

STATE OF CALIFORNIA
WORKERS' COMPENSATION
RATE STUDY COMMISSION

COMMISSION REPORT



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VOLUME IV
SUB-CONTRACT RESOURCE REPORT
MILLIMAN & ROBERTSON, INC.

MARCH 1992

**STATE OF CALIFORNIA
WORKERS' COMPENSATION RATE STUDY COMMISSION**

COMMISSION REPORT

**VOLUME IV
SUB-CONTRACT RESOURCE REPORT
MILLIMAN & ROBERTSON, INC.**

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OTHER VOLUMES:

In addition to this Volume, the Workers' Compensation Rate Study Commission Report includes the following four Volumes:

**VOLUME I
EXECUTIVE SUMMARY**

**VOLUME II
COMMISSION STAFF REPORT
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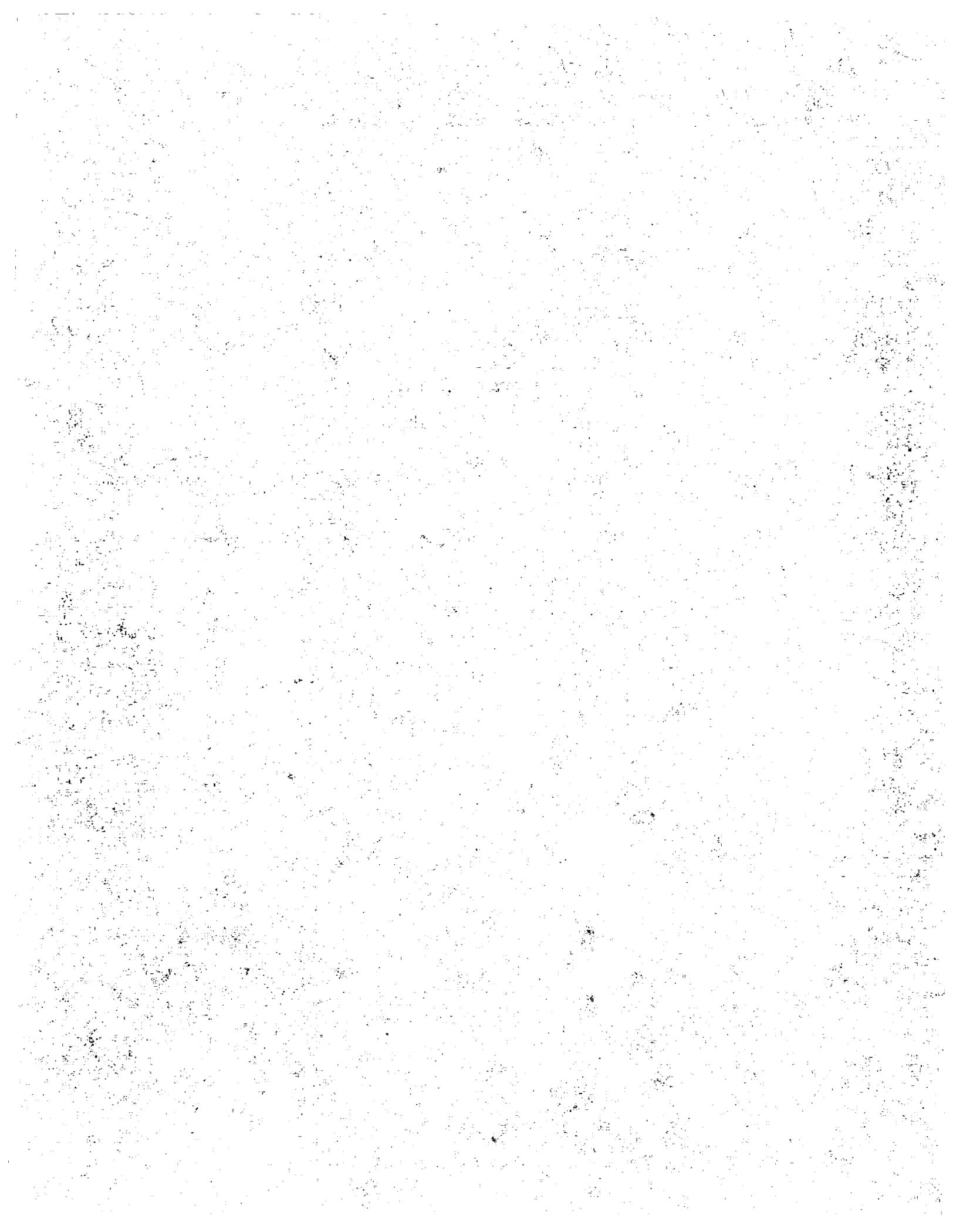
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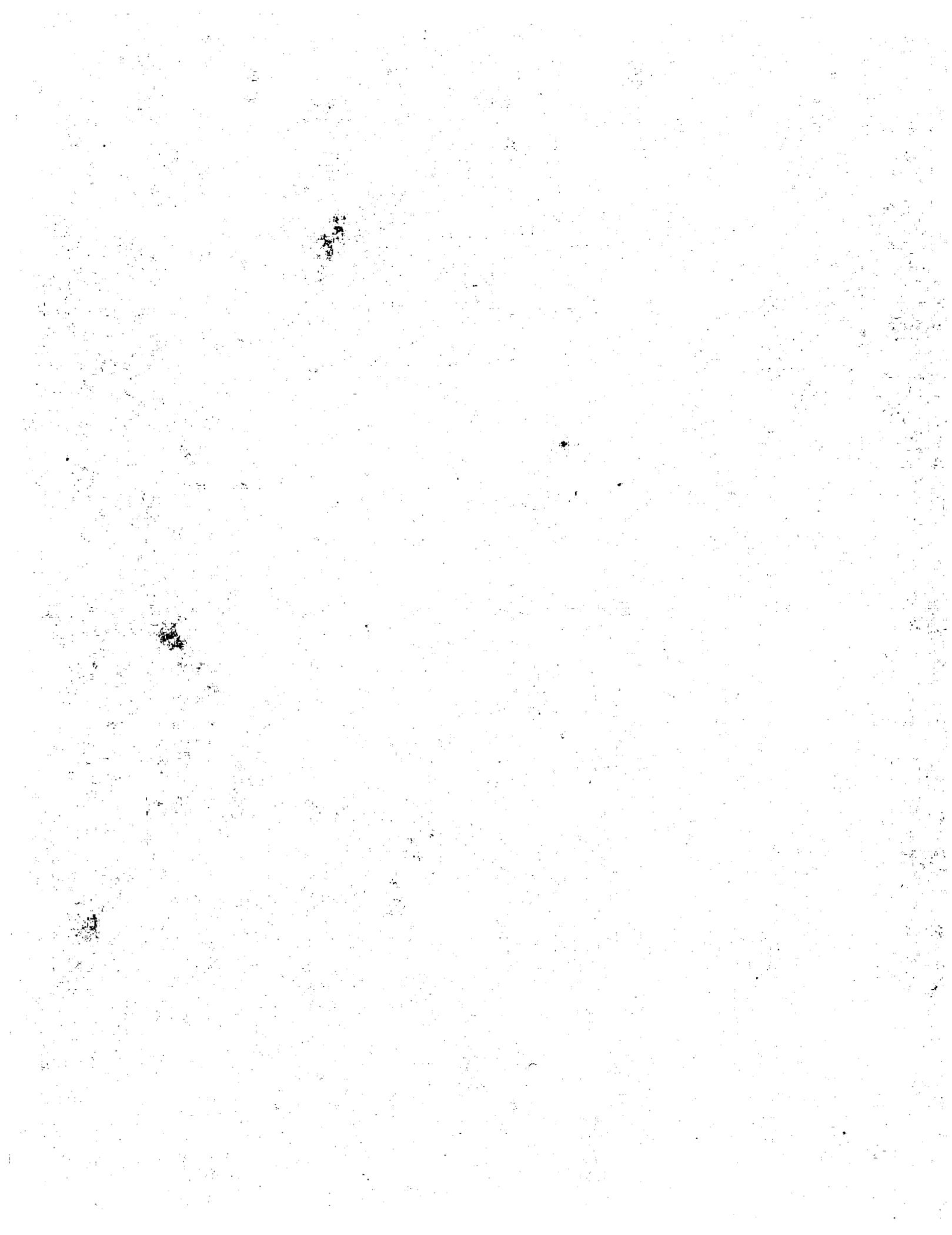
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COMMISSION INTRODUCTION

CONSULTING TECHNICAL RESOURCES

Additional assistance in the form of technical resources was requested by the Workers' Compensation Rate Study Commission. The desired technical resource was in the area of actuaries and economists who were retained as subcontractors to the Soper & Associates consulting organization.

The Commission approved and retained technical resource organization which served as a sub-contractor is as follows:

DAVID APPEL, Ph.D. (Project Manager)
Director - Economic Consulting
Milliman & Robertson, Inc.
New York, New York

Senior Support Staff:

Michael A. McMurray, F.C.A.S., Principal
Mark W. Mulvaney, F.C.A.S., Consulting Actuary

MILLIMAN & ROBERTSON, INC. SUB-CONTRACT SCOPE

The Workers' Compensation Rate Study Commission Approved Study was under the direction of David Appel, Ph.D., Director - Economic Consulting and the sub-contract within the study involved the following scope of work:

1.0 Initial Review of Ratemaking Systems

Contractor will provide overview of alternative ratemaking and ratesetting systems currently in use in U.S. Narrative will include description of various kinds of ratemaking systems including: 1) administered pricing, with and without deviations allowed; 2) competitive rating, with bureau advisory rates and with pure premiums; and 3) systems utilizing exclusive state funds without rating bureaus for ratesetting. States will be categorized into groups, with discussion of similarities and differences within and between groups.

Contractor will describe the operation of workers' compensation insurance ratesetting program under various scenarios corresponding to categories above. Contractor will survey a subsample of interest groups involved in and/or affected by ratemaking to determine opinions and perceptions of

how changes in current system would be felt. Groups surveyed will include random samples of regulators (both in and out of California), insured businesses, insurance companies, service providers, and industrial accident agencies/workers' compensation agencies. (Survey may include questions to injured workers, if appropriate and doable.) If randomization is impossible, contractor will provide Commission with documentation of attempts to randomize selection, and perception of bias in sample, if any. Survey will concentrate on perceived effects on interest groups of changes, including effects on availability of coverage, costs of coverage, levels of service, incentives for health and safety, rate competition, dividend competition, claims service, solvency of carriers, and distribution of cost. Narrative will describe priorities for various interest groups, and group perception of which alternatives lead to favorable or unfavorable outcomes. Report will be in form of narrative with matrices explaining viewpoints of interests.

Contractor will provide Commission with description of sampling technique and copies of all completed survey forms (hard copy and computer data received from respondents. (Confidentiality may be assured by removing personal identifiers, if necessary.)

2.0 Net Cost of Workers' Compensation Insurance

The contractor will investigate and report on factors that contribute to the net cost of workers' compensation insurance in a sample of 15 states comprising the bulk of the national workers' compensation market. States should be representative of the various categories of ratemaking cited in (A) above. Using existing published academic analyses comparing state costs of compensation systems, contractor will attempt to investigate the degree to which injury rates, levels and utilization rates of workers' compensation benefits, the type of rating system, macroeconomic variables, socio-political factors and other factors influence average net employer costs of compensation insurance. To the extent possible, measures of injury rates will include both frequency and duration of various types of injuries (lost-time, medical only, etc) as reported to state and federal labor statistics bureaus, and frequency of workers' compensation claims. Measures of workers' compensation benefits will include both statutory and actual claims paid estimates. Contractor will enumerate and describe potential sources of error and/or bias from the inclusion or omission of certain types of data from these calculations. Data used in the analyses will be made available to members and staff of the Commission for review purposes.

3.0 Rate of Return

Contractor will analyze statewide rate of return (profitability) for workers' compensation insurance carriers in 13 states utilizing private insurance coverage and surrogate measure of profitability for 2 exclusive state fund states. Analysis will be done for each state for ten years of calendar year results comprising, as nearly as possible, the years 1981-1990. Methodology used will be to compute post-tax underwriting, operating, and total returns attributable to workers' compensation insurance for the period, and to convert total return to a return on net worth. Contractor will discuss methodology for allocating investment income to line of insurance for individual states. Profitability estimates should be presented so as to determine the effect of dividends, underwriting profit (or loss) and investment income effects on rate of return. Analysis of profitability should include narrative that contrasts rates of return found by contractor with rates of return reported by National Association of Insurance Commissioners in their most recent annual Report on Profitability by Line By State. Contractor shall highlight and explain discrepancies between the two results, with respect to differences in accounting for investment income, tax treatment, and other factors identified by the contractor as appropriate. Contractor will provide Commissioners and Commission staff with data used for the analysis for purposes of review and independent analysis.

4.0 Financial Incentives for a Safe Workplace

Contractor will evaluate financial incentives attributable to experience rating plans through conduct of two-stage analysis. The contractor will describe and evaluate the experience rating plans in use by the National Council on Compensation Insurance for states under its jurisdiction and for independent bureau states. The contractor will summarize the factors and present the information for a broad sample of states. Factors analyzed will include: qualifying threshold and extent of change in threshold over prior decade; weight attached to employer's experience, determined by size or risk level of employer; use of primary versus excess losses, formula for computing the modification factor; and the extent to which nonpreventable injuries and/or random events (i.e. murder of employees, automobile fatalities) are or are not reflected in an individual employer's experience modification plan. The contractor will discuss the similarities and differences between experience rating plans, and evaluate from a theoretical perspective the implications of the alternatives on safety incentives. The contractor will discuss the role of a rating bureau with respect to experience rating plans in states that have gone to open competition, and/or have otherwise restricted the role of the rating bureau (such as Michigan).

The contractor will comment on experience rating plans that allow small employers to participate in the plan, such as that in the State of Washington.

Assuming data availability, the contractor will attempt to ascertain the predictive accuracy of the experience modification factor for a selected sample of employers by comparing predicted losses with actual experience that emerged. The contractor will then attempt to ascertain which if any alternative models of experience rating would have better predictive accuracy, and whether premium threshold levels for eligibility for experience modification could be reduced to encourage more safety incentives. If data are not available for this empirical investigation, a theoretical analysis of experience modification will be done by modeling the modification inherent under various existing experience rating formulas. This analysis would include a cross-section of employers with respect to classification, payroll levels, and past loss experience.

The contractor will also furnish the Commission with summary information describing the extent to which states encourage or utilize other forms of financial incentives relating to health and safety. Specifically, the contractor will furnish listings of states that use: schedule rating plans, and the extent of use of such plans including payroll or premium thresholds, classification restrictions, etc; states that use dividends as an incentive for safety, and states that use other deviations in rates to promote safety.

5.0 Availability of Workers' Compensation Insurance

The contractor will provide the Commission with tables and/or original source material to assist Commission staff in conducting an analysis of market availability of compensation insurance in various states during the past decade. Such information may include data on market conditions over past 10 years in states identified for focus above. Such data will assist in determining the extent of the assigned risk pool and other market performance measures in workers' compensation for states that both have and have not switched from administered to competitive pricing.

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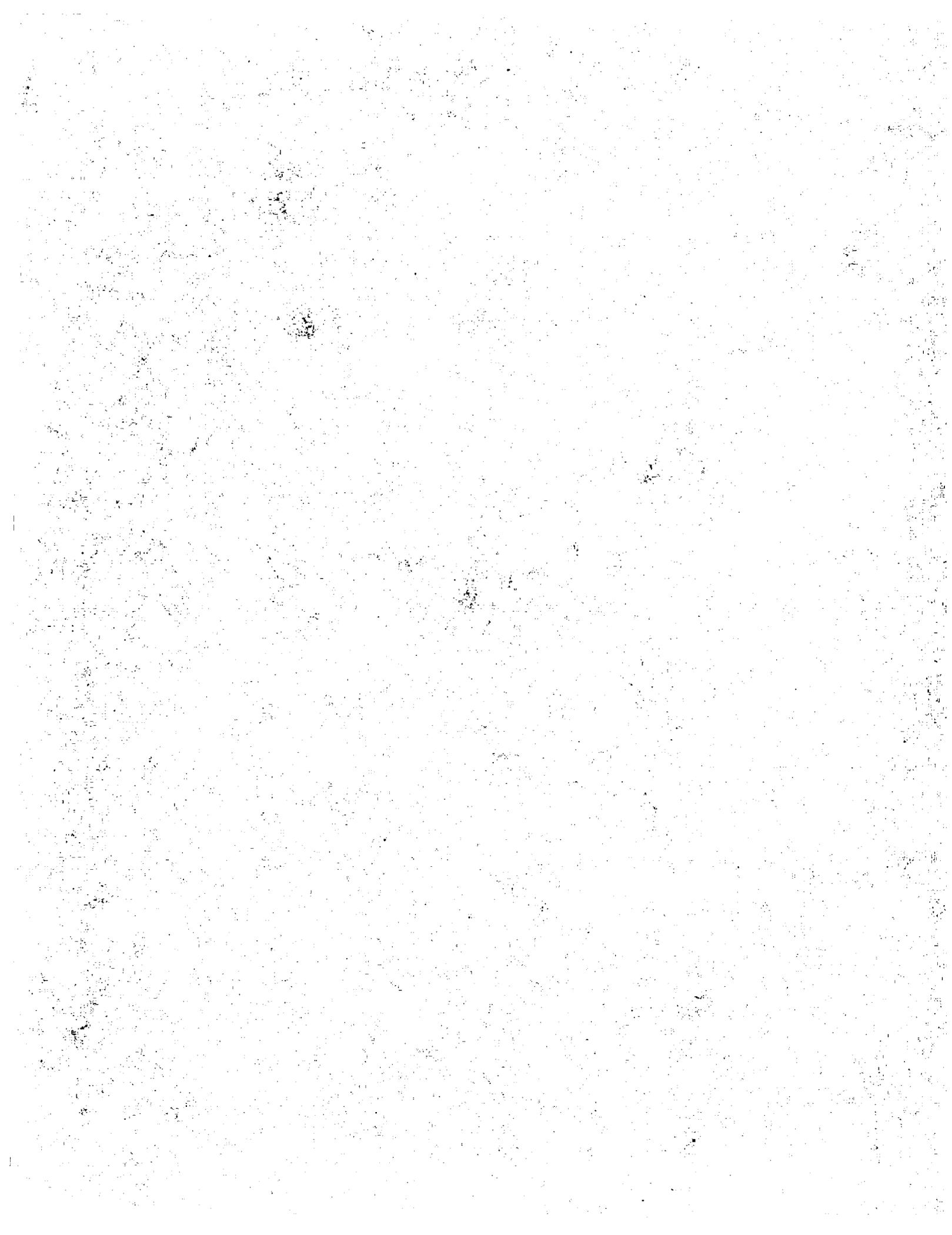
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CALIFORNIA RATE STUDY COMMISSION
ALTERNATIVE RATEMAKING SYSTEMS

prepared for

The California Workers' Compensation Rate Study Commission

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January 1992

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Appendix A

CALIFORNIA RATE STUDY COMMISSION

ALTERNATIVE RATEMAKING SYSTEMS

INTRODUCTION

A comprehensive evaluation of workers' compensation rating requires that the ratemaking framework itself be reviewed. Milliman & Robertson, Inc. (M&R) was retained by the California Rate Study Commission to assist the Commission in fulfilling this aspect of its assignment.

This report provides a qualitative description of the existing ratemaking system and potential alternatives for California workers' compensation insurance. Furthermore, the report includes M&R's evaluation of the perceived impact of the alternative systems on various stakeholders in the workers' compensation environment. The evaluation is based on our own assessments as well as the results of a stakeholder survey.

Within the context of this study, the term "ratemaking system" refers to the regulatory framework and the corresponding assignment of responsibilities among regulators, private insurers, state funds, insurance purchasers, and rating bureaus. The term does not refer to specific actuarial ratemaking methodologies.

Early on in our study, two conclusions were reached:

1. There are a limited number of categories of ratemaking systems in effect or under consideration, and
2. There are a seemingly unlimited number of system variations under each category. The latter conclusion reflects the impact of implementation strategies and consequent market reaction to any one category of ratemaking

system.

For this study, we concentrate on describing the categories. However, we do discuss implementation strategies to a limited extent. In our opinion, implementation strategy is primarily a public policy issue, which we understand is the subject of a separate report, distinct from the M&R engagement.

To supplement existing literature and data concerning stakeholder interests, M&R attempted to survey a wide variety of participants in the workers' compensation system. To facilitate this survey, a series of questionnaires were distributed to elicit confidential comments regarding the potential impact of various ratemaking systems. The questionnaires were not intended to provide a scientifically derived random sample of opinions. Instead, they were designed to provide a vehicle for informed parties to convey their viewpoints and judgments. The questionnaires were a practical substitute for personal interviews.

CONCLUSIONS

The American Insurance Association's (A.I.A.) 1982 Workers' Compensation Insurance Rate Regulation Study (page 5) identified special ratemaking needs for a mandated social insurance system such as workers' compensation. These special needs suggest that more centralized ratemaking activity is required for workers' compensation than for other lines of insurance. In our opinion, the most important of these needs are referenced below:

- "Insurers should possess as wide a knowledge as possible of the inherent and potential costs of providing the benefits specified by law;"
- "Insurance costs should be equitably assigned among employers;"
- "Each state should be provided reliable estimates of the likely cost effects on employers of proposed benefit changes;..."

Based on our review of developments subsequent to the release of the 1982 A.I.A. study, including the results of our stakeholder surveys, we believe that workers' compensation insurance still requires more centralized ratemaking activity than other lines of insurance. This finding is consistent with the 1990 National Association of Insurance Commissioner's (NAIC) resolution to move to an advisory loss cost ratemaking system for workers' compensation in which rating bureaus maintain a vital role in the process.

As discussed in subsequent sections of this report, there are at least five different categories of ratemaking systems in which some level of centralized pricing activity can be conducted. Although there is no conclusive information as to how each workers' compensation stakeholder group would fare under each system, our study did reveal the following:

- o Regulators and carriers both expressed the opinion that the type of ratemaking system was much less important than the actual or perceived adequacy of the premium rate levels in a state. As pointed out, politicization of the process and inappropriate rate suppression can exist under any ratemaking system.

- o A majority of the 21 insurance regulators responding to our survey indicated that a bureau advisory loss cost system would
 - result in the lowest net cost of coverage to employers,
 - result in the most fair and equitable distribution of costs,
 - maximize insurance coverage availability, and
 - eventually maximize insurer opportunity for a fair rate of return.

- o On the other hand, a majority of the insurance carriers we surveyed suggested that centralized ratemaking with no downward rate deviations (i.e., the current California system) would
 - maximize insurance coverage availability,
 - maximize opportunities for insurers to realize a fair rate of return, and
 - maximize employer incentives for workplace safety.

- o Insurance carriers expressed a strong preference for serving the residual market through a competitive state fund.

- o There was no clear consensus among the insurance regulators on how to service the residual market.

- o To date, only a limited number of survey responses have been received for other stakeholder groups, including industrial accident boards, service providers, insured businesses and self-insured employers. The responses provided no clear indication of how these stakeholders perceive the ratemaking system itself affecting their

interests.

- o The few insured businesses and self-insured entities responding did indicate that more "front-end" price competition would result in lower net costs to them.
- o In order to increase the number of surveyed insured businesses on a random basis, the Workers' Compensation Insurance Bureau of California (WCIRB) assisted us by distributing over 200 questionnaires to a sample of employers stratified by industry group and employer size. However, due to the WCIRB's commitment of resources to the 1992 rate filing and hearing process, it was not possible to compile the responses within the time frame of this study. This information will be available for subsequent review.

In summary, those stakeholders most familiar with ratemaking, i.e., regulators and insurers, commented emphatically that the legislative and regulatory climate under which a given system operates is much more significant than the system itself. With this caveat, the regulators prefer an advisory loss cost system, whereas insurers prefer California's existing ratemaking system.

DESCRIPTION OF RATEMAKING SYSTEMS

Current California System

Since 1915, California workers' compensation insurance pricing has been regulated under the State's "minimum rate law," as codified under Sections 11730-11742 of the Insurance Code. The key characteristics of that law are as follows:

- The Insurance Commissioner is charged with the authority and responsibility for approving or issuing premium rates, classification of risk rating plans, and merit rating plans.
- The rates and rating plans approved or issued by the Commissioner are to be adequate and uniform as to all insurers.
- Insurers are prohibited from writing insurance at premium rates less than those approved by the Commissioner; ergo, the "minimum rate" aspect of the law.
- Insurers are expressly authorized to issue dividend paying policies. However, dividend payments are restricted to surplus accumulated from California workers' compensation insurance premiums.
- Insurers are prohibited from guaranteeing dividend payments to policyholders in advance of expiration of the subject policy, among other conditions.
- The Workers' Compensation Insurance Rating Bureau of California serves as the central administrative body for the workers' compensation insurance system. Membership in the Bureau is a requirement for insurers to transact workers' compensation business in the state. Financing for the Bureau operations is obtained through assessments of its members.
- The Bureau operates under the management of a Governing Committee consisting

of seven private insurers, the State Compensation Insurance Fund, two public members representing insured employers and two public members representing organized labor.

- The primary purpose of the Bureau is to develop adequate premium rates for submission to the Commissioner. However, the Bureau also administers virtually all aspects of the premium rating structure that is ultimately approved by the Commissioner. This includes collection and tabulation of information and statistics on workers' compensation insurance.
- Premium rates prepared by the Bureau and authorized by its Governing Committee are submitted to the Commissioner as a rate filing. The Commissioner then holds public hearings to determine the adequacy of the proposed rates. Ultimately, a manual of rules, classifications, and rates which reflect the Commissioner's evaluation of premium rate adequacy, is approved.

Summarizing the California ratemaking system in the vernacular of the alternative systems described below, the state workers' compensation insurers are operating under centralized pricing with prior approval provisions and no downward rate deviations permitted. The California law does permit upward deviations (surcharges) from the centralized pricing structure, a characteristic that is not common.

Although not directly related to the ratemaking system, another very important characteristic of the California workers' compensation environment is the State Compensation Insurance Fund. The State Fund was created in 1913 to guarantee employers an available market for workers' compensation coverage at reasonable cost. Therefore, the State Fund effectively precludes the need for a residual market mechanism.

The State Fund is also intended to be fairly competitive with other insurers and to be "neither more nor less than selfsupporting." As such, the State Fund is to return all funds not needed to support operations back to its policyholders. However, the minimum rate law is binding on all insurers, including the State Fund.

Alternative Systems

There are an almost unlimited number of alternative ratemaking systems when such factors as degree of regulation and nature of the residual market are considered. For the purposes of this study, we have identified categories of systems differentiated by the rate promulgation responsibility and the corresponding level of centralized activity. In evaluating the latter, we consider six different activities that impact the net cost of workers' compensation insurance to employers:

1. development of the loss cost provision of premium rates,
2. development of the expense provision of premium rates,
3. development and administration of classification rating plans,
4. development and administration of experience rating plans,
5. development and administration of dividend plans, and
6. collection and compilation of premium and loss data.

The six categories of rating systems that we have identified are presented below in descending order of centralization.

- o **EXCLUSIVE STATE FUND**

An exclusive state fund represents the ultimate in a centralized ratemaking system. Virtually all ratemaking activities are either performed by or under the control of the state fund. Private insurers are essentially precluded from writing workers' compensation insurance coverage. The carriers may or may not have a role in offering ancillary coverage such as employer's liability.

Price competition, or any other form of competition, are not issues in an exclusive state fund environment. Premium rate levels are determined by the extent to which the state fund is to be self-supporting as well as the actuarial basis for evaluating rate adequacy. Traditionally, insurance premiums are intended to be adequate to fulfill all obligations incurred during the policy period, in the interests of policyholder fairness and security.

At times, exclusive state funds have varied from the traditional insurance industry concepts of ratemaking adequacy. Given their status as quasi-governmental agencies, the need to maintain a completely self-supporting operation at all times may not be as obvious. For example, exclusive state fund premium rates for a given policy period could be promulgated on a cash needed or "pay-as-you-go" basis. It is important to recognize that variances such as this from traditional actuarial concepts raise questions of inter-generational equity among policyholders.

Premium rate regulation for an exclusive state fund can be provided outside of the typical insurance department setting. However, some states have specifically involved the insurance departments as a monitor of rate adequacy and reasonableness.

An exclusive state fund obviates the need for a residual market mechanism. Coverage availability is guaranteed.

At this time, the following states provide coverage through exclusive state funds:

Nevada

Washington

North Dakota

West Virginia

Ohio

Wyoming

o BUREAU ADMINISTERED PRICING WITHOUT INSURER DEVIATIONS

This type of system is the most restrictive under which private insurers can participate. Premium ratemaking is centralized in a rating bureau and all insurers are required to use the same rates and rating plans. This is the category in which California now falls with one notable exception. Insurers can apply surcharges to individual account premiums if the employer has a demonstrably poor loss history or presents an unusual hazard for its industry classification.

In this system, premium rates are completely determined by the bureau-administered plans. Front-end price competition essentially does not exist. Instead, insurer price competition is focused on dividend plans that are predicated on future premium refunds to be made after policy expiration. Generally, such payments are contingent upon both the insured employers' own experience under the subject policy and the insurer's statewide results.

This type of system puts increased emphasis on non-price competition. This would include such items as risk management, workplace safety and claim service.

As of this time, all five states that fall into this category require prior approval by state regulatory authorities before bureau developed rates become effective. The states include:

California	Texas
Massachusetts	Wisconsin
New Jersey	

Significantly, only California has a competitive state fund to service the residual market. We do understand that a competitive state fund will be introduced in Texas in 1992.

o **BUREAU ADMINISTERED PRICING WITH INSURER DEVIATIONS**

Under this system, a rating bureau still has the responsibility for all pricing activities with the exception of dividend plans. However, insurers are permitted to file deviation factors for application to the bureau generated premium rates.

The ability of insurers to significantly vary from the uniform rate is dependent on the factual support for such deviations and on regulatory attitudes toward deviation filings. Depending on the filing requirements, insurers may find it necessary to perform loss cost and expense provision calculations that parallel those of the bureau.

Assuming a relatively non-restrictive regulatory approach, such a system can enhance front-end price competition. However, given that all insurers start from a uniform base, dividend plans still can play an important competitive role.

In total, the following 24 jurisdictions fall into this category of ratemaking systems. Of these, only the four systems designated with asterisks are not subject to prior regulatory approval before a premium rate level can become effective.

Alabama	Kansas	North Carolina
Alaska	Maine	Pennsylvania
Arizona*	Mississippi	Oklahoma
Delaware	Missouri	South Carolina

D.C.*	Montana*	South Dakota
Florida	Nebraska	Tennessee
Idaho	New Hampshire	Utah*
Iowa	New York	Virginia

Competitive state funds exist in Arizona, Idaho, Montana, New York, Oklahoma, Pennsylvania and Utah. However, the state fund does not service the residual market in Arizona.

o BUREAU ADVISORY RATES WITH EXPENSE PROVISIONS

Under an advisory rate system, centralized pricing activity that results in full manual rates does take place. The bureau promulgated advisory rates are generally subject to prior approval by regulatory authorities before they can be used by subscribing insurers.

Insurers are permitted to vary from the bureau rates. Variance can consist of a uniform deviation factor applied to the advisory rates, independent development of an insurers' own manual rates, and/or promulgation of separate rating plans. Filing of the proposed variance is required; however, the regulatory approval process is frequently less restrictive than what is applied to rating bureaus.

This approach is intended to increase the level of front-end price competition among insurers. However, the true difference between "administered pricing with deviations" and "advisory rates" is dependent on both market forces and regulatory implementation. An advisory rate system that involves individual insurers in an involved regulatory process may be indistinguishable from a deviation system.

Assuming a relatively non-restrictive regulatory process, a bureau advisory rate system can be expected to enhance price competition further.

Simultaneously, dividend competition will become less important.

Currently, an advisory rate system is in affect in six states:

Arkansas	Indiana
Georgia	New Mexico
Illinois	Vermont

The three states in the first column of this list do not require prior regulatory approval for insurers to vary from the advisory rates.

None of the states in this category have competitive state funds at this time. The residual market in each state is serviced by some type of assigned risk facility.

o BUREAU ADVISORY LOSS COSTS WITHOUT EXPENSE PROVISIONS

Under an advisory loss cost system, centralized pricing is limited to bureau promulgation of the loss cost provision of the manual rates. Individual insurers are responsible for either adopting or deviating from the advisory loss costs and for developing their own expense provisions. The expense provision normally includes acquisition costs, general overhead expenses, premium taxes, other fees and assessments, plus a profit and contingency margin.

The advisory loss cost system envisioned here is consistent with the model adopted by the National Association of Insurance Commissioners (NAIC) in December 1990. That model did not preclude all centralized or bureau activity. However, bureau functions were limited primarily to:

- development of statistical plans including class definitions,
- collection of statistical data,

- preparation and distribution of loss cost data,
- preparation and distribution of factors and formulas pertaining to classification,
- preparation and distribution of manuals of rating rules and rating schedules, but not final rates,
- preparation and distribution of information required to be filed with the Insurance Commissioner,
- preparation of policy forms and endorsements,
- preparation of experience rating plan rules and values and dissemination of individual risk premium modifications,
- performance of research to determine the impact of benefit level changes, and
- collection of other information and performance of research concerning loss causes, past and current insurer pricing, and evaluation of classification.

This approach maximizes the opportunity for rating competition without totally eliminating all centralized functions. The role of dividend plans in such a system is uncertain. As a competitive tool, the plans would not appear to be critical. However, dividends may still be effective in providing safety incentives. In fact, there is evidence that dividend payments in advisory loss cost states are still significant.

