital (excess allocation) is 240%.* *These same capital call charge factors have been applied in Examples 1-8.*
10	*10*	*Same assumptions as in Example 9, with the exception of capital call factors.* *The Consumption Fee for Capital Less than Allocation and the Consumption Fee for Common Capital (excess allocation) are both set to 180%.*
11	*11*	*Same assumptions as in Example 9, with the exception of capital call factors.* *The Consumption Fee for Capital Less than Allocation is 100%, while the Consumption Fee for Common Capital (excess allocation) is 400%.*

Table 2: Comparison of Results for Test Examples

	Returns on Risk Adjusted Capital		*Risk Returns on Capital*		*Economic Value Added*	
	Gross	*Net*	*Gross*	*Net*	*Gross*	*Net*
Example	*RORAC*	*RORAC*	*RROC*	*RROC*	*EVA*	*EVA*
1	11.43%	11.43%	5.30%	5.30%	(19,077)	(19,077)
2	14.60%	14.60%	7.95%	7.95%	170,541	170,541
3	20.18%	20.18%	12.20%	12.20%	337,106	337,106
4	17.91%	17.91%	10.17%	10.17%	239,886	239,886
5	18.68%	18.68%	11.39%	11.39%	386,023	386,023
6	11.78%	11.78%	4.92%	4.92%	(187,275)	(187,275)
7	13.94%	13.94%	7.47%	7.47%	133,870	133,870
8	14.72%	15.06%	8.03%	8.14%	170,631	185,141
9	14.71%	20.03%	8.04%	11.48%	170,871	235,927
10	14.63%	19.91%	7.97%	11.40%	(27,654)	87,025
11	14.69%	19.91%	8.02%	11.41%	233,126	283,519

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Supplementary Material

Seminar notes from 2005 Seminar on Reinsurance on "Risk Load, Profitability Measures, and Enterprise

Risk Management," which may be downloaded from the CAS web site.

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Abbreviations and notations

CAR, Capital Adequacy Ratio
ELR, Expected Loss Ratio
EVA, Economic Value Added
Co-TVAR, Co-Tail Value at Risk
Co-XTVAR, Co-Excess Tail Value at Risk
LOB, Line of Business
LOC, letter of credit
RMK algorithm, a conditional risk allocation method
ROE, Return on Equity
RORAC, Return on Risk Adjusted Capital
RROC, Risk Return on Capital After Rental Cost of Ca
TVAR, Tail Value at Risk
VAR, Value at Risk
XTVAR, Excess Tail Value at Risk

Biography of the Author

Robert Bear is currently a Consulting Actuary, Reinsurance Consultant and Arbitrator in the firm he has established, RAB Actuarial Solutions, LLC. He previously served as Senior Vice President and Chief Actuary of PXRE Group. The author began his career at Insurance Services Office and subsequently served as an actuarial manager at Prudential Reinsurance, Signet Star Reinsurance and SCOR Reinsurance Company.

The author's service to the actuarial profession has included terms as Chairperson of the RAA Actuarial Committee and as President of Casualty Actuaries in Reinsurance. He has earned MS degrees in both theoretical and applied mathematics, as well as in economic systems. He is currently serving on the CAS Committee on the Theory of Risk and the Committee on Dynamic Risk Modeling.

The author previously co-authored "Pricing the Impact of Adjustable Features and Loss Sharing Provisions of Reinsurance Treaties" (1990 CAS Proceedings), which won the 1991 Woodward-Fondiller prize. He also authored a discussion of the Pinto-Gogol paper on "An Analysis of Excess Loss Development" (1992 CAS Proceedings) and a discussion of Rodney Kreps' paper on "Riskiness Leverage Models" which will be published in the 2005 CAS Proceedings.

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Exhibit 1

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Example 1 Comparing EVA with Returns on Capital (RROC and RORAC) where Interest is Not Credited on Surplus

Key Assumptions: Write equal amounts of premium in three lines of business. *Interest Credited on Supporting Surplus:* *No*

Pricing is accurate, as the Plan Loss Ratio equals the Expected Loss Ratio (ELR) for all three lines. The ELR's are equal to 80% for all three lines.

All three lines are uncorrelated and no reinsurance is purchased. Correlation Between LOB 1 and LOB 2 L *0.0%*

Note: Alternative EVA measures and RARAC are computed before taxes, overhead, and returns on non-allocated capital or attributable to assumption of investment risk.

	Fast Pay	*Average Pay*	*Slow Pay*		
1) Loss Generator	*LOB 1*	*LOB 2*	*LOB 3*	*NET TOTAL*	*GROSS TOTAL*
1A) Expected Loss: Copy and Paste-Special from LOB 4 of (3K).	*1,000,000*	*1,000,000*	*1,000,000*	3,000,000	3,000,000
1B) Coefficient of Variation of Assumed Lognormal Loss Distribution	*80.0%*	*20.0%*	*40.0%*		
1C) Standard Deviation	*800,000*	*200,000*	*400,000*		
1D) Profit and Overhead Margin (includes Brokerage on Reinsurance)	9.0%	8.0%	7.0%	8.0%	8.0%
1E) Variable Expense Ratio	11.0%	12.0%	13.0%	*12.0%*	*12.0%*
1F) Plan Premium	1,250,000	1,250,000	1,250,000	3,750,000	3,750,000
1G) Expected Loss Ratio = (1A)/(1F)	80.0%	80.0%	80.0%	*80.0%*	*80.0%*
1H) Expected Underwriting Return (Profit & Overhead)	112,500	100,000	87,500	300,000	300,000
1I) Plan Loss Ratio	80.0%	80.0%	80.0%	*80.0%*	*80.0%*
1J) Plan Expected Loss	1,000,000	1,000,000	1,000,000	3,000,000	3,000,000
1K) Pricing Error = ((1J)-(1A))/(1A)	0.0%	0.0%	0.0%	0.0%	0.0%
2) Capital Usage Calculation	*LOB 1*	*LOB 2*	*LOB 3*	*NET TOTAL*	*GROSS TOTAL*
2A) Required Capital Charge on Premium	40.0%	40.0%	40.0%	*40.0%*	*40.0%*
2B) Required Capital Charge on Reserves	25.0%	25.0%	25.0%	*25.0%*	*25.0%*
2C) Rental Fee	10.0%				
2D) Consumption Fee for Capital Less than Allocation	*120.0%*	12.00			
2E) Consumption Fee for Common Capital (excess allocation)	*240.0%*	24.00			
2F) Required Premium Capital =(1F)(2A)*	500,000	500,000	500,000	1,500,000	1,500,000
2G) Simulated Required NPW Reserves Capital = (2B)(NPW Future Reserves)*					
2H) Simulated Total Required Rating Agency Capital = (2F)+(2G)					
3) Annual Simulation - Calculation of Capital Call Costs and XTVAR	*LOB 1*	*LOB 2*	*LOB 3*	*NET TOTAL*	*GROSS TOTAL*
3A) Simulated Losses					
3B) Deviations From Plan = (1J)-(3A)					
3C) Segment Level Capital Usage Charges (Capital Call Costs)					
3D) Net Portfolio Capital Usage Cost with RMK Algorithm					
3E) Gross Portfolio Capital Usage Cost with RMK Algorithm					
3F) Deviation from Plan at 2nd Percentile: Copy and Paste-Special from (3M)					
3G) Deviation from Plan when Exceed 1 in 50 Year Result					
3H) Flag to Count Number of Simulations in Excess of 1 in 50 Year Result					
3I) Contribution to Gross 1 in 50 Year Result					
3J) Contribution to Net 1 in 50 Year Result					
Loss Simulation Statistics		Number of Simulations:		100,000	
3K) Expected Loss	1,000,011	1,000,000	999,996	3,000,007	3,000,007
3L) Standard Deviation	800,185	200,004	399,962	916,520	916,520
3M) Percentiles of Deviations from Plan (Negatives are Values at Risk)					
0.1 Percentile (1 in 1000)	(5,866,794)	(809,359)	(2,055,270)	(6,034,577)	(6,034,577)
1st Percentile (1 in 100)	(3,010,869)	(554,457)	(1,275,198)	(3,153,170)	(3,153,170)
2nd Percentile (1 in 50)	(2,511,103)	(472,772)	(1,048,573)	(2,460,701)	(2,460,701)
10.0 Percentile (1 in 10)	(923,344)	(263,898)	(521,231)	(1,091,084)	(1,091,084)
50th Percentile (1 in 2)	219,120	19,417	71,517	174,654	174,654
90th Percentile	682,951	239,216	433,302	919,994	919,994

Exhibit 1

Page 2

Example Comparing EVA with Returns on Capital (RROC and RORAC) where Interest is Not Credited on Surplus

Key Assumptions: Write equal amounts of premium in three lines of business. Interest Credited on Supporting Surplus: No
Pricing is accurate, as the Plan Loss Ratio equals the Expected Loss Ratio (ELR) for all three lines. The ELR's are equal to 80% for all three lines.
All three lines are uncorrelated and no reinsurance is purchased.

