



Chapter 25

Uses of Efficient Frontier Analysis in Strategic Risk Management

Enterprise Risk Management



Introduction

- Strategic risk management framework
- Modern portfolio theory
- Practical application of risk measurement for insurance
- Sample case study
- Intended uses

Strategic Risk Management Framework

- Enables organization to discover risks
 - Across organizational boundaries
- Continuous cycle
- Considers interactions of multiple risks
- Combines risk appetite and risk tolerance
- Defines exploitable risks

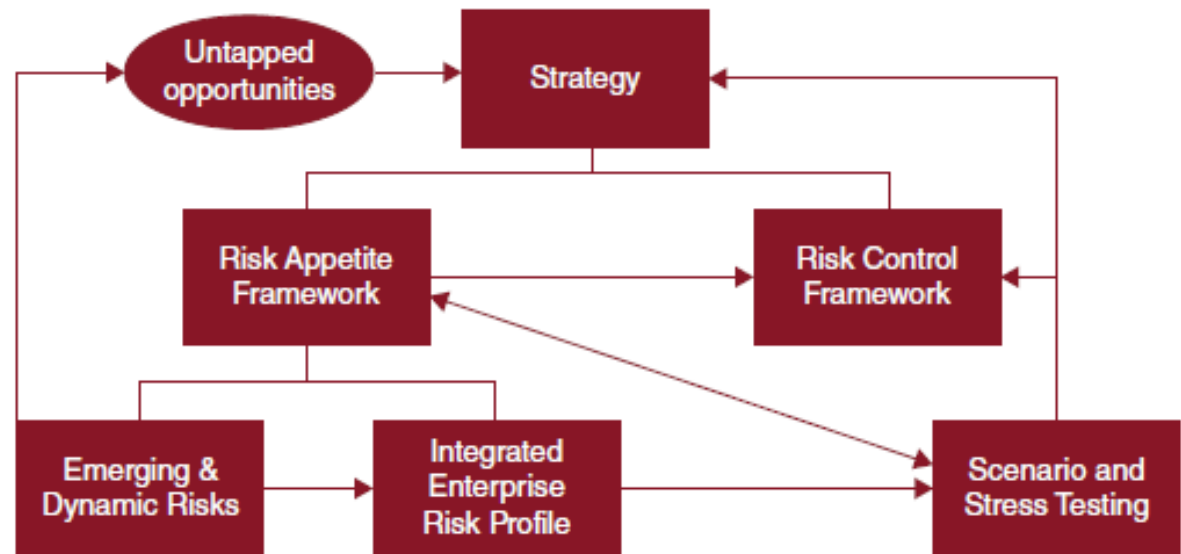
Strategic Risk Management

Strategic objectives, strategic risks, and risks arising from plans to meet objectives

Risk appetite and tolerance statements for key risk categories are used to reframe risks as opportunities and to position control framework

Scenario and stress testing used for:

- Calculation of investment, resource needs, capital allocation
- Revising risk appetite positions and control actions
- Guiding strategy adjustments



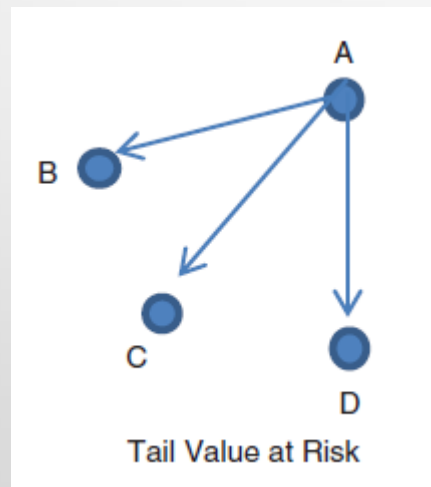
Modern Portfolio Theory

- Mathematical model – from 1950s
- Risk is standard deviation
 - When portfolio is weighted combination of assets
- R_p – return of portfolio
- R_i – return of asset i
- W_i – weighting of asset i

$$E(R_p) = \sum w_i E(R_i)$$

Practical Application of Risk Measurement for Insurance

- Purpose is to optimize insurance placements
 - And risk limits
- Tail value at risk of loss – $TVaR_L$
 - Expected value of loss, given that an event has occurred