Currently, advisory loss cost systems are in effect in ten states:

Colorado*	Maryland*
Connecticut	Michigan*
Hawaii	Minnesota*
Kentucky	Oregon*
Louisiana	Rhode Island

Seven of these states do require prior regulatory approval before insurer proposed rates can be used. The three states with less restrictive rate regulations are Maryland, Michigan and Minnesota.

Competitive state funds are currently operational in the five states designated with an asterisk. However, only the Colorado and Maryland state funds service the residual market. All other states are served by some form of assigned risk facility.

o INSURER PRICING WITH NO CENTRALIZED ACTIVITIES

Under this type of system, no centralized rating activity would take place. The bureau activities would essentially be limited to that of a statistical agent, or possibly the administrator of insurer developed experience rating plans. The bureau may also be responsible for administering whatever residual market facility may exist.

By definition, this approach would result in the ultimate in open rating for workers' compensation. However, to date, no state has implemented such a ratemaking system. Furthermore, we are not aware that it is being seriously considered in any jurisdiction.

STAKEHOLDER INTERESTS

Identification of Stakeholders

In developing the proposal for this engagement, M&R identified the following groups of key participants in the California workers' compensation system:

- o COVERED EMPLOYEES**

This groups includes all workers who rely on the workers' compensation system for protection against economic loss due to injuries suffered on the job.

- o INSURED BUSINESSES**

This group includes all employers who purchase workers' compensation insurance to protect their covered employees. This group also includes employers who, as an alternative to purchasing insurance, provide employee protection through a qualified workers' compensation self-insurance plan.

- o INSURANCE CARRIERS**

This group is comprised of commercial insurance companies authorized to write workers' compensation coverage in California. The State Compensation Insurance Fund of California is included in this category.

- o INSURANCE REGULATORS**

This group includes state insurance department personnel who, under direction of the Insurance Commissioner, are responsible for regulating workers' compensation insurance carrier activity. The regulated activity does encompass premium rate promulgation.

- o **INDUSTRIAL ACCIDENT BOARDS**

This group is responsible for administering the state workers' compensation system. Although the responsibilities are numerous and vary by state, the basic function of the industrial accident boards is to assure employer compliance with the workers' compensation laws and to expedite the payment of legitimate benefits to injured employees.

- o **SERVICE PROVIDERS**

This group is comprised of organizations that provide services to other stakeholders; primarily covered employees, insured and self-insured businesses, and insurance carriers. The service provider group includes the medical establishment, third party claims administrators, the plaintiffs bar, and vocational rehabilitation specialists, among others.

Although it is possible to develop a more extensive list of stakeholders, we believe that these groups are those most likely to have an interest (direct or indirect) in the type of ratemaking system applicable to workers' compensation. The most obvious exclusion from this list is the rating bureau group. However, we view this category of stakeholder as being a product of the chosen ratemaking system, not a factor in the selection of a particular system.

Discussion of Ratemaking System Considerations

Our review of available research (i.e., AIA, NAIC, Journal of Insurance Regulation and National Council on Compensation Insurance articles) on the subject of stakeholder interests indicates an almost unlimited number of considerations pertaining to all aspects of the workers' compensation environment. However, the list of considerations is dramatically reduced when only the ratemaking system characteristics of workers' compensation insurance are isolated. These latter considerations are the focus of this report.

We have identified nine outcomes related to the ratemaking system that affect workers' compensation stakeholder interests. These nine outcomes are described below. Following this discussion is a matrix that provides our opinions as to the likelihood of accomplishing each outcome in a given ratemaking system.

o **RATE COMPETITION**

The most obvious and direct influence of a given ratemaking system on workers' compensation insurance is rate competition. By rate competition, we mean front-end premium rate level competition for business among participating insurers. This is separate and distinct from back-end (i.e. dividend) competition that is a trademark of California's current system.

The stakeholders with a primary interest in rate competition are the potential benefactors (insured business), the competitors (insurance carriers), and those who have the responsibility for monitoring competition (the insurance regulators). Within the benefactor group, we would include currently self-insured businesses that may find traditional insurance more economically attractive with enhanced rate competition.

We would fully expect rate competition to increase as the level of centralized pricing activity is diminished. The matrix that follows this discussion reflects this thinking. However, two important caveats to this conclusion must be recognized:

1. Without some level of centralized activity, insurers may not have sufficient information with which to develop rates. This is the conclusion reached by the NAIC in its 1990 advisory loss cost resolution. Therefore, the enhanced rate competition implied by "individual insurer pricing" may be illusory.
2. Restrictive legislative or regulatory action applied to individual insurers

can undermine the benefits of decentralized pricing. To the extent that such action leads to inappropriate rate suppression or restricted pricing flexibility, rate competition may not be realized no matter what ratemaking system exists.

A review of the limited number of insured and self-insured business responses received to date suggests a strong preference for more front-end price competition. The regulatory responses also indicate that enhanced rate competition, through an advisory loss cost system, would likely result in lower net costs to policyholders.

o **DIVIDEND COMPETITION**

In a system where ratemaking is highly centralized and private insurance carriers participate, dividend competition becomes an important factor. Dividend competition becomes a substitute for rate competition. Essentially, this is the situation in California today.

The same three stakeholder groups that have a primary interest in rate competition also have an interest in dividend competition. However, given that dividend payments are largely contingent on favorable claim experience, covered employees may have a secondary interest to the extent that workplace safety is emphasized.

Since dividends are a proxy for rate competition, dividend competition should diminish with front-end pricing. However, the same caveats discussed for rate competition apply here. In fact, dividend competition for high hazard occupational classes that are amenable to safety enhancements may become even more significant in a highly regulated decentralized ratemaking system.

o **LOWEST NET COST OF COVERAGE**

In a competitive environment, the net cost of coverage should be the combined result of price and dividend competition. However, this leaves open the issue of cost of coverage under an exclusive state fund. Theoretically, an exclusive state fund system could realize the maximum possible economies of scale in providing insurance coverage. Furthermore, an exclusive state fund could be the recipient of other governmental revenues that could be used to subsidize policyholder costs.

In reality, an exclusive state fund's ability to deliver coverage at the lowest net cost is dependent on:

1. the size threshold at which maximum operating economics are realized,
2. its design and ability to function as a responsible economic entity,
3. the degree to which the fund is intended to be selfsupporting, and
4. its immunity from governmental assaults on any actual or perceived surpluses generated from workers' compensation policyholder premiums.

Given the variables surrounding an exclusive state fund, we do not believe that general conclusions regarding the cost of coverage impact of such a system can be reached. In our opinion, an exclusive state fund can only be evaluated in the context of specific organizational characteristics and its relationship to other governmental bodies.

o REASONABLE RATE OF RETURN

A critical interest to insurers participating in a workers' compensation market

is the ability to realize a fair and reasonable rate of return on their investment in the state. Their investment would include capital and surplus committed, expenses incurred in maintaining an operation, and diversion of resources from other insurance opportunities.

The stakeholders with a primary interest in rates of return are, of course, the carriers and the regulators. The latter stakeholder group would be charged with monitoring the reasonableness of insurer profits on behalf of the insurance purchasers. In that regard, insured businesses represent a stakeholder group with a strong secondary interest in carrier rates of return.

Working again under the assumption of a non-restrictive legislative and regulatory environment, a centralized ratemaking system with minimal insurer pricing flexibility will tend to enhance insurer profit potential. Carriers who can operate at lower expense levels than those anticipated in the premium rates will have a potential surplus. This surplus can then be used to offset higher than anticipated benefit payments, to increase policyholder dividend payments, or to increase retained earnings. Effectively then, centralized pricing without restrictive regulation can result in a premium cushion for the more efficient carriers that may or may not increase net retained profits.

Most insurance carriers surveyed agreed with the observation that centralized pricing without deviations would maximize their ability to realize a reasonable rate of return. Interestingly, the insurance regulators indicated that an advisory loss cost system would maximize realization of reasonable returns. These two diverse opinions might reflect carrier and regulator differences as to the definition of "reasonable".

o INSURER SOLVENCY

This one consideration would appear to be of primary interest to five of the

six stakeholder groups. The carriers themselves and their regulators would have an obvious interest in maintaining the solvency of the participating insurers. Furthermore, insured businesses have a clear interest in knowing whether or not the insurer to whom they paid premiums will be able to fulfill their financial obligation.

Two other stakeholder groups also have a direct interest in insurer solvency: industrial accident boards and covered employees. Both groups have the same concern; will timely payment of the full benefits to an injured employee be jeopardized by an insurer insolvency? In virtually all jurisdictions, injured employees can look to an insurance guarantee association (IGA) to meet the claim obligations of a failed workers' compensation carrier. However, accessing the IGA does represent a temporary new hurdle for the claimant.

Again assuming no legislative or regulatory rate suppression, insurer solvency is most likely to be preserved under a highly centralized pricing system. Specifically, a ratemaking system that depends on dividends for price competition provides a margin of safety. In simple terms, insurers are not allowed to reduce prices until the subject policies have expired and the corresponding claims have occurred. This establishes a barrier to predatory or otherwise irresponsible rate cutting.

The issue of carrier solvency can be considered a problem that exists only where private insurers participate in the workers' compensation system. However, solvency has been a consideration even for exclusive state funds. The problem may be more complex, in that solvency versus insolvency is not as well defined for exclusive state funds given their quasi-governmental status.

In reality, the economic consequences of insurer insolvency are the same in an exclusive state fund state as they are in other jurisdictions. Ultimately, the obligations of the failed insurer must be absorbed by the employers participating in the workers' compensation.

o **EQUITABLE DISTRIBUTION OF COSTS**

The two stakeholder groups with a primary interest in an equitable distribution of workers' compensation costs are insured businesses and insurance regulators. The latter group is charged with assuring that "unfair discrimination" among insureds does not exist.

One theory is that maximum emphasis on front-end price competition will result in the most equitable premium rates. This assumes that market forces will drive premium rates to a level reflecting actual costs for various classes of business. However, this also assumes that insurers have sufficient information about those costs to rationally price their product.

Another theory is that a combination of rate and dividend competition will generate the most equitable distribution. This assumes that true cost equity can only be realized if some retrospective recognition of actual loss experience is made.

The need for adequate cost information was one the "special needs" of workers' compensation insurance discussed in the 1982 AIA report on insurance regulations. This suggests that maximization of equity in ratemaking does require some level of centralized activity that does not result in uniform premium rates. In our opinion, this is most likely to occur in an advisory loss cost system.

Seventy-eight percent of the insurance regulators shared our opinion that an advisory loss cost system would maximize rate fairness. Sixty percent indicated that a centralized ratemaking system with no deviations minimizes the equitable distribution of costs.

o **COVERAGE AVAILABILITY**

All stakeholder groups have an important interest in the degree of workers' compensation coverage availability. However, those most involved in the purchase of insurance (i.e., insured businesses, insurance carriers and insurance regulators) have a direct concern over the availability of coverage.

We would expect coverage availability to be directly correlated with the degree of centralized pricing activity. In many respects, the issues surrounding coverage availability are similar to those of insurer solvency. However, a solvent exclusive state fund would appear to provide the best mechanism for assuring coverage for all employers.

Curiously, 12 of the 21 insurance regulators surveyed believed that an advisory loss cost system would maximize coverage in a voluntary market situation. Thirteen suggested that centralized ratemaking without deviations would minimize coverage availability; an opinion directly counter to our a priori hypothesis. The comments received indicate that such a system may invite more restrictive rate regulation and consequently deter private carrier participation.

On the other hand, three-quarters of the insurers surveyed believed that bureau administered pricing with no deviations would maximize availability. Almost half suggested that advisory loss costs would maximize coverage.

A critical element of any voluntary insurance market is that group of risks who are unable to find coverage among private insurers. This group comprises the residual market.

The regulators and the insurers surveyed both indicated a preference for serving the residual market with a competitive state fund. Both groups suggested that assigned risk facilities were not a desirable substitute; possibly due to the recent rate adequacy problems attributed to such facilities. These problems have imposed heavy burdens on the voluntary market in some

states.

o SAFETY INCENTIVES

The stakeholders with primary interests in workplace safety incentives would include the direct beneficiaries (covered employees), the responsible party (insured businesses), and the promoter of incentives (insurance carriers).

Under the assumption that emphasis on safety requires up-front expenditures by insurers, it would not appear that a system that maximizes rate competition would facilitate such efforts. On the other hand, if the cost of workplace safety is inherently an employer expense, a competitive rating system may make more funds available for this activity. In any event, safety incentives would be most easily maintained in a system that recognizes and rewards favorable experience through a dividend plan.

The survey responses from insurance carriers indicated that this stakeholder group believes that safety incentives will diminish as rating flexibility increases.

o CLAIM SERVICE

The stakeholders with an obvious direct interest in the timely and fair adjudication of claims are the claimants (covered employees), those involved in providing claimant services (service providers), the claim payers (insurers), and those charged with monitoring claims (industrial accident boards). Two other groups have a vital secondary interest: the original premium payers (insured businesses) and the insurance regulators.

The affect of the ratemaking on claim service is very difficult to assess. It is possible that insurers will compete on the basis of claim service in lieu of true price competition. Furthermore, emphasis on price competition may ultimately

reduce the amount of funds available to provide quality claim service.

We believe that both of the phenomena discussed above can occur. However, the degree of claim service diminution corresponding with price competition is very uncertain. We do not believe that the workers' compensation insurance pricing and claim adjustment mechanisms are closely linked.

Unfortunately, the number of industrial accident boards and service providers responding to our survey was too small to be conclusive. However, the responses received suggested little correlation between claim service and the ratemaking system.

M&R APRIORI RANKINGS

1 = Most likely to produce outcome 6 = Least likely to produce outcome

RATE PROMULGATION RESPONSIBILITY	RATE COMPETITION	DIVIDEND COMPETITION	LOWEST NET COST OF COVERAGE	REASONABLE RATE OF RETURN	SOLVENCY	EQUITABLE DISTRIBUTION OF COSTS	COVERAGE AVAILABILITY	SAFETY INCENTIVES	CLAIM SERVICE
EXCLUSIVE STATE FUND	---	---	?	--	?	?	1	?	?
BUREAU ADMINISTERED PRICING	5	1	5	1	1	4	2	1	1
	4	2	3	2	2	4	3	2	2
BUREAU ADVISORY RATES	3	3	2	3	3	2	4	2	3
BUREAU ADVISORY LOSS COSTS	2	4	2	4	4	1	5	3	3
NO CENTRALIZED ACTIVITY, INDIVIDUAL INSURER PRICING	1	5	1	5	5	3	6	4	5

Assumptions:

- Insurers are capable of ratemaking activities.
- Regulatory or legislative action does not preclude a reasonable rate of return.
- Residual market costs do not impede competition.

Stakeholder Questionnaires

In order to elicit the opinions of stakeholders, we developed and distributed five different questionnaires. Copies of these questionnaires and the accompanying cover letters are included in the appendix to this report. In total, 343 questionnaires were distributed as follows:

1. 59 insurance regulator surveys were sent encompassing all state insurance departments. To date, 21 completed questionnaires have been returned.
2. 26 insurance carrier surveys were sent; 12 have returned to date.
3. 15 industrial accident board surveys were distributed and four returned.
4. 11 service provider questionnaires were distributed were distributed; only two completed surveys were returned. We did contact three provider associations for their assistance in increasing the number of respondents. However, this effort did not succeed.
5. In total, 232 insured business questionnaires were distributed in two phases. The first phase included seven surveys, with three responses, sent directly by M&R. The second phase included 225 surveys distributed by the Workers' Compensation Insurance Rating Bureau (WCIRB). To date, the responses have not yet been compiled.

The WCIRB distributed surveys were drawn from a random sample of employers stratified into nine based on industry group and payroll size. The three industry groups were manufacturing, contracting, and all others. The payroll size groups were \$10,000 to \$99,000; \$100,000 to \$999,999; and greater than \$1,000,000.

The attached Exhibits 1, 2, and 3 summarize the survey results for regulators, carriers, and

industrial accident boards, respectively. However, of possibly greater significance, are the comments received from the respondents. The following is a sample of those comments that address the most significant issues.

o **INSURANCE REGULATORS**

Regulator A

"I have reviewed the 'Insurance Regulator Questionnaire' and find that it is directed entirely at obtaining opinions on which type of ratemaking system functions best. This is a 'red herring' type of survey because it does not address the cause of problems confronting the workers' compensation system in many jurisdictions. There is no correlation between the ratemaking system used in any state and the problems being experienced. Simply put, now here is the system itself at fault."

"Naturally, we believe the system in ... , an administered pricing system without deviations, to be highly desirable. Such system has been successful in ... , but that success must be shared by all. The Department of Labor has administered benefits in a fair manner, while controlling unnecessary costs. The employer and carrier choice of medical provider has served to keep medical costs reasonable and customary as required by Law. Employer safety and loss prevention programs serve to prevent accidents. Last, but not least, rate level recommendations have been approved resulting in adequate and reasonable rates, generally free from political considerations.

"In other words, the ... Bureau has been successful in balancing the interests of the buying public, the insurance carrier, and the workers."

Regulator B

"In ... , all insurers, to include the competitive state fund, are required to belong to a rating organization which files rates on their behalf. Insurers may deviate, by a uniform percentage upward or downward from the filed rates. The deviation must apply to all classification codes and to all policies, regardless of premium size. If insurers deviate, they cannot use the rating organization's schedule rating plan; they must choose the deviation or the plan, but they cannot use both within the same company. They must adhere to the rating organization's filed rules.

"This system enables 'stabilized' competitive rating which can be monitored through rate examinations by the We have found that two markets are developing. The competitive state fund writes the small to medium sized risks and approximately 50% of the market; the private insurers, for the most part, write the larger risks and also write about 50% of the market. At times, both 'stray' into other's market; but, for the most part, each engages in laissez-faire.

The residual market by which we mean the 'assigned risk plan' is administered by the state fund but all insurers must belong and each receives its proportion of the risks in direct relationship to its pro rate share of the written premium in the state. In order for a risk to be eligible for the assigned risk plan, the risk must have been denied coverage by two private insurers and the fund. ... has very few risks in the assigned risk which we believe is indicative a competitive, but healthy marketplace."

"For a time, competitive rating will benefit the consumer by permitting him to shop for the lowest price possible. However, if predatory pricing is implemented adverse competition will drive smaller insurers out and restrict the market to a few survivors which will thereafter raise rates. Rate examinations are helpful in slowing this process; it is doubtful whether any

'law' or perceived 'safeguards' will absolutely curtail it. To avoid it, there must be one rate from which no insurer, to include, any state fund can deviate. This, of course, then results in artificial pricing fixing which passes those other problems always associated with cartel-like rating."

Regulator C

"Certain companies prosper under one system and others under another. This lumps them all together as if they were exactly alike."

"Depending on how the losses of a residual market plan are made up and again depending on whether the plans rates are realistic or not the activities of a residual market plan could make any answer correct to either question."

Regulator D

"The above answers assume that a competitive market exists or would develop. Without a competitive market centralized ratemaking would be a more effective means of producing a reasonable rate of return."

Regulator E

"We are hopeful that a competitive state fund, coupled with a file and use ratemaking system, will be conducive to both the availability and affordability of workers' compensation in insurance in"

Regulator F

"The often conflicting (and always somewhat related) issues of availability, affordability, reasonable rate of return, lowest cost, and to a lesser extent, equitablility are in many ways driven by the regulatory and political

environments. For example, if needed rate levels are not allowed, 'affordability' and 'lowest cost' are enhanced, but 'availability' and 'reasonable rate of return' are restricted, and visa versa. Your survey made no allowance for these factors, and systems could react differently to varying environments."

"... , forcing each insurer to 'load' its needed expenses and desired profit puts the burden on the insurer to explicitly consider each factor. ... , the characteristics that would minimize the insurers' ability to realize a reasonable rate of return would be, in our judgment, over-zealous rate regulation by the regulatory body(s)."

Regulator G

"Centralized ratemaking is very likely to become politicized, especially in times of rapid loss cost consideration."

Regulator H

"Not all insurers will succeed under competitive rating, but the increased efficiencies of the system will be advantageous to the best run companies and to the public."

"A state fund might conceivable lower costs in rare circumstances and more often still might give the appearance of lower costs. Most likely though, it will reduce efficiencies and add to costs either explicitly or implicitly."

Regulator I

"Early experience with competition loss-cost rating laws indicate that regulator discipline is needed to prevent any insurer with substantial market share from reacting through paranoia and filing absurdly low rates."

"A state fund without a statute or tradition requiring acceptance of all applicants becomes among the most aggressive with undisciplined pricing - believing it has a public mandate to do so. Financial solidity is more of an important consideration for other insurers."

"A state fund which is not the residual market has to wonder why it exists - rightly so - and comes to rest on a quest to aggressively pursue unscrupulous pricing."

"Insurers decide to participate in a state market on the basis of:

1. perceived rate adequacy
2. administrative difficulties
3. stabilizing

The form of rating law is likely to do with this decision."

"Exclusive state funds are notorious for having no incentive to use sophisticated rating systems to accurately assess each risk."

Regulator J

"If the centralized rates are inadequate, then the availability will be minimized. Does not apply to California where the rates have been adequate and the rates are minimum rates."

o INSURANCE CARRIER

Carrier A

"We struggled to respond to the questions comparing centralized ratemaking

to competitively selected rates. We believe the type of rating system used in a jurisdiction has little relevance to many of the issues covered in the questionnaire. Rather, such issues are dependent much more on rate adequacy, which is, in turn, more dependent upon the integrity of the regulator to balance fairly the interests of all market participants than it is on the particular rating system employed by the regulator."

"The questions comparing market factors affected by a viable state fund compared to the effect of the presence of a residual market were much easier to analyze. With the exception of enhancing safety incentives, the presence of a residual market rather than a state fund has a detrimental affect on all of the factors considered in the questionnaire."

"A carrier's ability to realize a reasonable rate of return depends upon the existence of adequate rates. None of these items in and of itself ensures adequate rates. In our opinion, however, the politically motivated rate suppression which occurs in virtually all centralized ratemaking systems [produces an] environment in which a reasonable rate of return is least likely. Thus, under the present political circumstances, a system as free of those political influences as possible provides the best opportunity for a reasonable rate of return."

"The overwhelming lesson our company has learned is that states with residual markets tend to underfund that residual market mechanism, necessitating massive assessments on carriers' voluntary books of business."

"We believe no appropriate answer can be given because safety incentives are independent on the question of competitive pricing versus centralized ratemaking. Rather, safety incentives involve the choice between up-front discounts versus dividends. Between those two choices, our opinion is that up-front discounts provide greater financial incentives to employers."

"In a competitive market, smaller carriers are less likely to exist, leading to market concentration. This can lead to the remaining carriers choosing to reduce capacity should price competition become severe."

"In a market where a vital state fund exists, private carriers are going to be more willing to invest capital, free of concerns that such capital will ultimately subsidize an underfunded residual market."

Carrier B

"The ratemaking system is essentially irrelevant to the availability of coverage. Availability of coverage is a function of rate adequacy. If the ratemaking system allows for adequate rates, coverage will be freely available."

"It would obviously be of some convenience to residual market employers to allow employers to place their coverage with the State Fund and have the State Fund bill the costs of the residual market burden to other carriers. An assigned risk model requires employers to document several voluntary market rejections and apply for assignment to a carrier. The assigned risk model could take employers longer to effect coverage and entail more administrative steps/hassles."

Carrier C

"The type of rating law governing the administration of rates in any given state is not a factor in maximizing or minimizing ability to realize a reasonable rate of return. The regulatory climate as supported or hampered by legislation and regulatory decisions is the key factor in determining the adequacy of rates, whether they be advisory or mandatory."

"Financial incentives for providing a safe workplace can be equally as efficient under all four options as long as the regulatory climate allows for rate

adequacy."

Carrier D

"While I understand the political implications of this study and appreciate the power behind the various points of view, I hope that the 'minimum rate' plan has not been discarded before the study even starts. This survey certainly did not make any provision for it. In fact, this survey seemed to me to ask 'If we change the way we feed the horse, how will it affect the quality of the ride in the wagon?' Thanks for the opportunity to get our 2 cents worth."

"The current California 'minimum rate' structure is the best system for maximizing the potential for a reasonable return. Any system that allows companies to charge rates that are not profitable is a threat to realizing a profit. The questions do not address the issue of control as in Arizona where deviations must be justified. Without some sort of control, you open the workers' compensation system to the same wild cycles that we have in other lines. If the central authority sets rates at an unacceptable level (i.e., Maine), then the maximum rate low scenario allows companies to charge a fair and reasonable surcharge."

"I think it is a quantum leap of faith to assume that competitive rating will translate into a safety incentive. It is more likely to provide the opposite effect because as the costs rise, there will be less money to spend on safety or the insured will be able to bluff his way from company to company with the promise of action which he has no intention of taking. As long as he has his discount up front, there is no incentive."

"The minimum rate plan maximizes availability. The plans above would only maximize availability if they allowed rate discrimination based on exposure. The converse is also true. They would all minimize availability for half of the population if rate discrimination is not allowed."

Carrier E

"We feel small insurance companies, especially short-term, are at a distinct disadvantage when forced to compete on a purely expense basis."

"To the extent companies must support or fund the residual market, it would minimize a company's rate of return. However, if the system allowed the state fund to have a pricing advantage, this would also minimize a company's rate of return."

"To the extent the system allows companies discretion in establishing their own rates, we believe there is less incentive for the employer to provide and promote a safe workplace."

"In our opinion, ratemaking systems that allow upward pricing do tend to increase market availability for small employers and high hazard employers, two segments that come up often in rate inadequate environments."

Carrier F

"Centralized ratemaking should be an efficient mechanism to reflect all premium and loss data in the process. Company deviations introduce competition and provide incentives to lower costs."

"A residual market shared by all private insurers would be a big improvement over a state run, and subsidized, fund."

"The Company deviations will prompt all parties to provide safety in order to hold down costs."

"Residual market is fairer to all concerned if run on a sound fiscal basis."

"A more open rating approach will encourage competition and entice more carriers into the market."

"Absence of a state fund which has a competitive edge and distorts statistics will do the most toward maximizing availability."

Carrier G

"[Advisory pure premiums without expense provisions] provides credible pure premiums with an ability to recognize our unique strategies and method of operating."

"[Centralized ratemaking with deviations] allows for politically suppressed rates with ignorant competition."

"The residual market burden is not a problem in a healthy, competitive market - made possible only by adequate rates. It's better for private enterprise to provide services to voluntary or involuntary business than it is for a government run entity."

"Retrospective rewards (retro plans or dividends) are the best incentive for safety, but are unaffordable in a 'centralized ratemaking' system with continually inadequate, politically suppressed, rates."

"Again, the system doesn't matter nearly as much as the way it is administered by the regulator."

Carrier H

"In theory, we would expect to do best in states with fully funded assigned risk plans and no competitive state fund. In practice, the existence of assigned risk plans has been detrimental to profitability because they incur chronic

operating losses. So we have done better in states with no assigned risk plans."

"Loss sensitive rating plans can be implemented with any type of ratemaking system, but clearly, if base rates start out at a high level, larger returns (read 'incentives') can be offered."

"A system that minimizes the assigned risk component in the general rate level would maximize the potential loss sensitivity of a rating plan. Or, in other words, the lower the level of subsidies in the rates, the more prices can be responsive to individual employer performance."

"Availability of coverage is a function of the relationship between price and cost. Any system that allows prices in excess of cost would promote coverage availability. We have seen examples of each of the systems listed that work this way as well as examples of each that do not work."

"The existence of a residual market makes coverage available to all. The real issue is the availability of good service and choices in the market place."

Carrier I

"These answers assume that 'adequate' rates would be approved by the regulatory authorities, regardless of the ratemaking system utilized. Your description of competitive rating options does not indicate the extent of regulatory approval. However, our answers assume that there will be some controls; i.e., carriers will not have full pricing freedom."

"Centralized ratemaking with no deviation would place emphasis on retrospective rating or dividend plans, which tie safety incentives to losses incurred during the policy term. While competitive rating may do some of this, getting premium reductions up front materially reduces the incentive."

Carrier J

"With existing [California] system, emphasis continues to be placed on service to policyholders, safety incentives, and rewards to policyholders. Other alternatives squeeze expenses and thus service, increase market instability and solvency concerns."

Carrier K

"Competitive rating with advisory pure premiums' is the type of system which we would expect to produce the lowest up-front price levels, at least initially, and for the duration of the 'soft market' which would ensue as an immediate effect of the adoption of this type of system. We expect that workers' compensation would go through the same pricing and profitability cycle that the insurance industry has historically experienced in the non-compensation lines. We expect this would produce both a lower overall rate of return and much more instability of earnings."

"A key consideration which has not been addressed in the questionnaire is the regulatory impact on any rating system which may be used. There are many current examples of states in which workers' compensation rate levels have been suppressed below profitable levels through regulatory action. If this were to become the norm in California, an unregulated competitive rating system would be preferable to a centralized ratemaking system with chronically inadequate rates. Application of the proposed Proposition 103 regulations to a competitive rating system, as is happening in the non-compensation lines, would not be satisfactory because it would not allow true pricing freedom, which is necessary to maximize competition. If Proposition 103-type rate regulation were to significantly suppress rate levels in a competitive rating system, it would result in the loss of both adequate returns to insurers and the financial incentives to promote workplace safety that are inherent in the current dividend system."

"We believe that a separate residual market plan, such as an assigned risk plan, would not be self-funding, because adequate rates would be too high to be politically acceptable. A residual market 'burden' would be created which would have to be borne by the voluntary market. There are many examples of this across the country, in workers' compensation, in both personal and commercial auto, and in other lines. The California Automobile Assigned Risk Plan is a prime example. It is clear that regulatory suppression of voluntary rate levels has caused rapid and substantial growth in the size of the residual market 'burden' in many states in both workers' compensation and auto. We believe, however, that even with adequate voluntary rates, some residual market 'burden' is inevitable."

"The current system, through its uniform data reporting requirements, maintains the integrity of both manual rates and the experience rating process. Thus the manual rate is relatively stable and predictable, and the mandatory experience rating process provides an incentive for continued, ongoing attention to loss prevention. While this incentive is limited by the risk's experience rating credibility, the dividend system provides a more direct, more substantial reward for loss prevention efforts once the actual experience under the policy is known."

"We also expect competitive rating, with its emphasis on upfront price competition, will put pressure on insurance companies to minimize expenses. This may very well lead many companies to reduce significantly their expenditures on loss prevention and safety efforts in the pursuit of lower rates and increased market share."

"As previously stated, we believe the current dividend system is the primary provider of financial incentive to the insured to engage in loss prevention activities. From an actuarial standpoint, there is a direct relationship between the margin for dividends implicit in the rate structure and the degree to which dividends can be allowed to vary with actual loss experience. Higher manual

rates will actually produce lower net costs, after dividends, for those insureds with superior loss experience. If manual rate adequacy is allowed to decline, there will be less available funding for dividends, and less variation allowable in dividend plans."

"However, compared to the workers' compensation systems of other states, and especially to the non-compensation lines, the California workers' compensation system has shown more stable and more consistently profitable results. Competition through the dividend mechanism has both stabilized year-to-year swings in profitability prior to dividends, and has avoided excessive rates of return to insurers."

"If a competitive system were adopted, coverage availability would probably not change much in the short term."

"Over time, we would expect California workers' compensation to be subject to the same competitive cycle that has been repeatedly displayed in non-compensation lines. This means that eventually, and perhaps soon, California workers' compensation would be subjected to 'hard market' conditions, which always include reduced availability of coverage in the voluntary market. This lack of availability is never uniform by class of business."

"The existence of the current State Fund, which accepts all comers, guarantees that every risk has availability of coverage in the voluntary market. This obviously maximizes availability of coverage. There is no residual market because of the State Fund's presence."

o INDUSTRIAL ACCIDENT BOARD

Board A

"Do not believe the type of ratemaking system affects the administration of

providing prompt and accurate benefit payments to claimants whatsoever."

o **INSURED BUSINESS**

Business A

"A monopoly will not solve anything - we need competition but believe front end cost with services identified is more beneficial."

"It is possible to blend front end pricing for small employers and retro plans for large. Dividends are merely an overcharge planned to cover contingencies and for rebate if adequate profit is achieved."

o **SERVICE PROVIDER**

Provider A

"We do not feel that there is a strong correlation between the ratemaking system and benefit provision. However, to the extent that a company can be adequately staffed, benefit provision will be enhanced. We believe that a monopolistic arrangement, however, is the very least efficient. This belief was confirmed after having recently completed a large audit of one of the five or so monopolistic funds that exist."