4) Economic Value Added (EVA) where Usage Charges Are Computed Using Two Step Formula

	LOB 1	LOB 2	LOB 3	GROSS TOTAL
4A) Plan Premium	1,250,000	1,250,000	1,250,000	3,750,000
4B) Expected Underwriting Return (Profit & Overhead)	112,500	100,000	87,500	300,000
4C) Interest Rate Assumed	3.0%	4.0%	5.0%	
4D) Mean Net Present Value of Interest Earned on Reserves	27,485	163,602	327,516	518,602
4E) Mean Rating Agency Capital	729,013	1,522,318	2,137,091	4,388,422
4F) Mean Interest Earned on Rating Agency Capital	-	-	-	-
4G) Mean Rental Cost of Rating Agency Capital ((Mean of (2H)) x (2C))	72,901	152,232	213,709	438,842
4H) Gross Expected Cost of Capital - Rental and Usage ((4G) + (Mean of (3E)))	340,098	187,529	310,052	837,679
4I) Gross Economic Value Added (GEVA) = (4B)+(4D)+(4F)-(4H)	(200,114)	76,073	104,963	(19,077)
4J) Gross Capital Cost Percentage = (4H)/(4E)	46.7%	12.3%	14.5%	19.1%
4K) Net Expected Cost of Capital - Rental and Usage ((4G) + (Mean of (3D)))	340,098	187,529	310,052	
4L) Net Economic Value Added (NEVA) = (4B)+(4D)+(4F)-(4K)	(200,114)	76,073	104,963	
4M Net Capital Cost Percentage = (4K)/(4E)	46.7%	12.3%	14.5%	
4N) Change in EVA Due to Reinsurance = NEVA - GEVA	-			

5) Risk Returns on Capital (RROC) After Rental Cost of Capital

Risk Capital Standard (Multiple K of XTVAR): 200%

	LOB 1	LOB 2	LOB 3	GROSS TOTAL
5A) Average Deviation from Plan When Exceed 1 in 50 Year Result (XTVAR)	(3,425,698)	(587,974)	(1,380,969)	(3,575,724)
5B) Gross Risk Capital K% of XTVAR, Allocated to Line Based Upon Co-XTVAR's	6,523,075	98,481	538,412	7,159,968
5C) Mean Interest Earned on Rating Agency Capital = (4F)	-	-	-	-
5D) Mean Rental Cost of Rating Agency Capital (4G)	72,901	152,232	213,709	438,842
5E) Expected Underwriting Return After Rental Cost of Capital = (4B)+(4D)+(5C)-(5D)	67,083	111,371	201,306	379,760
5F) Gross Risk Return on Capital = GRROC = (5E)/(5B)	1.03%	113.09%	37.39%	5.30%
5G) Net Risk Capital K% of XTVAR, Allocated to Line Based Upon Co-XTVAR's	6,523,075	98,481	538,412	
5H) Net Risk Return on Capital = NRROC = (5E)/(5G)	1.03%	113.09%	37.39%	
5I) Change in Return Due to Reinsurance = (5E for LOB 4)	-			
5J) Change in Allocated Capital = (5G)-(5B)	-			

6) Returns on Risk Adjusted Capital (RORAC)

	LOB 1	LOB 2	LOB 3	GROSS TOTAL
6A) Gross Risk Capital K% of XTVAR, Allocated to Line Based Upon Co-XTVAR's	6,523,075	98,481	538,412	7,159,968
6B) Interest Earned on Gross Allocated Capital = (4C)x(6A)	-	-	-	-
6C) Gross Expected Total Underwriting Return = (4B)+(4D)+(6B)	139,985	263,602	415,016	818,602
6D) Gross Return on Risk Adjusted Capital = GRORAC = (6C)/(6A)	2.15%	267.67%	77.08%	11.43%
6E) Net Risk Capital K% of XTVAR, Allocated to Line Based Upon Co-XTVAR's	6,523,075	98,481	538,412	
6F) Interest Earned on Net Allocated Capital = (4C)x(6E)	-	-	-	
6G) Net Expected Total Underwriting Return = (4B)+(4D)+(6F)	139,985	263,602	415,016	
6H) Net Return on Risk Adjusted Capital = NRORAC = (6G)/(6E)	2.15%	267.67%	77.08%	
6I) Change in Return Due to Reinsurance = (6G - Net Total) - (6C - Gross Total)	-			
6J) Change in Allocated Capital = (6E - Net Total) - (6A - Gross Total)	-			

Exhibit 2

Base Example 2 Comparing EVA with Returns on Capital (RROC and RORAC) where Interest is Credited on Surplus

Key Assumptions: Write equal amounts of premium in three lines of business. *Interest Credited on Supporting Surplus:* *Yes*
Pricing is accurate, as the Plan Loss Ratio equals the Expected Loss Ratio (ELR) for all three lines. The ELR's are equal to 80% for all three lines.
All three lines are uncorrelated and no reinsurance is purchased.

4) Economic Value Added (EVA) where Usage Charges Are Computed Using Two Step Formula

	LOB 1	LOB 2	LOB 3	GROSS TOTAL
4A) Plan Premium	1,250,000	1,250,000	1,250,000	3,750,000
4B) Expected Underwriting Return (Profit & Overhead)	112,500	100,000	87,500	300,000
4C) Interest Rate Assumed	3.0%	4.0%	5.0%	
4D) Mean Net Present Value of Interest Earned on Reserves	27,485	163,602	327,516	518,602
4E) Mean Rating Agency Capital	729,013	1,522,318	2,137,091	4,388,422
4F) Mean Interest Earned on Rating Agency Capital	21,870	60,893	106,855	189,618
4G) Mean Rental Cost of Rating Agency Capital ((Mean of (2H)) x (2C))	72,901	152,232	213,709	438,842
4H) Gross Expected Cost of Capital - Rental and Usage ((4G) + (Mean of (3E)))	340,098	187,529	310,052	837,679
4I) Gross Economic Value Added (GEVA) = (4B)+(4D)+(4F)-(4H)	(178,243)	136,966	211,818	170,541
4J) Gross Capital Cost Percentage = (4H)/(4E)	46.7%	12.3%	14.5%	19.1%
4K) Net Expected Cost of Capital - Rental and Usage ((4G) + (Mean of (3D)))	340,098	187,529	310,052	
4L) Net Economic Value Added (NEVA) = (4B)+(4D)+(4F)-(4K)	(178,243)	136,966	211,818	
4M Net Capital Cost Percentage = (4K)/(4E)	46.7%	12.3%	14.5%	
4N) Change in EVA Due to Reinsurance = NEVA - GEVA	-			

