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The Role of Enterprise Risk and Capital Management in the Value Creation Process

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Overview

In the value creation process, insurance company managers utilize a variety of financial and operational decision tools to manage risk and efficiently employ capital. These tools include underwriting, reinsurance, asset portfolio management and capital structure (leverage). In this report, we define the value creation process and illustrate the interrelationships between the operational and financial decisions within this process. Because these decisions are interrelated, optimizing enterprise value is complex. For example, appropriate asset allocation is dependent upon underwriting, capital structure, and reinsurance strategy. Likewise, in an enterprise risk management framework, the appropriate reinsurance strategy is related not only to underwriting, but also to asset allocation choice and capital structure. These trade-offs are generally not intuitive. Detailed and sophisticated modeling capabilities are required to help identify appropriate mixes of strategies that will achieve maximum expected return subject to an enterprise's risk tolerance.

General Re Capital Consultants is a business practice that assists insurance companies in the value creation process by providing risk and capital management advisory services. Using proprietary analytical systems, a team of actuarial scientists and financial economists model the risk embedded in an insurer's balance sheet under numerous risk management/value generation strategies. Through analysis of these choices, optimal insurance company operational and financial decisions can be made to achieve various stated objectives (e.g., capital efficiency, value at risk tolerances). The group's analytical tools, coupled with the business expertise of its members, provide insurance companies with a framework for maximizing the value creation process.

More specifically, General Re Capital Consultants' business practice provides quantitative assessment of a variety of value creating decisions such as:

- Measuring and monitoring the enterprise value at risk;
- Deriving optimal asset allocation and reinsurance strategies;
- Establishing a risk-adjusted allocation of capital to operating entities and/or lines of business; and
- Evaluating the economic implications of business plans to include acquisitions.

The following sections will explain the value creation process and illustrate ways in which an Enterprise Risk and Capital Management framework can be applied to help analyze specific operational and financial dilemmas faced by insurance managers.

The Value Creation Process

In the 1995 Berkshire Hathaway Inc. Annual Report, Warren Buffett wrote, "Any company's level of profitability is determined by three items: (1) what its assets earn; (2) what its liabilities cost; and (3) its utilization of leverage — that is, the degree to which its assets are funded by liabilities rather than equity." Similarly, managers of insurance companies render three critical decisions in creating value for its owners: (1) what liabilities to underwrite; (2) what assets to invest in; and (3) how much equity capital is needed. In addition, insurance managers have a fourth opportunity for effecting the value creation process — the reinsurance choice. Managers provide "value added" to owners when the enterprise earns a return on capital in excess of the opportunity cost of investing it elsewhere. After reviewing each of the value-creating opportunities facing insurance managers, we can mathematically formulate the value creation process.

Underwriting

Insurance managers render underwriting decisions, such as which risk to underwrite and the premium charge for the risk. Collectively, these underwriting decisions result in the collection of premiums and the payment of losses and expenses. Because certain loss and expense payments do not coincide with the collection of premium, funds for these payments are set aside as loss reserves. Effectively these funds are "loaned" to portfolio managers for investment. The return on underwriting is equal to premiums less losses less expenses expressed as a percent of funds.

Asset Portfolio Management

Insurance managers render portfolio management decisions to include the allocation of assets across broad asset classes and/or market sectors. In addition, insurance managers may elect to actively implement their asset allocation choices by selecting undervalued securities within the asset class as opposed to purchasing a passively managed index proxy. The return on assets (R^{Assets}) is the weighted average of the individual asset returns (the weights become the percent of total assets allocated to the individual asset).

Capital Structure

Due to the uncertainty in the loss estimate, regulatory authorities ensure that policyholder obligations are met by

Figure 1: **Value Creation**

VALUE CREATION FORMULA

Value Added = [Actual Return] - [Cost of Equity Capital]

$$= \text{Funds} \times (R^{Assets} + R^{Underwriting}) + \text{Equity} \times (R^{Assets} - C^{Capital})$$

Where

Funds = Funds from underwriting = Loss and expense reserves
R^{Assets} = Return on invested assets
$R^{Underwriting}$ = (Premiums - Losses - Expenses)/Funds
Equity = Equity required due to loss uncertainty
$C^{Capital}$ = Cost of equity capital

VALUE PROPOSITIONS

Proposition I: Value creation occurs when the return on assets is greater than the annualized costs of funds.