INSURANCE CARRIERS SURVEY

Type of Ratemaking System Residual Market Options

Objective	Type of Ratemaking System				Residual Market Options				Number of Responses
	Centralized Ratemaking No Deviations	Centralized Ratemaking With Deviations	Advisory Rates	Advisory Loss Costs	Competitive State Fund Serving Residual Market	Competitive State Fund and Separate Residual Market	Residual Market State Fund	Residual Market and No State Fund	
Insurer Rate of Return									
Maximize	60%	10%	0%	30%	87.5%	0%	12.5%	12	
Minimize	10%	33.3%	13.3%	40.3%	4.5%	40.9%	54.5%	11	
Financial Incentives for Workplace Safety									
Maximize	88.9%	11.1%	0%	0%	59.1%	0%	40.9%	11	
Minimize	33.3%	3.3%	3.3%	59.2%	25%	35%	40%	10	
Coverage Availability In Voluntary Market									
Maximize	75%	20%	0%	5%	79.2%	8.3%	12.5%	12	
Minimize	25%	13.3%	.3%	48.3%	4.5%	31.8%	63.1%	11	
Type of Markets Now Participating In*	91.7%	75%	41.7%	58.3%					
Types of Markets With-Drawn From In Last 10 Years*	33.3%	41.7%	8.3%	41.7%					

* Multiple answers allowed

INDUSTRIAL ACCIDENT BOARD

TIMELINES OF PAYMENTS TO INJURED WORKERS

Impacted by Ratemaking System?	Yes	No
	0	4

FREQUENCY OF LITIGATED CASES

Impacted by Ratemaking System?	Yes	No
	1	3

	Centralized Ratemaking No Dev.	Centralized Ratemaking With Dev.	Advisory Rates	Advisory Loss Costs	Exclusive State Fund
Ratemaking System Minimizing Litigation	0	1	0	0	0
Ratemaking System Maximizing Litigation	0	0	0	0	0

APPENDIX A
SAMPLE LETTERS AND QUESTIONNAIRES



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Wendell Milliman, F.S.A. (1976)
Stuart A. Robertson, F.S.A.
Chairman Emeritus

October 21, 1991

Dear _____ :

The California Workers' Compensation Rate Study Commission has been charged by the California legislature to evaluate the performance of the California Minimum Rate Law and compare it to ratemaking systems in other jurisdictions. As part of that evaluation Milliman & Robertson, Inc. (M&R) has been requested to identify alternatives to the current ratemaking system for workers' compensation insurance, to outline the issues important to the participants in the system, and to develop a research plan to evaluate the effects of the alternative systems on the major participants.

As a participant in a workers' compensation system, your input is significant. We need to know the issues you consider important and we request your cooperation in completing the attached survey form. Your answers and comments will help us to evaluate possible alternatives from your "hands on" perspective.

To meet the schedule of the Rate Study Commission, it is necessary for us to receive all responses as soon as possible. If convenient, you may fax your response to M&R's Pasadena office at (818)793-2808. In any event we will contact you shortly to follow up on this request.

We will observe strict confidentiality regarding the source of individual answers and comments.

Albany • Atlanta • Boston • Chicago • Cincinnati • Dallas • Denver • Hartford • Houston
Indianapolis • Irvine • Los Angeles • Milwaukee • Minneapolis • New York • Omaha • Philadelphia
Phoenix • Portland • St. Louis • San Diego • San Francisco • Seattle • Washington, D.C.

Internationally WOODROW MILLIMAN

Australia • Austria • Belgium • Bermuda • Canada • Channel Islands • Denmark
France • Germany • Ireland • Italy • Mexico • Netherlands • New Zealand • Norway
Philippines • Spain • United Kingdom • United States • West Indies

Thank you for your cooperation in this project which is important to the future of the California workers' compensation system.

Best regards,

Michael A. McMurray

MAM:cas

INSURANCE REGULATOR QUESTIONNAIRE

1. Please identify those characteristics of a workers' compensation ratemaking system that would maximize insurers' ability to realize a reasonable rate of return.

Centralized ratemaking with no company deviations

Centralized ratemaking with company deviations

Competitive rating with advisory bureau rates (including expense provisions)

Competitive rating with advisory bureau pure premiums (without expense provisions)

2. Please identify those characteristics of a workers' compensation ratemaking system that would minimize insurers' ability to realize a reasonable rate of return.

Centralized ratemaking with no company deviations

Centralized ratemaking with company deviations

Competitive rating with advisory bureau rates (including expense provisions)

Competitive rating with advisory bureau pure premiums (without expense provisions)

3. Please provide any comments you may wish to make to further explain your answers to Questions 1 and 2.

INSURANCE REGULATOR QUESTIONNAIRE

4. Please identify those characteristics of a workers' compensation system that would maximize insurers' ability to realize a reasonable rate of return.

Existence of a competitive state fund that also services the residual market

Existence of a competitive state fund and a separate residual market plan (e.g., assigned risk)

A residual market plan without a state fund

5. Please identify those characteristics of a workers' compensation system that would minimize insurers' ability to realize a reasonable rate of return.

Existence of a competitive state fund that also services the residual market

Existence of a competitive state fund and a separate residual market plan (e.g., assigned risk)

A residual market plan without a state fund

6. Please provide any comments you may wish to make to further explain your answers to Questions 4 and 5.

INSURANCE REGULATOR QUESTIONNAIRE

7. Please identify those characteristics of a workers' compensation ratemaking system that would result in the lowest net cost for coverage.

Centralized ratemaking with no company deviations

Centralized ratemaking with company deviations

Competitive rating with advisory bureau rates (including expense provisions)

Competitive rating with advisory bureau pure premiums (without expense provisions)

An exclusive state fund

8. Please provide any comments you may wish to make to further explain your answers to Question 7.

INSURANCE REGULATOR QUESTIONNAIRE

9. Please identify those characteristics of a workers' compensation system that would result in the lowest net cost for coverage.

Existence of a competitive state fund that also services the residual market

Existence of a competitive state fund and a separate residual market plan (e.g., assigned risk)

A residual market plan without a state fund

An exclusive state fund

10. Please provide any comments you may wish to make to further explain your answers to Question 9.

INSURANCE REGULATOR QUESTIONNAIRE

11. Please identify those characteristics of a workers' compensation ratemaking system that would maximize availability of coverage in the voluntary market.

- Centralized ratemaking with no company deviations
- Centralized ratemaking with company deviations
- Competitive rating with advisory bureau rates (including expense provision)
- Competitive rating with advisory bureau pure premiums (without expense provisions)

12. Please identify those characteristics of a workers' compensation ratemaking system that would minimize availability of coverage in the voluntary market.

- Centralized ratemaking with no company deviations
- Centralized ratemaking with company deviations
- Competitive rating with advisory bureau rates (including expense provisions)
- Competitive rating with advisory bureau pure premiums (without expense provisions)

13. Please provide any comments you may wish to make to further explain your answers to Questions 11 and 12.

INSURANCE REGULATOR QUESTIONNAIRE

14. Please identify those characteristics of a workers' compensation system that would maximize availability of coverage in the voluntary market.

Existence of a competitive state fund that also services the residual market

Existence of a competitive state fund and a separate residual market plan (e.g., assigned risk)

A residual market plan without a state fund

15. Please identify those characteristics of a workers' compensation system that would minimize availability of coverage in the voluntary market.

Existence of a competitive state fund that also services the residual market

Existence of a competitive state fund and a separate residual market plan (e.g., assigned risk)

A residual market plan without a state fund

16. Please provide any comments you may wish to make to further explain your answers to Questions 14 and 15.

INSURANCE REGULATOR QUESTIONNAIRE

17. Please identify those characteristics of a workers' compensation ratemaking system that would result in the most fair and equitable distribution of costs.

Centralized ratemaking with no company deviations

Centralized ratemaking with company deviations

Competitive rating with advisory bureau rates (including expense provisions)

Competitive rating with advisory bureau pure premiums (without expense provisions)

An exclusive state fund

18. Please identify those characteristics of a workers' compensation ratemaking system that would result in the least fair and equitable distribution of costs.

Centralized ratemaking with no company deviations

Centralized ratemaking with company deviations

Competitive rating with advisory bureau rates (including expense provisions)

Competitive rating with advisory bureau pure premiums (without expense provisions)

An exclusive state fund

INSURANCE REGULATOR QUESTIONNAIRE

19. Please provide any comments you may wish to make to further explain you answers to Questions 17 and 18.

INSURANCE CARRIER QUESTIONNAIRE

1. Please identify those characteristics of a workers' compensation ratemaking system that would maximize your ability to realize a reasonable rate of return.

- Centralized ratemaking with no company deviations
- Centralized ratemaking with company deviations
- Competitive rating with advisory bureau rates (including expense provisions)
- Competitive rating with advisory bureau pure premiums (without expense provisions)

2. Please identify those characteristics of a workers' compensation ratemaking system that would minimize your ability to realize a reasonable rate of return.

- Centralized ratemaking with no company deviations
- Centralized ratemaking with company deviations
- Competitive rating with advisory bureau rates (including expense provisions)
- Competitive rating with advisory bureau pure premiums (without expense provisions)

3. Please provide any comments you may wish to make to further explain your answers to Questions 1 and 2.

INSURANCE CARRIER QUESTIONNAIRE

4. Please identify those characteristics of a workers' compensation system that would maximize your ability to realize a reasonable rate of return.

Existence of a competitive state fund that also services the residual market

Existence of a competitive state fund and a separate residual market plan (e.g., assigned risk)

A residual market plan without a state fund

5. Please identify those characteristics of a workers' compensation system that would minimize your ability to realize a reasonable rate of return.

Existence of a competitive state fund that also services the residual market

Existence of a competitive state fund and a separate residual market plan (e.g., assigned risk)

A residual market plan without a state fund

6. Please provide any comments you may wish to make to further explain your answers to Questions 4 and 5.

INSURANCE CARRIER QUESTIONNAIRE

7. Please identify those characteristics of a workers' compensation ratemaking system that would maximize employer financial incentives for providing a safe workplace.

Centralized ratemaking with no company deviations

Centralized ratemaking with company deviations

Competitive rating with advisory bureau rates (including expense provisions)

Competitive rating with advisory bureau pure premiums (without expense provisions)

8. Please identify those characteristics of a workers' compensation ratemaking system that would minimize employer financial incentives for providing a safe workplace.

Centralized ratemaking with no company deviations

Centralized ratemaking with company deviations

Competitive rating with advisory bureau rates (including expense provisions)

Competitive rating with advisory bureau pure premiums (without expense provisions)

9. Please provide any comments you may wish to make to further explain your answers to Questions 7 and 8.

INSURANCE CARRIER QUESTIONNAIRE

10. Please identify those characteristics of a workers' compensation system that would maximize employer financial incentives for providing a safe workplace.

Existence of a competitive state fund that also services the residual market

Existence of a competitive state fund and a separate residual market plan (e.g., assigned risk)

A residual market plan without a state fund

11. Please identify those characteristics of a workers' compensation system that would minimize employer financial incentives for providing a safe workplace.

Existence of a competitive state fund that also services the residual market

Existence of a competitive state fund and a separate residual market plan (e.g., assigned risk)

A residual market plan without a state fund

12. Please provide any comments you may wish to make to further explain your answers to Questions 10 and 11.

INSURANCE CARRIER QUESTIONNAIRE

13. Please identify those characteristics of a workers' compensation ratemaking system that would maximize availability of coverage in the voluntary market.

- Centralized ratemaking with no company deviations
- Centralized ratemaking with company deviations
- Competitive rating with advisory bureau rates (including expense provision)
- Competitive rating with advisory bureau pure premiums (without expense provisions)

14. Please identify those characteristics of a workers' compensation ratemaking system that would minimize availability of coverage in the voluntary market.

- Centralized ratemaking with no company deviations
- Centralized ratemaking with company deviations
- Competitive rating with advisory bureau rates (including expense provisions)
- Competitive rating with advisory bureau pure premiums (without expense provisions)

15. Please provide any comments you may wish to make to further explain your answers to Questions 13 and 14.

INSURANCE CARRIER QUESTIONNAIRE

16. Please identify those characteristics of a workers' compensation system that would maximize availability of coverage in the voluntary market.

Existence of a competitive state fund that also services the residual market

Existence of a competitive state fund and a separate residual market plan (e.g., assigned risk)

A residual market plan without a state fund

17. Please identify those characteristics of a workers' compensation system that would minimize availability of coverage in the voluntary market.

Existence of a competitive state fund that also services the residual market

Existence of a competitive state fund and a separate residual market plan (e.g., assigned risk)

A residual market plan without a state fund

18. Please provide any comments you may wish to make to further explain your answers to Questions 16 and 17.

INDUSTRIAL ACCIDENT BOARD QUESTIONNAIRE

1. Do you believe that the type of workers' compensation ratemaking system in use in a state effects the timeliness of benefit payments to injured workers?
- Yes
- No
2. If the answer to Question #1 is "Yes," which of the following types of ratemaking systems will best expedite benefit payments?
- Centralized ratemaking with no company deviations
- Centralized ratemaking with company deviations
- Competitive rating with advisory bureau rates (including expense provisions)
- Competitive rating with advisory bureau pure premiums (without expense provisions)
- An exclusive state fund
3. If the answer to Question #1 is "Yes," which of the following types of ratemaking systems is most likely to slow benefit payments?
- Centralized ratemaking with no company deviations
- Centralized ratemaking with company deviations
- Competitive rating with advisory bureau rates (including expense provisions)
- Competitive rating with advisory bureau pure premiums (without expense provisions)
- An exclusive state fund

INDUSTRIAL ACCIDENT BOARD QUESTIONNAIRE

4. Please provide any comments you may wish to make to further explain your answers to Questions, 1, 2, and 3.

5. Do you believe that the type of workers' compensation ratemaking system in use in a state effects the frequency of litigated claims?

Yes

No

6. If the answer to Question #5 is "Yes," which of the following types of ratemaking systems will best expedite benefit payments?

Centralized ratemaking with no company deviations

Centralized ratemaking with company deviations

Competitive rating with advisory bureau rates (including expense provisions)

Competitive rating with advisory bureau pure premiums (without expense provisions)

An exclusive state fund

INDUSTRIAL ACCIDENT BOARD QUESTIONNAIRE

7. If the answer to Question #5 is "Yes," which of the following types of ratemaking systems is most likely to slow benefit payments?

Centralized ratemaking with no company deviations

Centralized ratemaking with company deviations

Competitive rating with advisory bureau rates (including expense provisions)

Competitive rating with advisory bureau pure premiums (without expense provisions)

An exclusive state fund

8. Please provide any comments you may wish to make to further explain your answers to Questions 5, 6, and 7.

SERVICE PROVIDER QUESTIONNAIRE

1. Are you familiar with the different types of ratemaking systems for workers' compensation (e.g., centralized industrywide ratemaking vs. individual insurer ratemaking)?

Yes

No

2. If your answer to Question #1 is "Yes," do you believe that the type of ratemaking system in use in a state effects the timeliness of benefit payments to injured workers?

Yes

No

3. If the answer to Question #1 is "Yes," which of the following types of ratemaking systems will best expedite benefit payments?

Centralized ratemaking with no company deviations

Centralized ratemaking with company deviations

Competitive rating with advisory bureau rates (including expense provisions)

Competitive rating with advisory bureau pure premiums (without expense provisions)

An exclusive state fund

SERVICE PROVIDER QUESTIONNAIRE

4. If the answer to Question #1 is "No," which of the following types of ratemaking systems is most likely to slow benefit payments?

- Centralized ratemaking with no company deviations
- Centralized ratemaking with company deviations
- Competitive rating with advisory bureau rates (including expense provisions)
- Competitive rating with advisory bureau pure premiums (without expense provisions)
- An exclusive state fund

5. Please provide any comments you may wish to make to further explain your answers to Questions 2, 3, and 4.

SERVICE PROVIDER QUESTIONNAIRE

6. If your answer to Question #1 is "Yes," do you believe that the type of ratemaking system has an impact on your cost as a service provider?
- Yes
- No
7. If your answer to Question #6 is "Yes," which of the following systems would maximize your costs?
- Centralized ratemaking with no company deviations
- Centralized ratemaking with company deviations
- Competitive rating with advisory bureau rates (including expense provisions)
- Competitive rating with advisory bureau pure premiums (without expense provisions)
- An exclusive state fund
8. If your answer to Question #6 is "Yes," which of the following systems would minimize your costs?
- Centralized ratemaking with no company deviations
- Centralized ratemaking with company deviations
- Competitive rating with advisory bureau rates (including expense provisions)
- Competitive rating with advisory bureau pure premiums (without expense provisions)
- An exclusive state fund

SERVICE PROVIDER QUESTIONNAIRE

9. Please provide any comments you may wish to make to further explain your answers to Questions 6, 7, and 8.

10. If your answer to Question #6 is "Yes," which of the following systems is most beneficial to the injured worker?

- Centralized ratemaking with no company deviations
- Centralized ratemaking with company deviations
- Competitive rating with advisory bureau rates (including expense provisions)
- Competitive rating with advisory bureau pure premiums (without expense provisions)
- An exclusive state fund

SERVICE PROVIDER QUESTIONNAIRE

11. If your answer to Question #6 is "Yes," which of the following systems is least beneficial to the injured worker?

Centralized ratemaking with no company deviations

Centralized ratemaking with company deviations

Competitive rating with advisory bureau rates (including expense provisions)

Competitive rating with advisory bureau pure premiums (without expense provisions)

An exclusive state fund

12. Please provide any comments you wish to make to further explain your answer Questions 10 and 11.

INSURED BUSINESS QUESTIONNAIRE

1. Please identify those characteristics of a workers' compensation system that would result in the lowest net cost for coverage.

Private insurance companies compete on the basis of premiums charged to policyholders

Private insurance companies compete on the basis of dividends returned to policyholders

A state insurance company is the sole source of coverage

2. Please provide any comments you may wish to make to further explain your answer to Question 1.

INSURED BUSINESS QUESTIONNAIRE

3. Please identify those characteristics of a workers' compensation system that would result in the most fair and equitable distribution of costs.

Private insurance companies compete on the basis of premiums charged to policyholders

Private insurance companies compete on the basis of dividends returned to policyholders

A state insurance company is the sole source of coverage

4. Please identify those characteristics of a workers' compensation system that would result in the least fair and equitable distribution of costs.

Private insurance companies compete on the basis of premiums charged to policyholders

Private insurance companies compete on the basis of dividends returned to policyholders

A state insurance company is the sole source of coverage

5. Please provide any comments you may wish to make to further explain your answer to Questions 3 and 4.

INSURED BUSINESS QUESTIONNAIRE

6. Do you believe that the type of workers' compensation ratemaking system in use in a state effects the timeliness of benefit payments to injured workers?
- Yes
- No
7. If the answer to Question #6 is "Yes," which of the following types of ratemaking systems will best expedite benefit payments?
- Centralized ratemaking with no company deviations
- Centralized ratemaking with company deviations
- Competitive rating with advisory bureau rates (including expense provisions)
- Competitive rating with advisory bureau pure premiums (without expense provisions)
- An exclusive state fund
8. If the answer to Question #6 is "Yes," which of the following types of ratemaking systems is most likely to slow benefit payments?
- Centralized ratemaking with no company deviations
- Centralized ratemaking with company deviations
- Competitive rating with advisory bureau rates (including expense provisions)
- Competitive rating with advisory bureau pure premiums (without expense provisions)
- An exclusive state fund

INSURED BUSINESS QUESTIONNAIRE

9. Please provide any comments you may wish to make to further explain your answers to Questions 6, 7, and 8:

WORKERS' COMPENSATION INSURANCE RATING BUREAU of California

SPEAR STREET TOWER, SUITE 500 • ONE MARKET PLAZA • SAN FRANCISCO, CA 94105-1088

Telephone (415) 777-0777

ROBERT G. MIKE
President

December 20, 1991

*Please address reply for
Attention
File*

Re: Workers' Compensation Rate Study Commission Survey

Dear Workers' Compensation Program Manager:

The California Workers' Compensation Rate Study Commission has been charged by the California Legislature to evaluate the performance of the California workers' compensation insurance rating law and compare it to ratemaking systems in other jurisdictions. As part of that evaluation, Milliman & Robertson, Inc. (M&R) has been requested by the Commission to identify alternatives to the current ratemaking system for workers' compensation insurance, to outline the issues important to the participants in the system, and to develop a research plan to evaluate the effects of the alternative systems on the major participants.

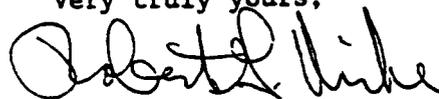
The Workers' Compensation Insurance Rating Bureau (WCIRB) is assisting in the distribution of an opinion survey to California policyholders who have been selected randomly. (The survey form was prepared by M&R.) As a participant in the workers' compensation system, your input is significant. Your cooperation in completing the attached survey form is requested. Your answers and comments will help to evaluate possible alternatives from your "hands on" perspective. A return envelope is enclosed for your convenience.

To meet the schedule of the Rate Study Commission, it is necessary for us to receive all responses as soon as possible. A response date of January 10, 1992 would be greatly appreciated.

We will observe strict confidentiality regarding the source of individual answers and comments.

Thank you for your cooperation in this project which is important to the future of the California workers' compensation system.

Very truly yours,



ROBERT G. MIKE
President

RGM:ev
encls.

INSURED BUSINESS QUESTIONNAIRE

1. Please identify those characteristics of a workers' compensation system that would result in the lowest net cost for coverage.

Private insurance companies compete on the basis of premiums quoted to prospective policyholders based on anticipated costs to be incurred during the policy period

Private insurance companies compete on the basis of dividends paid to policyholders after the expiration of the policy based on actual costs incurred during the policy period

A state insurance company is the sole source of coverage

2. Please provide any comments you may wish to make to further explain your answer to Question 1.

INSURED BUSINESS QUESTIONNAIRE

3. Please identify those characteristics of a workers' compensation system that would result in the most fair and equitable distribution of costs.

Private insurance companies compete on the basis of premiums quoted to prospective policyholders based on anticipated costs to be incurred during the policy period

Private insurance companies compete on the basis of dividends paid to policyholders after the expiration of the policy based on actual costs incurred during the policy period

A state insurance company is the sole source of coverage

4. Please identify those characteristics of a workers' compensation system that would result in the least fair and equitable distribution of costs.

Private insurance companies compete on the basis of premiums quoted to prospective policyholders based on anticipated costs to be incurred during the policy period

Private insurance companies compete on the basis of dividends paid to policyholders after the expiration of the policy based on actual costs incurred during the policy period

A state insurance company is the sole source of coverage

5. Please provide any comments you may wish to make to further explain your answer to Questions 3 and 4.

INSURED BUSINESS QUESTIONNAIRE

6. Do you believe that the type of workers' compensation ratemaking system in use in a state effects the timeliness of benefit payments to injured workers?

Yes

No

7. If the answer to Question #6 is "Yes," which of the following types of ratemaking systems will best expedite benefit payments?

Rates developed by a single rating bureau, with companies not being permitted to deviate from bureau rates

Rates developed by a single rating bureau, with companies being permitted to deviate from bureau rates

Advisory rates developed by a single bureau, but individual companies do not have to adopt these rates

Advisory partial premiums developed by a single bureau, but individual companies have to develop the expense component of the rates to be charged

An exclusive state fund (i.e., private industry not permitted to participate)

8. If the answer to Question #6 is "Yes," which of the following types of ratemaking systems is most likely to slow benefit payments?

Rates developed by a single rating bureau, with companies not being permitted to deviate from bureau rates

Rates developed by a single rating bureau, with companies being permitted to deviate from bureau rates

Advisory rates developed by a single bureau, but individual companies do not have to adopt these rates

Advisory partial premiums developed by a single bureau, but individual companies have to develop the expense component of the rates to be charged

An exclusive state fund (i.e., private industry not permitted to participate)

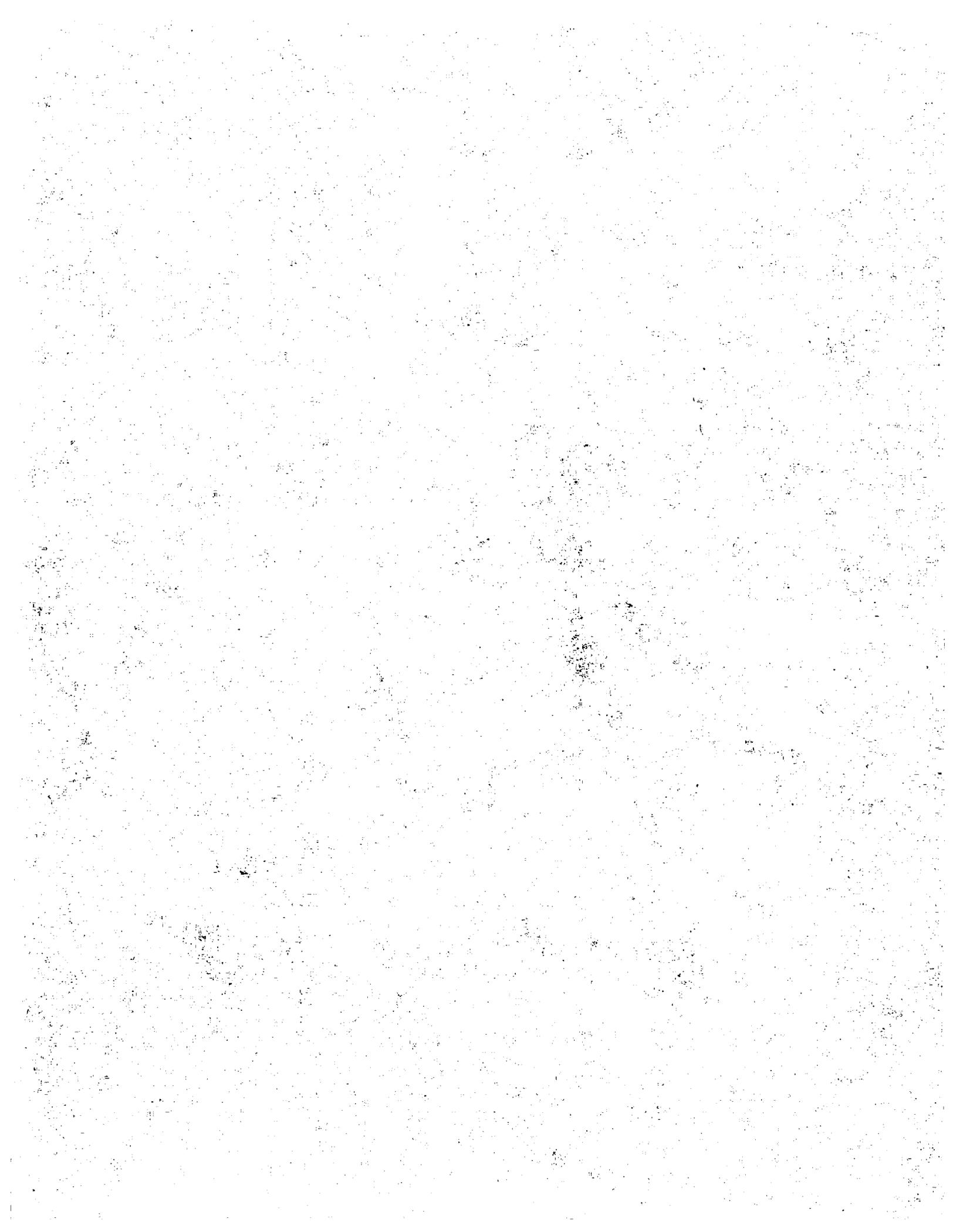
INSURED BUSINESS QUESTIONNAIRE

9. Please provide any comments you may wish to make to further explain your answers to Questions 6, 7, and 8.

SECTION 2.0

AN ANALYSIS OF THE NET COSTS OF WORKERS' COMPENSATION INSURANCE

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**AN ANALYSIS OF
THE NET COSTS OF
WORKERS' COMPENSATION
INSURANCE**

prepared for

The California Workers' Compensation Rate Study Commission

prepared by

**David Appel, Ph.D.
Michael McMurray, F.C.A.S.
Mark Mulvaney, F.C.A.S.**

January 1992

MILLIMAN & ROBERTSON, INC.

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CALIFORNIA RATE STUDY COMMISSION
NET COST OF WORKERS' COMPENSATION INSURANCE

OVERVIEW

In this section of the report, we evaluate the determinants of employers' net cost of workers' compensation coverage. The methodology we employ investigates whether the ratemaking system, per se, influences the employers' net costs of insurance after controlling for other factors that may affect costs.

The starting point for determining an employer's costs is the manual rate for the business in which the employer is engaged. The manual rate is typically expressed as a number of dollars per \$100 of payroll. Then, depending on the ratemaking system and the employer's circumstances, the manual premium may be adjusted by a variety of pricing programs, some of which occur prior to the inception of the insurance policy, and some of which occur subsequent to the expiration of the policy. The pricing adjustments include: premium discounts, experience rating, retrospective rating, deviations and schedule rating, or policyholder dividends.

The employer' net cost is the final premium after the application of these various pricing programs. The employer's total cost of workers' compensation insurance will be the manual rate, adjusted as described above, multiplied by the employer's payroll.

State data on the employer's costs of workers' compensation insurance have been previously developed and used for a number of purposes. While the principal focus of this prior research has been the relative ranking of net costs across states, there has also been limited investigation of whether the interstate cost differences are strictly a function of differences in benefit levels, or whether other factors also have an impact. As might be expected, the level of benefits is by far the largest determinant of employers' net costs. Indeed, some

recent research¹ suggests there is virtually a one-to-one relationship between benefits and the employers' net cost of workers' compensation (i.e., the elasticity of net cost with respect to benefits is not different from one). That is, for every percentage change in benefits there is a similar percentage change in the net cost of workers' compensation insurance.

Despite the previous work however, there has been little research on the effect of the ratemaking system on the net cost to employers' of workers' compensation insurance. A major reason for this has been the relatively short time period since the appearance of competitive rating (i.e., "open competition") in workers' compensation insurance. The first state to switch to this form of ratemaking system was Arkansas in 1981, and there are currently 16 competitive rating states. The Appendix to this report contains a list of states and their ratemaking system.

For this report, we have compiled the most recent information on the net cost to employers' of workers' compensation insurance along with measures of benefits, the frequency and severity of accidents, and other economic characteristics that have been previously found to affect workers' compensation costs. Sufficient data are now available to estimate the net or marginal impact of the rate system on the net cost, and further, to observe trends in the net costs across different rating systems. In this fashion we will assess whether, and the extent to which, the type of ratemaking system affects the net costs of workers' compensation insurance, after consideration of the quantifiable exogenous factors.

The remainder of the net cost discussion will proceed as follows: First, there will be a description of the net cost data including the assumptions and adjustments that were made to the published manual rates. In effect the discussion will consider the difference between the "list" and "retail" price for workers' compensation insurance. In the context of the analysis presented, it is the retail price which is of interest. Next, descriptive statistics will be presented including growth rates and differences in the levels of workers' compensation costs between different rate systems. This section of the report will conclude with the results from multivariate regression analyses that assess the marginal impact of the type of rating

system on the net cost of workers' compensation insurance.

DATA DISCUSSION

The data used in this analysis are drawn from several reports and studies prepared over the past decade by John F. Burton, Jr. (along with several co-authors).² Burton has compiled net cost data for 47 states based on the manual rates of 44 widely used insurance industry classifications. The 44 classifications represent the largest number of classes for which an historically comparable series is available. In addition, each of the classifications has some payroll exposure in each state. These 44 classifications represent approximately 62 percent of all payroll for employers who purchased workers' compensation insurance nationally. The starting point for selecting the classifications was the National Council On Compensation Insurance's Classification Codes used in 42 states. In states that use other classification schemes, the classes were converted to the NCCI system by selecting the classification which appeared to match most closely with the NCCI class. Twelve of the classifications are manufacturing industries, seven are contracting industries, and the remainder are primarily service-related industries.

To the manual rates for these 44 classifications, a number of adjustments are made to reflect the distribution of payroll across the classifications and also to reflect the various workers' compensation pricing programs that are in use. The result of these adjustments is a "weighted average adjusted manual rate", which represents the net cost of workers' compensation insurance to employers in a given state.

The details of the adjustment process are important in understanding exactly what the data represent. The first step in the adjustment process is to take a weighted average of the manual rates for the 44 classifications in each state and year where the weights are the proportion of national payroll among the classifications. Thus, all the states in the sample are on an equal basis for comparison purposes, and not affected by differences in industrial mix across states. The result of the multiplication of the manual rate by payroll is termed

the manual premium.

The first pricing adjustment considered is the mandatory experience rating plan which is designed to credit or debit an insured based on its own past loss experience. The product of the experience rating factor and the manual premium is termed the standard earned premium excluding constants. However, there is a possibility that the experience rating plan in a particular state can create an off-balance where the aggregate standard premium is greater than or less than the aggregate manual premium. Thus, an experience rating adjustment factor is used to adjust the manual premium.

The standard earned premium excluding constants is then adjusted for loss and expense constants and premium discounts. These adjustments vary depending on the size of the premium for the individual insured. The expense constant represents a flat dollar charge that is assessed on employers in almost all states to cover the minimum costs of issuing and servicing a workers' compensation insurance policy. In prior years, employers were also assessed a loss constant, which was also a flat dollar charge. The intent of the loss constant was to compensate for the generally inferior safety record of small businesses. If the expense constants and loss constants are added to the standard earned premium excluding constants, the results is standard earned premium including constants.

Next an adjustment is made for the premium discount schedule that is used in most states (in states such as California that do not permit premium discounts no such adjustments are made). Employers with annual premiums in excess of \$5000 are entitled to premium discounts due to economies of scale. The amount of the discount increases depending on the size of the standard earned premium, and depending on whether the insurer is a participating stock company or a nonparticipating stock or mutual company. The actual discount is a percentage of the premium. In the states that have premium discounts, the discounts are generally mandatory unless both the insurance carrier and the employer agree to substitute retrospective rating for the discounts.

Retrospective rating plans are also subject to a schedule where the same expense reductions provided by the premium discounts are built into the retrospective rating plans. Retrospective rating differs from experience rating in that instead of using prior loss experience to determine pricing adjustments, experience from the current policy period determines the current premium.