5) Risk Returns on Capital (RROC) After Rental Cost of Capital

Risk Capital Standard (Multiple K of XTVAR): 200%

	LOB 1	LOB 2	LOB 3	GROSS TOTAL
5A) Average Deviation from Plan When Exceed 1 in 50 Year Result (XTVAR)	(3,425,698)	(587,974)	(1,380,969)	(3,575,724)
5B) Gross Risk Capital K% of XTVAR, Allocated to Line Based Upon Co-XTVAR's	6,523,075	98,481	538,412	7,159,968
5C) Mean Interest Earned on Rating Agency Capital = (4F)	21,870	60,893	106,855	189,618
5D) Mean Rental Cost of Rating Agency Capital (4G)	72,901	152,232	213,709	438,842
5E) Expected Underwriting Return After Rental Cost of Capital = (4B)+(4D)+(5C)-(5D)	88,954	172,263	308,161	569,378
5F) Gross Risk Return on Capital = GRROC = (5E)/(5B)	1.36%	174.92%	57.24%	7.95%
5G) Net Risk Capital K% of XTVAR, Allocated to Line Based Upon Co-XTVAR's	6,523,075	98,481	538,412	
5H) Net Risk Return on Capital = NRROC = (5E)/(5G)	1.36%	174.92%	57.24%	
5I) Change in Return Due to Reinsurance = (5E for LOB 4)	-			
5J) Change in Allocated Capital = (5G)-(5B)	-			

6) Returns on Risk Adjusted Capital (RORAC)

	LOB 1	LOB 2	LOB 3	GROSS TOTAL
6A) Gross Risk Capital K% of XTVAR, Allocated to Line Based Upon Co-XTVAR's	6,523,075	98,481	538,412	7,159,968
6B) Interest Earned on Gross Allocated Capital = (4C)x(6A)	195,692	3,939	26,921	226,552
6C) Gross Expected Total Underwriting Return = (4B)+(4D)+(6B)	335,677	267,542	441,936	1,045,155
6D) Gross Return on Risk Adjusted Capital = GRORAC = (6C)/(6A)	5.15%	271.67%	82.08%	14.60%
6E) Net Risk Capital K% of XTVAR, Allocated to Line Based Upon Co-XTVAR's	6,523,075	98,481	538,412	
6F) Interest Earned on Net Allocated Capital = (4C)x(6E)	195,692	3,939	26,921	
6G) Net Expected Total Underwriting Return = (4B)+(4D)+(6F)	335,677	267,542	441,936	
6H) Net Return on Risk Adjusted Capital = NRORAC = (6G)/(6E)	5.15%	271.67%	82.08%	
6I) Change in Return Due to Reinsurance = (6G - Net Total) - (6C - Gross Total)	-			
6J) Change in Allocated Capital = (6E - Net Total) - (6A - Gross Total)	-			

Exhibit 3

Modified Base Example 3 Comparing EVA with Returns on Capital (RROC and RORAC) where Adjust Margins

Key Assumptions: Write equal amounts of premium in three lines of business. Interest Credited on Supporting Sh Yes
Pricing is accurate, as the Plan Loss Ratio equals the true ELR for all three lines. Adjust Margins by line to reflect results of Example 2.
The ELR's for LOB 1, LOB 2, and LOB 3 are now 60%, 88% and 85%, respectively. All three lines are uncorrelated and no reinsurance is purchased.

4) Economic Value Added (EVA) where Usage Charges Are Computed Using Two Step Formula

	LOB 1	LOB 2	LOB 3	GROSS TOTAL
4A) Plan Premium	1,250,000	1,250,000	1,250,000	3,750,000
4B) Expected Underwriting Return (Profit & Overhead)	362,500	-	25,000	387,500
4C) Interest Rate Assumed	3.0%	4.0%	5.0%	
4D) Mean Net Present Value of Interest Earned on Reserves	20,613	179,963	347,987	548,562
4E) Mean Rating Agency Capital	671,754	1,624,552	2,239,416	4,535,722
4F) Mean Interest Earned on Rating Agency Capital	20,153	64,982	111,971	197,106
4G) Mean Rental Cost of Rating Agency Capital ((Mean of (2H)) x (2C))	67,175	162,455	223,942	453,572
4H) Gross Expected Cost of Capital - Rental and Usage ((4G) + (Mean of (3E)))	252,757	205,404	337,901	796,062
4I) Gross Economic Value Added (GEVA) = (4B)+(4D)+(4F)-(4H)	150,509	39,541	147,057	337,106
4J) Gross Capital Cost Percentage = (4H)/(4E)	37.6%	12.6%	15.1%	17.6%
4K) Net Expected Cost of Capital - Rental and Usage ((4G) + (Mean of (3D)))	252,757	205,404	337,901	
4L) Net Economic Value Added (NEVA) = (4B)+(4D)+(4F)-(4K)	150,509	39,541	147,057	
4M Net Capital Cost Percentage = (4K)/(4E)	37.6%	12.6%	15.1%	
4N) Change in EVA Due to Reinsurance = NEVA - GEVA	-			

5) Risk Returns on Capital (RROC) After Rental Cost of Capital

Risk Capital Standard (Multiple K of XTVAR): 200%

	LOB 1	LOB 2	LOB 3	GROSS TOTAL
5A) Average Deviation from Plan When Exceed 1 in 50 Year Result (XTVAR)	(2,566,035)	(646,459)	(1,468,083)	(2,784,762)
5B) Gross Risk Capital K% of XTVAR, Allocated to Line Based Upon Co-XTVAR's	4,450,243	149,438	970,231	5,569,913
5C) Mean Interest Earned on Rating Agency Capital = (4F)	20,153	64,982	111,971	197,106
5D) Mean Rental Cost of Rating Agency Capital (4G)	67,175	162,455	223,942	453,572
5E) Expected Underwriting Return After Rental Cost of Capital = (4B)+(4D)+(5C)-(5D)	336,090	82,490	261,016	679,596
5F) Gross Risk Return on Capital = GRROC = (5E)/(5B)	7.55%	55.20%	26.90%	12.20%
5G) Net Risk Capital K% of XTVAR, Allocated to Line Based Upon Co-XTVAR's	4,450,243	149,438	970,231	
5H) Net Risk Return on Capital = NRROC = (5E)/(5G)	7.55%	55.20%	26.90%	
5I) Change in Return Due to Reinsurance = (5E for LOB 4)	-			
5J) Change in Allocated Capital = (5G)-(5B)	-			

6) Returns on Risk Adjusted Capital (RORAC)

	LOB 1	LOB 2	LOB 3	GROSS TOTAL
6A) Gross Risk Capital K% of XTVAR, Allocated to Line Based Upon Co-XTVAR's	4,450,243	149,438	970,231	5,569,913
6B) Interest Earned on Gross Allocated Capital = (4C)x(6A)	133,507	5,978	48,512	187,996
6C) Gross Expected Total Underwriting Return = (4B)+(4D)+(6B)	516,620	185,940	421,498	1,124,059
6D) Gross Return on Risk Adjusted Capital = GRORAC = (6C)/(6A)	11.61%	124.43%	43.44%	20.18%
6E) Net Risk Capital K% of XTVAR, Allocated to Line Based Upon Co-XTVAR's	4,450,243	149,438	970,231	
6F) Interest Earned on Net Allocated Capital = (4C)x(6E)	133,507	5,978	48,512	
6G) Net Expected Total Underwriting Return = (4B)+(4D)+(6F)	516,620	185,940	421,498	
6H) Net Return on Risk Adjusted Capital = NRORAC = (6G)/(6E)	11.61%	124.43%	43.44%	
6I) Change in Return Due to Reinsurance = (6G - Net Total) - (6C - Gross Total)	-			
6J) Change in Allocated Capital = (6E - Net Total) - (6A - Gross Total)	-			

Exhibit 4

Modified Base Example 4 Comparing EVA with Returns on Capital where Adjust Premiums by Line

Key Assumptions: Write $0.250m less in LOB 1, and write $0.125m more in LOB 2 and in LOB 3. Interest Credited on Supporting Surplus: Yes
Priang is accurate, as the Plan Loss Ratio equals the true Expected Loss Ratio (ELR) for all three lines. The ELR's are equal to 80% for all three lines,.
All three lines are uncorrelated and no reinsurance is purchased.

