Workers' Compensation Ratemaking:
A Handbook for the Pricing Actuary

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Preface

In May 2000, Dr. Edmund Kelly, President, CEO, and Chairman of Liberty Mutual, stated his concern that the lack of clear texts on property-casualty insurance pricing may lead to improper pricing. Better understanding of actuarial techniques helps insurers set adequate premiums, allows consumers to obtain a wider range of products, and assists regulators in identifying excessive or discriminatory rates. Insurance price fluctuation is exacerbated by our inability to accurately estimate needed premiums.

Dr Kelly asked me to write a textbook on workers' compensation ratemaking and pricing giving a firm foundation in actuarial and financial principles. This textbook is a handbook for the practicing actuary, not a research monograph for the pure actuary. The textbook culls the best procedures from actuarial and financial practice, with clear exposition, full illustrations, and student exercises.

The textbook is geared to practitioners, and it has benefitted from critiques by hundreds of my peers. The initial drafts of these volumes were used for actuarial seminars on ratemaking, experience rating, retrospective rating, and financial pricing. Many exercises have been adapted from CAS exam problems.

Three themes recur through this text: independent pricing, financial modeling, and product differentiation:

Independent pricing: Until the 1980's, rating bureaus set advisory rates, and most insurers used the same individual risk rating plans. Insurers often deviated from bureau rates, but independent analysis of benefit changes, class relativities, experience rating credibilities, or retrospective rating charges was rare.

By the mid-1980's, pricing in unison fell out of public favor, and rating bureaus shifted from advisory rates to loss cost filings.[1] Independent rate setting increases the need for pricing expertise. This text assumes the pricing actuary is responsible for all pricing and individual risk rating and can not rely on the rating bureau for indicated rates.

Financial modeling: The lag from premium collection to loss payment provides substantial investment income to the insurer. The profit margin is set by return on capital, net present value, internal rate of return, or discounted cash flow models. Many insurers are changing their planning, pricing, and measurement systems to return on capital metrics. This text provides clear expositions of financial modeling for workers' compensation pricing.

Product differentiation: When bureaus set advisory rates and insurers used mandatory experience rating plans, insurers sold the same products at similar prices. They competed on loss engineering and claims service, but pure price competition was weak. Since the early 1990's, insurers have developed a variety of policy forms with different mixes of financial responsibility by the insurer and the employer. The varieties of claim service continues to grow, with managed care systems used to control costs and improve physical rehabilitation. Some insurers are experimenting with new class dimensions and revised experience rating or retrospective rating plans. These changes give advantages to the insurers with greater ratemaking expertise.

Two principles have structured this text.

- *Practice:* The text is practical, not abstract theory for armchair academics. The methods are rooted in the pricing and modeling of actual workers' compensation business.
- *Objectivity:* Only an objective textbook gains acceptance by actuaries, regulators, and consumers. This textbook should have no trace of partisan lobbying.

This textbook is organized in three volumes:

- Volume 1 covers class ratemaking: trending, development, current rate and benefit levels, residual market burdens, assessments, expense gradations, rate indications, class pure premiums, incentive effects of benefit changes, economic influences on loss costs, and class dimensions.[2]
- Volume 2 covers experience rating, retrospective rating, large dollar deductible policies, and reserving for accrued retrospective premiums.
- Volume 3 covers financial pricing (return on capital, internal rate of return, net present value, discounted cash flow), federal income taxes, and investment strategy.

Each chapter has numerous illustrations and exercises, so that students can work through the procedures; complete solutions are in the *Student's Manual*. The accompanying CD contains worksheets for the actuarial procedures and financial models.

ROLE OF THE ACTUARY

Insurance operations have financial implications, and the actuary must provide timely estimates of costs and benefits. The pricing actuary must

- set rates that provide a reasonable return on invested capital and attract new business, yet avoid adverse selection by insureds or lower rates by competitors.
- determine ultimate historical losses to project future loss costs.
- develop individual risk rating plans for insureds with credible experience.
- project cost implications of benefit changes: direct effects from revised compensation rates and incentive effects on claim filing behavior.

- design new coverages, such as large dollar deductible policies, and new class plans.
- analyze potential benefits of managed care and other cost containment initiatives.

The text often links actuarial concepts to their statistical or financial counterparts.

- Actuaries use a savings-charge parity relation to price retrospectively rated policies that is analogous to the put call parity relation used in option pricing.
- Actuaries speak of process risk and shifting risk parameters, which statisticians refer to as sampling error and mean reversion.

The concepts are rarely identical, but the similarities let us apply statistical and financial procedures to actuarial problems.

[1] The June 1993 Supreme Court decision against ISO and several member companies hastened the change from advisory rates to loss costs.

[2] The *Practitioner's Guides* on minimum bias and generalized linear models that I have written with co-workers at Liberty Mutual (Drs J. Eric Brosius, Neeza Thandi, Ernesto Schirmacher, and Doris Schirmacher) present more advanced treatments of this subject and will ultimately be incorporated into this text as well.