Adjustments are made to reflect other competitive devices used in the market that reduce the net cost of coverage. In many jurisdictions (see the Appendix for a listing of states which allow/disallow various pricing adjustments), insurers compete for business by varying the insurance rates at the beginning of the policy period. These "upfront" pricing adjustments include deviations and schedule rating. In states which allow deviations, carriers may deviate from the manual rates and charge lower rates. (In some instances deviations may result in higher rates). In contrast to a competitive rating environment where individual risk pricing adjustments occur, deviations offered by specific carriers are uniform for all insureds in that state. Schedule rating adjustments reflect either debits or credits that are based on a subjective evaluation of factors such as an employer's loss control program. In some states, there are also now schedule rating programs for insureds that are too small to meet the experience rating threshold. Typically, these schedule rating plans specify debits or credits based on prior experience. After application of the savings attributable to the premium discounts, retrospective rating plans, and deviations and schedule rating, the result is called net earned premium.

There is one final adjustment that is made between the published ("list") manual rates and the rates that are actually paid by employers. The final adjustment is for dividends that are returned to employers by mutual companies or stock companies with participating dividend plans. These companies tend to use premium discount schedules that are less steeply graded than nonparticipating stock companies, but usually cut the net cost to their policyholders by paying dividends. The amount of the dividend is typically related to the amount of the net earned premium of the employer and will often depend on the loss experience in the particular policy period. However, unlike the other adjustments, dividends are discretionary

on the part of the insurer and may not be guaranteed in advance. Individual state dividend data are used in making this adjustment.

This final adjustment of subtracting dividends paid from the net earned premium results in the net cost to policyholders and forms the basis for the analyses presented in this section. This measure has been labeled the "adjusted manual rate" when the net cost to policyholders is divided by the appropriate payroll³.

The following table summarizes the derivation of the net cost to policyholders:

Table 1
Derivation of Net Cost to Policyholders

	Manual Rate
x	Experience Rating
=	Standard Premium
+	Expense Constants
-	Premium Discounts
x	Schedule Rating/Deviations
=	Net Earned Premium
-	Policyholder Dividends
=	Net Cost to Policyholder

Since the principal focus of this investigation is the influence of the rate system on the net costs to policyholders, or on the adjusted manual rate, and since different rate systems only began to emerge in workers' compensation in the early 1980s, adjusted manual rate data

have been collected for 1983, 1986, 1987, 1988, and 1989 for 47 states. Data have also been collected on the amount of workers' compensation benefits paid in each state for the same years except for 1989, which is not yet available. Additional economic and labor force data have also been collected for the same time period. Finally, OSHA data and claim frequency data from insurer statistical plans have been collected for selected states and years.

DESCRIPTIVE ANALYSIS

In this section, descriptive statistics are reported and compared between states that may be considered to operate in a competitive rating environment and states with some sort of regulatory oversight. (The Appendix provides a list of states and their ratemaking systems.) For the purposes of the descriptive and multivariate analyses, competitive rating states that allow advisory rates and those that only publish pure premium data are all combined into a single competitive rating category, and are compared against all other ratemaking systems.

Table 1 contains means and standard deviations, and t-tests of the differences in means, for competitive rating and non-competitive rating states. The variables considered in Table 1 are the adjusted manual rate, as described above, and the adjusted manual rate multiplied by a statewide average weekly wage (SAWW) index which provides an estimate of the adjusted premium. Results are shown for all years combined, and, since over the course of the sample period several states switched rating systems, the analysis is also provided for each year of available data.

Except for 1983, the adjusted manual rate and the adjusted manual rate multiplied by the SAWW reported in Table 1 are higher in competitive rating states. This is also true if all the years are combined, However, the differences are minor and are not statistically significant. The only exception is if all years are combined, then the adjusted manual rate is significantly higher (at the 5 percent level) for competitive rating states.

Two additional observations are worth noting about Table 1. First, for both competitive

rating and non-competitive rating states, the adjusted manual rates have been increasing since 1983. And in 1989, there was an increase in the difference in the average adjusted manual rate between competitive and non-competitive rating states.

The results of the descriptive analysis suggest weak evidence that the net cost to policyholders is higher for competitive rating states, although this analysis does not contemplate other factors which may drive system costs.

Table 2 contains a description of data and sources for those factors thought to influence costs. Table 3 contains descriptive statistics and tests for differences in means for the additional variables thought to influence costs, and that are considered in the multivariate analysis. Interestingly, similar to the mean levels of the adjusted manual rate measures, average paid benefits were higher for competitive rating states only in 1983⁴. Since 1986, paid benefits have been higher on average for non-competitive rating states, although once again, any differences between the rate systems are not statistically significant.

On the other hand, the number of lost workdays as reported through OSHA to the Bureau of Labor Statistics is always higher for competitive rating states. This difference is statistically significant across all years combined and individually for 1987, and is almost significant for the other years. Unemployment rates and the proportion of the workforce that is unionized (labor market controls which will be used in the multivariate analysis) are both higher for competitive rating states, although the only significant difference is the unemployment rate in 1983.

Clearly, one of the major concerns that has developed over the past several years has been the rate of growth in workers' compensation costs. From the perspective of the Rate Study Commission, this raises questions about whether the rating system has any effect on the growth rate in costs as well as differences in the cost levels. To address this issue, several trend regressions were performed in an attempt to distinguish any differences in growth rates between competitive rating and non-competitive rating states. Table 3 contains the

results of the trend regressions. The dependent variable in these models is the natural logarithm of the adjusted manual rate; data were used from 1983 and 1986 - 1989 for 47 states⁵.

There are three panels of results in Table 3. Panel A contains results from all the data combined with and without the inclusion of a dichotomous or dummy variable that takes the value of one for competitive rating states and zero for all other states. Since the data are pooled cross section/time series, controls were also added for the individual states in the sample. The results indicate that the adjusted manual rates have been growing at approximately 8.5 to 8.9 percent per year. The competitive rating dummy is positive and significant in models without the state controls, but not different than zero in models with the state controls. Note the inclusion of the state dummies dramatically improves the explanatory power of the equation; the adjusted R^2 improves from .186 to .909 indicating significant differences across states in the growth rate of costs after consideration of the rating system.

Panels B and C contain trend regression results for non-competitive rating and competitive rating states run separately. If no state effects are considered, the time trend is higher for competitive rating states (9.6% v. 8.3%). However, statistical tests (Chow F-test) indicate no structural differences between the growth in the adjusted manual rate in competitive rating versus non-competitive rating states ($F=2.480$ with 2 and 231 degrees of freedom which is less than 3, the critical value at 5 percent, i.e., accept the null hypothesis of no difference). If state effects are considered, the adjusted manual rate has grown at a even higher rate for competitive rating states (10.4% v. 8.6%).

To summarize the results from the descriptive statistics and growth rate regressions, it appears that both the level and the growth rate in the adjusted manual rate may be higher for competitive rating states. However, the differences are so slight as to not be statistically significant, and an additional test confirms that there are no structural differences between the growth rates of the competitive rating and non-competitive rating states. Put differently,

there is no support that competitive rating reduces the level or growth in costs relative to noncompetitive rating states. The overall performance of the models used in this section improves considerably with the inclusion of the individual state controls suggesting the importance of these controls and perhaps other omitted factors in the determination of the net costs. To the extent these additional factors are independent of the state controls, but perhaps correlated with the type of rate system, the true effect of the rate system on the costs of workers' compensation insurance may be masked.

MULTIVARIATE ANALYSIS

In this section, we consider whether additional factors may be influencing costs, and whether accounting for some of these factors will allow a more definitive conclusion on the net effect of the rate system on workers' compensation costs. The list of factors considered is not exhaustive; indeed, in some respects it is relatively sparse. As frequently noted, there are a wide variety of forces which can affect workers' compensation costs in any particular state. However, many of these forces are not quantifiable in a fashion that would be meaningful across a number of states and years, and thus are not amenable to econometric analysis.

In addition, our primary concern in this report is more global: We are interested in whether the major determinants of the net costs to policyholders (adjusted manual rate) can be identified, and whether the type of rate system is one of those factors. It is almost certainly the case that the manner in which a state administers its workers' compensation system, or the details of the calculation of benefits, vocational rehabilitation programs, fee schedules, level of litigation, type of adjudication system etc., will all affect costs. However, there is no extant research which suggests these factors are systematically related to the type of rating system, although they may play a role in determining why states switch to competitive rating.

In the analysis that follows, we have not investigated the reasons that states may switch rating systems, and thus implicitly assume that these factors can be captured in large part by individual state controls (i.e., we assume these additional factors are to a large extent

independent of the type of rating system and the behavior of pricing programs in the market place). These issues will be addressed in more detail in the discussion to follow.

Because of these considerations, the multivariate analysis conducted for this report is not intended to conclusively identify and quantify the myriad forces affecting the net costs to policyholders (a task that is likely impossible under the best of circumstances). Rather, we set out to explain the major factors, and to determine whether the type of rating system has any relationship with those factors and with the net costs to policyholders. Simply stated, our strategy is to see how much of the variation in the net costs of workers' compensation insurance may be explained by these major factors, and how much of the remaining variation may be explained by the type of rate system.

Our general approach to this problem will be to estimate a regression model of the following form:

$$\text{NET_COST} = f(\text{Average Benefits, OSHA lost workdays, Proportion P.P.}, \\ \text{COMPRATE, Z})$$

where NET_COST is the average employer cost of workers' compensation insurance (or the adjusted manual rate), Average Benefits is the average paid benefit per covered worker across states and over time, OSHA lost workdays and Proportion P.P. (permanent partial) are controls for the frequency or severity of workplace accidents, COMPRATE is a categorical variable which characterizes the ratemaking system (1 = competitive rating, 0 = all other; in some models we extend this to 1 = competitive rating, advisory rates, 2 = competitive rating, pure premiums, 3 = monopolistic state funds, 4 = administered pricing, deviations allowed, and 5 = administered pricing, deviations not allowed), and Z is a vector of other variables considered useful for explaining differences in employer costs. In different specifications, Z includes the unemployment rate, the level of unionization, and annual average interest rates. Table 4 contains a list of variables and sources used in the analysis.

The underlying conceptual framework we used in the regression models derives from the notion that insurer profits are related to the probability of injury, the costs of workers' compensation insurance, and the level of benefits. This relationship can be restated such that the costs of workers' compensation are a function of benefits and the probability of an accident. This model has been utilized in a number of studies⁶. To this framework, we introduce the type of rate system.

Regression results from the basic model with the natural logarithm of the adjusted manual rate as the dependent variable are contained in Table 5. Two general comments are worth noting about these regression results before discussing the effect of the rate system on the adjusted manual rate.

First, as expected, the single most important variable in explaining the net cost of workers' compensation insurance is the average paid benefits per covered worker in a given state. The average paid benefit measure incorporates both the various benefit parameters such as the minimum and maximum amounts, the replacement rate, and any time limits on payment, and also captures the actual distribution of wages in the state and year. In a regression model that includes just average benefits, the explanatory power is quite high (adjusted $R^2 = .601$), and the coefficient suggests that a 10 percent increase in benefits will increase the adjusted manual rate by 6.8%.

The second general comment concerns a technical matter, relating to the characteristics of pooled cross sectional and time series data. In regression analysis, the nature of this type of data often needs to be taken into account. One common way of doing this is by introducing individual state and year controls and testing their joint significance (by using an F test). If the controls are jointly significant (the year and state controls are considered separately), this suggests it is appropriate to include them in the model. This will not only help to mitigate some econometric concerns⁷, but will in addition, serve to capture any differences across states or years that are not explicitly captured otherwise. For example, one such important characteristic that will be captured in this fashion is the differences in the

way states administer their workers' compensation system.

Interestingly, as in the trend regressions, statistical tests confirm that the individual state controls belong in the regression models. However, the year effects are found statistically significant ($F=2.210$, which is less than 2.60 the critical value at 5 percent). Other researchers have reached the same conclusion, and have argued that it is the common time series variation in benefits and costs which allow the regressions to be run without the individual year controls.

The remaining models reported in Table 5 provide estimated regression coefficients including and excluding the additional variables in order to observe the effect on the rate system variable. Even with the inclusion of the additional controls, the average paid benefits measure remains the most significant cost driver. The estimated average paid benefit coefficient ranges between .518 and .843 and is statistically less than one. That is, costs vary in less than a one-to-one fashion with changes in benefits. This contrasts with some earlier research using similar data. It is our view that this is a reasonable finding since changes in benefits are, in general, not also proportionally reflected in some of the other components of the adjusted manual rates such as profits and expenses.

The competitive rating variable is positive in 12 of the 13 regression models although the magnitude of the coefficient varies depending on the other covariates. The statistical significance level also varies, and only in models with controls for the frequency or severity of injuries (OSHA lost workdays or proportion p.p.) is the competitive rating variable significant. In model (13), the full model specification including the state controls, the estimated competitive rating coefficient is .209, which is the largest value estimated across all models. Although not quite statistically significant, this suggests that everything else held constant, competitive rating states can be expected to have 23.2% higher net workers' compensation costs.⁸ The adjusted R^2 in this model is .929, i.e., the model explains 92.9% of the variation in net workers' compensation costs.

Both the number of lost workdays and proportion of permanent partial claims also exhibit a large and positive impact on the net costs or adjusted manual rate in model (13). The coefficient on OSHA lost workdays is .423 (although not significant), and the coefficient on the proportion of permanent partial claims is .176 (and significant). Thus the model confirms that the number and type of claims net of the benefits and type of rating system are important determinants of workers' compensation costs.

The additional labor market controls - unemployment rates and unionization rate -are both not statistically different from zero in the full model specification, while the interest rate measure is negative and significant. In some models, the unemployment rate is positive and significant (model (13)), and in others it is negative and significant (models (10) and (12)). The parameter instability suggests other unmeasured factors are likely also affecting costs. The inclusion of the additional economic controls in the model is important however, in that they reduce the likelihood that the effects of competitive rating and benefits on costs are driven by systematic factors not included in the analysis. By including state specific labor market indicators, the individual state dummy variables capture differences related more to the administration of the workers' compensation system, as well as other unmeasurable or unobservable differences across states, rather than any systematic differences. As a result, the competitive rating and benefit coefficients are less likely to be contaminated by these other factors.

Another way of viewing the results in model (13) is that a simple model is able to explain a large proportion of the variation in the adjusted manual rate. Further, there is evidence to support the view that the adjusted manual rate may be higher in competitive rating states, although we caution that the extent of this difference is hard to precisely identify. This can be seen by the variation in the estimated competitive rating coefficient depending on the inclusion/exclusion of other variables. Excluding model (9), the range of estimates when competitive rating is positive is fairly large: from .014 in model (5) to .209 in model (13). In the simple model specifications without some of the additional controls, models (2) - (4), the estimated coefficient is approximately .05 and not quite significant.

Given the range of parameter estimates and lack of statistical precision in many of the models, we urge caution in interpreting these results. While there are indications that the adjusted manual rates are higher in competitive rating states, the evidence is not overwhelming. The results of the multivariate analyses must also be considered with the findings in the growth rate regressions and descriptive statistics that there were no statistically significant differences between competitive rating and noncompetitive rating states.

The multivariate analysis does suggest that benefits and the proportion of permanent partial claims are the largest cost drivers net of the type of rating system. Further, the significance of the individual state controls suggests that administration of the system as well as other unmeasurable system features are important, but again net of the rating system. Only if these unmeasurable features are systematically correlated with the type of rating system will the results presented here be affected. It is our view that this is unlikely to be the case, especially since the simple models employed are able to explain a large portion of the variation in the adjusted manual rate.⁹ Indeed, even in the full model specification without the individual state controls, model (12), the model explains a large portion of the variation in the adjusted manual rate (adjusted $R^2 = .757$).

We attempted to further refine the multivariate regression analyses by disaggregating states into five different rate systems rather than just competitive rating versus noncompetitive rating. The results from these regressions are contained in Table 6. Five different rate systems are distinguished in these regression models with Rate 1 representing competitive rating states that allow advisory rates, and Rate 2 representing competitive rating states that allow only pure premium rate filings. Rate 5, administered pricing states with rate deviations not allowed, is the base case to which the other rate systems are compared. In general, the estimated rate system coefficients do not exhibit consistent patterns across different specifications. In addition, the coefficients on average paid benefits in these models were larger than those presented in Table 5. Due to the nature of the rate system variables constructed in the models in Table 6, individual state controls are not possible (except with

complicating covariance restrictions). As a consequence, the results potentially suffer from inadequate control for differences across states which may affect the results.

CONCLUSIONS

In general there appears to be weak evidence that the net workers' compensation costs to employers are higher in competitive rating states. Based on standard statistical conventions, this evidence is not conclusive, nor is the magnitude of the difference estimated with any consistency. As a result, we are unwilling to quantify any differences in costs across rating systems. However, none of the analyses we performed suggests that the level or growth rates in the net cost of workers' compensation are lower in competitive rating states. We believe this last point is an important finding. Indeed, our analysis suggests that factors other than the type of rating system play a more significant role in determining workers' compensation costs.

The following summarizes the most important findings:

1. The net costs of workers' compensation insurance have been slightly higher in competitive rating states since 1983. However, the difference is not statistically significant. Competitive rating and noncompetitive rating states on average pay out about the same amount in benefits, but there tends to be greater numbers of lost workdays in competitive rating states.
2. The net costs of workers' compensation insurance to employers has been growing at about 8.5% - 8.9% annually. If the type of rating system is accounted for, the growth rate in competitive rating states has been slightly higher (10.4% v. 8.6%) although the statistical evidence to support the hypothesis of structural differences in the growth rates between competitive rating and noncompetitive rating states is not particularly strong.

3. Multivariate analysis is able to explain a large portion of the variation across states and over time of the net costs of workers' compensation. This is the case even though only a few major factors are considered. Indeed, the amount of benefits and the proportion of permanent partial claims are confirmed to be significant cost drivers irrespective of the type of rating system. This suggests that the way in which a workers' compensation system is administered may play an important role in determining the net costs. The inclusion of labor market and economic controls along with the inclusion of individual state controls strengthens this point as the individual state controls capture unquantifiable but perhaps systematic differences across states.
4. The costs in competitive rating states were found to be higher in the multivariate analysis. In 12 of 13 regression models, the competitive rating coefficient was positive, but the magnitude and statistical credibility of the results varied across the alternative model specifications. The strongest finding was for the full model specification, although a number of the additional variables were not themselves statistically significant. The results suggest that costs in competitive rating states may be anywhere from 1.4 to 23.2 percent greater than in noncompetitive rating states.

LIMITATIONS

There are several limitations to the analyses presented in this section.

- Measuring differences in regulatory environments by use of categorical or dummy variable schemes does not allow for any subtle differences across states. For example, it is not possible to capture the intensity of regulation or other differences in political environment using categorical variables.

- No attempt was made to model or incorporate the reasons why states may have switched to competitive rating. It may well be the case that states make the switch based on the perception that costs are too high. To the extent that this might be true, capturing this effect in a multivariate regression framework requires more sophisticated modelling than was possible given the available time and data. Such an approach would potentially include a political economy model to explain why states switch ratemaking systems, and then would investigate differences in costs across regulatory schemes (i.e., accounting for the inherent endogeneity of competitive rating).
- The analysis presented here is more descriptive: We only observe the differences in costs between competitive rating and noncompetitive rating systems without exploring the underlying reasons for the ratemaking system itself. The analysis does suggest that there are other more important factors, and that the type of rating system is unlikely in and of itself to have a large impact.

ENDNOTES

1. Alan B. Krueger and John F. Burton Jr., "The Employers' Costs of Workers' Compensation Insurance: Magnitudes, Determinants, and Public Policy", Review of Economics and Statistics, May 1990, p. 228 - 241.
2. For example, see "John F. Burton, Jr., and Timothy P. Schmidle, Workers' Compensation Insurance Costs: National Averages and Interstate Differences", in John F. Burton's Workers' Compensation Monitor, Volume 3, Number 6, November/December 1990. The discussion of the derivation of the net cost variable relies heavily on John F. Burton, Jr. and Alan B. Krueger, "Interstate Variations in the Employers' Costs of Workers' Compensation, with Particular Reference to Connecticut, New Jersey, and New York" in Current Issues in Workers' Compensation, James Chelius, editor, W.E. Upjohn Institute for Employment Research, 1986.
3. Previously published data for 1983 used a countrywide adjustment for premium discounts and policyholder dividends. We used individual state dividend data to re-adjust data for 1983 based on dividend data published in A.M. Best Co. Executive Data Service. In recent years, Burton has used individual state data for these adjustments. In addition, the previously published 1983 data did not fully reflect the impact of deviations and schedule rating. We used individual state data provided by NCCI to make these additional adjustments.
4. More data were available for paid benefits than just 1983, 1986-1988. Hence the all years combined include the years 1984 and 1985.
5. Due to the availability of data on certain pricing adjustments (see note 3), 41 states were used for 1983.
6. See note 1 and the cites contained therein.
7. Specifically, there is the potential that the error disturbances are heteroskedastic in an OLS regression framework when using pooled cross sectional and time series data.
8. The elasticity of a dichotomous variable in a semi-log model is evaluated as follows: $e^{\beta} - 1$.
9. It is important to realize, as other researchers have suggested, that differences in regulatory oversight may not be adequately captured by simple dummy variables. As a consequence, besides measurement problems, regression analysis may be susceptible to heteroskedastic disturbances in models of this sort. We performed Breusch-Pagan tests and were unable to reject the null hypothesis of no

heteroskedasticity (Chi-Square = .028), i.e., there are no heteroskedasticity problems with the regression results we report. In addition, tests of studentized residuals indicate no unusual problems with outliers. The results from these supplemental statistical tests provide support that the regression results are not contaminated by systematic unmeasured factors.

CALIFORNIA RATE STUDY COMMISSION
DIFFERENCES IN MEANS (S.D.): NET COST TO POLICYHOLDERS

	Adjusted Manual Rate	Adjusted Manual Rate x SAWW
Panel A: All Years Combined (N = 229)		
Non-competitive Rating	1.681 (.758)	6.131 (3.537)
Competitive Rating	1.914 (.585)	6.666 (2.628)
T	2.29**	.868
Panel B: 1983 (N = 41)		
Non-competitive Rating	1.255 (.635)	3.730 (2.164)
Competitive Rating	1.236 (.193)	3.538 (.911)
T	.1488	.371
Panel C: 1986 (N = 47)		
Non-competitive Rating	1.585 (.678)	
Competitive Rating	1.783 (.537)	
T	.815	
Panel D: 1987 (N = 47)		
Non-competitive Rating	1.705 (.081)	6.788 (3.200)
Competitive Rating	1.833 (.463)	7.151 (2.310)
T	.532	.321
Panel E: 1988 (N = 47)		
Non-competitive Rating	1.885 (.749)	7.838 (3.749)
Competitive Rating	1.981 (.512)	7.974 (2.148)
T	.346	.151
Panel F: 1989 (N = 47)		
Non-competitive Rating	1.998 (.856)	
Competitive Rating	2.317 (.587)	
T	1.455	

* Significant at .01
 ** Significant at .05
 *** Significant at .10

DATA DEFINITION AND SOURCES

VARIABLE	DEFINITION AND SOURCE
<i>Net-Cost</i>	Adjusted manual rate as described in text; John F. Burton, Jr. various publication and private correspondence
<i>Average Benefits</i>	Average paid benefit per covered workers; National Foundation for Unemployment Compensation and Workers' Compensation
<i>Unemployment Rate</i>	Average annual unemployment rate; U.S. Department of Labor, <u>Employment and Earnings</u> , various editions
<i>Union Rate</i>	Proportion of workforce belonging to labor unions; Michael A. Curme, Barry T. Mirsch, and David A. MacPherson, "Union Membership and Contract coverage in the United States, 1983-1988", <u>Industrial and Labor Relations Review</u> , Vol. 44, No. 1, Oct. 1990
<i>Treasury Bonds</i>	Annual average 3 year bond rate; Federal Reserve Bulletin and <u>1990 Statistical Abstract</u>
<i>OSHA Lost Workdays</i>	Total lost workdays per 100 full-time equivalent workers, Bureau of Labor Statistics, U.S. Department of Labor
<i>Proportion P.P.</i>	Proportion of claims that are permanent partial; NCCI, <u>Annual Statistical Bulletin</u> , various issues

**CALIFORNIA RATE STUDY COMMISSION
DIFFERENCES IN MEANS (S.D.): OTHER VARIABLES**

	VARIABLE			
	Average Pd. Benefits	Lost Workdays	Unemployment	Union
Panel A: All Years Combined				
Non-competitive Rating	254.83 (143.58)	68.83 (20.02)	6.95 (2.68)	18.57 (6.94)
Competitive Rating	273.92 (92.37)	83.22 (23.00)	7.16 (2.45)	20.07 (6.06)
T	1.200	4.002*	.420	1.176
N	285	208	188	188
Panel B: 1983				
Non-competitive Rating	194.69 (93.85)	63.10 (17.33)	9.02 (2.55)	22.07 (6.72)
Competitive Rating	242.83 (67.21)	76.10 (17.25)	11.08 (1.95)	24.33 (6.05)
T	1.208	1.550	1.893***	.781
N	47	35	47	47
Panel C: 1986				
Non-competitive Rating	271.61 (152.74)	68.09 (16.83)	6.93 (2.37)	17.54 (6.29)
Competitive Rating	270.11 (93.59)	80.21 (23.14)	7.03 (2.04)	19.69 (6.17)
T	.028	1.591	.116	.924
N	47	35	47	47
Panel D: 1987				
Non-competitive Rating	299.21 (109.42)	71.97 (21.91)	6.18 (2.28)	17.26 (7.13)
Competitive Rating	296.22 (104.83)	90.56 (28.10)	6.33 (1.91)	19.58 (6.08)
T	.050	1.879***	.188	.899
N	47	33	47	47
Panel E: 1988				
Non-competitive Rating	321.81 (166.24)	77.82 (22.71)	5.36 (1.99)	16.96 (6.49)
Competitive Rating	318.91 (108.94)	91.73 (25.60)	5.80 (1.94)	18.45 (5.70)
T	.054	1.515	.641	.684
N	47	33	47	47

CALIFORNIA RATE STUDY COMMISSION
TIME TREND REGRESSION COEFFICIENTS (T-STATISTICS)
LN (ADJUSTED MANUAL RATE) = DEP. VARIABLE

Variable	(1)	(2)	(3)
Panel A: All Data			
Intercept	-.923	-.907	-.974
Time	.088* (6.963)	.085* (6.756)	.089* (20.224)
Competitive Rating	-	.138** (2.199)	.022 (.390)
State Effects	No	No	Yes
Adj. R ²	.172	.186	.909
N	229	229	229
Panel B: Non-Competitive Rating States			
Intercept	-.869	-.918	
Time	.083* (5.518)	.086* (17.880)	
State Effects	No	Yes	
Adj. R ²	.140	.919	
N	181	181	
Panel C: Competitive Rating States			
Intercept	-.945	-1.438	
Time	.096* (5.123)	.104* (12.223)	
State Effects	No	Yes	
Adj. R ²	.350	.887	
N	48	48	

CALIFORNIA RATE STUDY COMMISSION
DETERMINANTS OF NET COSTS OF WORKERS' COMPENSATION¹
LN (ADJUSTED MANUAL RATE) = DEPENDENT VARIABLE

VARIABLE	MODEL					
	1	2	3	4	5	6
Intercept	-3.307	-3.290	-3.009	-3.060	-2.838	-3.041
Competitive Rating	-	.047 (.935)	.053 (1.120)	.054 (1.124)	.014 (1.189)	.115*** (1.717)
Average Benefits	.677* (16.579)	.672* (16.336)	.685* (17.484)	.687* (16.433)	.692* (7.766)	.716* (9.361)
Unemployment Rate	-	-	-.248* (5.046)	-.251* (4.772)	-.129** (2.020)	-
Union Rate	-	-	.038 (.776)	.036 (.713)	-.046 (.114)	-.024 (.344)
Treasury Bonds	-	-	-	.023 (.158)	.068 (.729)	-
OSHA Lost Workdays	-	-	-	-	-	-.109 (.696)
Proportion P.P.	-	-	-	-	-	-
State Effects	No	No	No	No	Yes	No
Adj. R ²	.601	.601	.647	.645	.915	.605
N	182	182	182	182	182	127

1. *T* - statistics in parentheses; all continuous variables entered in natural logarithms
* Significant at .01
** Significant at .05
*** Significant at .10

CALIFORNIA RATE STUDY COMMISSION
DETERMINANTS OF NET COSTS OF WORKERS' COMPENSATION¹
LN (ADJUSTED MANUAL RATE) = DEPENDENT VARIABLE

MODEL

VARIABLE	7	8	9	10	11	12	13
Intercept	-2.528	-2.439	-3.434	-3.158	-2.064	-2.781	-3.971
Competitive Rating	.110*** (1.650)	.140** (2.297)	-.041 (.453)	.029 (.529)	.158 (1.520)	.095 (1.451)	.209 (1.330)
Average Benefits	.695* (8.858)	.843* (10.997)	.585* (4.432)	.651* (12.435)	.518* (4.793)	.718* (7.745)	.503* (3.429)
Unemployment Rate	-	.360* (5.208)	-.057 (.495)	-.178* (2.808)	-.123 (1.533)	-.244* (2.865)	.041 (.309)
Union Rate	.003 (.042)	-.002 (.032)	-.067 (.492)	.043 (.718)	.027 (.220)	.051 (.716)	.078 (.546)
Treasury Bonds	-.229 (1.179)	.145 (.761)	-.179 (1.445)	.046 (.304)	-.200 (1.602)	.002 (.013)	-.295*** (1.819)
OSHA Lost Workdays	-.107 (.681)	-.344** (2.301)	.311 (1.443)	-	-	-.191 (1.174)	.423 (1.564)
Proportion P.P.	-	-	-	.193* (3.648)	.198* (2.261)	.228* (2.434)	.176*** (1.664)
State Effects	No	No	Yes	No	Yes	No	Yes
Adj. R ²	.606	.676	.920	.722	.926	.757	.929
N	127	127	127	130	130	92	92

1. T - statistics in parentheses; all continuous variables entered in natural logarithms
* Significant at .01
** Significant at .05
*** Significant at .10

**CALIFORNIA RATE STUDY COMMISSION
DETERMINANTS OF NET COST OF WORKERS' COMPENSATION
LN (ADJUSTED MANUAL RATE) = DEPENDENT VARIABLE**

MODEL			
VARIABLE	1	2	3³
Intercept	-3.194	-2.823	-2.704
Rate 1	-.023 (.306)	.073 (.578)	.012 (.070)
Rate 2	.024 (.413)	.042 (.648)	.061 (.801)
Rate 3	-.528* (4.883)	-.933* (6.265)	- -
Rate 4	-.079*** (1.895)	-.067 (1.343)	-.068 (1.200)
Average Benefits	.732* (17.868)	.887* (13.084)	.733* (7.804)
Unemployment Rates	-.215* (4.273)	-.279* (4.426)	-.254* (2.886)
Union Rate	.050 (1.009)	.011 (.188)	.033 (.453)
Treasury Bonds	.048 (.734)	.038 (.224)	.012 (.066)
OSHA Lost Workdays	-	-.284** (2.160)	-.203 (1.240)
Proportion P.P.	-	-	.217 (3.206)
State Effects ²	No	No	No
Adj. R ²	.684	.751	.756
N	182	127	92

1. Rate 1 = competitive rating state, advisory rates;
Rate 2 = competitive rating state, pure premiums;
Rate 3 = monopolistic state funds;
Rate 4 = administered pricing state, deviation allowed;
Rate 5 = administered pricing state, deviations not allowed.
2. Models are not estimable with both the rate system dummies and state dummies
3. Since the proportion PP are derived from NCCI data, which doesn't include monopolistic fund data, this model could not be estimated with Rate 3.

SECTION 3.0

RATES OF RETURN FOR WORKERS' COMPENSATION INSURANCE IN SELECTED STATES

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**RATES OF RETURN FOR
WORKERS' COMPENSATION INSURANCE
IN SELECTED STATES**

prepared for

The California Workers' Compensation Rate Study Commission

prepared by

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- A - **Estimated Returns on Net Worth for Workers' Compensation Insurance: 1981-1990 (13 states)**
- B - **Estimated Returns for State Compensation Insurance Funds: 1983-1988 (8 states)**

REPORT SUMMARY

The California Workers' Compensation Rate Study Commission has been charged with evaluating the efficacy of the workers' compensation rating law as it pertains to a number of desirable social objectives. Among these objectives is the provision of an adequate rate of return; that is, the ratemaking system should produce a total return which fairly compensates insurers for the risks attendant to underwriting workers' compensation coverage in the state. In order to evaluate performance on this goal, the Rate Study Commission contracted with Milliman and Robertson, Inc. to calculate the historical profitability of the workers' compensation insurance in California and 14 other states.

In response to this request we computed two historical profitability measures: (1) the operating return to workers' compensation insurance, where this return is the underwriting result plus the income from the investment of reserves, and (2) the total return on net worth, which is the operating return plus the income from investing surplus, converted to a net worth basis. Our objective was to compute the rates of return for all insurers. Data limitations however precluded us from including state fund results, and consequently the returns in this study concern private insurers only. Furthermore, in two of the 15 states selected for this study workers' compensation insurance is provided through a monopolistic fund, and consequently our calculations covered only 13 states.

The principal conclusions from the study follow. Between 1981 and 1990, the 10-year average operating returns from workers' compensation insurance ranged from -11.78% of earned premium in Texas to 9.41% in New York, with a 4.73% average in California. Further, during this period the average returns on net worth were between -9.23% (Texas) and 15.21% (New York), with a 13.04% average in California. Although care is needed in making interindustry comparisons, the average returns for three broad U.S. aggregates were between 12.2% and 14.6% for the 1981-1990 period.