4) Economic Value Added (EVA) where Usage Charges Are Computed Using Two Step Formula

	LOB 1	LOB 2	LOB 3	GROSS TOTAL
4A) Plan Premium	1,000,000	1,375,000	1,375,000	3,750,000
4B) Expected Underwriting Return (Profit & Overhead)	90,000	110,000	96,250	296,250
4C) Interest Rate Assumed	3.0%	4.0%	5.0%	
4D) Mean Net Present Value of Interest Earned on Reserves	21,988	179,962	360,267	562,217
4E) Mean Rating Agency Capital	583,215	1,674,549	2,350,798	4,608,562
4F) Mean Interest Earned on Rating Agency Capital	17,496	66,982	117,540	202,018
4G) Mean Rental Cost of Rating Agency Capital ((Mean of (2H)) x (2C))	58,322	167,455	235,080	460,856
4H) Gross Expected Cost of Capital - Rental and Usage ((4G) + (Mean of (3E)))	259,101	209,513	351,987	820,600
4I) Gross Economic Value Added (GEVA) = (4B)+(4D)+(4F)-(4H)	(129,616)	147,432	222,070	239,886
4J) Gross Capital Cost Percentage = (4H)/(4E)	44.4%	12.5%	15.0%	17.8%
4K) Net Expected Cost of Capital - Rental and Usage ((4G) + (Mean of (3D)))	259,101	209,513	351,987	
4L) Net Economic Value Added (NEVA) = (4B)+(4D)+(4F)-(4K)	(129,616)	147,432	222,070	
4M Net Capital Cost Percentage = (4K)/(4E)	44.4%	12.5%	15.0%	
4N) Change in EVA Due to Reinsurance = NEVA - GEVA	-			

5) Risk Returns on Capital (RROC) After Rental Cost of Capital

Risk Capital Standard (Multiple K of XTVAR):	200%			
	LOB 1	LOB 2	LOB 3	GROSS TOTAL
5A) Average Deviation from Plan When Exceed 1 in 50 Year Result (XTVAR)	(2,739,812)	(646,227)	(1,519,256)	(2,944,172)
5B) Gross Risk Capital K% of XTVAR, Allocated to Line Based Upon Co-XTVAR's	4,802,202	153,679	938,356	5,894,237
5C) Mean Interest Earned on Rating Agency Capital = (4F)	17,496	66,982	117,540	202,018
5D) Mean Rental Cost of Rating Agency Capital (4G)	58,322	167,455	235,080	460,856
5E) Expected Underwriting Return After Rental Cost of Capital = (4B)+(4D)+(5C)-(5D)	71,163	189,489	338,977	599,630
5F) Gross Risk Return on Capital = GRROC = (5E)/(5B)	1.48%	123.30%	36.12%	10.17%
5G) Net Risk Capital K% of XTVAR, Allocated to Line Based Upon Co-XTVAR's	4,802,202	153,679	938,356	
5H) Net Risk Return on Capital = NRROC = (5E)/(5G)	1.48%	123.30%	36.12%	
5I) Change in Return Due to Reinsurance = (5E for LOB 4)	-			
5J) Change in Allocated Capital = (5G)-(5B)	-			

6) Returns on Risk Adjusted Capital (RORAC)

	LOB 1	LOB 2	LOB 3	GROSS TOTAL
6A) Gross Risk Capital K% of XTVAR, Allocated to Line Based Upon Co-XTVAR's	4,802,202	153,679	938,356	5,894,237
6B) Interest Earned on Gross Allocated Capital = (4C)x(6A)	144,066	6,147	46,918	197,131
6C) Gross Expected Total Underwriting Return = (4B)+(4D)+(6B)	256,054	296,110	503,435	1,055,599
6D) Gross Return on Risk Adjusted Capital = GRORAC = (6C)/(6A)	5.33%	192.68%	53.65%	17.91%
6E) Net Risk Capital K% of XTVAR, Allocated to Line Based Upon Co-XTVAR's	4,802,202	153,679	938,356	
6F) Interest Earned on Net Allocated Capital = (4C)x(6E)	144,066	6,147	46,918	
6G) Net Expected Total Underwriting Return = (4B)+(4D)+(6F)	256,054	296,110	503,435	
6H) Net Return on Risk Adjusted Capital = NRORAC = (6G)/(6E)	5.33%	192.68%	53.65%	
6I) Change in Return Due to Reinsurance = (6G - Net Total) - (6C - Gross Total)	-			
6J) Change in Allocated Capital = (6E - Net Total) - (6A - Gross Total)	-			

Exhibit 5

Modified Base Example 5 Comparing EVA with Returns on Capital where Update ELR for LOB 1

Key Assumptions: Write equal amounts of premium in three lines of business. *Interest Credited on Supporting Surplus:* *Yes*

Right after renewal season, a new version of company's cat model is released which implies a 10% reduction in the ELR for LOB 1.

The original plan loss ratio for LOB 1 was 80%, but the estimated ELR has been revised to 70%. All lines are uncorrelated and no reinsurance is purchased.

4) Economic Value Added (EVA) where Usage Charges Are Computed Using Two Step Formula

	LOB 1	LOB 2	LOB 3	GROSS TOTAL
4A) Plan Premium	1,250,000	1,250,000	1,250,000	3,750,000
4B) Expected Underwriting Return (Profit & Overhead)	237,500	100,000	87,500	425,000
4C) Interest Rate Assumed	3.0%	4.0%	5.0%	
4D) Mean Net Present Value of Interest Earned on Reserves	24,048	163,602	327,517	515,168
4E) Mean Rating Agency Capital	700,381	1,522,318	2,137,097	4,359,796
4F) Mean Interest Earned on Rating Agency Capital	21,011	60,893	106,855	188,759
4G) Mean Rental Cost of Rating Agency Capital ((Mean of (2H)) x (2C))	70,038	152,232	213,710	435,980
4H) Gross Expected Cost of Capital - Rental and Usage ((4G) + (Mean of (3E)))	259,685	182,851	300,367	742,903
4I) Gross Economic Value Added (GEVA) = (4B)+(4D)+(4F)-(4H)	22,875	141,644	221,504	386,023
4J) Gross Capital Cost Percentage = (4H)/(4E)	37.1%	12.0%	14.1%	17.0%
4K) Net Expected Cost of Capital - Rental and Usage ((4G) + (Mean of (3D)))	259,685	182,851	300,367	
4L) Net Economic Value Added (NEVA) = (4B)+(4D)+(4F)-(4K)	22,875	141,644	221,504	
4M Net Capital Cost Percentage = (4K)/(4E)	37.1%	12.0%	14.1%	
4N) Change in EVA Due to Reinsurance = NEVA - GEVA	-			

5) Risk Returns on Capital (RROC) After Rental Cost of Capital

Risk Capital Standard (Multiple K of XTVAR): 200%

	LOB 1	LOB 2	LOB 3	GROSS TOTAL
5A) Average Deviation from Plan When Exceed 1 in 50 Year Result (XTVAR)	(2,871,920)	(587,447)	(1,380,805)	(3,038,640)
5B) Gross Risk Capital K% of XTVAR, Allocated to Line Based Upon Co-XTVAR's	5,359,487	93,120	630,998	6,083,606
5C) Mean Interest Earned on Rating Agency Capital = (4F)	21,011	60,893	106,855	188,759
5D) Mean Rental Cost of Rating Agency Capital (4G)	70,038	152,232	213,710	435,980
5E) Expected Underwriting Return After Rental Cost of Capital = (4B)+(4D)+(5C)-(5D)	212,522	172,263	308,162	692,947
5F) Gross Risk Return on Capital = GRROC = (5E)/(5B)	3.97%	184.99%	48.84%	11.39%
5G) Net Risk Capital K% of XTVAR, Allocated to Line Based Upon Co-XTVAR's	5,359,487	93,120	630,998	
5H) Net Risk Return on Capital = NRROC = (5E)/(5G)	3.97%	184.99%	48.84%	
5I) Change in Return Due to Reinsurance = (5E for LOB 4)	-			
5J) Change in Allocated Capital = (5G)-(5B)	-			