Proposition II: Value Creation from Proposition I is reduced by the cost of capital.

requiring the insurance company to maintain equity within their capital (Equity). Equity capital has an implicit cost ($C^{Capital}$). The cost of capital and amount of supporting capital reflect the risk/return relationship anticipated by the asset portfolio and underwriting book of business. For example, the amount of required capital would be higher for a mono-line property catastrophe writer relative to a multi-line, well diversified primary insurer. Consequently, the required dollar return on capital would be higher for the catastrophe writer.

Reinsurance

An insurer may engage in a reinsurance contract to mitigate the volatility resulting from underwriting. The use of reinsurance affects the value creation process by reducing the capital charge, the return on underwriting, and the level of underwriting funds.

An Example

The formula for creating value is specified in *Figure 1*. Using a simplified example, we can illustrate the use of the value creation formula. Let us assume that the insurance enterprise annually collects $1,200 in premiums and incurs $200 in expenses from a single policy. Let us assume that the policy generates a $1,090 claim that is paid in three years. Thus, on a nominal basis, the policy generates an underwriting loss of $90. In a steady state, assuming only one policy is written at the beginning of each year, the insurance company will carry loss reserves of 2 x $1,090, or $2,180. These "Funds" from underwriting are invested in the capital markets generating an annualized return on assets (R^{Assets}) of 7 percent. Now assume the equity capital (Equity) is $600 and the weighted average cost of capital ($C^{Capital}$) is 10 percent. Using our formula, the actual return for the company is $104.60 = $2,180 x (.07 + (-90) / 2,180) + $600 x .07. The cost of capital is $60 = $600 x .10. So in this example, the enterprise value created from running an insurance business is $44.60 = $2,180 x (.07 - 90 / 2,180) + (.07 - .10) x $600.

From this example and formula, several points can be made:

1. Economic value is created when net return on funds from underwriting and investment return on supporting capital exceed the cost of capital.

2. Investment policy and underwriting policy are linked.

3. Diversification of underwriting and/or asset portfolios can increase value added by lowering the cost of capital.

4. Negative nominal underwriting returns can add value provided the return on assets exceeds certain thresholds.

5. An insurer may engage in a reinsurance contract to mitigate the volatility resulting from underwriting. In addition to this reduction in underwriting volatility, reinsurance can impact the value creation process in the following ways:

- Lowering the amount of required capital to support the business;
- Lowering the cost of capital;
- Lowering the level of underwriting funds;
- Increase or decrease the return on underwriting (dependent on pricing); and
- Increase the asset return by allowing a more aggressive investment policy. In essence, reduced underwriting volatility can be offset by taking greater asset risk (if desired).

6. Aggressive investment policy can increase value added by raising the return on assets, though this effect may be reduced by the higher marginal cost of capital associated with a greater risk position.

Economic value is created when the net return on funds from underwriting (i.e., return on assets less underwriting loss, if any) exceeds the net cost of capital. Put another way, two propositions are obvious. Value creation can only occur when the return on assets is greater than the annualized cost of funds, but value creation is reduced by the cost of capital. Insurance managers may consider the effect of an operational or financial decision on the value creation process to evaluate its effectiveness. For example, reinsurance may impact three of the drivers in the value creation formula: (1) funds provided by underwriting may be reduced; (2) return on underwriting may be reduced; and (3) the cost of capital may be reduced. For example, reinsurance increases value creation if the reduction in the capital charge ($C^{Capital}$) exceeds the potential reduction in the return on underwriting ($R^{Underwriting}$) and the reduction in the funds provided by underwriting (Funds).

The remainder of this article will illustrate the use of Enterprise Risk and Capital Management (ERCM) techniques in identifying enterprise strategies to create or enhance value.