The present study should be reviewed with several points kept in mind. For this study, we needed to rely on sources that provided data on workers' compensation insurance for a large number of states. To meet this demand, we relied on reports from the A.M. Best Company, the National Council on Compensation Insurance, and the American Association of State Compensation Insurance Funds. Also, historical returns may not be good indicators of future profitability. Since 1989, major legislation has been enacted in three of the largest workers' compensation insurance markets in the U.S.--California, Florida, and Texas. In each state, the legislation included major changes to statutory benefits and the procedures for administering the state's ratemaking system. Each state is included in the present study.

REPORT OUTLINE

For this project, we computed insurance operating returns and the returns on net worth for private workers' compensation insurers in California and 12 other states for 1981 through 1990.¹ Ten years were included to control for anomalies in loss experience or investment returns that might arise in a single year or a small number of years. We believe that a ten-year period is sufficiently long to provide reasonable estimates of the long-term profitability for this line.

We produced two rate of return measures: the operating return and the return on net worth. The operating return is the underwriting result plus the investment income allocable to reserves for this line. These operating returns are presented in Table 1. The total return on net worth is the operating return plus the investment income allocable to surplus adjusted to a net worth basis. The returns on net worth

¹ State fund results were not included in these calculations because the financial reporting practices of the state funds differ from the private insurers. Besides California, the other states in the study with competitive funds were Michigan, Minnesota, New York, Oregon, and Pennsylvania. In the two states selected for this study--Ohio and West Virginia--workers' compensation coverage is provided through a monopolistic fund, and consequently these states were not included the calculations.

are presented in Table 2. For purposes of comparing these returns to other industries, the all-industries average returns are presented in Table 3.

The present report is comprised of three sections:

- Sources of Income, which identifies the three sources of income for a workers' compensation insurance operation, and describes the procedures and data sources for computing the operating returns and returns on net worth;
- Special Considerations for Computing a Rate of Return for Workers' Compensation Insurance, which identifies the procedures for allocating income and capital and the most important tax considerations;
- Rate of Return Comparisons With Other Industries, which presents the rates of return experienced by other industries.

In two additional sections, we discuss the differences between the returns in this report and the returns in the NAIC 1989 Report on Profitability by Line by State, and state fund financial results reported by the American Association of State Compensation Insurance Funds.

In a previous report for the Association of California Insurance Companies and the American Insurance Association, we presented operating returns and returns on net worth for California workers' compensation insurance. Because the previous study was specific to California, we were able to rely data from the California Workers' Compensation Insurance Rate Bureau (WCIRB). Given the number of states considered for the present study, it was necessary to rely on data sources that provide information on many states. Consequently, the results in the previous report are not comparable to the results from this study. Arguably the WCIRB data provide a more accurate estimate of returns in California; however, the rating bureau reports data

for California only. The present work relies more heavily on data from the A.M. Best Company, the National Council on Compensation Insurance and the American Association of State Compensation Insurance Funds.

SOURCES OF INCOME

In principle a profitability analysis must calculate the difference between total revenues and total costs for a given activity, and then relate this profit to an appropriate equity base. In the case of an individual line of insurance in a single state, this exercise is complicated by the fact that certain relevant data are not typically reported at the level of detail required to perform this calculation directly. Thus we relied on allocations of countrywide data to individual-state workers' compensation insurance operations for situations where state specific data are unavailable.

Traditionally, insurance profitability analyses differentiate income attributable to three distinct activities:

- the insurance or underwriting transaction;
- the investment of funds held in reserves for the payment of future losses and expenses; and
- the investment of statutory surplus, or capital.

The first two sources taken together are usually referred to as the "return to insurance operations," and this return is usually expressed as a percent of earned premium. This operating return plus the income from the investment of statutory surplus comprise the total return to insurers. When this total return is converted to a GAAP net worth base, we can compare the profitability of the insurance business to other business activities. This conversion requires an allocation of insurer equity

to the workers' compensation line and then to the individual state. The present section will identify the procedures used to compute the return on premium, and the next section explains the surplus allocation and surplus-to-net worth considerations.

- **THE INSURANCE TRANSACTION**

The income earned from the insurance transaction is commonly referred to as the "underwriting result" or "underwriting ratio." The underwriting result is the difference between earned premiums and incurred losses, expenses, and policyholder dividends. In the present analysis, we relied on premiums earned and losses, expenses, and policyholder dividends incurred during a particular January 1-December 31 period. We principally relied on data compiled and published by the A.M. Best Company to compute underwriting results.

- **THE INVESTMENT OF FUNDS HELD IN RESERVES FOR THE PAYMENT OF FUTURE LOSSES AND EXPENSES**

Insurers are required to establish reserves for claims that are currently unpaid, for the loss adjustment expenses associated with those claims, and for the premiums that have already been written but are as yet unearned. While these reserves appear on the liability side of the insurer's balance sheet, they are used to purchase financial assets, the income from which is commonly referred to as "investment income on reserves".

In most states, workers' compensation insurers are required to file an annual statement with the insurance department if they write coverage in that state. In a supplement to the annual statement--the Insurance Expense Exhibit--insurers allocate income earned from their investment operations to the individual lines of insurance and to their capital and surplus.

Generally speaking, the investment income that is allocated on the IEE is proportional to the investable reserves for each line. Thus, a line that accounts for 20% of an insurer's investable reserves will be assigned approximately 20% of the investment income allocated to the individual lines. A limitation in the IEE reports, however, is that the individual-lines allocation is not further allocated to the individual states. The procedure we used to overcome this limitation is described in the "Special Considerations for Computing the Rate of Return" section.

- **THE INVESTMENT OF STATUTORY SURPLUS, OR CAPITAL**

Statutory surplus is the difference between assets and liabilities as defined under Statutory Accounting Principles (SAP). While this is akin to insurer equity or net worth, there are important differences between SAP and Generally Accepted Accounting Principles (GAAP) which cause statutory surplus to be substantially lower than GAAP net worth. These differences, which are critical when computing rates of return, are discussed later in this report.

For the income calculations, the principal issue is to allocate the investment income attributable to statutory surplus to individual lines of business and states. This calls for an allocation of surplus across activities, an issue which has been the subject of considerable debate. In our opinion an allocation proportional to insurer liabilities is a reasonable basis for the assignment of surplus. This derives from the view that the principal purpose for statutory surplus, or capital, is to support the various liabilities of the property-casualty insurer, particularly its commitments to make claim payments. The details of this procedure are described below.

- **DATA SOURCES**

There were three principal data sources employed in this study. (1) State workers' compensation premium, loss, dividend, and loss reserve information are compiled annually by the A. M. Best Company and published in its Executive Data Service series. (2) Countrywide workers' compensation reserve information, investment income returns and expense information are reported in the Insurance Expense Exhibit, a supplement to an insurer's annual statement. These reporting forms are compiled by the A. M. Best Company, and the results are published in its annual Aggregates & Averages series. (3) The Aggregates & Averages series did not provide underwriting expense from the IEE for 1981 through 1984. For these years, we relied on IEE compilations performed by the National Council on Compensation Insurance. Also, in states where the NCCI is the rate bureau, we relied on their computations for state premium taxes; in other states, we used the countrywide average.

SPECIAL CONSIDERATIONS FOR COMPUTING THE RATE OF RETURN FOR WORKERS' COMPENSATION INSURANCE

In computing the rate of return for workers' compensation insurance for a particular state, several issues required special consideration. Most notably:

- insurers' countrywide workers' compensation investment income results needed to be allocated to the individual states;
- insurers' investment income on statutory surplus, reported on an aggregated (i.e., countrywide, all-lines) basis, needed to be allocated to individual-state workers' compensation insurance operations;

- the Tax Reform Act of 1986 included several provisions specific to the taxation of property-casualty insurers; and
- the return on premium needed to be converted to a return on net worth.

Each issue is discussed below.

- **ALLOCATING INVESTMENT INCOME TO INDIVIDUAL-STATE WORKERS' COMPENSATION INSURANCE OPERATIONS**

The instructions for completing the Insurance Expense Exhibit (IEE) prescribe an allocation of investment income to the individual lines of insurance in proportion to the level of reserves in each line. As stated before, a line which accounts for 20% of an insurer's reserves will be allocated approximately 20% of the investment income allocated to the individual lines. When the allocated investment income is divided by earned premium, the result is commonly referred to as "investment income from operations" (or "investment income from reserves").

In 1990, countrywide workers' compensation insurance accounted for 18.3% of all insurance reserves, and was assigned 18.3% of all investment income allocated to the individual lines of insurance.² Under the allocation procedures used to complete the IEE, investment income allocated to the workers' compensation line was 13.0% of this line's earned premium.

² The procedure for allocating investment income to individual lines is based on "investable" reserves. While the proportion of investment income allocated to a particular line should be close to the proportion of total reserves, the closeness observed in the 1990 data is somewhat of a coincidence.

Since state specific data on investment income from operations is not available, it is often assumed that the countrywide result can be used to proxy the investment income for a single state's workers' compensation insurance operation. This assumption can be reasonable if coverage and claims settlement patterns for the line are similar in all states. This is not the case for workers' compensation insurance, however. Because statutory benefit provisions and claims administration practices vary dramatically from state to state, the average holding periods of reserves will also vary substantially. As a consequence, the investment income attributable to these reserves will differ across states as well.

In 1990, California accounted for 18.9% of the countrywide workers' compensation premium, but only 15.7% of countrywide reserves. This indicates that the average holding period of reserves in California is shorter than countrywide. Consequently, relying on the 13.0% countrywide investment income from operations would overstate the investment income earned on California workers' compensation insurance premium. By contrast, Florida accounted for 5.0% of countrywide premium, and 6.3% of countrywide reserves. Thus, relying on the countrywide investment income result would understate the investment income for Florida workers' compensation.

To estimate the investment income from reserves, we computed the proportion of countrywide reserves accounted for by each state, assigned that proportion of countrywide investment income to the state, and then expressed it as a percent of the state's premium. For example, in 1990, California accounted for 15.7% of countrywide workers' compensation reserves. Thus, 15.7% of the countrywide investment income for the line was assigned to California, and then expressed as a percent of California premium. The result was that California workers' compensation insurers earned a 11.2% return on California premium from the investment of reserves. Performing the same calculation for Florida, we estimated that in 1990 insurers earned a 17.2%

return from the investment of reserves attributable to this state's workers' compensation insurance operations.

The investment income allocated to California and Florida are in contrast to the 13% countrywide result. If we had not recognized the state differences in reserves, we would have overstated the investment income for California workers' compensation insurance and understated the result for Florida. We performed this allocation procedure for each of the 13 states.

- **ALLOCATING SURPLUS TO INDIVIDUAL-STATE WORKERS' COMPENSATION INSURANCE OPERATIONS**

Statutory surplus is reported on an insurer's annual statement as a consolidated entry, without any individual-line or individual-state breakdown. As a consequence, it was necessary to allocate statutory surplus to estimate the total return on an individual-state basis for workers' compensation.

As previously noted, we feel that it is reasonable to allocate surplus proportional to reserves. We began by computing the amount of California workers' compensation reserves for a state as a proportion of total (all lines) countrywide reserves. For example, in 1990, California workers' compensation reserves accounted for 3.23% of all-lines countrywide reserves, and thus 3.23% of the statutory surplus held by property-casualty insurers was assigned to California workers' compensation insurance.

We used the allocated surplus for two purposes: (1) to derive the investment income on surplus supporting the state's workers' compensation insurance operations, and (2) to compute a premium-to-surplus ratio for this line in each state. The investment income on countrywide surplus allocated to California mirrored the proportion of surplus allocated to California. For example, for 1990, 3.23% of the countrywide investment income on surplus was allocated

to California workers' compensation insurance, and then expressed as a percent of California earned premium. The result is that investment income on allocated surplus provided a 6.70% pre-tax return on California earned premium. This 6.70% result can be contrasted with Florida, a state with a large amount of reserves relative to its premium. For 1990, we estimated that the surplus supporting the Florida workers' compensation reserves produced a 10.29% return on earned premium.

The allocated surplus was also used to compute a premium-to-surplus ratio for each state's workers' compensation insurance operation. We divided earned premium by the allocated surplus to produce a premium-to-surplus ratio. In a procedure described below, this ratio was used to convert the return on premium to a return on net worth.

- **TAX REFORM ACT OF 1986**

The Tax Reform Act of 1986 was the most significant revision to federal income tax statutes in over 30 years. While many of the revisions were applicable to most corporate entities, other revisions were specific to property-casualty insurers (e.g., the introduction of loss discounting for computing taxable income). The present study captured the revisions that were applicable to all corporate entities, as well as those applicable solely to insurers.

- **CONVERTING THE RETURN ON PREMIUM TO A RETURN ON NET WORTH**

The procedures discussed thus far produce a post-tax return on premium for a state's workers' compensation insurance business. However, to produce a rate of return that could be compared to noninsurance businesses, the return

on premium needed to be converted to a return on net worth. We used a two-step procedure to make this conversion. First, the premium-to-surplus factor previously described was applied to the return on premium to produce a return on surplus. Next, the return on surplus was converted to a return on net worth using a factor to adjust for the differences between statutory surplus and GAAP net worth. Insofar as this latter step is of substantial conceptual and empirical significance, it is discussed in detail below.

Statutory surplus is the difference between assets and liabilities as measured under statutory accounting principles (SAP), while net worth is the difference between assets and liabilities as measured under generally accepted accounting principles (GAAP). It is the different perspectives of these two sets of principles that give rise to the quantitative differences between surplus and net worth.

GAAP focuses on the firm as a going concern, and is designed to report operating results and the firm's financial condition under the implicit assumption that the firm will continue operations in the future. SAP on the other hand stresses the ability of the firm to meet its obligations to policyholders, and thus reports operating results and the financial condition in a much more conservative manner. It has often been likened to evaluating the liquidation value of the firm.

These different viewpoints give rise to important differences in the treatment of certain income and asset items. As regards the distinction between surplus and equity, the differences arise from the fact that SAP excludes certain assets from the balance sheet. From a quantitative perspective the most significant exclusions are: deferred acquisition costs; agents' balances more than 90 days past due; furniture and fixtures, and leasehold improvements; and salvage and subrogation recoverable. Under GAAP these assets would typically be included, subject to appropriate tests of recoverability. Of course the exclusion

of assets under SAP implies that, all other things equal, surplus as measured using SAP will be less than equity under GAAP.

Statutory accounting principles were developed to aid regulators in monitoring insurer solvency, and they are well suited for that intended purpose. In our opinion however, GAAP is the better set of principles to use when evaluating insurer profitability on an on-going basis. In addition, virtually all other businesses use GAAP equity to measure profitability; to the extent that insurer returns will be compared with those in other industries, the comparisons should be made on a common base. Therefore in order to calculate returns for the purpose of profitability analysis, we have made our final calculations on a base of GAAP equity.

WORKERS' COMPENSATION PROFITABILITY

Tables 1 and 2 present the operating returns and returns on net worth for workers' compensation insurance in 13 states for 1981 through 1990. As noted above, the operating returns in Table 1 are expressed as a percent of earned premium and the returns on net worth were calculated to conform with generally accepted accounting principles.³

Operating returns, presented in Table 1, varied considerably across states. The 10-year average annual operating return was worse than -11% of earned premium in

³ The loss and expense components, underwriting result, investment income from reserves, and investment income from capital and surplus underlying the returns in Tables 1 and 2 are provided in Appendix A.

Florida and Texas, while better than 9% in Kentucky and New York.⁴ The 4.37% average return in California was fifth highest among the 13 states.

There was also a great deal of volatility in the average annual returns. The difference between the lowest and highest returns were as small as 11.6 percentage points in California and as much as 45.3 percentage points in Kentucky. The standard deviations of the annual returns, presented in the last column of Table 1, ranged from 3.6 in California to 13.0 in Kentucky. Given the present interest in ratemaking systems, it should be noticed that in four of the five states with the most volatile returns workers' compensation insurance rates were administered under a prior approval ratemaking system during the ten-year period.⁵

Elsewhere in our studies, we make a distinction between competitive and prior approval ratemaking systems. Between 1982 and 1984, a competitive ratemaking system was introduced in seven states in Tables 1 and 2--Arkansas, Georgia, Illinois, Kentucky, Michigan, Minnesota, and Oregon. To compare the returns under the two general forms of ratemaking, we computed the average returns for each group of states for 1986 through 1990. During this five-year period, the average return in the seven competitive ratemaking states was 0.22%, compared to -8.56% in the six prior approval states.

Total returns on net worth, presented in Table 2, followed the same patterns as the operating returns. Total returns were quite varied--from a -9.23% average return in Texas to 15.21% in New York, and there was considerable volatility--in Texas, the range was 35.4 percentage points and the standard deviation was 10.5. The California returns on net worth were generally higher and more stable than the

⁴ The averages in Tables 1 and 2 are 10-year annual averages. Due to premium increases and generally poorer results during the latter half of this period, the 10-year returns (i.e., weighted by earned premium or net worth) were generally worse than the 10-year average returns.

⁵ The four prior approval states were Florida, Massachusetts, Pennsylvania, and Texas.

returns in the other states. Over the 10-year period, California experienced the second highest average return (13.04%) and the third lowest standard deviation (4.0).⁶

As with the operating returns, we also computed the average returns separately for the competitive and prior approval ratemaking states. During 1986-1990, the average return on net worth in the competitive ratemaking states was 6.64%, compared to a -1.59% average return in the prior approval states.

RATE OF RETURN COMPARISONS WITH OTHER INDUSTRIES

It is well understood in the fields of economics and finance that much care is required to perform interindustry comparisons of accounting returns. Differences across industries in depreciation practices, the economic life of investment projects, and the rates of growth limit the comparability of accounting returns across industries.

In an effort to mitigate these limitations, the average returns for three broad U.S. aggregates are presented in Table 3: Standard & Poor's Compustat Data Service all industries, Standard & Poor's 400, and Dow Jones Industrials. For the 1981-1990 period, the all-industries' average returns were between 12.2% and 14.6%.

⁶ It would be hasty to conclude that workers' compensation insurance is currently less risky in California than in other states. While statutory benefits were generally stable over most of the 1981-1990 decade, the major changes enacted by the Benefit Reform Act of 1989 and the effects of the economic recession in this state have created uncertainties concerning the total losses and the adequacy of rates for policies currently being written.

NAIC 1989 REPORT ON PROFITABILITY

For a number of years, the NAIC has issued a "Report on Profitability by Line by State." Traditionally, the Profitability Report was limited to the underlying components of the underwriting result--incurred losses, expenses, and policyholder dividends--and the pre-tax operating return. The 1989 Profitability Report was extended to provide the total return on capital and surplus. Although this report was principally concerned with 1989, due to the change in format, total returns on capital and surplus were provided for 1985 through 1989.

There are several differences between our estimated total returns and those in the NAIC 1989 Profitability Report. These differences concern data sources, computations, and final rate of return measures.

As regards data sources, we relied on published A.M. Best Company reports and information generally available from the NCCI, while the NAIC performed separate compilations of insurers' annual statements.

In terms of computations, the major differences relate to the allocation of investment income and surplus, and the calculation of federal income taxes. The NAIC allocates investment income proportional to all reserves plus premium while our allocation is based on reserves only, following the procedures in the IEE. Also, the NAIC does not explicitly account for all aspects of the Tax Reform Act while our calculations do.

Finally, our rate of return calculations are computed on a net worth basis (to facilitate comparisons with other industries), while the NAIC total returns are on earned premium.

FINANCIAL RESULTS OF STATE COMPENSATION INSURANCE FUNDS

Earlier we noted that data limitations prevented us from including the state funds in the preceding calculations. In the 15 states selected for this study, there are competitive funds in six states--California, Michigan, Minnesota, New York, Oregon, and Pennsylvania--and monopolistic funds in two states--Ohio and West Virginia.

The most complete single source of financial results for these funds is an annual report compiled by the American Association of State Compensation Insurance Funds (AASCIF). While more detailed data may be available from the individual funds, the AASCIF reports are based on information gathered from the funds and the information is presented in a common format. Nevertheless, there are limitations with the information presented in the AASCIF reports. For example, the expense data appears incomplete for some funds, there is no financial base comparable to private insurers' equity, and the financial results occasionally are not meaningful (such as in the case of negative statutory surplus).

The data limitations notwithstanding, we used the AASCIF reports to summarize the financial results of the state funds. In Table 4, we present the earned premium, loss ratio, underwriting ratio, and total return on surplus for the eight state funds for 1983 through 1988.⁷ The total returns in Table 4 cannot be compared with the total returns in Table 2. Besides the problems noted above, the total returns in Table 4 are as a percent of statutory surplus, while the total return in Table 2 is on a net worth base.

⁷ AASCIF reports providing financial information for other years in the 1981-1990 period were not available when we performed this study.

LIMITATIONS

The present study calculated annual historical returns for selected states. Changes in rate levels, benefit provisions, and economic conditions that might affect workers' compensation losses will influence the current and prospective profitability of this line in a state. Thus, these returns should not be used to infer current or prospective profitability.

We relied on data from published data sources or that has been presented in public forums. While we consider these data reliable, we have not performed any audits of the underlying data.

The report has been prepared for the Rate Study Commission. If the RSC chooses to distribute this report, we request that it be provided in its entirety and that individuals be made aware that the authors are available to answer any questions regarding this report.

TABLE 1

OPERATING RETURNS FOR WORKERS' COMPENSATION INSURANCE

State	Percent of Earned Premium											Average	Standard Deviation
	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1990		
Arkansas	3.32	12.96	6.46	-3.32	2.62	-1.02	-3.30	-2.87	-3.19	-10.96	0.07	6.24	
California	11.96	9.12	5.07	1.12	0.34	0.81	0.94	4.77	4.71	4.89	4.37	3.64	
Florida	7.75	1.49	-11.50	-8.07	-3.84	-8.89	-21.77	-30.21	-29.30	-12.94	-11.73	11.79	
Georgia	0.30	6.02	-1.56	-12.19	-10.64	-10.90	-6.87	-11.45	-8.87	-3.94	-6.01	5.75	
Illinois	10.88	10.90	3.56	-3.93	4.19	7.25	5.15	5.15	2.59	2.66	4.84	4.10	
Kentucky	14.61	35.89	21.59	2.02	-1.60	20.99	0.74	4.46	3.11	-9.41	9.24	12.96	
Massachusetts	-3.18	0.17	2.39	0.76	0.87	-8.79	-18.00	-24.30	-14.40	-19.27	-8.38	9.41	
Michigan	13.24	16.24	6.21	5.10	10.48	8.11	3.91	-0.85	4.89	1.12	6.85	5.02	
Minnesota	-3.35	-4.25	8.83	-13.17	-0.29	-2.40	-1.90	3.13	5.19	1.51	-0.67	5.70	
New York	17.57	16.81	16.38	7.71	13.19	9.54	6.33	1.49	3.85	1.20	9.41	5.98	
Oregon	6.70	8.63	-0.28	-7.70	-1.68	-5.23	-1.18	2.03	-0.80	10.82	1.13	5.65	
Pennsylvania	11.66	19.18	12.84	0.92	8.00	3.81	-1.08	-7.69	-8.77	-8.94	2.99	9.36	
Texas	2.22	-1.50	-3.28	-11.05	-19.47	-12.67	-18.11	-23.38	-18.72	-11.87	-11.78	8.11	

Sources: A.M. Best Company, NCCI, M&R Analysis

TABLE 2

**TOTAL RATE OF RETURN ON NET WORTH
FOR WORKERS' COMPENSATION INSURANCE**

State	Percent of Net Worth											Average	Standard Deviation
	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1990		
Arkansas	9.86	24.13	15.11	3.71	13.75	8.58	1.98	3.10	3.57	-5.95	7.78	8.00	
California	21.97	18.17	14.04	9.55	10.63	11.00	7.97	12.83	12.81	11.44	13.04	3.97	
Florida	14.62	7.52	-4.35	-0.66	5.79	0.27	-14.72	-18.65	-15.44	-3.68	-2.93	10.27	
Georgia	5.79	13.65	5.11	-6.86	-3.55	-5.04	-2.71	-8.29	-2.72	1.41	-0.32	6.45	
Illinois	16.15	15.62	9.63	4.69	14.37	17.82	12.72	12.60	9.97	8.81	12.24	3.79	
Kentucky	11.34	20.89	14.27	8.74	9.49	19.21	7.09	9.11	8.79	0.68	10.96	5.60	
Massachusetts	2.37	6.16	9.50	8.74	11.23	0.18	-11.93	-16.95	-5.51	-9.97	-0.62	9.44	
Michigan	17.77	17.27	10.71	11.16	17.92	16.30	10.15	6.03	10.89	6.68	12.49	4.28	
Minnesota	2.87	3.08	12.56	-0.59	9.94	7.92	5.38	8.83	10.86	6.88	6.77	3.88	
New York	21.81	20.25	19.24	13.92	21.75	18.37	12.25	7.90	9.89	6.72	15.21	5.50	
Oregon	11.86	13.46	6.71	0.98	8.35	3.97	5.37	8.95	6.35	17.25	8.33	4.55	
Pennsylvania	15.51	21.27	15.59	8.53	16.60	13.05	5.76	0.07	0.07	-1.20	9.53	7.63	
Texas	9.59	3.20	1.43	-9.41	-16.90	-8.78	-18.97	-25.84	-16.95	-9.65	-9.23	10.54	

Sources: A.M. Best Company, NCCI, M&R Analysis

Table 3

RATES OF RETURN ON NET WORTH

<u>Year</u>	S&P Compustat Data Service: <u>All Industries</u>	S&P <u>400</u>	Dow Jones Industrial <u>Average</u>
1981	14.0	14.9	11.9
1982	11.0	11.3	1.0
1983	11.5	12.2	8.2
1984	13.2	14.6	12.6
1985	11.2	12.2	10.3
1986	10.4	11.5	12.0
1987	11.6	15.7	13.3
1988	14.8	19.0	20.7
1989	13.2	18.4	18.8
1990	11.7	16.3	13.2
Average	12.3	14.6	12.2

TABLE 4

RATES OF RETURN FOR STATE COMPENSATION INSURANCE FUNDS: 1982-1988

	1982	1983	1984	1985	1986	1987	1988
<i>Total Return on Premium</i>							
California	-1.37	3.01	6.25	1.52	7.14	4.63	6.01
Michigan	66.25	29.58	124.60	-5.57	-37.19	10.11	9.26
Minnesota	-	-	-33.01	-1.71	14.20	5.72	3.25
New York	-1.72	-14.44	1.62	-0.84	88.12	14.78	11.27
Ohio	47.53	85.39	80.50	-100.52	-55.57	0.14	-16.83
Oregon	-14.91	-12.61	-38.86	-3.25	-3.06	3.39	-20.16
Pennsylvania	-46.21	142.20	112.94	181.04	105.85	71.53	45.60
West Virginia	-0.01	0.01	0.00	-0.19	0.00	-53.73	-100.32
<i>Total Return on Surplus</i>							
California	-1.33	3.05	7.60	2.18	12.86	10.71	14.94
Michigan	15.36	4.60	20.57	-1.57	-35.65	18.92	15.15
Minnesota	-	-	-7.10	-2.73	46.61	27.53	16.01
New York	-2.45	-20.86	2.26	-1.45	68.32	13.25	11.92
Ohio	54.43	64.03	172.20	NMF	NMF	NMF	NMF
Oregon	-15.94	-15.81	-86.53	-8.31	-14.84	26.00	-32.54
Pennsylvania	-266.29	72.83	19.03	36.60	29.43	20.41	16.47
West Virginia	-0.01	0.01	0.00	-0.25	0.00	NMF	NMF

Notes: Minnesota State Fund began operations in 1983.

"NMF" - not meaningful figures due to negative surplus.

Sources: American Association of State Compensation Insurance Funds, M&R Analysis.

ESTIMATED RETURN ON NET WORTH FOR WORKERS COMPENSATION INSURANCE: 1981-1990 - ARKANSAS

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1981-90
EARNED PREMIUMS (\$millions)	129.3	136.2	123.4	125.8	152.6	159.6	200.8	216.2	226.9	252.3	1,723.1
I. UNDERWRITING RESULT											
A. Loss and Expense Components											
1. Losses incurred	74.16	55.80	67.13	86.37	77.47	84.10	81.62	81.66	83.95	94.73	
2. Loss adjustment exp.	10.10	7.90	8.75	10.45	9.09	10.04	10.82	10.57	11.49	12.10	
3. Comm, brokerage & oth acq	8.58	9.13	10.00	9.70	8.51	8.16	8.45	8.33	8.09	8.11	
4. General	6.62	7.37	7.67	7.18	6.05	5.49	5.20	5.12	4.89	4.99	
5. Prem taxes, licenses, & fees	4.10	4.40	4.80	5.00	5.10	5.80	5.50	5.50	5.50	5.50	
6. Policyholder dividends	4.96	6.10	6.55	5.87	4.46	3.79	2.88	2.53	2.23	1.53	
B. Pre-Tax Underwriting Result	-8.52	9.30	-4.90	-24.57	-10.68	-17.38	-14.47	-13.71	-16.15	-26.96	
C. Post-Tax Underwriting Result	-4.60	5.02	-2.65	-13.27	-5.77	-9.39	-10.89	-10.92	-12.34	-20.20	
II. INVESTMENT INCOME FROM RESERVES											
A. Pre-Tax Return from Reserves	10.52	10.55	12.10	12.94	11.24	11.26	9.80	10.25	11.54	11.77	
B. Post-Tax Return from Reserves	7.92	7.94	9.11	9.95	8.39	8.37	7.59	8.05	9.15	9.24	
III. TOTAL RETURN ON INSURANCE OPERATIONS (as a percent of premium)											
	3.32	12.96	6.46	-3.32	2.62	-1.02	-3.3	-2.87	-3.19	-10.96	
IV. INVESTMENT RETURN ON CAPITAL AND SURPLUS											
A. Pre-Tax Return from Cap & Surp	5.2	5.51	6.98	8.07	9.49	9.77	6.21	6.91	8.29	7.06	
B. Post-Tax Return from Cap & Surp	4.03	4.27	5.41	6.26	7.41	7.52	4.68	5.35	6.33	5.44	
V. TOTAL POST-TAX RETURN ON PREMIUM											
	7.35	17.23	11.87	2.94	10.03	6.50	1.38	2.48	3.14	-5.52	
VI. TOTAL POST-TAX RETURN ON NET WORTH											
	9.86	24.13	15.11	3.71	13.75	8.58	1.98	3.10	3.57	-5.95	

1981-1990 Average Return on Net Worth:
Weighted Average Return:

7.78
6.23

Sources:

- A.M. Best Company, Executive Data Survey (earned premium, incurred losses, policyholder dividends)
- A.M. Best Company, Aggregates & Averages (loss adjustment expenses, commission & brokerage, other underwriting expenses, investment return on countrywide workers compensation reserves and capital and surplus, surplus-to-net worth factor)
- National Council on Compensation Insurance (taxes, licenses, & fees)

ESTIMATED RETURN ON NET WORTH FOR CALIFORNIA WORKERS COMPENSATION INSURANCE: 1981-1990
(Based on loss and expense data from WCIRB.)

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
EARNED PREMIUMS (\$millions)	2,449.0	2,395.0	2,789.0	3,244.0	3,536.0	3,963.0	4,612.0	5,374.0	5,953.0	6,495.0
I. UNDERWRITING RESULT										
A. Loss and Expense Components										
1. Losses incurred	51.70	52.30	58.70	66.70	72.60	75.20	71.60	66.00	64.00	66.10
2. Loss adjustment exp.	8.50	9.35	9.11	9.25	9.50	9.97	10.66	11.09	11.27	11.16
3. Commission & brokerage	7.12	7.36	8.18	7.18	6.85	6.98	6.81	6.98	6.44	6.69
4. Other acquisition expenses	3.15	3.57	3.89	4	3.62	3.1	2.95	3.09	3.25	3.28
5. General expenses	6.02	7.50	7.85	6.68	6.15	5.73	5.79	5.73	5.62	5.46
6. Premium & other taxes	2.61	2.48	2.58	2.59	2.69	2.74	2.8	2.83	2.78	2.88
7. Policyholder dividends	16.60	18.80	17.40	15.30	14.90	12.70	10.70	9.30	11.8	11.00
B. Pre-Tax Underwriting Result	4.30	-1.36	-7.71	-11.70	-16.31	-16.42	-11.31	-5.02	-5.16	-6.57
C. Post-Tax Underwriting Result	2.32	-0.73	-4.16	-6.32	-8.81	-8.87	-8.69	-4.84	-5.09	-6.18
II. INVESTMENT INCOME FROM RESERVES										
A. Pre-Tax Return from Reserves	9.47	10.58	10.31	10.55	10.79	10.62	10.36	10.11	10.90	11.22
B. Post-Tax Return from Reserves	7.13	7.96	7.76	8.11	8.05	7.89	8.03	7.94	8.65	8.81
III. INVESTMENT RETURN ON CAPITAL AND SURPLUS										
A. Pre-Tax Return from Cap & Surp	4.72	5.58	6.07	6.61	9.05	9.41	6.77	6.63	7.95	6.68
B. Post-Tax Return from Cap & Surp	3.66	4.33	4.71	5.13	7.07	7.25	5.11	5.14	6.07	5.15
IV. TOTAL POST-TAX RETURN ON PREMIUM	13.11	11.56	8.31	6.92	6.31	6.27	4.45	8.24	9.63	7.78
V. TOTAL POST-TAX RETURN ON SURPLUS	22.94	18.84	14.29	12.59	10.66	9.91	6.90	12.77	13.48	10.35
VII. TOTAL POST-TAX RETURN ON NET WORTH	18.89	15.52	11.91	10.03	8.96	8.24	5.53	10.51	11.28	8.48
1981-1990 Average Return on Net Worth:										10.94

Sources:

- California WCIRB (loss and expense components, reserves)
- A.M. Best Company, Aggregates & Averages and Executive Data Survey (only for allocating inv inc to reserves and surplus, and for premium-to-surplus and surplus-to-net worth factors)

ESTIMATED RETURN ON NET WORTH FOR CALIFORNIA WORKERS COMPENSATION INSURANCE: 1981-1990
(Based on loss and expense data from non-WCIRB sources.)