6) Returns on Risk Adjusted Capital (RORAC)

	LOB 1	LOB 2	LOB 3	GROSS TOTAL
6A) Gross Risk Capital K% of XTVAR, Allocated to Line Based Upon Co-XTVAR's	5,359,487	93,120	630,998	6,083,606
6B) Interest Earned on Gross Allocated Capital = (4C)x(6A)	160,785	3,725	31,550	196,059
6C) Gross Expected Total Underwriting Return = (4B)+(4D)+(6B)	422,333	267,327	446,567	1,136,227
6D) Gross Return on Risk Adjusted Capital = GRORAC = (6C)/(6A)	7.88%	287.08%	70.77%	18.68%
6E) Net Risk Capital K% of XTVAR, Allocated to Line Based Upon Co-XTVAR's	5,359,487	93,120	630,998	
6F) Interest Earned on Net Allocated Capital = (4C)x(6E)	160,785	3,725	31,550	
6G) Net Expected Total Underwriting Return = (4B)+(4D)+(6F)	422,333	267,327	446,567	
6H) Net Return on Risk Adjusted Capital = NRORAC = (6G)/(6E)	7.88%	287.08%	70.77%	
6I) Change in Return Due to Reinsurance = (6G - Net Total) - (6C - Gross Total)	-			
6J) Change in Allocated Capital = (6E - Net Total) - (6A - Gross Total)	-			

Exhibit 6

Modified Base Example 6 Comparing EVA with Returns on Capital where Update ELR for LOB 3

Same as base case, but after renewal season a Supreme Court decision declared recent tort reforms to be unconstitutional.
This decision implies a 20% increase in the ELR for LOB 3. The original plan loss ratio for LOB 3 was 80%, but the estimated ELR has been revised to 100%.
All three lines are uncorrelated and no reinsurance is purchased.

4) Economic Value Added (EVA) where Usage Charges Are Computed Using Two Step Formula

	LOB 1	LOB 2	LOB 3	GROSS TOTAL
4A) Plan Premium	1,250,000	1,250,000	1,250,000	3,750,000
4B) Expected Underwriting Return (Profit & Overhead)	112,500	100,000	(162,500)	50,000
4C) Interest Rate Assumed	3.0%	4.0%	5.0%	
4D) Mean Net Present Value of Interest Earned on Reserves	27,485	163,603	409,398	600,486
4E) Mean Rating Agency Capital	729,016	1,522,321	2,546,383	4,797,719
4F) Mean Interest Earned on Rating Agency Capital	21,870	60,893	127,319	210,082
4G) Mean Rental Cost of Rating Agency Capital ((Mean of (2H)) x (2C))	72,902	152,232	254,638	479,772
4H) Gross Expected Cost of Capital - Rental and Usage ((4G) + (Mean of (3E)))	368,134	198,455	481,255	1,047,844
4I) Gross Economic Value Added (GEVA) = (4B)+(4D)+(4F)-(4H)	(206,279)	126,041	(107,038)	(187,275)
4J) Gross Capital Cost Percentage = (4H)/(4E)	50.5%	13.0%	18.9%	21.8%
4K) Net Expected Cost of Capital - Rental and Usage ((4G) + (Mean of (3D)))	368,134	198,455	481,255	
4L) Net Economic Value Added (NEVA) = (4B)+(4D)+(4F)-(4K)	(206,279)	126,041	(107,038)	
4M Net Capital Cost Percentage = (4K)/(4E)	50.5%	13.0%	18.9%	
4N) Change in EVA Due to Reinsurance = NEVA - GEVA	-			

5) Risk Returns on Capital (RROC) After Rental Cost of Capital

Risk Capital Standard (Multiple K of XTVAR): 200%

	LOB 1	LOB 2	LOB 3	GROSS TOTAL
5A) Average Deviation from Plan When Exceed 1 in 50 Year Result (XTVAR)	(3,425,534)	(588,031)	(1,977,400)	(3,871,434)
5B) Gross Risk Capital K% of XTVAR, Allocated to Line Based Upon Co-XTVAR's	6,218,516	99,077	1,429,846	7,747,439
5C) Mean Interest Earned on Rating Agency Capital = (4F)	21,870	60,893	127,319	210,082
5D) Mean Rental Cost of Rating Agency Capital (4G)	72,902	152,232	254,638	479,772
5E) Expected Underwriting Return After Rental Cost of Capital = (4B)+(4D)+(5C)-(5D)	88,954	172,264	119,579	380,796
5F) Gross Risk Return on Capital = GRROC = (5E)/(5B)	1.43%	173.87%	8.36%	4.92%
5G) Net Risk Capital K% of XTVAR, Allocated to Line Based Upon Co-XTVAR's	6,218,516	99,077	1,429,846	
5H) Net Risk Return on Capital = NRROC = (5E)/(5G)	1.43%	173.87%	8.36%	
5I) Change in Return Due to Reinsurance = (5E for LOB 4)	-			
5J) Change in Allocated Capital = (5G)-(5B)	-			

6) Returns on Risk Adjusted Capital (RORAC)

	LOB 1	LOB 2	LOB 3	GROSS TOTAL
6A) Gross Risk Capital K% of XTVAR, Allocated to Line Based Upon Co-XTVAR's	6,218,516	99,077	1,429,846	7,747,439
6B) Interest Earned on Gross Allocated Capital = (4C)x(6A)	186,555	3,963	71,492	262,011
6C) Gross Expected Total Underwriting Return = (4B)+(4D)+(6B)	326,540	267,566	318,391	912,497
6D) Gross Return on Risk Adjusted Capital = GRORAC = (6C)/(6A)	5.25%	270.06%	22.27%	11.78%
6E) Net Risk Capital K% of XTVAR, Allocated to Line Based Upon Co-XTVAR's	6,218,516	99,077	1,429,846	
6F) Interest Earned on Net Allocated Capital = (4C)x(6E)	186,555	3,963	71,492	
6G) Net Expected Total Underwriting Return = (4B)+(4D)+(6F)	326,540	267,566	318,391	
6H) Net Return on Risk Adjusted Capital = NRORAC = (6G)/(6E)	5.25%	270.06%	22.27%	
6I) Change in Return Due to Reinsurance = (6G - Net Total) - (6C - Gross Total)	-			
6J) Change in Allocated Capital = (6E - Net Total) - (6A - Gross Total)	-			

Exhibit 7

Modified Base Example 7 Comparing EVA with Returns on Capital where LOB 1 and LOB 2 are 50% Correlated

Key Assumptions: Write equal amounts of premium in three lines of business. *Interest Credited on Supporting Surplus:* *Yes*
Pricing is accurate, as the Plan Loss Ratio equals the Expected Loss Ratio (ELR) for all three lines. *The ELR's are equal to 80% for all three lines.*
Lines 1 and 2 losses are 50% correlated but uncorrelated with line 3. No reinsurance is purchased.