Sample Case Study

- Three basic risks
 - Earthquake exposure to buildings
 - Workers' compensation insurance
 - General liability insurance

Exhibit 25.4 Mean Retained Losses by Line

	Retention	Limit	Current
EQ	5%	\$25,000,000	\$2,500,501
WC	\$1,000,000	Statutory	\$3,163,992
GL	\$250,000	\$25,000,000	\$1,597,373
Portfolio			\$7,261,866

Portfolio Options

Exhibit 25.6 Portfolio Options under the Coverage Availability Approach

	Option #1	Option #2	Option #3	Option #4	Option #5
EQ	5% retention \$20M limit	5% retention \$50M limit	5% retention \$75M limit	5% retention \$100M limit	10% retention \$25M limit
WC	\$250K retention Statutory limit	\$500K retention Statutory limit	\$2M retention Statutory limit	\$5M retention Statutory limit	\$10M retention Statutory limit
GL	\$500K retention \$25M limit	\$2M retention \$25M limit	\$5M retention \$25M limit	\$10M retention \$25M limit	\$500K retention \$30M limit

Earthquake Options

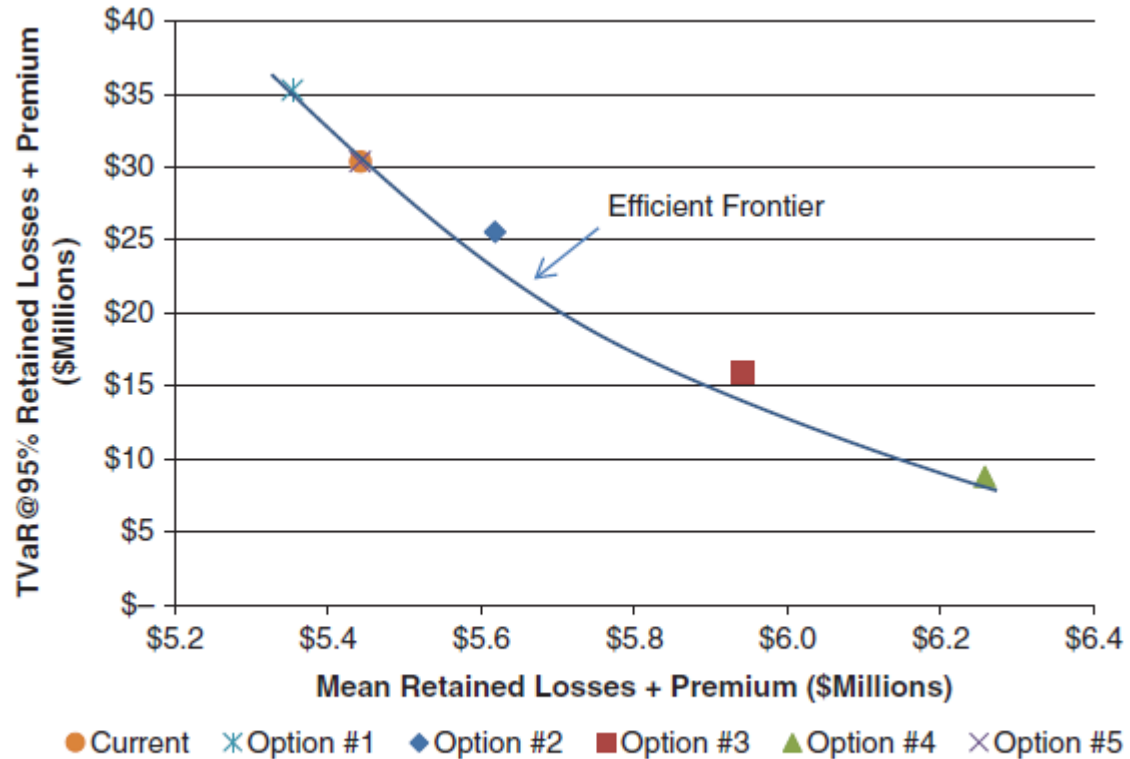


Exhibit 25.12 Efficient Frontier on Earthquake Options

Workers' Compensation Options