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
EARNED PREMIUMS (\$millions)	2,497.1	2,441.7	2,802.7	3,287.3	3,615.0	4,140.2	4,724.5	5,484.0	6,055.0	6,599.2
I. UNDERWRITING RESULT										
A. Loss and Expense Components										
1. Losses incurred	51.10	52.30	58.80	67.70	72.10	74.90	70.40	65.60	65.50	66.00
2. Loss adjustment exp.	7.00	7.40	7.70	8.20	8.50	8.90	9.30	8.50	9.00	8.40
3. Commission & brokerage	5.50	5.90	6.30	6.00	4.90	4.70	5.30	5.00	4.60	4.70
4. Other underwr exp	13.40	14.70	15.80	15.20	14.10	13.20	12.80	12.80	12.80	12.90
5. Policyholder dividends	14.90	18.30	17.20	16.40	14.90	11.10	10.40	9.90	11.20	11.30
B. Pre-Tax Underwriting Result	8.10	1.40	-5.80	-13.50	-14.50	-12.80	-8.20	-1.80	-3.10	-3.30
C. Post-Tax Underwriting Result	4.37	0.76	-3.13	-7.29	-7.83	-6.91	-5.83	-2.58	-4.24	-3.99
II. INVESTMENT INCOME FROM RESERVES										
A. Pre-Tax Return from Reserves	9.47	10.58	10.31	10.55	10.79	10.62	10.36	10.11	10.90	11.22
B. Post-Tax Return from Reserves	7.13	7.96	7.76	8.11	8.05	7.89	8.03	7.94	8.65	8.81
III. INVESTMENT RETURN ON CAPITAL AND SURPLUS										
A. Pre-Tax Return from Cap & Surp	4.72	5.58	6.07	6.61	9.05	9.41	6.77	6.63	7.95	6.68
B. Post-Tax Return from Cap & Surp	3.66	4.33	4.71	5.13	7.07	7.25	5.11	5.14	6.07	5.15
IV. TOTAL POST-TAX RETURN ON PREMIUM	15.16	13.05	9.34	5.95	7.29	8.23	7.31	10.50	10.48	9.97
V. TOTAL POST-TAX RETURN ON SURPLUS	26.53	21.27	16.06	10.83	12.32	13.00	11.33	16.28	14.67	13.26
VII. TOTAL POST-TAX RETURN ON NET WORTH	21.84	17.51	13.39	8.63	10.36	10.82	9.08	13.40	12.27	10.87
1981-1990 Average Return on Net Worth:										12.82

Sources:
 - A.M. Best Company, Executive Data Survey (earned premium, incurred losses, policyholder dividends)
 - A.M. Best Company, Aggregates & Averages (loss adjustment expenses, commission & brokerage, other underwriting expenses, investment return on countrywide workers compensation reserves and capital and surplus, surplus-to-net worth factor)

ESTIMATED RETURN ON NET WORTH FOR WORKERS COMPENSATION INSURANCE: 1981-1990 - FLORIDA

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1981-90
EARNED PREMIUMS (\$millions)	605.6	529.7	561.7	686.3	853.0	1,014.6	1,150.5	1,236.5	1,517.9	1,728.8	9,884.6
I. UNDERWRITING RESULT											
A. Loss and Expense Components											
1. Losses incurred	68.88	78.91	101.44	98.18	91.29	100.21	109.69	120.39	120.34	102.39	
2. Loss adjustment exp.	9.38	11.17	13.22	11.88	10.71	11.97	14.54	15.59	16.47	13.08	
3. Comm, brokerage & oth acq	8.58	9.13	10.00	9.70	8.51	8.16	8.45	8.33	8.09	8.11	
4. General	6.62	7.37	7.67	7.18	6.05	5.49	5.20	5.12	4.89	4.99	
5. Prem taxes, licenses, & fees	4.10	4.10	4.30	5.40	5.50	5.40	5.10	5.10	5.10	5.10	
6. Policyholder dividends	4.49	6.56	6.11	4.29	4.01	3.66	4.27	3.59	2.87	2.01	
B. Pre-Tax Underwriting Result	-2.05	-17.24	-42.74	-36.63	-26.07	-34.89	-47.25	-58.12	-57.76	-35.68	
C. Post-Tax Underwriting Result	-1.11	-9.31	-23.08	-19.78	-14.08	-18.84	-32.48	-42.52	-42.50	-26.47	
II. INVESTMENT INCOME FROM RESERVES											
A. Pre-Tax Return from Reserves	11.77	14.35	15.38	15.23	13.72	13.39	13.82	15.67	16.64	17.23	
B. Post-Tax Return from Reserves	8.86	10.8	11.58	11.71	10.24	9.95	10.71	12.31	13.20	13.53	
III. TOTAL RETURN ON INSURANCE OPERATIONS (as a percent of premium)	7.75	1.49	-11.5	-8.07	-3.84	-8.89	-21.77	-30.21	-29.3	-12.94	
IV. INVESTMENT RETURN ON CAPITAL AND SURPLUS											
A. Pre-Tax Return from Cap & Surp	5.87	7.52	9.08	9.61	11.46	11.87	9.07	10.27	12.19	10.29	
B. Post-Tax Return from Cap & Surp	4.55	5.83	7.04	7.45	8.95	9.14	6.84	7.96	9.31	7.93	
V. TOTAL POST-TAX RETURN ON PREMIUM	12.30	7.32	-4.46	-0.62	5.11	0.25	-14.93	-22.25	-19.99	-5.01	
VI. TOTAL POST-TAX RETURN ON NET WORTH	14.62	7.52	-4.35	-0.66	5.79	0.27	-14.72	-18.65	-15.44	-3.68	

1981-1990 Average Return on Net Worth:
Weighted Average Return:

-2.93
-5.53

Sources:

- A.M. Best Company, Executive Data Survey (earned premium, incurred losses, policyholder dividends)
- A.M. Best Company, Aggregates & Averages (Loss adjustment expenses, commission & brokerage, other underwriting expenses, investment return on countryside workers compensation reserves and capital and surplus, surplus-to-net worth factor)
- National Council on Compensation Insurance (taxes, licenses, & fees)

ESTIMATED RETURN ON NET WORTH FOR WORKERS COMPENSATION INSURANCE: 1981-1990 - GEORGIA

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1981-90
EARNED PREMIUMS (\$millions)	298.6	314.4	285.5	322.1	407.2	543.4	681.8	774.6	837.0	996.5	5,461.1
I. UNDERWRITING RESULT											
A. Loss and Expense Components											
1. Losses incurred	80.08	69.68	82.96	101.54	100.49	100.79	86.68	92.00	90.73	84.70	
2. Loss adjustment exp.	10.91	9.86	10.81	12.29	11.79	12.03	11.49	11.91	12.42	10.82	
3. Comm, brokerage & oth acq	8.58	8.16	10.00	9.70	8.51	8.16	8.45	8.33	8.09	8.11	
4. General	6.62	7.37	7.67	7.18	6.05	5.49	5.20	5.12	4.89	4.99	
5. Prem taxes, licenses, & fees	4.00	3.70	4.50	5.30	5.70	5.80	5.90	5.90	5.90	5.90	
6. Policyholder dividends	4.84	5.15	5.54	5.58	3.57	2.64	2.61	2.48	1.86	1.73	
B. Pre-Tax Underwriting Result	-15.03	-4.89	-21.48	-41.59	-36.11	-34.91	-20.33	-25.74	-23.89	-16.25	
C. Post-Tax Underwriting Result	-8.12	-2.64	-11.60	-22.46	-19.50	-18.85	-14.49	-19.42	-18.04	-12.74	
II. INVESTMENT INCOME FROM RESERVES											
A. Pre-Tax Return from Reserves	11.18	11.5	13.34	13.36	11.87	10.70	9.84	10.15	11.56	11.21	
B. Post-Tax Return from Reserves	8.42	8.66	10.04	10.27	8.86	7.95	7.62	7.97	9.17	8.80	
III. TOTAL RETURN ON INSURANCE OPERATIONS (as a percent of premium)	0.3	6.02	-1.56	-12.19	-10.64	-10.9	-6.87	-11.45	-8.87	-3.94	
IV. INVESTMENT RETURN ON CAPITAL AND SURPLUS											
A. Pre-Tax Return from Cap & Surp	5.63	6.06	7.80	8.40	10.08	9.39	6.49	6.59	8.43	6.73	
B. Post-Tax Return from Cap & Surp	4.37	4.7	6.05	6.52	7.88	7.23	4.90	5.11	6.44	5.19	
V. TOTAL POST-TAX RETURN ON PREMIUM	4.67	10.72	4.49	-5.67	-2.76	-3.67	-1.97	-6.34	-2.43	1.25	
VI. TOTAL POST-TAX RETURN ON NET WORTH	5.79	13.65	5.11	-6.86	-3.55	-5.04	-2.71	-8.29	-2.72	1.41	

1981-1990 Average Return on Net Worth: -0.32
Weighted Average Return: -1.48

Sources: - A.M. Best Company, Executive Data Survey (earned premium, incurred losses, policyholder dividends)
- A.M. Best Company, Aggregates & Averages (Loss adjustment expenses, commission & brokerage, other underwriting expenses, investment return on countrywide workers compensation reserves and capital and surplus, surplus-to-net worth factor)
- National Council on Compensation Insurance (taxes, licenses, & fees)

ESTIMATED RETURN ON NET WORTH FOR WORKERS COMPENSATION INSURANCE: 1981-1990 - ILLINOIS

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1981-90
EARNED PREMIUMS (\$millions)	904.4	797.7	700.2	730.6	992.1	1,193.9	1,437.8	1,592.8	1,744.5	2,082.9	12,176.9
I. UNDERWRITING RESULT											
A. Loss and Expense Components											
1. Losses incurred	69.13	69.86	84.04	99.40	83.37	75.45	73.62	73.43	78.50	76.75	
2. Loss adjustment exp.	9.42	9.89	10.95	12.03	9.78	9.01	9.76	9.51	10.75	9.80	
3. Comm, brokerage & oth acq	8.58	9.13	10.00	9.70	8.51	8.16	8.45	8.33	8.09	8.11	
4. General	6.62	7.37	7.67	7.18	6.05	5.49	5.20	5.12	4.89	4.99	
5. Prem taxes, licenses, & fees	2.50	2.40	2.80	3.00	3.10	3.10	3.00	3.00	3.00	3.00	
6. Policyholder dividends	3.51	4.41	5.10	4.34	2.64	3.78	3.14	4.00	2.46	3.80	
B. Pre-Tax Underwriting Result	0.24	-3.06	-20.56	-35.65	-13.45	-4.99	-3.17	-3.39	-7.69	-6.45	
C. Post-Tax Underwriting Result	0.13	-1.65	-11.10	-19.25	-7.26	-2.69	-3.87	-3.82	-6.98	-6.30	
II. INVESTMENT INCOME FROM RESERVES											
A. Pre-Tax Return from Reserves	14.28	16.67	19.48	19.93	15.34	13.37	11.64	11.42	12.06	11.41	
B. Post-Tax Return from Reserves	10.75	12.55	14.66	15.32	11.45	9.94	9.02	8.97	9.57	8.96	
III. TOTAL RETURN ON INSURANCE OPERATIONS (as a percent of premium)											
	10.88	10.9	3.56	-3.93	4.19	7.25	5.15	5.15	2.59	2.66	
IV. INVESTMENT RETURN ON CAPITAL AND SURPLUS											
A. Pre-Tax Return from Cap & Surp	7.12	8.76	11.49	12.50	12.90	11.87	7.65	7.51	8.81	6.84	
B. Post-Tax Return from Cap & Surp	5.52	6.79	8.91	9.70	10.08	9.14	5.77	5.82	6.73	5.27	
V. TOTAL POST-TAX RETURN ON PREMIUM											
	16.40	17.69	12.47	5.77	14.27	16.39	10.92	10.97	9.32	7.93	
VI. TOTAL POST-TAX RETURN ON NET WORTH											
	16.15	15.62	9.63	4.69	14.37	17.82	12.72	12.60	9.97	8.81	

1981-1990 Average Return on Net Worth:
Weighted Average Return:

12.24
12.06

- Sources:
- A.M. Best Company, Executive Data Survey (earned premium, incurred losses, policyholder dividends)
 - A.M. Best Company, Aggregates & Averages (Loss adjustment expenses, commission & brokerage, other underwriting expenses, investment return on countrywide workers compensation reserves and capital and surplus, surplus-to-net worth factor)
 - National Council on Compensation Insurance (taxes, licenses, & fees)

ESTIMATED RETURN ON NET WORTH FOR WORKERS COMPENSATION INSURANCE: 1981-1990 - KENTUCKY

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1981-90
EARNED PREMIUMS (\$millions)	203.1	206.0	163.6	195.3	203.8	231.4	249.2	314.7	336.9	386.6	2,490.6
I. UNDERWRITING RESULT											
A. Loss and Expense Components											
1. Losses incurred	84.19	50.50	82.84	112.96	117.03	75.66	100.03	87.38	90.03	104.16	
2. Loss adjustment exp.	11.47	7.15	10.79	13.67	13.73	9.03	13.26	11.32	12.33	13.30	
3. Comm, brokerage & oth acq	8.58	9.13	10.00	9.70	8.51	8.16	8.45	8.33	8.09	8.11	
4. General	6.62	7.37	7.67	7.18	6.05	5.49	5.20	5.12	4.89	4.99	
5. Prem taxes, licenses, & fees	5.10	3.70	5.10	4.40	6.20	4.80	4.50	4.50	4.50	4.50	
6. Policyholder dividends	4.91	4.61	5.77	5.25	5.18	4.00	2.46	1.86	1.82	1.90	
B. Pre-Tax Underwriting Result	-20.87	17.54	-22.17	-53.16	-56.70	-7.14	-33.90	-18.51	-21.66	-36.96	
C. Post-Tax Underwriting Result	-11.27	9.47	-11.97	-28.71	-30.62	-3.86	-22.03	-14.37	-16.39	-27.41	
II. INVESTMENT INCOME FROM RESERVES											
A. Pre-Tax Return from Reserves	34.38	35.1	44.58	39.98	38.88	33.43	29.39	23.97	24.58	22.92	
B. Post-Tax Return from Reserves	25.88	26.42	33.56	30.73	29.02	24.85	22.77	18.83	19.50	18.00	
III. TOTAL RETURN ON INSURANCE OPERATIONS (as a percent of premium)											
	14.61	35.89	21.59	2.02	-1.6	20.99	0.74	4.46	3.11	-9.41	
IV. INVESTMENT RETURN ON CAPITAL AND SURPLUS											
A. Pre-Tax Return from Cap & Surp	17.03	18.49	26.34	25.12	32.57	29.40	19.13	15.83	18.15	13.81	
B. Post-Tax Return from Cap & Surp	13.21	14.34	20.43	19.48	25.45	22.64	14.43	12.26	13.86	10.65	
V. TOTAL POST-TAX RETURN ON PREMIUM											
	27.82	50.23	42.02	21.50	23.85	43.63	15.17	16.72	16.97	1.24	
VI. TOTAL POST-TAX RETURN ON NET WORTH											
	11.34	20.89	14.27	8.74	9.49	19.21	7.09	9.11	8.79	0.68	

1981-1990 Average Return on Net Worth: 10.96
Weighted Average Return: 9.99

Sources:

- A.M. Best Company, Executive Data Survey (earned premium, incurred losses, policyholder dividends)
- A.M. Best Company, Aggregates & Averages (Loss adjustment expenses, commission & brokerage, other underwriting expenses, investment return on countrywide workers compensation reserves and capital and surplus, surplus-to-net worth factor)
- National Council on Compensation Insurance (taxes, licenses, & fees)

ESTIMATED RETURN ON NET WORTH FOR WORKERS COMPENSATION INSURANCE: 1981-1990 - MASSACHUSETTS

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1981-90
EARNED PREMIUMS (\$millions)	456.5	494.2	581.2	672.7	796.5	865.6	961.4	1,122.8	1,277.3	1,350.2	8,578.4
I. UNDERWRITING RESULT											
A. Loss and Expense Components											
1. Losses incurred	89.72	82.06	77.53	80.68	80.35	96.96	104.20	111.36	101.93	109.84	
2. Loss adjustment exp.	12.22	11.61	10.10	9.76	9.43	11.58	13.82	14.42	13.95	14.03	
3. Comm, brokerage & oth acq	8.58	9.13	10.00	8.70	8.51	8.16	8.45	8.33	8.09	8.11	
4. General	6.62	7.37	7.67	7.18	6.05	5.49	5.20	5.12	4.89	4.99	
5. Prem taxes, licenses, & fees	3.90	4.00	4.20	4.30	4.60	4.80	4.60	4.60	4.60	4.60	
6. Policyholder dividends	5.05	5.91	5.73	6.64	7.14	7.21	5.49	3.44	2.34	2.31	
B. Pre-Tax Underwriting Result	-26.09	-20.08	-15.23	-18.26	-16.08	-34.20	-41.76	-47.27	-35.80	-43.88	
C. Post-Tax Underwriting Result	-14.09	-10.84	-8.22	-9.86	-8.68	-18.47	-28.17	-34.88	-26.02	-31.39	
II. INVESTMENT INCOME FROM RESERVES											
A. Pre-Tax Return from Reserves	14.49	14.63	14.09	13.82	12.79	13.02	13.12	13.47	14.65	15.43	
B. Post-Tax Return from Reserves	10.91	11.01	10.61	10.62	9.55	9.68	10.17	10.58	11.62	12.12	
III. TOTAL RETURN ON INSURANCE OPERATIONS (as a percent of premium)											
	-3.18	0.17	2.39	0.76	0.87	-8.79	-18	-24.3	-14.4	-19.27	
IV. INVESTMENT RETURN ON CAPITAL AND SURPLUS											
A. Pre-Tax Return from Cap & Surp	7.26	7.71	8.28	8.67	10.76	11.62	8.62	8.87	10.68	9.23	
B. Post-Tax Return from Cap & Surp	5.63	5.98	6.42	6.72	8.41	8.95	6.50	6.87	8.16	7.12	
V. TOTAL POST-TAX RETURN ON PREMIUM											
	2.45	6.15	8.81	7.48	9.28	0.16	-11.50	-17.43	-6.24	-12.15	
VI. TOTAL POST-TAX RETURN ON NET WORTH											
	2.37	6.16	9.50	8.74	11.23	0.18	-11.93	-16.95	-5.51	-9.97	

1981-1990 Average Return on Net Worth:
Weighted Average Return:

-0.62
-3.07

Sources:

- A.M. Best Company, Executive Data Survey (earned premium, incurred losses, policyholder dividends)
- A.M. Best Company, Aggregates & Averages (Loss adjustment expenses, commission & brokerage, other underwriting expenses, investment return on countrywide workers compensation reserves and capital and surplus, surplus-to-net worth factor)
- National Council on Compensation Insurance (taxes, licenses, & fees)

ESTIMATED RETURN ON NET WORTH FOR WORKERS COMPENSATION INSURANCE: 1981-1990 - MICHIGAN

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1981-90
EARNED PREMIUMS (\$millions)	817.0	595.5	512.0	530.5	632.0	720.6	835.9	812.2	904.8	914.2	7,274.7
I. UNDERWRITING RESULT											
A. Loss and Expense Components											
1. Losses incurred	61.71	59.13	78.56	84.99	75.75	78.35	78.56	86.04	79.50	85.45	
2. Loss adjustment exp.	8.40	8.37	10.24	10.28	8.89	9.35	10.42	11.14	10.88	10.91	
3. Comm, brokerage & oth acq	8.58	9.13	10.00	9.70	8.51	8.16	8.45	8.33	8.09	8.11	
4. General	6.62	7.37	7.67	7.18	6.05	5.49	5.20	5.12	4.89	4.99	
5. Prem taxes, licenses, & fees	3.20	2.20	3.30	3.30	3.40	3.60	3.60	3.60	3.60	3.60	
6. Policyholder dividends	7.87	12.91	13.36	10.77	6.59	4.89	4.30	4.70	3.66	3.79	
B. Pre-Tax Underwriting Result	3.62	0.89	-23.13	-26.22	-9.19	-9.84	-10.53	-18.93	-10.62	-16.85	
C. Post-Tax Underwriting Result	1.95	0.48	-12.49	-14.16	-4.96	-5.31	-8.32	-14.30	-8.71	-12.89	
II. INVESTMENT INCOME FROM RESERVES											
A. Pre-Tax Return from Reserves	15	20.94	24.84	25.06	20.69	18.05	15.78	17.12	17.14	17.84	
B. Post-Tax Return from Reserves	11.29	15.76	18.70	19.26	15.44	13.42	12.23	13.45	13.60	14.01	
III. TOTAL RETURN ON INSURANCE OPERATIONS (as a percent of premium)											
	13.24	16.24	6.21	5.1	10.48	8.11	3.91	-0.85	4.89	1.12	
IV. INVESTMENT RETURN ON CAPITAL AND SURPLUS											
A. Pre-Tax Return from Cap & Surp	7.47	11.05	14.59	15.78	17.38	16.13	10.32	11.19	12.48	10.63	
B. Post-Tax Return from Cap & Surp	5.79	8.57	11.32	12.24	13.58	12.42	7.79	8.67	9.53	8.19	
V. TOTAL POST-TAX RETURN ON PREMIUM											
	19.03	24.81	17.53	17.34	24.06	20.53	11.70	7.82	14.42	9.31	
VI. TOTAL POST-TAX RETURN ON NET WORTH											
	17.77	17.27	10.71	11.16	17.92	16.30	10.15	6.03	10.89	6.68	

1981-1990 Average Return on Net Worth: 12.49
Weighted Average Return: 12.18

- Sources:
- A.M. Best Company, Executive Data Survey (earned premium, incurred losses, policyholder dividends)
 - A.M. Best Company, Aggregates & Averages (Loss adjustment expenses, commission & brokerage, other underwriting expenses, investment return on countrywide workers compensation reserves and capital and surplus, surplus-to-net worth factor)
 - National Council on Compensation Insurance (taxes, licenses, & fees)

ESTIMATED RETURN ON NET WORTH FOR WORKERS COMPENSATION INSURANCE: 1981-1990 - MINNESOTA

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1981-90
EARNED PREMIUMS (\$millions)	406.9	371.9	352.6	358.9	476.9	551.1	536.2	537.7	632.8	666.6	4,891.6
I. UNDERWRITING RESULT											
A. Loss and Expense Components											
1. Losses incurred	94.60	96.68	78.36	118.31	93.48	94.94	89.19	82.16	78.54	84.44	
2. Loss adjustment exp.	12.88	13.68	10.21	14.32	10.97	11.34	11.83	10.64	10.75	10.78	
3. Comm, brokerage & oth acq	8.58	9.13	10.00	9.70	8.51	8.16	8.45	8.33	8.09	8.11	
4. General	6.62	7.37	7.67	7.18	6.05	5.49	5.20	5.12	4.89	4.99	
5. Prem taxes, licenses, & fees	3.90	4.00	4.20	4.30	4.60	4.80	4.60	4.60	4.60	4.60	
6. Policyholder dividends	5.04	7.07	6.68	6.24	4.28	4.52	5.08	5.14	4.11	3.80	
B. Pre-Tax Underwriting Result	-31.62	-37.93	-17.12	-60.05	-27.89	-29.25	-24.35	-15.99	-10.98	-16.72	
C. Post-Tax Underwriting Result	-17.07	-20.48	-9.24	-32.43	-15.06	-15.79	-16.44	-12.17	-9.32	-13.04	
II. INVESTMENT INCOME FROM RESERVES											
A. Pre-Tax Return from Reserves	18.23	21.56	24.00	25.06	19.79	18.01	18.77	19.48	18.29	18.53	
B. Post-Tax Return from Reserves	13.72	16.23	18.07	19.26	14.77	13.39	14.54	15.30	14.51	14.55	
III. TOTAL RETURN ON INSURANCE OPERATIONS (as a percent of premium)											
	-3.35	-4.25	8.83	-13.17	-0.29	-2.4	-1.9	3.13	5.19	1.51	
IV. INVESTMENT RETURN ON CAPITAL AND SURPLUS											
A. Pre-Tax Return from Cap & Surp	9.1	11.33	14.06	15.79	16.71	15.94	12.27	12.74	13.38	11.09	
B. Post-Tax Return from Cap & Surp	7.06	8.79	10.90	12.25	13.06	12.27	9.26	9.87	10.22	8.55	
V. TOTAL POST-TAX RETURN ON PREMIUM											
	3.71	4.54	19.73	-0.92	12.77	9.87	7.36	13.00	15.41	10.06	
VI. TOTAL POST-TAX RETURN ON NET WORTH											
	2.87	3.08	12.56	-0.59	9.94	7.92	5.38	8.83	10.86	6.88	

1981-1990 Average Return on Net Worth:
Weighted Average Return:

6.77
7.10

Sources:

- A.M. Best Company, Executive Data Survey (earned premium, incurred losses, policyholder dividends)
- A.M. Best Company, Aggregates & Averages (Loss adjustment expenses, commission & brokerage, other underwriting expenses, investment return on countryside workers compensation reserves and capital and surplus, surplus-to-net worth factor)
- National Council on Compensation Insurance (taxes, licenses, & fees)

ESTIMATED RETURN ON NET WORTH FOR WORKERS COMPENSATION INSURANCE: 1981-1990 - NEW YORK

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1981-90
EARNED PREMIUMS (\$millions)	985.3	908.8	839.8	858.8	1,047.0	1,168.2	1,251.8	1,285.6	1,329.3	1,568.1	11,242.7
I. UNDERWRITING RESULT											
A. Loss and Expense Components											
1. Losses incurred	54.92	55.16	57.27	73.90	64.79	70.67	71.91	78.86	78.32	81.89	
2. Loss adjustment exp.	7.48	7.81	7.46	8.94	7.60	8.44	9.54	10.21	10.72	10.46	
3. Comm, brokerage & oth acq	8.58	9.13	10.00	9.70	8.51	8.16	8.45	8.33	8.09	8.11	
4. General	6.62	7.37	7.67	7.18	6.05	5.49	5.20	5.12	4.89	4.99	
5. Prem taxes, licenses, & fees	3.90	4.00	4.20	4.30	4.60	4.80	4.60	4.60	4.60	4.60	
6. Policyholder dividends	6.86	9.46	10.76	11.51	8.27	7.16	6.37	6.20	5.99	4.24	
B. Pre-Tax Underwriting Result	11.64	7.07	2.64	-15.53	0.18	-4.72	-6.07	-13.32	-12.61	-14.29	
C. Post-Tax Underwriting Result	6.29	3.82	1.43	-8.39	0.10	-2.55	-5.71	-11.39	-10.62	-12.33	
II. INVESTMENT INCOME FROM RESERVES											
A. Pre-Tax Return from Reserves	14.99	17.26	19.86	20.94	17.54	16.27	15.54	16.40	18.24	17.23	
B. Post-Tax Return from Reserves	11.28	12.99	14.95	16.10	13.09	12.09	12.04	12.88	14.47	13.53	
III. TOTAL RETURN ON INSURANCE OPERATIONS (as a percent of premium)											
	17.57	16.81	16.38	7.71	13.19	9.54	6.33	1.49	3.85	1.20	
IV. INVESTMENT RETURN ON CAPITAL AND SURPLUS											
A. Pre-Tax Return from Cap & Surp	7.46	9.08	11.72	13.10	14.76	14.44	10.15	10.75	13.33	10.30	
B. Post-Tax Return from Cap & Surp	5.79	7.04	9.09	10.16	11.53	11.12	7.66	8.33	10.18	7.94	
V. TOTAL POST-TAX RETURN ON PREMIUM											
	23.36	23.85	25.47	17.87	24.72	20.66	13.99	9.82	14.03	9.14	
VI. TOTAL POST-TAX RETURN ON NET WORTH											
	21.81	20.25	19.24	13.92	21.75	18.37	12.25	7.90	9.89	6.72	

1981-1990 Average Return on Net Worth: 15.21
Weighted Average Return: 14.56

Sources:

- A.M. Best Company, Executive Data Survey (earned premium, incurred losses, policyholder dividends)
- A.M. Best Company, Aggregates & Averages (loss adjustment expenses, commission & brokerage, other underwriting expenses, investment return on countrywide workers compensation reserves and capital and surplus, surplus-to-net worth factor)
- National Council on Compensation Insurance (taxes, licenses, & fees)

ESTIMATED RETURN ON NET WORTH FOR WORKERS COMPENSATION INSURANCE: 1981-1990 - OREGON

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1981-90
EARNED PREMIUMS (\$millions)	157.9	142.5	130.5	156.7	221.0	274.7	327.3	357.1	411.8	471.9	2,651.4
I. UNDERWRITING RESULT											
A. Loss and Expense Components											
1. Losses incurred	63.54	64.48	88.22	102.26	91.81	94.27	84.37	79.67	82.89	69.16	
2. Loss adjustment exp.	8.65	9.12	11.50	12.37	10.77	11.26	11.19	10.32	11.35	8.83	
3. Comm, brokerage & oth acq	8.58	9.13	10.00	9.70	8.51	8.16	8.45	8.33	8.09	8.11	
4. General	6.62	7.37	7.67	7.18	6.05	5.49	5.20	5.12	4.89	4.99	
5. Prem taxes, licenses, & fees	4.50	5.70	4.00	4.40	3.60	6.20	2.80	2.80	2.80	2.80	
6. Policyholder dividends	16.42	12.01	6.50	4.40	1.88	1.71	1.11	2.00	2.05	1.60	
B. Pre-Tax Underwriting Result	-8.31	-7.81	-27.89	-40.31	-22.62	-27.09	-13.12	-8.24	-12.07	4.51	
C. Post-Tax Underwriting Result	-4.49	-4.22	-15.06	-21.77	-12.21	-14.63	-10.19	-7.25	-10.48	1.33	
II. INVESTMENT INCOME FROM RESERVES											
A. Pre-Tax Return from Reserves	14.87	17.07	19.64	18.30	14.11	12.64	11.63	11.81	12.21	12.09	
B. Post-Tax Return from Reserves	11.19	12.85	14.78	14.07	10.53	9.40	9.01	9.28	9.68	9.49	
III. TOTAL RETURN ON INSURANCE OPERATIONS (as a percent of premium)											
	6.7	8.63	-0.28	-7.7	-1.68	-5.23	-1.18	2.03	-0.8	10.82	
IV. INVESTMENT RETURN ON CAPITAL AND SURPLUS											
A. Pre-Tax Return from Cap & Surp	7.3	8.91	11.55	11.33	12.02	11.35	7.63	7.67	8.76	7.25	
B. Post-Tax Return from Cap & Surp	5.66	6.91	8.96	8.79	9.39	8.74	5.76	5.94	6.69	5.59	
V. TOTAL POST-TAX RETURN ON PREMIUM											
	12.36	15.54	8.68	1.09	7.71	3.51	4.58	7.97	5.89	16.41	
VI. TOTAL POST-TAX RETURN ON NET WORTH											
	11.86	13.46	6.71	0.98	8.35	3.97	5.37	8.95	6.35	17.25	

1981-1990 Average Return on Net Worth:
Weighted Average Return:

8.33
8.85

- Sources:
- A.M. Best Company, Executive Data Survey (earned premium, incurred losses, policyholder dividends)
 - A.M. Best Company, Aggregates & Averages (loss adjustment expenses, commission & brokerage, other underwriting expenses, investment return on countrywide workers compensation reserves and capital and surplus, surplus-to-net worth factor)
 - National Council on Compensation Insurance (taxes, licenses, & fees)

ESTIMATED RETURN ON NET WORTH FOR WORKERS COMPENSATION INSURANCE: 1981-1990 - PENNSYLVANIA

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1981-90
EARNED PREMIUMS (\$millions)	1,216.3	1,130.3	962.9	1,031.8	1,215.4	1,353.0	1,600.0	1,763.2	1,987.9	2,160.7	14,421.5
I. UNDERWRITING RESULT											
A. Loss and Expense Components											
1. Losses incurred	63.48	47.91	60.27	83.86	72.56	79.70	80.39	88.18	90.84	92.21	
2. Loss adjustment exp.	8.65	6.78	7.85	10.15	8.51	9.52	10.66	11.42	12.44	11.78	
3. Comm, brokerage & oth acq	8.58	9.13	10.00	9.70	8.51	8.16	8.45	8.33	8.09	8.11	
4. General	6.62	7.37	7.67	7.18	6.05	5.49	5.20	5.12	4.89	4.99	
5. Prem taxes, licenses, & fees	3.90	4.00	4.20	4.30	4.60	4.80	4.60	4.60	4.60	4.60	
6. Policyholder dividends	9.77	14.85	17.01	14.70	11.64	9.57	8.63	8.48	7.79	7.55	
B. Pre-Tax Underwriting Result	-1.00	9.96	-7.00	-29.89	-11.87	-17.24	-17.93	-26.13	-28.65	-29.24	
C. Post-Tax Underwriting Result	-0.54	5.38	-3.78	-16.14	-6.41	-9.31	-12.97	-19.69	-21.34	-21.61	
II. INVESTMENT INCOME FROM RESERVES											
A. Pre-Tax Return from Reserves	16.21	18.33	22.08	22.19	19.30	17.65	15.34	15.28	15.85	16.14	
B. Post-Tax Return from Reserves	12.2	13.8	16.62	17.06	14.41	13.12	11.89	12.00	12.57	12.67	
III. TOTAL RETURN ON INSURANCE OPERATIONS (as a percent of premium)											
	11.66	19.18	12.84	0.92	8	3.81	-1.08	-7.69	-8.77	-8.94	
IV. INVESTMENT RETURN ON CAPITAL AND SURPLUS											
A. Pre-Tax Return from Cap & Surp	8.06	9.65	13.05	13.93	16.19	15.71	10.07	10.03	11.59	9.63	
B. Post-Tax Return from Cap & Surp	6.25	7.48	10.12	10.80	12.65	12.10	7.60	7.77	8.85	7.42	
V. TOTAL POST-TAX RETURN ON PREMIUM											
	17.91	26.66	22.96	11.72	20.65	15.91	6.52	0.08	0.08	-1.52	
VI. TOTAL POST-TAX RETURN ON NET WORTH											
	15.51	21.27	15.59	8.53	16.60	13.05	5.76	0.07	0.07	-1.20	