4) Economic Value Added (EVA) where Usage Charges Are Computed Using Two Step Formula

	LOB 1	LOB 2	LOB 3	GROSS TOTAL
4A) Plan Premium	1,250,000	1,250,000	1,250,000	3,750,000
4B) Expected Underwriting Return (Profit & Overhead)	112,500	100,000	87,500	300,000
4C) Interest Rate Assumed	3.0%	4.0%	5.0%	
4D) Mean Net Present Value of Interest Earned on Reserves	27,484	163,602	327,518	518,605
4E) Mean Rating Agency Capital	729,012	1,522,317	2,137,104	4,388,433
4F) Mean Interest Earned on Rating Agency Capital	21,870	60,893	106,855	189,618
4G) Mean Rental Cost of Rating Agency Capital ((Mean of (2H)) x (2C))	72,901	152,232	213,710	438,843
4H) Gross Expected Cost of Capital - Rental and Usage ((4G) + (Mean of (3E)))	359,046	204,285	311,022	874,353
4I) Gross Economic Value Added (GEVA) = (4B)+(4D)+(4F)-(4H)	(197,191)	120,210	210,851	133,870
4J) Gross Capital Cost Percentage = (4H)/(4E)	49.3%	13.4%	14.6%	19.9%
4K) Net Expected Cost of Capital - Rental and Usage ((4G) + (Mean of (3D)))	359,046	204,285	311,022	
4L) Net Economic Value Added (NEVA) = (4B)+(4D)+(4F)-(4K)	(197,191)	120,210	210,851	
4M Net Capital Cost Percentage = (4K)/(4E)	49.3%	13.4%	14.6%	
4N) Change in EVA Due to Reinsurance = NEVA - GEVA	-			

5) Risk Returns on Capital (RROC) After Rental Cost of Capital

Risk Capital Standard (Multiple K of XTVAR): 200%

	LOB 1	LOB 2	LOB 3	GROSS TOTAL
5A) Average Deviation from Plan When Exceed 1 in 50 Year Result (XTVAR)	(3,422,804)	(587,438)	(1,382,036)	(3,812,609)
5B) Gross Risk Capital K% of XTVAR, Allocated to Line Based Upon Co-XTVAR's	6,547,208	607,181	471,515	7,625,903
5C) Mean Interest Earned on Rating Agency Capital = (4F)	21,870	60,893	106,855	189,618
5D) Mean Rental Cost of Rating Agency Capital (4G)	72,901	152,232	213,710	438,843
5E) Expected Underwriting Return After Rental Cost of Capital = (4B)+(4D)+(5C)-(5D)	88,954	172,263	308,163	569,380
5F) Gross Risk Return on Capital = GRROC = (5E)/(5B)	1.36%	28.37%	65.36%	7.47%
5G) Net Risk Capital K% of XTVAR, Allocated to Line Based Upon Co-XTVAR's	6,547,208	607,181	471,515	
5H) Net Risk Return on Capital = NRROC = (5E)/(5G)	1.36%	28.37%	65.36%	
5I) Change in Return Due to Reinsurance = (5E for LOB 4)	-			
5J) Change in Allocated Capital = (5G)-(5B)	-			

6) Returns on Risk Adjusted Capital (RORAC)

	LOB 1	LOB 2	LOB 3	GROSS TOTAL
6A) Gross Risk Capital K% of XTVAR, Allocated to Line Based Upon Co-XTVAR's	6,547,208	607,181	471,515	7,625,903
6B) Interest Earned on Gross Allocated Capital = (4C)x(6A)	196,416	24,287	23,576	244,279
6C) Gross Expected Total Underwriting Return = (4B)+(4D)+(6B)	336,401	287,889	438,594	1,062,884
6D) Gross Return on Risk Adjusted Capital = GRORAC = (6C)/(6A)	5.14%	47.41%	93.02%	13.94%
6E) Net Risk Capital K% of XTVAR, Allocated to Line Based Upon Co-XTVAR's	6,547,208	607,181	471,515	
6F) Interest Earned on Net Allocated Capital = (4C)x(6E)	196,416	24,287	23,576	
6G) Net Expected Total Underwriting Return = (4B)+(4D)+(6F)	336,401	287,889	438,594	
6H) Net Return on Risk Adjusted Capital = NRORAC = (6G)/(6E)	5.14%	47.41%	93.02%	
6I) Change in Return Due to Reinsurance = (6G - Net Total) - (6C - Gross Total)	-			
6J) Change in Allocated Capital = (6E - Net Total) - (6A - Gross Total)	-			

Exhibit 8

Stop Loss Reinsurance Example 8 Comparing EVA with Returns on Capital (RROC and RORAC)

Key Assumptions: Write equal amounts of premium in three lines of business. Interest Credited on Supporting Surplus: Yes
Pricing is accurate, as the Plan Loss Ratio equals the Expected Loss Ratio (ELR) for all three lines. The ELR's are equal to 80% for all three lines.
A 30% xs 90% LR Stop Loss reinsurance program is purchased for LOB 1 for a 10% rate. All three lines are uncorrelated.

Refer to Exhibits 1-7 for detailed descriptions of items below.

4) Economic Value Added (EVA) where Usage Charges Are Computed Using Two Step Formula

	LOB 1	LOB 2	LOB 3	LOB 4	NET TOTAL	GROSS TOTAL
4A) Plan Premium	1,250,000	1,250,000	1,250,000	(125,000)	3,625,000	3,750,000
4B) Expected Underwriting Return (Profit & Overhead)	112,500	100,000	87,500	(37,555)	262,445	300,000
4C) Interest Rate Assumed	3.0%	4.0%	5.0%	3.0%		
4D) Mean Net Present Value of Interest Earned on Reserves	27,484	163,602	327,518	(3,890)	514,714	518,604
4E) Mean Rating Agency Capital	729,006	1,522,318	2,137,102	(69,680)	4,318,746	4,388,426
4F) Mean Interest Earned on Rating Agency Capital	21,870	60,893	106,855	(2,090)	187,528	189,618
4G) Mean Rental Cost of Rating Agency Capital	72,901	152,232	213,710	(6,968)	431,875	438,843
4H) Gross Expected Cost of Capital - Rental and Usage	340,294	187,406	309,891			837,590
4I) Gross Economic Value Added (GEVA)	(178,440)	137,090	211,982			170,631
4J) Gross Capital Cost Percentage	46.7%	12.3%	14.5%			19.1%
4K) Net Expected Cost of Capital - Rental and Usage	324,725	191,436	320,905	(57,522)	779,545	
4L) Net Economic Value Added (NEVA)	(162,871)	133,059	200,968	13,987	185,141	
4M Net Capital Cost Percentage	44.5%	12.6%	15.0%	82.6%	18.1%	
4N) Change in EVA Due to Reinsurance	14,510					

5) Risk Returns on Capital (RROC) After Rental Cost of Capital

Risk Capital Standard (Multiple K of XTVAR): 200%

	LOB 1	LOB 2	LOB 3	LOB 4	NET TOTAL	GROSS TOTAL
5A) Average 1 in 50 Year Deviation from Plan (XTVAR)	(3,421,737)	(587,394)	(1,380,739)	287,561	(3,273,740)	(3,543,084)
5B) Gross Risk Capital K% of XTVAR	6,441,898	83,285	561,977			7,087,161
5C) Mean Interest Earned on Rating Agency Capital	21,870	60,893	106,855	(2,090)	187,528	189,618
5D) Mean Rental Cost of Rating Agency Capital	72,901	152,232	213,710	(6,968)	431,875	438,843
5E) Expected Underwriting Return After Rental Cost of Capital	88,953	172,263	308,163	(36,567)	532,812	569,379
5F) Gross Risk Return on Capital = GRROC	1.38%	206.83%	54.84%			8.03%
5G) Net Risk Capital K% of XTVAR	6,425,757	85,226	599,625	(562,210)	6,548,397	
5H) Net Risk Return on Capital = NRROC	1.38%	202.13%	51.39%	6.50%	8.14%	
5I) Change in Return Due to Reinsurance	(36,567)					
5J) Change in Allocated Capital	(538,763)	*5K) Cost of Additional XTVAR Capital = (5I)/(5J)*				6.8%

6) Returns on Risk Adjusted Capital (RORAC)