The ERCM Framework

Optimization routines not only manage financial risk, but also allow for maximization of the firm's success drivers and ultimately its value within the constraints of risk tolerance and other internal/external limitations. One way of illustrating this concept is to refer to the efficient frontier, as depicted in *Figure 2*. Although the concept may be familiar, it is not to be confused with the asset-only efficient frontier. We recognize the complete enterprise and, therefore, have considered the risks associated with both sides of the balance sheet. Point A benchmarks the firm's current operational/financial decision set (product mix, asset allocation, reinsurance choice, leverage policy) in a risk/return paradigm. By optimizing the various operational/financial decisions while recognizing the interrelationships, efficient decision sets (illustrated as points B and C) are identified. At point B, the firm's expected measure of success is improved without increasing risk. Alternatively, at point C, enterprise risk is reduced without affecting the success measure.

The efficient sets, underlying points B and C, reflect a business process that maximizes the impact of operational and financial decisions on the enterprise's success drivers, while constraining for risk as well as other internal/external constraints. Financial economic theory becomes the foundation for these optimization routines, while systems and technology become the engine allowing management to gain insights from detailed and interrelated company data. Evaluating the effectiveness of a capital management strategy, in a risk/return framework, is complicated since decision-makers tend to manage towards numerous success drivers. In addition, risk has numerous metrics. Using alternative measures of success as the objective function (after-tax total return on equity, book income, growth in premiums) and alternative measures of risk (volatility, downside risk, value at risk), managers can more fully appreciate the various risk and return profiles relative to their business. Furthermore, managers gain insights into the various conflicts such as managing towards economic value versus GAAP or statutory value. These conflicts exist because we have numerous agents in our business (rating agencies, regulatory authorities, tax, security analysts, shareholders), each with differing perceptions of return and risk. Ultimately, decision-makers manage the divergence between the various conflicts in their business. Identifying the conflicts, and the resulting costs attributed to these conflicts, supports the ultimate resolution.

Figure 2: **ERCM Framework**

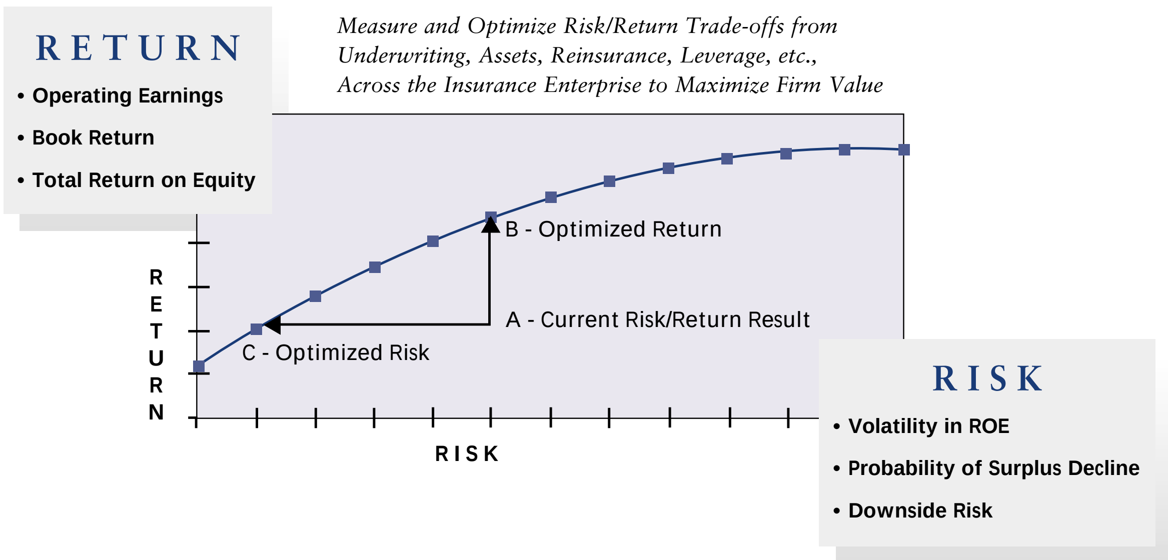
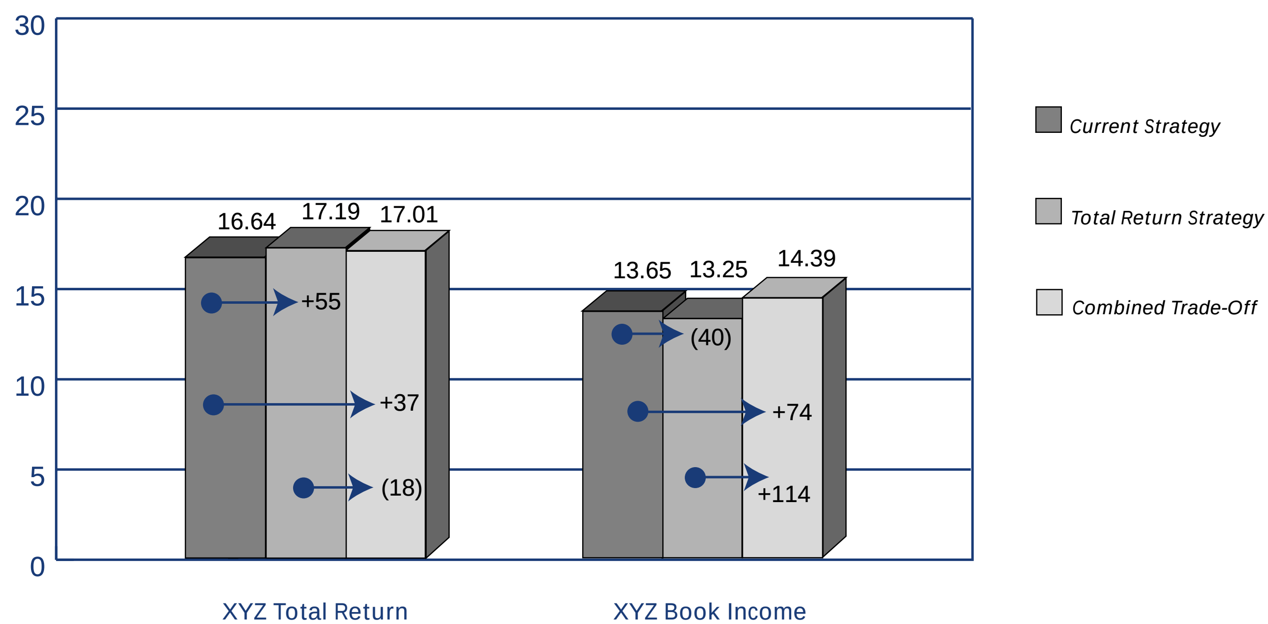