1981-1990 Average Return on Net Worth: 9.53
 Weighted Average Return: 7.73

Sources:

- A.M. Best Company, Executive Data Survey (earned premium, incurred losses, policyholder dividends)
- A.M. Best Company, Aggregates & Averages (loss adjustment expenses, commission & brokerage, other underwriting expenses, investment return on countrywide workers compensation reserves and capital and surplus, surplus-to-net worth factor)
- National Council on Compensation Insurance (taxes, licenses, & fees)

ESTIMATED RETURN ON NET WORTH FOR WORKERS COMPENSATION INSURANCE: 1981-1990 - TEXAS

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1981-90
EARNED PREMIUMS (\$millions)	1,469.8	1,564.0	1,614.0	1,639.3	1,681.7	2,174.6	2,430.9	2,846.6	3,370.8	4,063.8	22,855.5
I. UNDERWRITING RESULT											
A. Loss and Expense Components											
1. Losses incurred	72.38	76.69	80.21	96.93	113.69	104.57	105.54	110.04	104.48	95.26	
2. Loss adjustment exp.	9.86	10.85	10.45	11.73	13.34	12.49	13.99	14.25	14.30	12.16	
3. Comm, brokerage & oth acq	8.58	9.13	10.00	9.70	8.51	8.16	8.45	8.33	8.09	8.11	
4. General	6.62	7.37	7.67	7.18	6.05	5.49	5.20	5.12	4.89	4.99	
5. Prem taxes, licenses, & fees	2.70	2.80	3.10	3.10	3.30	3.60	3.70	3.70	3.70	3.70	
6. Policyholder dividends	6.15	7.03	7.31	6.62	6.60	2.73	2.33	1.92	1.86	1.88	
B. Pre-Tax Underwriting Result	-6.29	-13.87	-18.74	-35.26	-51.49	-37.04	-39.21	-43.36	-37.32	-26.10	
C. Post-Tax Underwriting Result	-3.40	-7.49	-10.12	-19.04	-27.80	-20.00	-25.54	-30.83	-26.64	-19.53	
II. INVESTMENT INCOME FROM RESERVES											
A. Pre-Tax Return from Reserves	7.46	7.96	9.08	10.40	11.16	9.86	9.59	9.48	9.99	9.76	
B. Post-Tax Return from Reserves	5.62	5.99	6.84	7.99	8.33	7.33	7.43	7.45	7.92	7.66	
III. TOTAL RETURN ON INSURANCE OPERATIONS (as a percent of premium)											
	2.22	-1.5	-3.28	-11.05	-19.47	-12.67	-18.11	-23.38	-18.72	-11.87	
IV. INVESTMENT RETURN ON CAPITAL AND SURPLUS											
A. Pre-Tax Return from Cap & Surp	3.73	4.17	5.34	6.50	9.33	8.73	6.30	6.21	7.30	5.83	
B. Post-Tax Return from Cap & Surp	2.89	3.23	4.14	5.04	7.29	6.72	4.75	4.81	5.58	4.49	
V. TOTAL POST-TAX RETURN ON PREMIUM											
	5.11	1.73	0.86	-6.01	-12.18	-5.95	-13.36	-18.57	-13.14	-7.38	
VI. TOTAL POST-TAX RETURN ON NET WORTH											
	9.59	3.2	1.43	-9.41	-16.90	-8.78	-18.97	-25.84	-16.95	-9.65	

1981-1990 Average Return on Net Worth:

-9.23

Weighted Average Return:

-11.27

Sources:

- A.M. Best Company, Executive Data Survey (earned premium, incurred losses, policyholder dividends)
- A.M. Best Company, Aggregates & Averages (loss adjustment expenses, commission & brokerage, other underwriting expenses, investment return on countrywide workers compensation reserves and capital and surplus, surplus-to-net worth factor)
- National Council on Compensation Insurance (taxes, licenses, & fees)

ESTIMATED RATES OF RETURN: 1982-1988 - CALIFORNIA STATE COMPENSATION INSURANCE FUND

	1982	1983	1984	1985	1986	1987	1988
EARNED PREMIUMS (\$thousands)	418,015	492,199	601,115	724,989	1,038,219	1,451,486	1,773,357
I. UNDERWRITING RESULT							
A. Loss and Expense Components							
1. Losses incurred	62.04	69.67	74.44	78.84	80.34	76.41	78.43
2. Loss adjustment exp.	8.82	8.02	8.49	8.33	8.83	8.92	8.77
3. Other underwr exp	9.9	8.72	8.42	8.05	7.14	7.38	7.09
4. Policyholder dividends	55.75	41.73	31.76	30.25	18.03	19.11	16.45
B. Underwriting Result	-36.51	-28.14	-23.11	-25.47	-14.34	-11.82	-10.74
II. TOTAL INVESTMENT INCOME (% of premium)	35.14	31.15	29.36	26.99	21.48	16.45	16.75
III. TOTAL POST-TAX RETURN ON PREMIUM	-1.37	3.01	6.25	1.52	7.14	4.63	6.01
IV. TOTAL POST-TAX RETURN ON SURPLUS	-1.33	3.05	7.6	2.18	12.86	10.71	14.94

Sources: American Association of State Compensation Insurance Funds, annual reports.

ESTIMATED RATES OF RETURN: 1982-1988 - ACCIDENT FUND OF MICHIGAN

	1982	1983	1984	1985	1986	1987	1988
EARNED PREMIUMS (\$thousands)	25,040	17,958	23,897	40,031	81,129	125,161	146,281
I. UNDERWRITING RESULT							
A. Loss and Expense Components							
1. Losses incurred	71.65	94.65	57.15	114.85	133.92	86.59	82.52
2. Loss adjustment exp.	12.63	18.82	9.91	17.32	20.67	9.52	12.94
3. Other underwr exp	18	25.49	26.07	22.96	23.64	20.23	17.51
4. Policyholder dividends	22.18	68.77	3.34	26.55	0	0.91	3.64
B. Underwriting Result	-24.26	-107.73	3.53	-81.68	-78.23	-17.25	-16.61
II. TOTAL INVESTMENT INCOME (% of premium)	90.51	137.31	121.07	76.11	41.04	27.36	25.87
III. TOTAL POST-TAX RETURN ON PREMIUM	66.25	29.58	124.6	-5.57	-37.19	10.11	9.26
IV. TOTAL POST-TAX RETURN ON SURPLUS	15.36	4.6	20.57	-1.57	-35.65	18.92	15.15

Sources: American Association of State Compensation Insurance Funds, annual reports.

ESTIMATED RATES OF RETURN: 1982-1988 - MINNESOTA STATE FUND

	1982	1983	1984	1985	1986	1987	1988
EARNED PREMIUMS (\$thousands)	0	0	1,136	8,868	23,025	34,195	43,539
I. UNDERWRITING RESULT							
A. Loss and Expense Components							
1. Losses incurred			86.71	74.36	65.51	62.07	65.56
2. Loss adjustment exp.			5.37	8.06	7.97	8.22	9.43
3. Other underwr exp			75.53	29.51	20.52	20.3	22.41
4. Policyholder dividends			0	0	0	4.07	2.01
B. Underwriting Result			-67.61	-11.93	6	5.34	0.59
II. TOTAL INVESTMENT INCOME (% of premium)							
			34.6	10.22	8.2	9.3	7.65
III. TOTAL POST-TAX RETURN ON PREMIUM							
			-33.01	-1.71	14.2	5.72	3.25
IV. TOTAL POST-TAX RETURN ON SURPLUS							
			-7.1	-2.73	46.61	27.53	16.01

Sources: American Association of State Compensation Insurance Funds, annual reports.

ESTIMATED RATES OF RETURN: 1982-1988 - NEW YORK STATE INSURANCE FUND

1982 1983 1984 1985 1986 1987 1988

EARNED PREMIUMS (\$thousands) 345,178 308,091 314,422 387,899 525,396 649,583 809,354

I. UNDERWRITING RESULT

A. Loss and Expense Components

1. Losses incurred	119.29	134.72	129.45	116.59	17.87	91.09	87.05
2. Loss adjustment exp.	11.59	15.8	16.74	17.67	12.76	11.84	11.12
3. Other underwr exp	13.14	18.86	17.36	23.44	13.45	10.29	14.02
4. Policyholder dividends	8.59	8.48	6.66	5.07	13.52	4.86	4.62
B. Underwriting Result	-52.61	-77.86	-70.21	-62.77	42.4	-18.08	-16.81

II. TOTAL INVESTMENT INCOME (% of premium)

50.89 63.42 71.83 61.93 45.72 32.86 28.08

III. TOTAL POST-TAX RETURN ON PREMIUM

-1.72 -14.44 1.62 -0.84 88.12 14.78 11.27

IV. TOTAL POST-TAX RETURN ON SURPLUS

-2.45 -20.86 2.26 -1.45 68.32 13.25 11.92

Sources: American Association of State Compensation Insurance Funds, annual reports.

ESTIMATED RATES OF RETURN: 1982-1988 - OHIO BUREAU OF WORKERS' COMPENSATION

	1982	1983	1984	1985	1986	1987	1988
EARNED PREMIUMS (\$thousands)	604,937	590,490	686,251	710,194	1,045,751	983,926	1,332,716
I. UNDERWRITING RESULT							
A. Loss and Expense Components							
1. Losses incurred	99.3	73.09	67.66	268.02	202.57	152.78	159.48
2. Loss adjustment exp.	0	0	0	0	0	0	0
3. Other underwr exp	0	0.07	0	0	3.05	2.72	0
4. Policyholder dividends	0	0	0	0	0	0	0
B. Underwriting Result	0.7	26.84	32.34	-168.02	-105.62	-55.5	-59.48
II. TOTAL INVESTMENT INCOME (% of premium)	46.83	58.55	48.16	67.5	50.05	55.64	42.65
III. TOTAL POST-TAX RETURN ON PREMIUM	47.53	85.39	80.5	-100.52	-55.57	0.14	-16.83
IV. TOTAL POST-TAX RETURN ON SURPLUS	54.43	64.03	172.2	-999	-999	-999	-999

Sources: American Association of State Compensation Insurance Funds, annual reports.

ESTIMATED RATES OF RETURN: 1982-1988 - OREGON SAIF CORPORATION

1982 1983 1984 1985 1986 1987 1988

EARNED PREMIUMS (\$thousands) 137,684 129,956 122,531 143,651 217,416 246,217 247,522

I. UNDERWRITING RESULT

A. Loss and Expense Components

1. Losses incurred 97.74 130.34 160.77 142.48 126.2 116.71 135.43
 2. Loss adjustment exp. 16.07 14.98 17.97 15.76 13.75 11.1 13.1
 3. Other underwr exp 26.53 14.18 12.17 16.78 15.37 12.52 12.28
 4. Policyholder dividends 33.54 21.07 7.51 0.02 -0.11 -0.16 -0.05

B. Underwriting Result

-73.88 -80.57 -98.42 -75.04 -55.19 -40.17 -60.76

II. TOTAL INVESTMENT INCOME (% of premium)

58.97 67.96 59.56 71.79 52.13 43.56 40.6

III. TOTAL POST-TAX RETURN ON PREMIUM

-14.91 -12.61 -38.86 -3.25 -3.06 3.39 -20.16

IV. TOTAL POST-TAX RETURN ON SURPLUS

-15.94 -15.81 -86.53 -8.31 -14.84 26 -32.54

Sources: American Association of State Compensation Insurance Funds, annual reports.

ESTIMATED RATES OF RETURN: 1982-1988 - PENNSYLVANIA STATE WORKER'S INSURANCE FUND

	1982	1983	1984	1985	1986	1987	1988
EARNED PREMIUMS (\$thousands)	89,782	49,081	23,438	42,792	84,533	108,203	125,489
I. UNDERWRITING RESULT							
A. Loss and Expense Components							
1. Losses incurred	189.8	78.83	319.48	131.94	99.74	104.71	125.84
2. Loss adjustment exp.	17.43	3.07	7.68	1.56	3.1	4.91	6.87
3. Other underwr exp	4.33	15.79	-27.59	-6.28	2.33	3.29	4.01
4. Policyholder dividends	0	0	0	0	0	0	0
B. Underwriting Result	-111.56	2.31	-199.57	-27.22	-5.17	-12.91	-36.72
II. TOTAL INVESTMENT INCOME (% of premium)	65.35	139.89	312.51	208.26	111.02	84.44	82.32
III. TOTAL POST-TAX RETURN ON PREMIUM	-46.21	142.2	112.94	181.04	105.85	71.53	45.6
IV. TOTAL POST-TAX RETURN ON SURPLUS	-266.29	72.83	19.03	36.6	29.43	20.41	16.47

Sources: American Association of State Compensation Insurance Funds, annual reports.

ESTIMATED RATES OF RETURN: 1982-1988 - WEST VIRGINIA WORKERS' COMPENSATION FUND

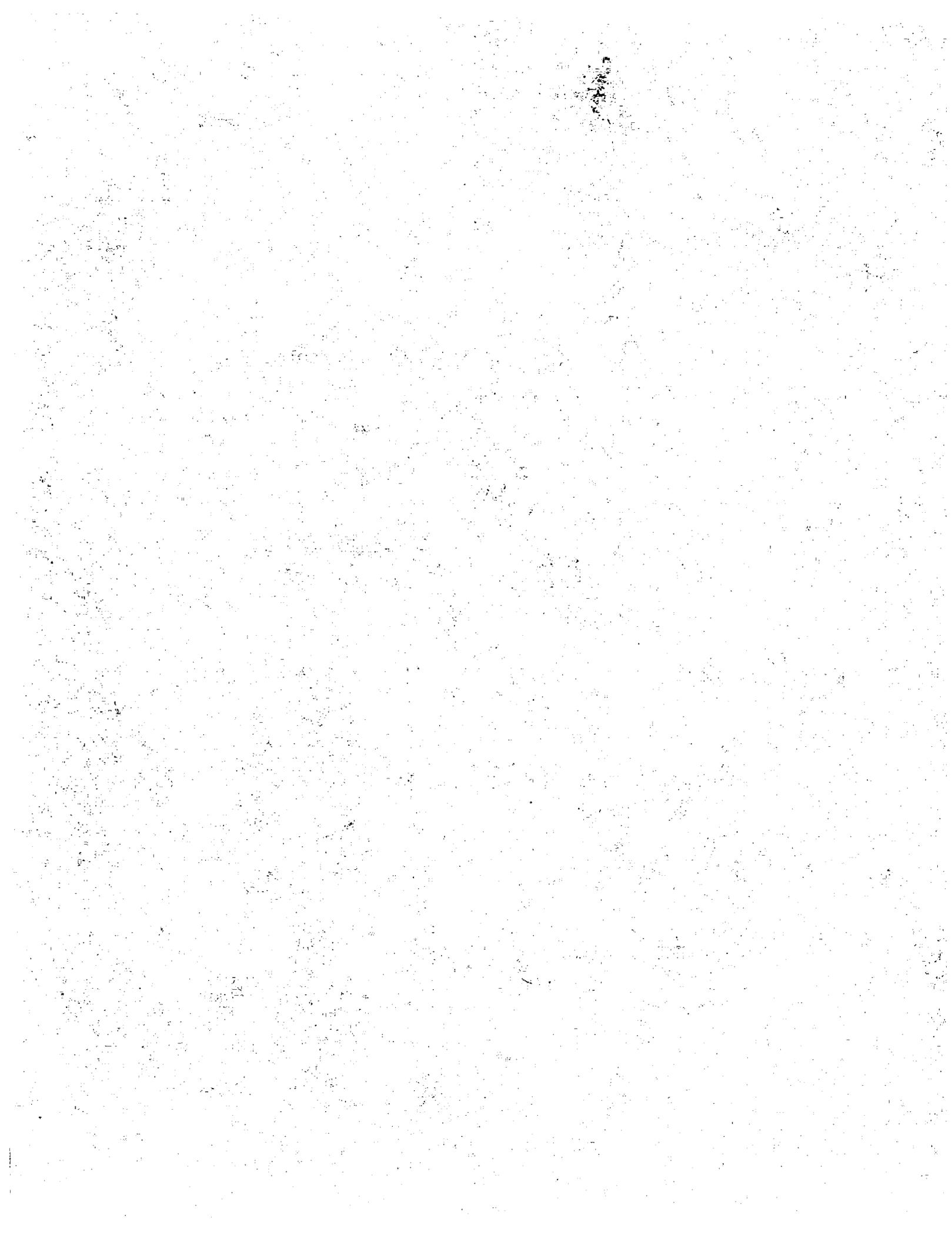
	1982	1983	1984	1985	1986	1987	1988
EARNED PREMIUMS (\$thousands)	185,600	153,600	180,200	153,200	140,700	170,500	156,200
I. UNDERWRITING RESULT							
A. Loss and Expense Components							
1. Losses incurred	126.89	134.7	126.58	120.76	157.57	190.44	232.65
2. Loss adjustment exp.	0	0	0	41.12	0	0	0
3. Other underwr exp	4.42	6.05	5.83	8.22	9.67	8.8	10.37
4. Policyholder dividends	0	0	0	0	0	0	0
B. Underwriting Result	-31.31	-40.75	-32.41	-70.1	-67.24	-99.24	-143.02
II. TOTAL INVESTMENT INCOME (% of premium)	31.3	40.76	32.41	69.91	67.24	45.51	42.7
III. TOTAL POST-TAX RETURN ON PREMIUM	-0.01	0.01	0	-0.19	0	-53.73	-100.32
IV. TOTAL POST-TAX RETURN ON SURPLUS	-0.01	0.01	0	-0.25	0	-999	-999

Sources: American Association of State Compensation Insurance Funds, annual reports.

SECTION 4.0

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**CALIFORNIA RATE STUDY
COMMISSION
EXPERIENCE RATING**

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**CALIFORNIA RATE STUDY COMMISSION
EXPERIENCE RATING**

INTRODUCTION

A principal objective for an insurance ratemaking system is the equitable and efficient distribution of costs among insured employers. This objective is important not only for the obvious equity reasons, but also because it will embed the proper incentives to invest in safety. The experience rating program in workers' compensation insurance is designed to facilitate this objective. In this report to the California Rate Study Commission, we examine the California experience rating program and compare it with programs in other states to investigate the equity and efficiency properties.

Overall, we found the existing California experience rating plan reasonably accurate for currently eligible risks. We conclude that it results in appropriate debits and credits for historical experience and will provide proper incentives for safety. We did observe some under responsiveness in the California plan, but this was also present in the alternatives. It is not presently known whether other formulas or different parameterizations of the credibility curves could be devised to increase accuracy and simultaneously reduce or eliminate this under responsiveness.

Testing of the smaller size risks indicated improvement in accuracy due to the application of experience rating. Based on accuracy alone, we conclude that the plan could be extended to risks with three year manual premiums of \$10,000 and higher. However, we believe that the administrative and other costs associated with such an extension should be carefully considered before such a decision is ultimately adopted.

We believe that a plan similar to the Washington plan that allows maximum experience modification factors for small risks with claim-free experience would grant credits in excess of the proper amount indicated at the expense of the larger risks. We therefore do not recommend such an alternative.

The experience rating plans in use for workers' compensation in the various states provide an important incentive for employer safety. The thrust of experience rating is to charge individual employers different premiums on the basis of their historical loss record. On this basis, all workers' compensation accidents have a direct and measurable impact on the cost of an employer's workers' compensation premiums.

It would appear that experience rating results in the employers participating with the insurer in the payment of workers' compensation losses. However, this is not strictly correct. Experience rating is prospective in nature. The cost of workers' compensation insurance in any given period depends upon the employer's accident record, but once the premium is determined it does not vary with the losses that may occur under the current policy¹.

The fundamental technique in prospective experience rating is to compare the actual historical experience of the insured with the expected experience (based on the insured's classification) in order to adjust the price of the insurance provided. The experience rating plan is intended to rely on the historical data of the individual insured to the extent it is a reliable predictor of future loss potential and to rely on the experience of the entire classification of similar risks to the extent it is a reliable predictor of future loss potential.

Experience rating plans use the term "actual" to define the experience of the individual insureds in the formula. The term "expected" refers to the experience of similarly classified risks.

¹Retrospective rating plans are optional mechanisms that adjust the cost of the current policy based on the losses that occur under that policy. Such retrospective rating plans are generally used in addition to the traditional prospective experience rating plans.

Both the individual risk experience (actual) and the classification experience (expected) have value as predictors of the future loss potential of an individual risk. The experience rating plans we examined use both of these components in their formulae. To the extent an experience rating formula gives weight to expected experience, it is relying on the average of similar risks to predict an individual risk's future loss potential. To the extent it gives weight to actual experience, it is relying on the individual risk experience to predict that individual risk's future loss potential.

Workers' compensation manual rates are based on the costs averaged over many employers with similar businesses. The workers' compensation classification system groups the loss experience for employers engaged in similar businesses. However, it is generally recognized that all employers within a classification do not have the same exposure to loss. Even though in the same general business, individual employers operate differently and therefore have different exposures to loss. Since all employers are not alike with respect to the exposure to loss, their individual accident records will help to distinguish each employer's true exposure from the average.

We believe that safety and fairness are enhanced if each employer is charged a workers' compensation premium that best reflects that employer's true exposure to loss. Insurance is necessary to protect against randomly high workers' compensation loss costs. However, individual employers should pay for their true exposure to loss--premiums should be charged in such a manner that in the long run individual employers pay their own way and no more or less.

Experience rating is a tool to assist in the estimation of an individual employer's true exposure to loss. If the estimation of the true exposure to loss is accurate, each employer will be charged the appropriate price. Accuracy can be measured in two ways. First, prices will be accurate if in the long run each employer pays for his own losses, i.e., no employer will subsidize the losses of any other employer. Second, the price charged in any given period should reflect the expected cost during that period. If expected costs are accurate, then differences between actual and expected will be minimized over time.

If a system allows subsidies, the subsidizers will perceive their compensation costs as unusually high. They will therefore spend more on safety than warranted by their actual losses. Those who are subsidized in a system will spend less on safety than warranted by their actual losses. If the law of diminishing returns holds for safety expenditures, the result will be an inefficient allocation of society's safety resources. Overall losses would be reduced if those spending too much on safety decreased their expenditures and those spending too little increased their expenditures. If insurance prices are unbiased (do not contain subsidies), then society will benefit by a greater utilization of the limited safety resources.

Eliminating subsidies is not the only goal, however. If a single employer is alternately charged too much and then too little, a similar misallocation of resources will occur—even if in the long run each employer pays his own way. This can be viewed as a single employer alternately subsidizing and being subsidized over time.

Thus, appropriate incentives for safety will occur with the most accurate pricing of workers' compensation insurance. Accuracy should be measured both cross sectionally (by a lack of subsidies from one employer to another) as well as inter temporally (by a lack of subsidies for a single employer over time).

The workers' compensation system groups insureds in similar businesses into similar classifications. Manual rates are calculated for each of approximately 400 classifications of businesses based on the combined experience of all insureds within the classification. In the experience rating plans, the term "expected losses" is used to represent the amount of losses based on the average of all businesses within a classification. It is also an indicator of the level of loss inherent in the manual rate². Therefore, expected losses serves as the benchmark to which the actual losses of an individual risk are compared.

²There are several important differences between the absolute level of loss inherent in the manual rate and expected losses that primarily relate to timing differences. The experience rating period is in the past and the loss level provided in the manual rate is in the future. Thus, there are inflationary, utilization, and benefit level differences. In addition, the historical experience is valued as of specified dates and thus there will development differences. Finally, the experience rating plan limits losses entering the formula whereas the manual rate must provide for all losses without limit.

All of the insureds that are classified in a certain business will not have the same true loss rate. There will be differences among the insureds in terms of their methods of operation, workplace hazards, their safety programs, and their efforts towards loss control. These differences will be manifested in differences in each insured's true underlying loss rate.

In pricing insurance, we would like to charge each risk on the basis of its true underlying loss rate. Since we recognize that all insureds within a classification do not have the same true underlying loss rate, the experience of each insured provides evidence as to whether or not its true underlying loss rate is higher or lower than average and by how much. However, it must be recognized that individual risk experience will vary about its true underlying loss rate due to randomness.

Both the classification experience (expected losses) and individual risk experience (actual losses) have value in predicting an individual insured's true underlying loss rate. The classification experience with its broader base of similar risks will be less affected by random influences, but may not be directly reflective of the peculiarities of each risk within the class. The individual risk experience will reflect the special conditions of each risk, but may be seriously affected by random influences.

The experience rating plan solution is to combine both estimators for a risk's true underlying loss rate. Weights called credibilities are assigned in proportion to the predictive ability of each estimator. If an insured has premiums during the experience period defined in experience rating plan in excess of the eligibility threshold, then experience rating is mandatory.

The experience modification factor is a ratio. The numerator of this ratio contains the predicted value of an individual risk's losses, considering both the actual risk's losses and the classification's expected losses. The denominator contains only the classification's expected losses. The ratio of these values is therefore an adjustment that when applied to the manual rate will substitute the predicted value of the risk's actual losses in place of the average classification experience.

In experience rating, both actual losses (individual risk losses) and expected losses (classification average losses) are split into **primary** and **excess** components. The primary component is the low part of each loss, and the excess component is the remainder. Formulas exist that define the amount of primary and excess loss for each claim based on its total dollar amount. Primary losses are designed to be more responsive to the incidence or frequency of claims. Excess losses are responsive to the amounts or severity of claims. Primary and excess losses receive different weights in the experience rating formula.

We will examine the experience rating plan in California to see whether the accuracy from each of these perspectives could be improved. In so doing, we will consider the following specific elements of the current experience rating plan:

1. We consider the qualifying threshold. We will test whether the use of experience rating formula will tend to increase or decrease the accuracy of individual risk prices for employers currently below the existing experience rating plan eligibility.
2. We will examine the use of primary and excess losses in the experience rating plan formula and the relative weight each receives.
3. The extent to which non-preventable injuries or random events are or are not reflected in the experience rating plan.
4. We will discuss the similarities between the California experience rating plan and the experience rating plan used in most other states—the National Council on Compensation Insurance (NCCI) experience rating plan.
5. We will discuss the role of the rating bureau in states that have gone to open competition.
6. We will comment on experience rating plans that allow the participation of small employers such as that in the state of Washington.

7. We will measure the accuracy of the California plan and the NCCI plan based on the difference between actual and predicted experience. We will use non-linear regression techniques to solve for the optimum credibility values resulting in the greatest accuracy over a sample of employers. We will compare this result with the results produced by the current California and NCCI plans.
8. We will provide the Commission with summary information describing the extent to which states utilize other forms of financial incentives such as schedule rating plans, dividends and deviations.

CONCLUSIONS

In evaluating the accuracy of and considering alternatives to the current California experience rating plan, tests were developed to measure the effectiveness of experience rating as a predictor of future experience. The Workers Compensation Insurance Rating Bureau of California supplied data from two time periods for each insured with manual premiums in excess of \$10,000. We used the data from the earlier period to calculate an experience modification factor for each insured (under a variety of formulas) and data from the later period to test the accuracy of the factor calculated. The experience modification factor predicts the relationship of an insured with the average. The subsequent data was used as one observation of the true relationship to average. Mean squared errors were calculated based on various stratifications by size and historical loss ratio.

These tests and results are discussed in more detail in the Technical Appendix attached to this report.

Overall Accuracy

1. We believe that the existing California formula is reasonably accurate, and therefore will provide appropriate incentives for safety for the risks that are rated. On the whole, we find that the California experience rating plan performed better than the unadjusted NCCI plan.

2. Optimization of the NCCI plan did produce better results than the California plan, but that is to be expected since the testing was based on the same data that was used in the optimization. However, the wide divergence between the optimized excess credibility and the California excess credibility probably indicates that some fine tuning of these values could produce improvement. Further testing over more years would be necessary before arriving at definite conclusions.
3. Splitting the losses between primary and excess is important in improving the accuracy of experience rating. We found little difference in accuracy between the multi-split plan of California and the single-split plan of NCCI.

Smaller Risks

1. We find that credibility for risks currently below the California eligibility point is significantly different from zero. This means that the historical experience of these smaller risks has value as a predictor of their future experience. We found that the current California plan and both the optimized and standard NCCI plans would improve the accuracy of these risks as a group when compared to the manual rate alone. Therefore, extending the experience rating plan to smaller risks would create the proper incentives for those risks to increase their safety efforts.
2. Risks with three year manual premiums greater than \$10,000 were examined for this report. This value is approximately one-half of the current eligibility level of \$20,600. None of the risks had expected losses during the experience period of less than \$2,500. We find significant credibility and improvement of accuracy of the smallest size group tested between \$2,500 and \$5,000. Based on accuracy alone, we conclude that the existing formula could be extended to risks with three year manual premium of \$10,000 and above.
3. There may be significant other costs associated with extending the plan to smaller risks that should be carefully considered. Generally for small risks, the potential savings for low losses is relatively small considering the

potential penalty for high losses. The marginal utility gained by the small credits may be outweighed by the marginal disutility of large debits. As a result, small employers with high losses may be less able to afford additional expenditures on safety. The small credits applicable to employers with low losses may not be enough to encourage meaningful safety investments.

The volatility in premium charges that could result from the occurrence of a single claim may be more than small employers can reasonably absorb. Consequently, small marginal employers may be significantly affected by an extension of the experience rating plan. Special limitations could be employed to prevent large changes in the experience modification factor, but these limits could affect the resulting accuracy.

Finally, the administrative costs of assembling, storing, calculating, and disseminating the experience modification factors should be considered. Extending the plan to smaller insureds will significantly increase the volume of experience modification factors.

Non-preventable Injuries

1. Currently, all injuries, preventable and non-preventable are included in the experience rating plans of California and NCCI. The credibility formulas in both instances, however, are based on the performance of the plan in predicting future period loss ratios. Consequently, these plans base their credibility on the predictive power of historical losses without reference to whether the injury was preventable or non-preventable. If the non-preventable injuries are those injuries that are purely random in nature, they should receive zero credibility as they would have no value in predicting future experience. The preventable injuries are those that reflect on the safety efforts of management, and therefore should have greater predictive ability. In practice, the credibility assigned to individual risk experience is based on the average predictability of an average loss without reference to whether or not it was preventable. Thus, the current experience rating formulas are adapted to the type of losses included within them. If non-

predictive losses were eliminated, the weights given to the remaining losses would need to be increased.

2. The credibility formulas in use are not independent of the type of loss to which they are applied. If non-preventable injuries were excluded from the experience rating process, the credibilities of the preventable injuries would increase. In addition, the average amount of non-preventable injuries would need to be added back into the numerator of the formula so that the rate charged would encompass all losses, preventable or not. Clearly, the premium must reflect both types of accidents.
3. If a modification were made to the experience rating formula to eliminate the impact of non-preventable accidents on an individual risk's experience modification factor, then those with a higher than normal proportion of non-preventable accidents would see their modification factor decrease, while those with lower than normal proportions of non-preventable accidents would see an increase. However, the average experience modification factor should remain the same.
4. The difficulty in such an approach is the difficulty in identifying whether or not an individual loss was preventable or non-preventable. Any such definition would be a highly subjective and arbitrary. If such a system allows individual employers to petition for the elimination of certain accidents from their experience modification factors it would create severe administrative difficulties and costs. The definition of non-preventable would be constantly changing as new circumstances and special conditions were evaluated.
5. Due to the difficulties in establishing and administering a definition of preventable vs. non-preventable injuries, we recommend the current method of including all injuries be continued.

LIMITATIONS

This report is prepared solely for the internal use of the California Rate Study Commission to evaluate the safety incentives resulting from the California workers'

compensation experience rating plan. No other use of this report is authorized or intended. This report may not be reproduced or distributed to any other party without the prior written consent of Milliman & Robertson.

In preparing this report we have relied on data supplied by the California Workers Compensation Rating Bureau, the National Council on Compensation Insurance, the Washington State Fund, and other public sources without audit.