	LOB 1	LOB 2	LOB 3	LOB 4	NET TOTAL	GROSS TOTAL
6A) Gross Risk Capital K% of XTVAR	6,441,898	83,285	561,977			7,087,161
6B) Interest Earned on Gross Allocated Capital	193,257	3,331	28,099			224,687
6C) Gross Expected Total Underwriting Return	333,241	266,934	443,117			1,043,291
6D) Gross Return on Risk Adjusted Capital	5.17%	320.50%	78.85%			14.72%
6E) Net Risk Capital K% of XTVAR	6,425,757	85,226	599,625	(562,210)	6,548,397	
6F) Interest Earned on Net Allocated Capital	192,773	3,409	29,981	(16,866)	209,297	
6G) Net Expected Total Underwriting Return	332,756	267,011	444,999	(58,311)	986,456	
6H) Net Return on Risk Adjusted Capital	5.18%	313.30%	74.21%	10.37%	15.06%	
6I) Change in Return Due to Reinsurance	(56,835)					
6J) Change in Allocated Capital	(538,763)	*6K) Cost of Additional XTVAR Capital = (6I)/(6J)*				10.5%

Exhibit 9

Quota Share Reinsurance Example 9 Comparing EVA with Returns on Capital (RROC and RORAC)

Key Assumptions: Write equal amounts of premium in three lines of business. *Interest Credited on Supporting Surplus:* *Yes*
Pricing is accurate, as the Plan Loss Ratio equals the Expected Loss Ratio (ELR) for all three lines. The ELR's are equal to 80% for all three lines.
A 40% Quota Share is purchased for LOB 1 with commission just covering variable costs. *All three lines are uncorrelated.*

Refer to Exhibits 1-7 for detailed descriptions of items below.

4) Economic Value Added (EVA) where Usage Charges Are Computed Using Two Step Formula

	LOB 1	LOB 2	LOB 3	LOB 4	NET TOTAL	GROSS TOTAL
4A) Plan Premium	1,250,000	1,250,000	1,250,000	(500,000)	3,250,000	3,750,000
4B) Expected Underwriting Return (Profit & Overhead)	112,500	100,000	87,500	(45,000)	255,000	300,000
4C) Interest Rate Assumed	3.0%	4.0%	5.0%	3.0%		
4D) Mean Net Present Value of Interest Earned on Reserves	27,484	163,602	327,517	(10,994)	507,610	518,603
4E) Mean Rating Agency Capital	729,007	1,522,317	2,137,100	(248,282)	4,140,142	4,388,424
4F) Mean Interest Earned on Rating Agency Capital	21,870	60,893	106,855	(7,448)	182,169	189,618
4G) Mean Rental Cost of Rating Agency Capital	72,901	152,232	213,710	(24,828)	414,014	438,842
4H) Gross Expected Cost of Capital - Rental and Usage	340,069	187,586	309,695			837,351
4I) Gross Economic Value Added (GEVA)	(178,215)	136,908	212,177			170,871
4J) Gross Capital Cost Percentage	46.6%	12.3%	14.5%			19.1%
4K) Net Expected Cost of Capital - Rental and Usage	313,366	191,567	324,933	(121,014)	708,852	
4L) Net Economic Value Added (NEVA)	(151,512)	132,928	196,939	57,572	235,927	
4M Net Capital Cost Percentage	43.0%	12.6%	15.2%	48.7%	17.1%	
4N) Change in EVA Due to Reinsurance	65,057					

5) Risk Returns on Capital (RROC) After Rental Cost of Capital

Risk Capital Standard (Multiple K of XTVAR): 200%

	LOB 1	LOB 2	LOB 3	LOB 4	NET TOTAL	GROSS TOTAL
5A) Average 1 in 50 Year Deviation from Plan (XTVAR)	(3,422,444)	(587,552)	(1,381,531)	1,368,533	(2,310,833)	(3,542,615)
5B) Gross Risk Capital K% of XTVAR	6,490,236	93,743	502,173			7,086,151
5C) Mean Interest Earned on Rating Agency Capital	21,870	60,893	106,855	(7,448)	182,169	189,618
5D) Mean Rental Cost of Rating Agency Capital	72,901	152,232	213,710	(24,828)	414,014	438,842
5E) Expected Underwriting Return After Rental Cost of Capital	88,953	172,263	308,162	(38,614)	530,765	569,379
5F) Gross Risk Return on Capital = GRROC	1.37%	183.76%	61.37%			8.04%
5G) Net Risk Capital K% of XTVAR	5,527,702	173,740	1,131,906	(2,211,081)	4,622,267	
5H) Net Risk Return on Capital = NRROC	1.61%	99.15%	27.23%	1.75%	11.48%	
5I) Change in Return Due to Reinsurance	(38,614)					
5J) Change in Allocated Capital)	(2,463,885)	*5K) Cost of Additional XTVAR Capital = (5I)/(5J)*				1.6%

6) Returns on Risk Adjusted Capital (RORAC)

	LOB 1	LOB 2	LOB 3	LOB 4	NET TOTAL	GROSS TOTAL
6A) Gross Risk Capital K% of XTVAR	6,490,236	93,743	502,173			7,086,151
6B) Interest Earned on Gross Allocated Capital	194,707	3,750	25,109			223,565
6C) Gross Expected Total Underwriting Return	334,691	267,352	440,126			1,042,169
6D) Gross Return on Risk Adjusted Capital	5.16%	285 20%	87.64%			14.71%
6E) Net Risk Capital K% of XTVAR	5,527,702	173,740	1,131,906	(2,211,081)	4,622,267	
6F) Interest Earned on Net Allocated Capital	165,831	6,950	56,595	(66,332)	163,044	
6G) Net Expected Total Underwriting Return	305,815	270,552	471,613	(122,326)	925,653	
6H) Net Return on Risk Adjusted Capital	5.53%	155.72%	41.67%	5.53%	20.03%	
6I) Change in Return Due to Reinsurance	(116,515)					
6J) Change in Allocated Capital	(2,463,885)	*6K) Cost of Additional XTVAR Capital = (6I)/(6J)*				4.7%

Exhibit 10

Quota Share Reinsurance Example 10 Comparing Alternative Parameterization of EVA with Returns on Capital

Key Assumptions: Write equal amounts of premium in three lines of business. *Interest Credited on Supporting Surplus:* *Yes*
Pricing is accurate, as the Plan Loss Ratio equals the Expected Loss Ratio (ELR) for all three lines. The ELR's are equal to 80% for all three lines.
A 40% Quota Share is purchased for LOB 1 with commission just covering variable costs. *All three lines are uncorrelated.*
The Consumption Fee for Capital Less than Allocation is assumed to be the same as the Consumption Fee for Common Capital.

Refer to Exhibits 1-7 for detailed descriptions of items below.

4) Economic Value Added (EVA) where Usage Charges Are Computed Using Two Step Formula

	LOB 1	LOB 2	LOB 3	LOB 4	NET TOTAL	GROSS TOTAL
4A) Plan Premium	1,250,000	1,250,000	1,250,000	(500,000)	3,250,000	3,750,000
4B) Expected Underwriting Return (Profit & Overhead)	112,500	100,000	87,500	(45,000)	255,000	300,000
4C) Interest Rate Assumed	3.0%	4.0%	5.0%	3.0%		
4D) Mean Net Present Value of Interest Earned on Reserves	27,490	163,602	327,516	(10,996)	507,612	518,608
4E) Mean Rating Agency Capital	729,057	1,522,317	2,137,091	(248,298)	4,140,167	4,388,465
4F) Mean Interest Earned on Rating Agency Capital	21,872	60,893	106,855	(7,449)	182,170	189,619
4G) Mean Rental Cost of Rating Agency Capital	72,906	152,232	213,709	(24,830)	414,017	438,846
4H) Gross Expected Cost of Capital - Rental and Usage	466,132	207,661	362,088			1,035,881
4I) Gross Economic Value Added (GEVA)	(304,271)	116,834	159,783			(27,654)
4J) Gross Capital Cost Percentage	63.9%	13.6%	16.9%			23.6%
4K) Net Expected Cost of Capital - Rental and Usage	425,503	213,480	384,642	(165,869)	857,757	
4L) Net Economic Value Added (NEVA)	(263,641)	111,015	137,228	102,424	87,025	
4M Net Capital Cost Percentage	58.4%	14.0%	18.0%	66.8%	20.7%	
4N) Change in EVA Due to Reinsurance	114,679					