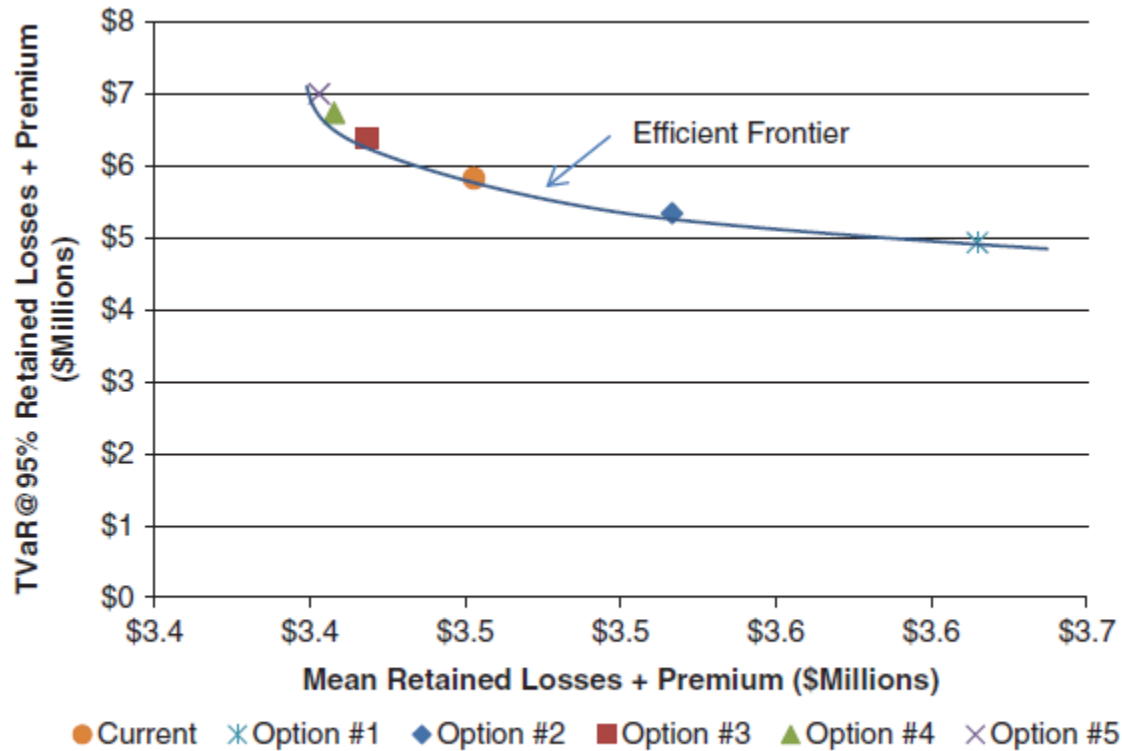


Exhibit 25.13 Efficient Frontier on Workers' Compensation Options

General Liability Options

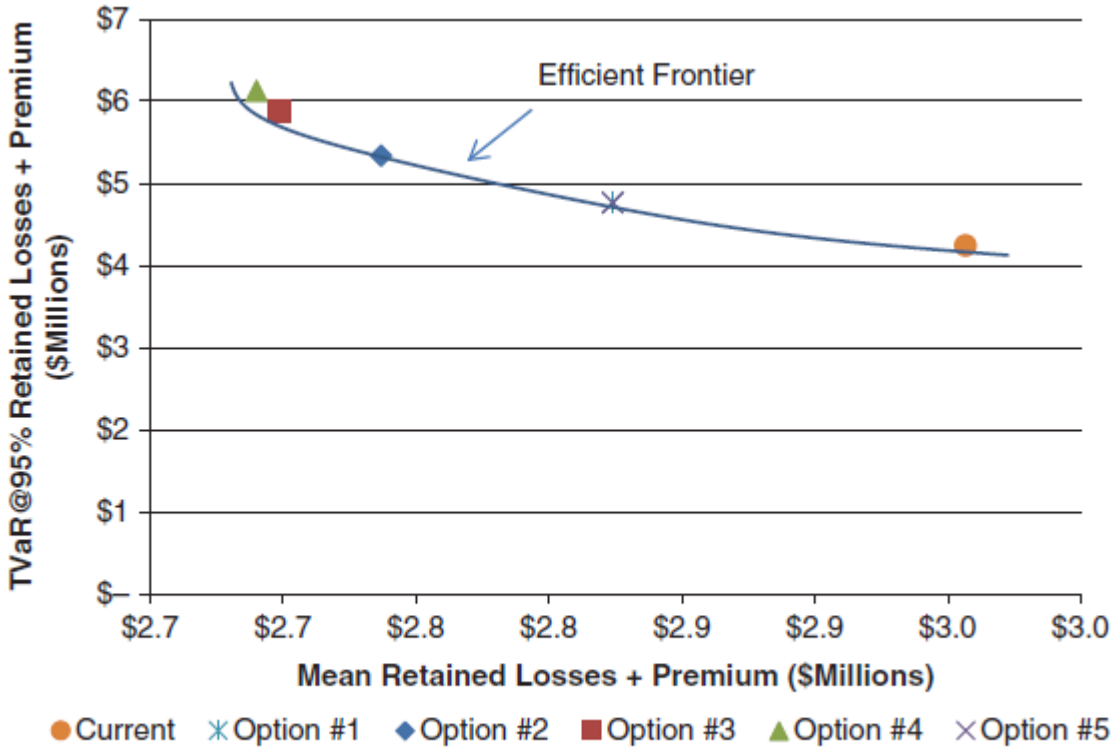


Exhibit 25.14 Efficient Frontier on General Liability Options

Combined Portfolio Options

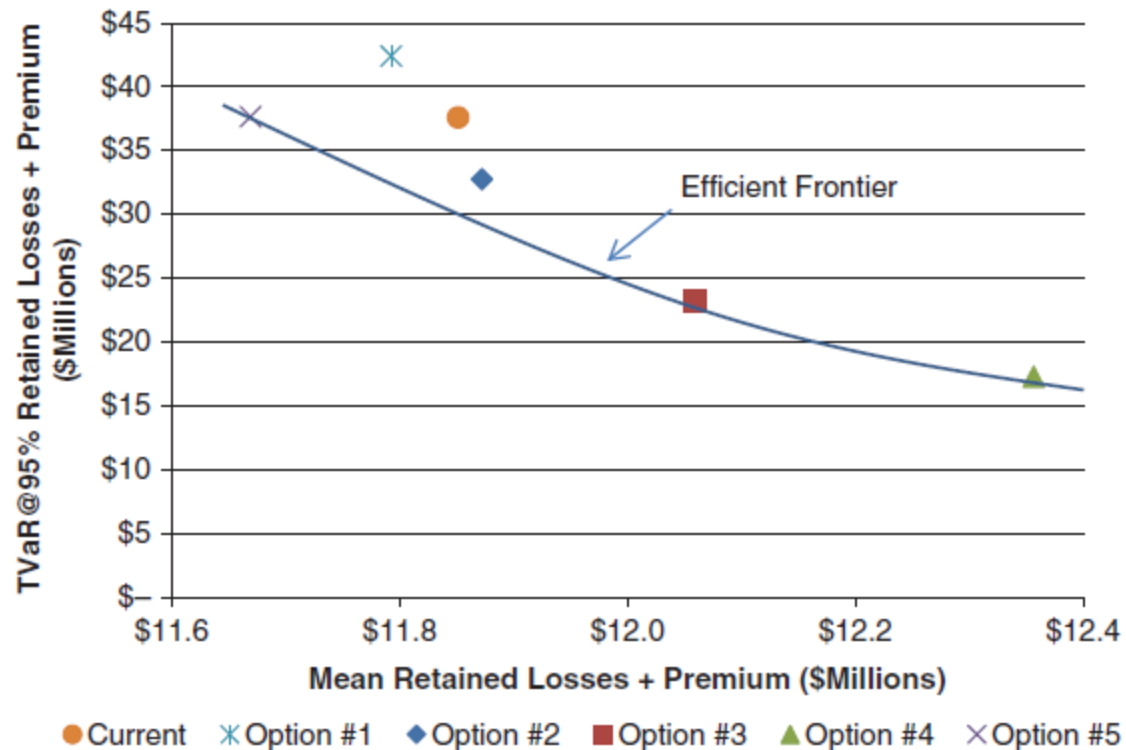


Exhibit 25.15 Efficient Frontier on the Combined Portfolio Options

Intended Uses

- Help large organizations
 - Risk management
 - Portfolio management
- Insurance and non-insurance risks
- Best fit
 - Established ERM