Figure 3 illustrates the tradeoffs between ERCM routines targeting optimal economic value versus optimal accounting value. Given the insurer's current set of capital decisions (business mix, asset allocation, reinsurance and leverage), the insurer's expected economic total return is 16.64 percent with a GAAP return on equity (book income) of 13.65 percent. Capital allocation choices are structured to optimize economic total return while achieving a target of 17.19 percent (an increase of 55 basis points relative to the current target). Nevertheless, this capital allocation choice reduces GAAP return on equity (book income) by 40 basis points. If the decision-maker considers book income and total return as equivalent units, this would be an acceptable position. Given the attention placed on book income by regulators, rating analysts and security analysts, a decision-maker most likely values a unit of book income more than a unit of total return. Consequently, a combined objective function targeting economic total return with a constraint on book income growth may be preferred. The capital allocation choice resulting from the combined objective function increases economic total return relative to the current strategy, although is suboptimal relative to the total return strategy. Nevertheless, the capital allocation strategy, resulting from the combined objective function, drives book income to 14.39 percent, an increase relative to the current decision set of 74 basis points.

Two methodologies may be employed in deriving optimal operational/financial decision sets — the Mean-Variance Method and the Stochastic Financial Statement Method. The Mean-Variance Method employs some simplifying assumptions. One of these assumptions suggests that the distribution of asset returns and losses can be captured with reasonable accuracy using the mean and variance. Although this assumption can be overly restrictive, the Mean-Variance Method is conceptually eloquent allowing for ease in interrelating numerous confounding variables. When attention to accuracy is paramount, as opposed to conceptual simplicity, the Stochastic Financial Statement Method is more appropriate. The advantage of the Stochastic Financial Statement Method is its ability to better capture the underlying distributions of the assets and liabilities and to model assets and liabilities at detailed levels.