5) Risk Returns on Capital (RROC) After Rental Cost of Capital

Risk Capital Standard (Multiple K of XTVAR): 200%

	LOB 1	LOB 2	LOB 3	LOB 4	NET TOTAL	GROSS TOTAL
5A) Average 1 in 50 Year Deviation from Plan (XTVAR)	(3,434,006)	(587,944)	(1,381,452)	1,373,154	(2,326,769)	(3,569,458)
5B) Gross Risk Capital K% of XTVAR	6,509,573	84,590	547,325			7,141,487
5C) Mean Interest Earned on Rating Agency Capital	21,872	60,893	106,855	(7,449)	182,170	189,619
5D) Mean Rental Cost of Rating Agency Capital	72,906	152,232	213,709	(24,830)	414,017	438,846
5E) Expected Underwriting Return After Rental Cost of Capital	88,956	172,263	308,161	(38,615)	530,765	569,380
5F) Gross Risk Return on Capital = GRROC	1.37%	203.65%	56.30%			7.97%
5G) Net Risk Capital K% of XTVAR	5,600,881	151,545	1,141,744	(2,240,352)	4,653,818	
5H) Net Risk Return on Capital = NRROC	1.59%	113.67%	26.99%	1.72%	11.40%	
5I) Change in Return Due to Reinsurance	(38,615)					
5J) Change in Allocated Capital	(2,487,669)	*5K) Cost of Additional XTVAR Capital = (5I)/(5J)*				1.6%

6) Returns on Risk Adjusted Capital (RORAC)	LOB 1	LOB 2	LOB 3	LOB 4	NET TOTAL	GROSS TOTAL
6A) Gross Risk Capital K% of XTVAR	6,509,573	84,590	547,325			7,141,487
6B) Interest Earned on Gross Allocated Capital	195,287	3,384	27,366			226,037
6C) Gross Expected Total Underwriting Return	335,277	266,986	442,382			1,044,645
6D) Gross Return on Risk Adjusted Capital	5.15%	315.62%	80.83%			14.63%
6E) Net Risk Capital K% of XTVAR	5,600,881	151,545	1,141,744	(2,240,352)	4,653,818	
6F) Interest Earned on Net Allocated Capital	168,026	6,062	57,087	(67,211)	163,965	
6G) Net Expected Total Underwriting Return	308,016	269,664	472,103	(123,206)	926,577	
6H) Net Return on Risk Adjusted Capital	5.50%	177.94%	41.35%	5.50%	19.91%	
6I) Change in Return Due to Reinsurance	(118,068)					
6J) Change in Allocated Capital	(2,487,669)	*6K) Cost of Additional XTVAR Capital = (6I)/(6J)*				4.7%

Exhibit 11

Quota Share Reinsurance Example 11 Comparing Alternative Parameterization of EVA with Returns on Capital

Key Assumptions: Write equal amounts of premium in three lines of business. Interest Credited on Supporting Surplus: Yes
Pricing is accurate, as the Plan Loss Ratio equals the Expected Loss Ratio (ELR) for all three lines. The ELR's are equal to 80% for all three lines
A 40% Quota Share is purchased for LOB 1 with commission just covering variable costs. All three lines are uncorrelated.
The Consumption Fee for Capital Less than Allocation is assumed to be 25% of the Consumption Fee for Common Capital.

Refer to Exhibits 1-7 for detailed descriptions of items below.

4) Economic Value Added (EVA) where Usage Charges Are Computed Using Two Step Formula

	LOB 1	LOB 2	LOB 3	LOB 4	NET TOTAL	GROSS TOTAL
4A) Plan Premium	1,250,000	1,250,000	1,250,000	(500,000)	3,250,000	3,750,000
4B) Expected Underwriting Return (Profit & Overhead)	112,500	100,000	87,500	(45,000)	255,000	300,000
4C) Interest Rate Assumed	3.0%	4.0%	5.0%	3.0%		
4D) Mean Net Present Value of Interest Earned on Reserves	27,484	163,602	327,518	(10,994)	507,610	518,604
4E) Mean Rating Agency Capital	729,007	1,522,317	2,137,103	(248,282)	4,140,145	4,388,427
4F) Mean Interest Earned on Rating Agency Capital	21,870	60,893	106,855	(7,448)	182,170	189,618
4G) Mean Rental Cost of Rating Agency Capital	72,901	152,232	213,710	(24,828)	414,014	438,843
4H) Gross Expected Cost of Capital - Rental and Usage	302,783	180,569	291,744			775,096
4I) Gross Economic Value Added (GEVA)	(140,929)	143,926	230,129			233,126
4J) Gross Capital Cost Percentage	41.5%	11.9%	13.7%			17.7%
4K) Net Expected Cost of Capital - Rental and Usage	280,343	184,040	304,683	(107,805)	661,261	
4L) Net Economic Value Added (NEVA)	(118,489)	140,455	217,191	44,363	283,519	
4M Net Capital Cost Percentage	38.5%	12.1%	14.3%	43.4%	16.0%	
4N) Change in EVA Due to Reinsurance	50,393					

5) Risk Returns on Capital (RROC) After Rental Cost of Capital

Risk Capital Standard (Multiple K of XTVAR): 200%

	LOB 1	LOB 2	LOB 3	LOB 4	NET TOTAL	GROSS TOTAL
5A) Average 1 in 50 Year Deviation from Plan (XTVAR)	(3,422,935)	(587,455)	(1,381,379)	1,368,729	(2,325,477)	(3,548,909)
5B) Gross Risk Capital K% of XTVAR	6,475,419	82,920	541,609			7,099,947
5C) Mean Interest Earned on Rating Agency Capital	21,870	60,893	106,855	(7,448)	182,170	189,618
5D) Mean Rental Cost of Rating Agency Capital	72,901	152,232	213,710	(24,828)	414,014	438,843
5E) Expected Underwriting Return After Rental Cost of Capital	88,953	172,263	308,163	(38,614)	530,766	569,379
5F) Gross Risk Return on Capital = GRROC	1.37%	207.75%	56.90%			8.02%
5G) Net Risk Capital K% of XTVAR	5,603,182	157,190	1,133,669	(2,241,273)	4,652,768	
5H) Net Risk Return on Capital = NRROC	1.59%	109.59%	27.18%	1.72%	11.41%	
5I) Change in Return Due to Reinsurance	(38,614)					
5J) Change in Allocated Capital	(2,447,179)	*5K) Cost of Additional XTVAR Capital = (5I)/(5J)*				1.6%

6) Returns on Risk Adjusted Capital (RORAC)

	LOB 1	LOB 2	LOB 3	LOB 4	NET TOTAL	GROSS TOTAL
6A) Gross Risk Capital K% of XTVAR	6,475,419	82,920	541,609			7,099,947
6B) Interest Earned on Gross Allocated Capital	194,263	3,317	27,080			224,660
6C) Gross Expected Total Underwriting Return	334,246	266,919	442,098			1,043,264
6D) Gross Return on Risk Adjusted Capital	5.16%	321.90%	81.63%			14.69%
6E) Net Risk Capital K% of XTVAR	5,603,182	157,190	1,133,669	(2,241,273)	4,652,768	
6F) Interest Earned on Net Allocated Capital	168,095	6,288	56,683	(67,238)	163,828	
6G) Net Expected Total Underwriting Return	308,079	269,890	471,701	(123,232)	926,439	
6H) Net Return on Risk Adjusted Capital	5.50%	171.70%	41.61%	5.50%	19.91%	
6I) Change in Return Due to Reinsurance	(116,825)					
6J) Change in Allocated Capital	(2,447,179)	*6K) Cost of Additional XTVAR Capital = (6I)/(6J)*				4.8%