

# Allocating Capital

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# An Insurer's Economic Environment

- Diminishing Returns
  - Increased exposure leads to
    1. Increased capital requirements, and
    2. Decreased return on capital
- Diversification
  - Increasing positively correlated exposure takes more capital than increasing uncorrelated (or negatively correlated) exposure.

# An Insurer's Economic Environment

- Prices for insurance products are given
  - By a competitive market
  - By regulation

# Insurer Strategy

- Increase exposure in lines of insurance that get the best return on capital.
- Long-run result of that strategy
  - Return on marginal capital is the same for all lines of insurance.
  - See Meyers “The Competitive Market Risk Load Formula for Increased Limits Ratemaking”
    - PCAS – 1991

# Allocating Capital

- Why not?
  - Capital supports all insureds
- Why?
  - “Insurers demand it”
    - Rodney Kreps – Originator of “MetaRisk”
  - “Use for setting incentive compensation targets”
    - Russ Bingham – Hartford Insurance Group
- Both sides are right – Allocating capital is a useful convenience, not a fundamental economic necessity.

# How Do We Allocate Capital to Promote the Best Economic Behavior?

- Answer – Allocate in proportion to Marginal Capital
- But!
  - Sum of marginal capitals is less than the total capital.
- So what!
  - That indicates that the insurer is benefitting from diversification.
  - That is what they do!
  - Can adjust with a Lagrange multiplier
    - Or a fudge factor

# Consider the Time Dimension

- How long must insurer hold capital?
  - The longer one holds capital to support a line of insurance, the greater the cost of writing the insurance.
  - Capital can be released over time as risk is reduced.
- Investment income generated by the insurance operation
  - Investment income on loss reserves
  - Investment income on capital

# The Cost of Financing Insurance

Capital invested in year $y+t$	$C(t)$
Capital needed in year $y+t$ if division $k$ is removed	$C_k(t)$
Marginal capital for division $k$	$\Delta C_k(t) = C(t) - C_k(t)$
Sum of marginal capital	$SM(t)$
Allocated capital for division $k$	$A_k(t) = \Delta C_k(t) \times C(t) / SM(t)$
Profit provision for division $k$	$\Delta P_k(t)$
Insurer's return in investment	$i$
Insurer's target return on capital	$r$



# The Cost of Financing Insurance

Time	Financial Support Allocated at time $t$	Amount Released at time $t$
0	$A_k(0)$	0
1	$A_k(1)$	$Rel_k(1) = A_k(0)(1+i) - A_k(1)$
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$t$	$A_k(t)$	$Rel_k(t) = A_k(t-1)(1+i) - A_k(t)$
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$$\text{Then } \Delta P_k(0) = A_k(0) - \sum_{t=1}^{\infty} \frac{Rel_k(t)}{(1+r)^t} = (r-i) \sum_{t=1}^{\infty} \frac{A_{k-1}}{(1+r)^t}$$



Note the similarity with the EU and SST risk margin formulas

# Conclusion

- Allocating capital is a convenient way to express an insurer's economic goals.
- Allocating capital in proportion to marginal capital leads to a more efficient use of capital.
- We should also allocate capital to reserves from prior years as well as the current year.