Figure 3: **Managing the Divergence:** *Total Return vs. Book Income*



Business Decisions Supported by ERCM

ERCM provides analytical support to the following operational and financial decisions:

1 What is the insurer's overall enterprise risk exposure measured in terms of "value at risk" or "probability of surplus decline?" How does this level of enterprise risk compare to peer companies?

2 What is the appropriate risk level and underlying optimal asset allocation policy relative to liabilities?

3 Given that capital is limited, which insurance markets should be targeted for growth while recognizing the economic interrelationships between the lines of business? How should capital be allocated across lines of business?

4 Which reinsurance structure(s) is appropriate from an economic perspective versus an accounting perspective?

5 When considering merger/acquisitions, what is the economic value of the target company relative to the acquirer's portfolio of assets and liabilities?

6 What constraints (internal and external) affect the employment of capital, and what are the economic costs of these constraints?

Value at Risk

ERCM derives a value at risk in terms of a probability of surplus decline. The distribution of potential percentage changes in surplus is derived using the Stochastic Financial Statement Method. Although alternative percentages can be derived, for the purpose of this example, value at risk is measured as the probability of a 10 percent surplus decline. Using a stochastic process, the distribution of each liability and each asset is modeled capturing the expected return, variance and covariances. For each path a financial statement is derived, resulting in a change in surplus from the beginning balance sheet. This distribution of percentage change in surplus across paths becomes a measure of downside risk — the fear of loss, as opposed to the fear of uncertainty.

Figure 4 illustrates the distribution of a percentage change in surplus for the XYZ Insurance Company given its current set of operational/financial decisions, versus an optimal (recommended) set of operational/financial decisions. In addition, the industry parameters are modeled for comparative purposes. To derive the probability of a 10 percent decline or more in surplus, the area under the distribution curve and to the left of 10 percent is calculated. The current operational/financial decisions result in an 8.99 percent chance of a 10 percent surplus decline. The recommended decision set reduces the value at risk to a 7.50 percent chance of a 10 percent surplus decline. For benchmarking purposes, the current and recommended decision set results in a value at risk less than the industry. An alternative benchmark population could be companies of similar A.M. Best's ratings or companies with similar characteristics (size, line of business structure, ownership structure).

Figure 4: **Value at Risk**

XYZ Insurance Company's Value at Risk and Probability of Drawdown in Surplus Analysis

	Current	Recommended	Industry
Mean	20.97	22.29	22.87
SD	23.09	22.43	30.29
10%	8.99	7.50	13.89

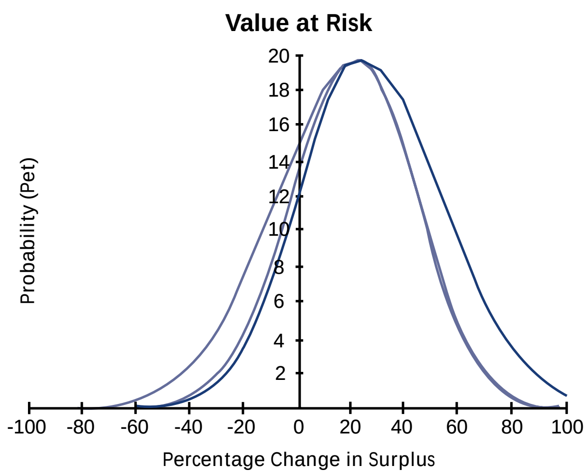
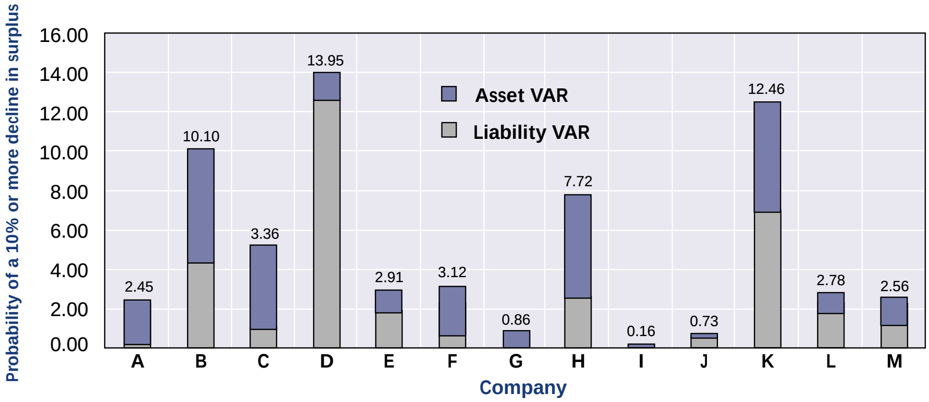


Figure 5 illustrates the value at risk (probability of a 10 percent or more decline in surplus) for Company A relative to individual companies specified as peer companies. Company A has a moderate value at risk relative to its peers. Furthermore, Company A's value at risk is largely driven by the risk embedded in assets as opposed to underwriting. The reverse is true for Company D.

Figure 5: **Value-At-Risk Peer Group Comparison By Assets and Liabilities**

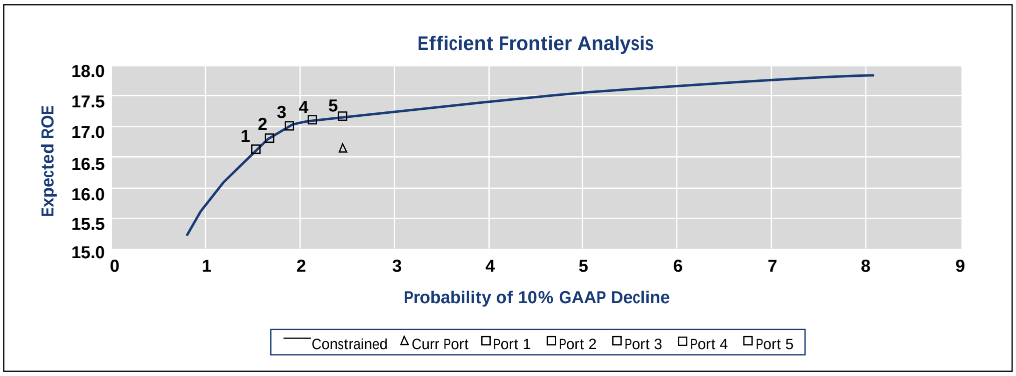


	A	B	C	D	E	F	G	H	I	J	K	L	M
Liab VAR	0.22	4.38	0.97	12.63	1.84	0.63	0.05	2.56	0.00	0.51	6.89	1.75	1.12
Asset VAR	2.23	5.73	2.39	1.33	1.07	2.49	0.81	5.16	0.16	0.22	5.56	1.03	1.44
Total VAR	2.45	10.10	3.36	13.95	2.91	3.12	0.86	7.72	0.16	0.73	12.46	2.78	2.56

Appropriate Level of Risk

The prior example benchmarked the risk level but was not explicit in terms of the appropriateness of the level. One approach to delineating an appropriate level of risk is to derive the point of diminishing marginal returns, that is, the level of risk whereby incremental increases in risk result in additional expected return although at a diminishing rate. At some point, it becomes senseless to continue traveling up the efficient frontier. In fact, eventually the efficient frontier flattens so that incremental increases in risk-taking behavior result in no additional expected return. Referencing *Figure 6*, reward for risk-taking begins to diminish beyond Portfolio 3.

Figure 6: **How Much Risk Should We Take?**



Prospective Returns – GAAP Risk Optimization

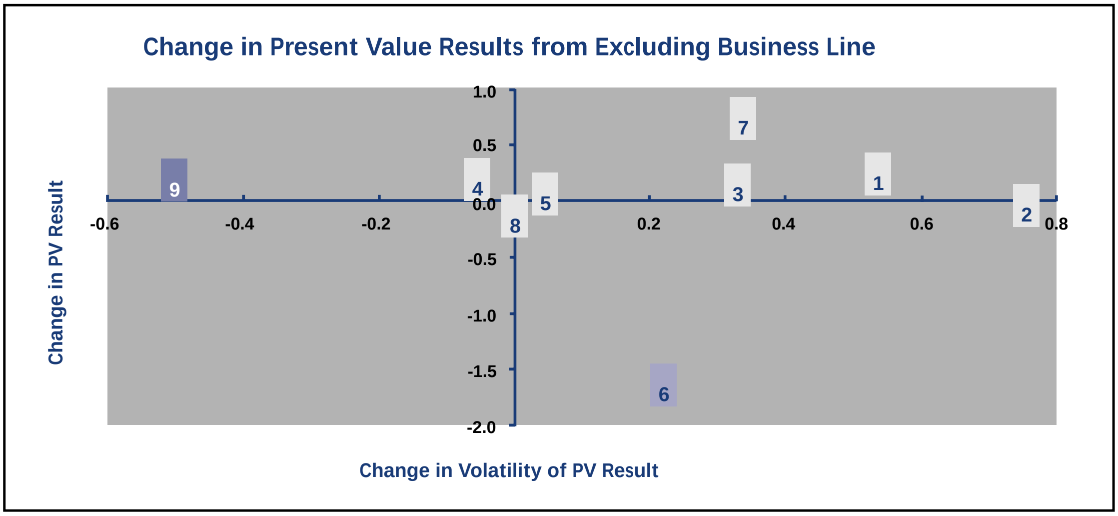
	Current Portfolio	Portfolio 1	Portfolio 2	Portfolio 3	Portfolio 4	Portfolio 5
Expected Return	16.64	16.64	16.81	17.01	17.10	17.17
Std. Dev. of Exp. Return	13.54	12.32	12.60	12.98	13.36	13.81
Probability of 10% Decline	2.46	1.53	1.67	1.87	2.13	2.46
Book Income	13.65	14.56	14.48	14.39	14.27	14.02
Additional Return			0.17	0.20	0.09	0.07
Additional Risk			0.14	0.20	0.26	0.33
Add'l Return/Add'l Risk			1.21	1.00	0.35	0.21

Capital Allocation

Given that capital is limited, operating entities and ultimately the lines within the operating entities should be capitalized on a risk-adjusted basis. That is, a line of business should be capitalized based upon the risk it adds to the enterprise as opposed to its "stand-alone" risk. Considering the expected return and risk characteristics of each line of business independently of the other lines can be problematic. The riskiness of the line, and ultimately the basis for allocating capital on a risk-adjusted basis, must be re-specified as the risk the line carries into the portfolio given the alternative financial decisions such as leverage and asset allocation. Allocation of capital on a risk-adjusted basis, whereby risk is specified as this "non-diversifiable" component of total risk, is contingent upon modeling enterprise risk as well as enterprise return.

Likewise, when targeting lines for growth, the decision-maker must consider the "relative" attractiveness of the line on an enterprise risk-adjusted basis. *Figure 7* illustrates the effect on the present value of cash flows (Y-axis), inclusive of assets and liabilities, and on the volatility of the present value of the cash flows (X-axis) across stochastic paths when a line is removed from the portfolio. For example, if Line 9 is excluded from the firm's portfolio of assets and liabilities, the present value of profits increases by 0.22 and the volatility in the present value of the cash flows falls by 0.54 (Win, Win). Hence, Line 9 would be targeted for sale or perhaps run-off. Alternatively, if Line 9 is critical to allow entrance into Line 6, then Line 9 may be kept (though perhaps heavily reinsured). Elimination of Line 6 from the portfolio would not only decrease the present value of the cash flows, but would also increase volatility (Lose, Lose).

Figure 7: **Allocating Capital by Line of Business**



	Mean PV Result	Std. Dev. of PV
All Lines	6.80	4.13

Excluding	Changes in Mean PV Result	Changes in Std. Dev. of PV
Line 1	0.25	0.50
Line 2	-0.02	0.72
Line 3	0.16	0.30
Line 4	0.19	-0.09
Line 5	0.06	0.01
Line 6	-1.63	0.18
Line 7	0.74	0.30
Line 8	-0.13	-0.03
Line 9	0.22	-0.54

Reinsurance Analysis

An appropriate reinsurance structure follows from the previous analysis. For example, assume that if Line 9 is reinsured, the enterprise's present value of cash flows will decline as will enterprise risk. Referencing *Figure 8*, economic enterprise value declines 7 units, whereas enterprise risk declines 14 units due to reinsuring Line 9. Having reinsured, Line 9 might be well justified because the decrease in enterprise cash flow volatility releases units of enterprise risk, even though this decrease may be less than that of the line. These units of enterprise risk released through the reinsurance decision may be subsequently spent in the asset markets by re-allocating assets to allow for additional units of interest rate risk, equity market risk or credit risk. If the reward for risk-taking behavior in the asset markets is greater than the cost for laying off risk in the liability markets via reinsurance, then the reinsurance choice is economically intuitive. In essence, the decision-maker swaps risk units across the balance sheet to optimize the portfolio of risk units. The decision-maker is indifferent as to where the risk units originate, as long as the resulting portfolio yields maximum expected return net transaction costs. Reinsurance releases risk exposures on the liability side of the balance sheet. Similarly, an asset hedge strategy will release risk exposures on the asset side of the balance sheet.

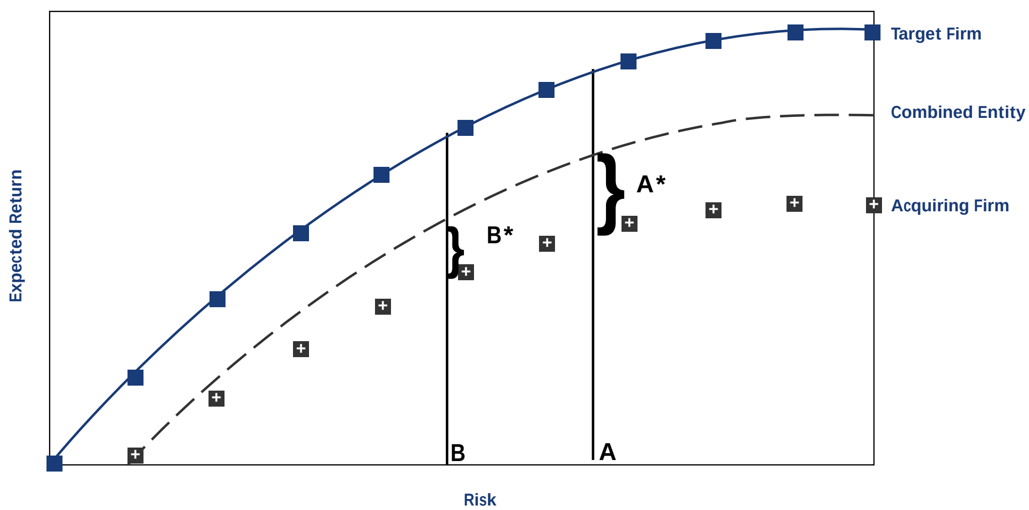
Figure 8: **Integrating Reinsurance**

	Mean Earnings	Standard Deviation of Earnings
No Reinsurance	6.80	4.13
With Reinsurance	6.73	3.99
	-.07	-.14

Merger and Acquisition Analysis

The economic value of an acquisition or merger may not be fully determined unless the interrelationships between the targeted and acquiring firms are explicitly recognized. Furthermore, the economic value of the acquisition or merger is dependent upon the risk propensity post-acquisition. *Figure 9* illustrates the enterprise efficient frontier for the acquiring firm, as well as for the combination of the acquiring firm and targeted firm's efficient frontier. Note that the economic value of the acquisition is dependent upon the post-acquisition risk tolerance. If the risk tolerance is A, then the economic value and ultimately the efficient price for the acquisition is a multiple of A*. Likewise, the efficient price is a multiple of B* if the risk tolerance is B.

Figure 9: **Merger and Acquisition Analysis**



Cost of Constraints

As external or internal constraints are imposed, the new constrained efficient frontier lies inside of the unconstrained efficient frontier. Hence, the opportunity cost of the constraint becomes observable. For any level of risk tolerance, some expected return will be foregone. The decision-maker may introduce the constraints sequentially, observing the cost of each constraint. Also, the effect of the constraint on the ultimate decision set may be evaluated. Some constraints appear important, yet are not binding. These constraints have little or no effect on the ultimate decision set, yet may impose an opportunity cost.

Conclusion

Managers of insurance companies are entrusted with capital, however, with the caveat that it will be used for maximizing enterprise value. Throughout time, they face many capital management decisions that present opportunities for taking on or laying off risk. ERCM provides a framework, supported by analytics, to assist managers when rendering optimal operational/financial decisions. These decisions may be optimized as a portfolio of choices.

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