**TECHNICAL APPENDIX
TO
CALIFORNIA RATE STUDY COMMISSION
EXPERIENCE RATING**

BACKGROUND

Experience rating uses the historical experience of an individual risk in combination with the average experience of similarly classified risks to calculate an experience modification factor that adjusts the future rate. There is a total of four loss elements that are combined in the experience rating formula. Losses are split into primary and excess. Primary losses are the lower part of the larger losses and are sensitive to the frequency or incidence of claims. Excess losses are the amounts of loss (if any) that exceed the primary amount. Primary losses and excess losses are calculated for both the individual risk (actual losses) and for the average of similar risks (expected losses). Expected losses are based on the experience of all risks in the state assigned to the same classifications. The four components are shown below:

<i>Individual Risk</i>	<i>Classification</i>
<i>Data (Actual)</i>	<i>Average (Expected)</i>
⇓	⇓
<i>Low Part of Loss (Primary)</i>	⇒
<i>Remainder of Loss (Excess)</i>	⇒

Actual Primary	Expected Primary
Actual Excess	Expected Excess

An Example

The following is an example of a typical experience modification factor calculation. Expected losses are based on the individual insured's payroll by classification for the policies entering during the experience period. Table I shows the calculation:

Table I – Calculation of Expected Primary and Excess Losses

(1) Class Code	(2) Payroll	(3) ELR*	(4) D-Ratio*	(5) Expected Losses (2)x(3)/100	(6) Expected Primary (5) x (4)	(7) Expected Excess (5) - (6)
3632	1,137,687	3.68	.33	41,867	13,816	28,051
7382	16,427	8.02	.34	1,317	448	869
8742	42,300	.73	.32	309	99	210
8810	323,348	.48	.33	1,552	512	1,040
9015	2,109	5.69	.32	120	38	82
TOTALS	1,521,871			45,165	14,913	30,252
* From Table II of the California Experience Rating Plan Manual.						

Expected losses are calculated as the product of the classification payroll and the Expected Loss Rate (ELR) divided by 100. Expected primary losses are expected losses multiplied by the D-Ratio.

Table II below shows the history of actual losses and the calculation of actual primary and actual excess values:

Table II – Actual Primary and Excess Losses

(8) Claim Number	(9) Total Loss	(10) Actual Primary**	(11) Actual Excess (9)-(10)
8844257	11,722	5,635	6,087
9133559	23,567	6,939	16,628
9026547	3,925	3,233	692
27 *	5,967	4,142	1,825
TOTAL	45,181	19,949	25,232
* Number of claims <2,000 grouped for this entry.			
** From Table I of the California Experience Rating Plan.			

Actual and expected losses, both primary and excess, are totaled for each policy in the experience period for experience rating. There are two additional values, W (Weighting Value) and B (Ballast Value), that are needed to calculate an experience modification factor. These values are provided in a table in the California Experience Rating Plan Manual. The total expected losses is used to locate the values.

An abbreviated table of W and B values is shown below in Table III:

Table III -- Abbreviated Table of W and B

Expected Loss Range	Weighting Value (W)
40,801-43,800	.03
43,801-46,800	.04
46,801-49,800	.05
Expected Loss Range	Ballast Value (B)
40,801-43,800	9,700
43,801-46,800	9,600
46,801-49,800	9,500

Thus, we see that the risk in Table I producing 45,165 in expected losses would use a W value of .04 and a B value of 9,600. These values along with the actual and expected losses are used in the experience modification formula as shown below in Table IV:

Table IV - Experience Modification Factor Calculation

	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
	Actual Primary	B Value	W Value	Ratable Excess WxActual Excess	(1-W)x Expected Excess	Total (13)+(14)+ (16)+(17)		
ACTUAL	19,949	9,600	.04	1,009	29,042	59,600		Experience Modification
EXPECTED	Total Expected 45,165	B Value 9,600				Total (13)+(14)		Actual (18)/ Expected (18)
						54,765		1.09

The experience modification for this hypothetical risk would be 1.09. The experience modification factor formula above (with a few minor editorial changes) is contained on the California experience rating worksheet.

A Rationalization

It is unfortunate, however, that the form for the experience modification factor calculation above is difficult to understand. A rationalization might proceed as follows:

The idea behind experience rating is to compare the actual experience of a given risk with the expected experience of similar businesses in the same classifications. Thus, the ratio of actual to expected will measure the percentage higher or lower than the average. This would produce the following ratio:

$$\frac{\text{Actual Losses}}{\text{Expected Losses}}$$

However, recognizing that actual losses for an individual risk may be highly variable from year to year, a value known as B is added to the numerator and denominator of this ratio. This will temper the ratio—that is, move it towards 1.00. The formula now becomes:

$$\frac{\text{Actual Losses} + B}{\text{Expected Losses} + B}$$

The value W can be introduced in the numerator and losses can be split into primary and excess components without changing the ratio:

$$\frac{\text{Actual Primary} + (1 - W)\text{Actual Excess} + B + (W)\text{Actual Excess}}{\text{Expected Losses} + B}$$

There may still be too much variation in the actual losses in the numerator of this formula. Primary actual losses should be fairly stable; however, the excess actual

losses could be highly variable. Therefore, the portion (W) of actual excess losses is kept in the numerator, but the portion (1-W) of actual excess is exchanged for the same portion (1-W) of expected excess. The experience modification formula now becomes:

$$\frac{\text{Actual Primary} + (1 - W)\text{Expected Excess} + B + (W)\text{Actual Excess}}{\text{Expected Losses} + B}$$

The value W will increase as the size of risk increases to recognize the greater stability associated with the higher volume of larger risks.

Credibility

Credibility is the term used by actuaries to represent the weight given to an estimator when there is more than one reasonable estimator for a given problem. In the pricing of insurance the manual rate is one estimator of the appropriate charge. The actual experience of the individual risk is another. The experience modification formula blends a risk's actual losses with expected losses to produce an estimate of the future loss potential of an individual risk. Credibility determines the weight given to the actual and expected losses in the formula.

If all the risks in a classification are very similar with respect to exposure to loss, then the classification rate (expected losses) will be a good predictor of future experience. Thus, for a highly homogenous classification, the weight given to the classification expected losses should be high. If there were many dissimilar risks in a classification, then the classification experience should be given less weight as it would be less relevant as a predictor of the loss potential of any individual risk.

In a similar manner, if the individual loss experience of any particular risk in a classification was expected to be highly variable (e.g., low frequency, high potential severity) then the actual experience would be a relatively poor predictor of the future experience of that risk, i.e., the observed results would be highly random. However, if the individual loss experience was expected to be fairly stable for an

individual risk (e.g., high frequency, low potential severity), then the observed results would be less random and should be a relatively good predictor.

The appropriate weights to give the actual and expected losses in the experience modification formula depend on the relative quality of each at predicting future losses. In theory, this could vary from class to class and from risk to risk. However, for practical reasons, the credibility used for experience rating varies only by the size of risk. In effect, each classification rate is assumed to be of equal quality in predicting the future experience of that classification, and the actual loss of each risk of comparable size is assumed to be of equal quality in predicting the future experience of each risk. This is an oversimplification, but one that we believe is reasonable given the complexity already extant in the experience rating formula.

DESCRIPTION OF EXPERIENCE RATING PLANS

The following explanation provides the basic framework of the experience rating plans in use in California and in most other states. The explanation of the plans is meant only to highlight their principal provisions and to identify the major differences between the California plan and the NCCI plan. Each of these plans is quite complex and has a significant number of special rules and exceptions that are not noted in the explanations below. The manuals available from the Rating Bureaus should be consulted for further details.

Definitions

In the equations that follow, the following definitions apply.

Ap -- Actual Primary Losses -- the sum of actual primary losses subject to the special limitations where they may apply.

A -- Actual Total Losses--subject to the special limitations.

Ae -- Actual Excess Losses -- the sum of actual total losses subject to special limitations minus actual primary losses subject to special limitations.

ELR -- Expected Loss Rate -- A rate for each business classification that is published in the experience rating plan manual. It is used to calculate expected losses.

E -- Expected Losses -- the payroll for each class multiplied by the expected loss rate (*ELR*) for each class divided by 100. The sum is taken over all classifications and years.

D-Ratio -- A ratio for each business classification published in the experience rating plan. It represents the average ratio of primary to total losses for the classification. It is used to calculate expected primary losses.

Ep -- Expected Primary Losses -- the payroll for each classification multiplied by the *ELR* for each classification multiplied by the *D-Ratio* for each classification divided by 100. The sum is taken over all classifications and years.

Ee -- Expected Excess Losses -- Expected Losses minus Expected Primary Losses (*E-Ep*).

W -- Weighting Value -- taken from the table of Weighting Values contained in the Experience Rating Plan Manual. *W* is a number between 0 and 1, inclusive.

B -- Ballast Value -- taken from the table of Ballast Values contained in the Experience Rating Plan Manual.

Formula for the Experience Modification Factor

The experience rating formula is the same under both the California plan and the NCCI plan. This formula is:

$$Mod = \frac{A_p + WA_e + (1-W)E_e + B}{E + B}$$

This form of the experience modification formula is not the best form to facilitate an understanding of the concept. Some algebraic manipulation, however, will yield:³

$$Mod = \frac{[Z_p A_p + (1-Z_p)E_p] + [Z_e A_e + (1-Z_e)E_e]}{E}$$

where Mod = Experience Modification Factor

Z_p = Primary Credibility = $E/(E+B)$

Z_e = Excess Credibility = $W Z_p$

The first numerator term $[Z_p A_p + (1-Z_p) E_p]$ represents a credibility weighted estimate for the individual risk's true exposure to primary losses. It is the weighted average between the risk's actual primary losses and the classification's expected primary with the credibility term Z_p determining the weights assigned to each value. The second numerator term $[Z_e A_e + (1-Z_e) E_e]$ is an estimate for the individual risk's true exposure to excess losses. The sum of the two numerator terms is therefore the estimator for the risk's exposure to loss. The denominator is the estimator for the exposure to loss provided by the classification rates. The ratio between these two values in the experience modification factor.

To continue the example previously described, one would first calculate:

$$\text{Primary Losses} = Z_p = \frac{E}{E + B} = \frac{45,165}{45,165 + 9,600} = .82,$$

and

$$\text{Excess Credibility} = Z_e = WZ_p = (.04)(.82) = .03$$

³Snader, R. H., "Fundamentals of Individual Risk Rating and Related Topics," Casualty Actuarial Society Study Note, Part I.

and then calculate the experience modification factor as shown in Table V:

Table V - Experience Modification Factor Calculation

(1)	(2)	(3)	(4)	(5)	(6)
	ACTUAL		EXPECTED		AVERAGE
	Losses	Credibility	Losses	Credibility	(2)(3)+(4)(5)
Primary	19,949	Z_p .82	14,913	$(1-Z_p)$.18	19,043
Excess	25,232	Z_e .03	30,252	$(1-Z_e)$.97	30,101
Total	45,181		45,165		49,144
				Experience Modification Total(6)/Total(4)	1.09

Credibility of the Plans

As shown above, the credibilities of the plans are based on the W and B values. Both W and B vary by size of risk as measured by expected losses E .

In California, the W values are provided only in tabular form with no underlying mathematical structure. However, the California Rating Bureau determined these values on the basis of regressions considering the performance of the experience rating plan by size of risk. Thus, the California table of W values is empirically defined. In California, B is defined as $[(1-W) \times \$10,000]$.

For the NCCI plan, W and B values are rating plan parameters that vary as functions of expected losses (E) and the State Scale Factor (G). Under the NCCI plan, G is defined as the average cost per claim in thousands (rounded to nearest .05) for each state. B and W are determined by the following formulas:

$$B = \frac{[E(.1E + 2,500G)]}{[E + 700G]}, \text{ Subject to a minimum of } \$7,500, \text{ and}$$

$$W = \frac{[(E + 5,100G)(1.1E + 3,200)]}{[(1.75E + 205,100G)(E + 700G)]}, \text{ Subject to a minimum of } .07.$$

Conceptually, we find it easier to express the NCCI formulas directly in terms of the credibility values Z_p and Z_e :

$$Z_p = \frac{[E + 700G]}{[1.1E + 3,270G]}, \text{ and}$$

$$Z_e = \frac{[E + 5,100G]}{[1.75E + 208,925G]}$$

In California, G would have been equal to approximately 3.75 during the experience period (1985-1987) reviewed in this report. This value of G was used in testing the accuracy of the NCCI experience rating formula to California risks.

Under the NCCI formula, the credibility of neither primary nor excess losses will ever equal 100%. As E increases the primary credibility approaches $(1 / 1.1) = 91\%$ and the excess credibility approaches $(1/1.75) = 57\%$. Under the California plan, both Z_p and Z_e equal 100% for risks with three year expected values larger than \$2,991,600.

Under the NCCI formula, W equals .07 at low values of E , compared to 0 under the California plan. Thus under the NCCI plan, excess losses always have some credibility.

We believe that it is logical to expect that the loss experience for any risk, even one with large expected losses, should not be fully credible. Full credibility implies that there is no predictive value associated with the manual rate when compared to the risk's historical losses. The California plan implicitly makes this assumption with respect to both primary and excess losses for large risks.

The NCCI plan provides only partial credibility to expected losses for all risks, regardless of size. Under this plan, there is always less credibility assigned to excess expected losses than to primary expected losses. It is interesting to note that this is also true for the California plan when credibilities are below 100%. This seems reasonable and is clearly consistent with the results of our study as described later in this report.

The ultimate test as to which formulas are superior, however, rests with the accuracy that each formula produces. We test the accuracy of the California plan, the NCCI plan, and an adjusted NCCI plan whereby the credibilities have been optimized to produce the best fit to the historical data. The results are considered later in this report.

Split of the Plans between Primary and Excess

In both the California and the NCCI plans, losses are subdivided between primary and excess components. In both plans, less credibility is attributed to excess losses than to primary losses. Therefore, if each of two risks (A and B) has the same dollar amount of loss experience, but A has a small number of large (i.e., excess) losses, while B has a large number of small losses, B's experience results in a higher experience modification factor.

The NCCI plan is a "single-split" plan. The first \$5,000 of each claim is considered the primary loss portion; whereas, the portion of each claim above \$5,000 is considered the excess loss portion. For example, a \$12,000 loss would have a primary value equal to \$5,000, with the remaining excess portion equal to \$12,000 - \$5,000, or \$7,000.

The California plan is a "multi-split" plan whereby a formula, and not a fixed dollar value, determines the dollar split between primary and excess losses. For claims less than \$2,000, the total loss is considered to be primary. Above \$2,000, the primary portion of a claim is given by the formula:

$$A_p = \frac{9,000A}{A + 7,000}$$

For example, a \$10,000 loss would have a primary value equal to \$5,294, with the remaining excess portion equal to \$10,000 - \$5,294, or \$4,706. Given the nature of the above formula, the primary portion of a loss can never rise above \$9,000, regardless of the magnitude of the total loss.

During the experience period tested (1985-1987), the NCCI formula produced primary losses that were approximately 12% lower than the values produced by the California formula.

Other Aspects of the Plans

Eligibility

In the NCCI states there are two thresholds used to determine experience rating eligibility. If a risk satisfies either test, it is eligible. The first test compares the premium for the latest two years to a threshold. This first threshold is currently \$9,000 to \$10,000 in most states, but some states have thresholds as low as \$3,500. The second test compares the premium averaged over more than two years to an amount that is half of the first threshold. Thus, an average annual premium of \$4,500 or higher is sufficient for eligibility in the typical NCCI state.

The California plan threshold is a single amount applicable to the entire experience period. Currently, this value is \$20,600. This amount corresponds to an average annual premium of \$6,867 or higher. This eligibility amount is higher than the typical NCCI state eligibility amount.

Having the eligibility requirements, it is mandatory that the employer's manual premium be modified by the application of the state approved experience rating plan. This is a unique feature of the workers' compensation line of business. The experience rating plans for most commercial casualty lines such as the plan administered by The Insurance Services Office (ISO) for general liability insurance are optional once eligibility requirements have been met. In the remainder of this report, we will refer to risks eligible for experience rating as rated risks.

Definition of Risk – Combination of Entities

The experience of several entities and policies must sometimes be combined for purposes of experience rating. The rules for the combination are based on common majority interest. Loosely speaking, all entities that have common ownership (50% or more) are combined into a single unit for purposes of experience rating. In practice, the rules for the combination of entities are quite complex. In general, the California and NCCI rules are similar. A complete discussion of these rules is contained in the California and NCCI Experience Rating Plan Manuals. A single entity or a group of entities that are combined to form the basis for an experience modification factor is called a "risk."

Experience Period

The experience period is the historical time that defines the experience to include in the experience rating formula. It generally consists of the three most recently completed policy years that expired at least one year before the effective date of the experience modification factor. Rules exist which provide longer or shorter experience periods in certain circumstances.

The experience period is defined in such a manner that the most recent completed policy year and the two prior policy years will be included. Although the most current data is used, there is an average lag of approximately two years. Thus, experience rating will not be responsive to changing circumstances, such as a material change in operations or the implementation of a new safety program.

Other programs, such as dividends, can be used to provide an immediate reward for changing conditions. If a policyholder is on a dividend program that reflects experience, any savings in losses will be immediately reflected in the dividend. These same savings may take longer to impact premiums through the experience rating plan.

Payrolls and Losses

The actual audited payroll and loss experience of the risk are collected for the policies in the experience period. It is based on the data submitted through the Statistical Plans. The losses are defined in the Statistical Plan. Generally, losses are evaluated as of 18 months after policy inception for the most recent of the three policy years, 30 months after inception for the middle policy year, and 42 months after inception for the earliest policy year.

Both the California and NCCI plans use the entire amount of losses, regardless of whether the employer was responsible for the loss or not.

Loss Limitations

The California plan limits individual claim amounts to a maximum amount (currently \$175,000) and substitutes the average death amount (currently \$69,000) for each fatality. If an accident involves more than one claim, the largest ratable primary amount is limited to twice the maximum primary amount and the largest ratable excess amount is limited to twice the maximum excess amount.

The NCCI limitations are similar in that losses are limited individually and per-occurrence, with the per-occurrence limits twice those of the per-claim limits. However, the NCCI plan generally uses much lower loss limitations than the California plan. On the basis of the average cost per claim during the experience period, we calculated that an NCCI limit of \$94,000 per claim would apply. Note that in the testing described later in this report, we use a limit of \$100,000 per claim to represent the NCCI limit. This value was selected for convenience and was incorporated into the data request before the actual NCCI limit was known.

Intrastate and Interstate Operation of the Plans

The NCCI experience rating plan contains special rules for risks with operations in more than one state of the group of states where interstate rating applies. If a risk is eligible for experience rating in at least one of the cooperating states, but has experience in more than one cooperating state, the interstate rating rules apply in

those states. Currently, California does not participate in interstate rating. Therefore, a separate experience modifier will always apply to the California premiums based on California experience alone, even if a risk is eligible for experience in the other states.

In general, interstate rules provide for the calculation of credibilities based on the volume of expected losses in all cooperating states combined. Intrastate credibilities are based only on the volume of expected losses within the state being rated.

Interstate rating does not apply in the six exclusive state fund states of Ohio, Nevada, North Dakota, Washington, West Virginia, and Wyoming—except for employers liability insurance that may be provided by private insurers. In addition it does not apply in California, Delaware, Michigan, New Jersey, and Pennsylvania. New York and Texas have independent experience rating plans that permit combination with states allowing interstate rating.

OPTIMIZATION OF NCCI FORMULA

Description

As mentioned earlier, the NCCI and California formulas for the experience modification factor are essentially the same. However, each plan has a different method for arriving at the credibilities that are used in the formula. The NCCI plan credibilities are again shown below:

$$Z_p = \frac{[E + 700G]}{[1.1E + 3,270G]}, \text{ and}$$

$$Z_e = \frac{[E + 5,100G]}{[1.75E + 208,925G]}$$

Each of the numeric constants in the formulas above is a parameter that can be modified to produce different credibilities and different results. We employed non-linear regression techniques to estimate these parameters based upon minimizing the weighted sum of the squared difference between a risk's subsequent experience and the experience modification factor based on prior experience.

Method

The NCCI plan contains three parameters each for primary and excess credibility formulas that describe the shape of these curves. In addition, there is a scale adjustment factor that varies by state. The credibility curves of the NCCI plan in their parametric form are as follows:

$$Z_p = \frac{[E + aG]}{[bE + cG]}, \text{ and}$$

$$Z_e = \frac{[E + xG]}{[yE + zG]}$$

G = State scale adjustment factor = 3.75 in California

$a, b, c, x, y,$ and z = parameters to be optimized

We obtained data from the California Workers Compensation Rating Bureau consisting of actual and expected losses for each risk with combined premium in 1985, 1986, and 1987 in excess of \$10,000 that also had experience in 1989. Data were provided for over 150,000 individual insureds representing a substantial majority of the insured premium volume in California. The entire database was used in the testing.

In the regressions, the dependent variable (left hand side) was each risk's ratio of the subsequent period (1989) actual to expected losses. It was assumed that this value is a proxy for each risk's true relationship to the average. The independent variables (right hand side) were the credibility parameters as applied to the risk's historical actual and expected primary and excess losses in the experience

modification formula. The experience modification factor is the predictor of the future experience of the risk as compared to average.

The subsequent period (1989) loss ratios can be thought of as a sample of what might have occurred for each risk given their true underlying loss rate. We recognize that there is a substantial variation in these loss ratios due to randomness. However, because we have available a large sample of individual insureds, we believe that such a measure can be utilized to solve for reasonable credibility parameters. However, we would advocate additional testing utilizing more years of data and subdivisions of existing data before deciding on new experience rating parameters to be utilized in a uniform state experience rating plan.

Results

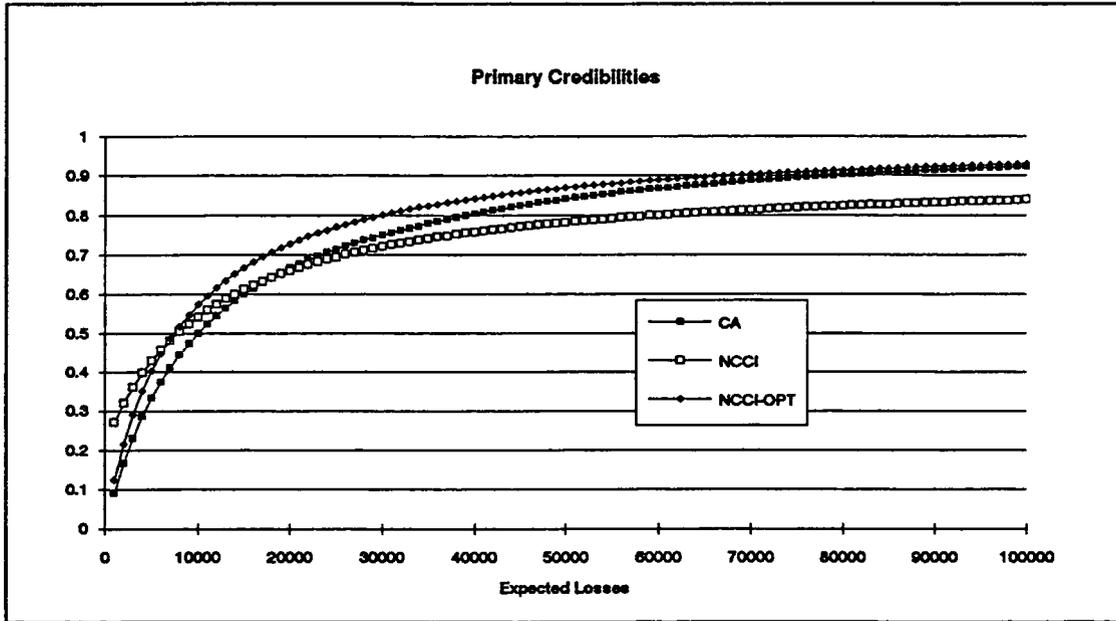
Our results showed a substantial difference between the NCCI parameters and the optimized parameters. These are shown in the table below:

Table VI – Parameters

Parameter	NCCI	Optimized on California Data
a	700	17
b	1.10	1.00
c	3,270	2,013
x	5,100	0
y	1.75	2.00
z	208,925	66,283

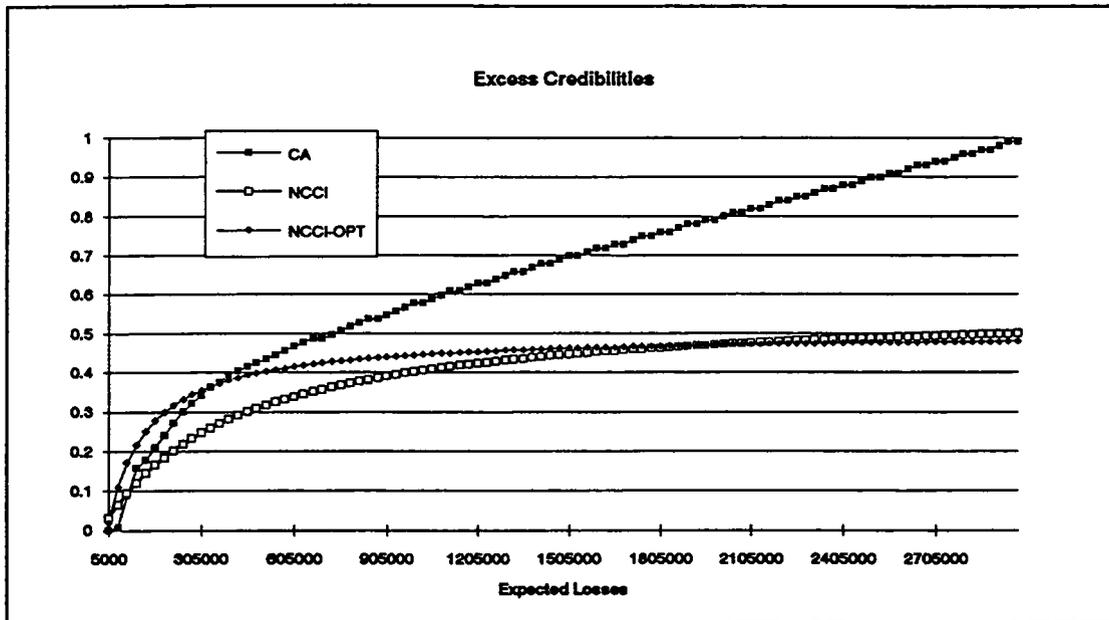
Since the California plan has credibilities that are not parametrically defined, there are no parameters that could be optimized. The optimization of the NCCI parameters, however, caused a significant shift in some of the values. The graphs below show the credibility curves that result from these parameterizations. In addition, the California credibilities are also shown. Note, however, that the California and NCCI credibilities are not directly comparable since different definitions of primary and excess losses are used.

Chart I – Primary Credibilities



The optimized NCCI credibilities start lower than the standard NCCI credibilities, but rise much faster. They start in about the same place as the California credibilities and again rise faster. Note that we would expect the optimized NCCI primary credibilities to be higher than the California primary credibilities, since on average, the NCCI definition of primary losses is lower. The lower NCCI definition of primary losses results in less variability in the amount of primary losses and therefore greater credibility results. The NCCI primary credibility flattens out and asymptotically approaches .91. The optimized primary and the California primary credibilities also flatten out. However, the California primary credibility will equal 1.00 for risks with expected losses equal to 2,991,601 and higher. The NCCI optimized primary credibility will always be less than 1.00 regardless of the size of the risk.

Chart II -- Excess Credibilities



Excess credibilities are also quite different. Both the NCCI standard and the NCCI optimized start out higher than the California excess credibilities. As with the primary credibilities, the California excess credibilities are not directly comparable due to the different definitions of primary losses as well as the higher maximum loss limitation. Since both the primary limit and the total limit is higher for the California plan, it is not clear whether the excess credibilities should be lower or higher. We believe, however, that these two differences should result in lower California excess credibilities. As mentioned earlier, the NCCI excess credibility will approach but will never quite reach .57. The optimized NCCI excess credibility approaches .50 as its maximum.

TESTING OF PLAN ACCURACY

Quintile Tests

Each of the credibility curves shown above is evaluated and compared in terms of the accuracy of the results it produces. Plan performance is shown in Exhibit I.

Risks are stratified by size of loss ratio in the experience period ("quintiles") and by size of expected losses. The quintiles test shows the corrective power of the experience rating plan to equalize loss ratios regardless of underlying historical experience. The tests by size look for biases that may result from the selection of a particular formula.

The first step in the performance measures shown in Exhibit I is to divide the data into five "quintiles." This was done as follows:

- a. Risks were divided into eight groups by size of expected loss.
- b. A loss ratio (actual to expected losses) was calculated for each risk for the prospective period (policy year 1989). A similar loss ratio was calculated for the experience period (the sum of policy years 1985-1987). Both the prospective and the experience period loss ratios were normalized so that the average loss ratio for each period was 1.00. In addition, a "modified" prospective period loss ratio was calculated for each risk, for each modification formula being tested. The modified loss ratio was calculated as:

$$\frac{\text{Actual Prospective Period Losses}}{\text{Normalized Expected Losses} \times \text{Experience Modification Factor}}$$

- c. The risks in each size group were then ranked according to their loss ratio in the experience period and arranged into quintiles. Thus, within each size group, we created five groupings, each containing approximately an equal number of risks. The first quintile included the 20% of risks with the lowest experience period loss ratios while the last quintile included the 20% of risks with the highest loss ratios.

The first performance measure is shown in the upper third of each sheet of Exhibit I. It shows the average modified loss ratio by quintile for each plan. For example, the third column of Exhibit I, Sheet 1 shows the average manual loss ratio for each quintile. The manual loss ratio of .6206 for the first quintile implies that the "best" 20% of risks, based on past loss ratios, have subsequent losses that are 62.06% of those anticipated in manual rates. Thus, if there were no experience rating plan, these risks would be overcharged by 61% ($1.00 / .6206 - 1.00$) on average. The

fourth column indicates that if manual expected losses are modified using the California plan, the overcharge for these risks decreases from 61% to 8% ($1.00 / .9217 - 1.00$). A perfect plan would eliminate any undercharge or overcharge. This would result in modified loss ratios of 1.000 for each quintile. The closer the modified loss ratios are to 1.000 the better this measure of plan performance.

The trend of the modified loss ratios across the quintiles is also meaningful. If the plan is over-responsive to historical experience (credibilities too high), the good risks during the experience period will receive experience rating modifications that are too low and the bad risks will receive modifications that are too high. If the plan is over-responsive, a downward trend in the modified loss ratios will result, when reviewed from the lowest to the highest quintile. Likewise, if the plan is under-responsive, an upward trend in the modified loss ratios will result.

The second performance measure is shown in the middle block of each sheet in Exhibit I. This measure is a function of the modified loss ratio measure discussed above. This measure shows the squared error of the modified loss ratio for each plan multiplied by 10,000. Thus the 61 shown for the California plan for the first quintile is calculated as $[(.9217-1.000)^2] \times 10,000$. If a plan did a perfect job of flattening the loss ratios by quintile, the total squared error for that plan would be zero. The better a plan performs, the closer the squared error will be to zero.

In comparing the plans using the squared error of the average corrected loss ratio, however, the results must be examined carefully. Since we are examining the squared errors, relatively small differences may appear quite large. In addition, the randomness inherent in the actual data could cause a more poorly performing plan to appear better.

The final statistic shown in Exhibit I is the mean squared prediction error for all risks within each quintile. This is calculated as the weighted average of the square of the actual subsequent period loss ratio (actual / normalized expected) minus the predicted normalized expected loss ratio (experience modification factor). This statistic measures the variation of a risk's actual losses in a year against the losses anticipated in that risk's modified rate. Even if the modified rate was exactly equal

to the true expected loss for each risk, there would still be considerable variation in the risk's actual experience from year to year.

Results

Primary Test Results

As expected, the unmodified loss ratios (Exhibit I - Column 3) indicate an upward trend. While this may be stating the obvious, it indicates that the historical experience has credibility in predicting future loss ratios. However, each of the plans shown in Exhibit I also appear to exhibit an upward trend in the corrected loss ratios. While this may be due to randomness, it may also be an indication that the plans are under responsive. Since at least the NCCI parameters were optimized, this may be an indication that a different structural form for the credibility is warranted.

Another possible explanation for this result is the measure for the error used in the optimization. The weighted squared error term causes the parameters to be sensitive to large errors in estimation for larger risks. We believe this is appropriate since a large error for a large risk would have a significant dollar impact. However, this measure will be sensitive to unusual shock-type losses. A single large loss can have a significant impact on the loss ratio of all but the largest risks. If these losses are random, the excess credibility for normal excess losses will have to be reduced to reflect the large potential impact of the more rare jumbo excess loss.

Since the very large claims are relatively uncommon, this would cause an experience rating plan to appear under responsive most of the time to prevent it from being over responsive on average. The upper limitation on the losses entering the experience rating formula is one method used to minimize this impact. The splitting of losses into primary and excess components is another. The existence of trends in the corrected loss ratios may be an indication that a more complicated transformation of the losses (rather than the existing primary and excess splits) could improve accuracy. This would, however, further complicate the formulas.

The between quintile squared error of average loss ratios (Exhibit I - second block) indicates that the California plan is superior to the NCCI plan before optimization. The error for all size groups combined is lower. Examination of the size groups shows the NCCI formula superior for the four smallest size groups, and the California formula superior for the four largest. The between quintile squared errors show that while the California formula is superior overall; the optimized NCCI formula was superior in all but the largest size group.

In examining the between quintile squared errors of loss ratios, however, there is a pattern that becomes apparent for most risk sizes. The squared errors are large for the low quintiles, become small for the middle quintiles, and again become large for the high quintiles. This pattern is most apparent for the manual loss ratios. It is less severe but quite noticeable for the other sizes as well.

Large values of this between quintile squared error statistic are an indication that experience rating is not correcting appropriately for historical experience. The hourglass pattern in the statistics is another indication of overall under responsiveness. The corrected loss ratios for the risks with good historical experience are lower than 1.00 indicating greater than average profitability in the subsequent period. This produces the high values for the low quintiles.

Average risks in the historical period receive experience modification factors close to 1.00 and also have average experience in the subsequent period. This results in subsequent period loss ratios close to 1.00 on the manual basis and on the corrected basis. This results in low squared errors for the average risks.

The higher quintiles have poor experience in the historical period and generally poor experience in the subsequent period, even after correction by the experience modification factor. Thus, the between quintile squared error statistic again becomes large.

Ideally, we would like to see low values of these squared error statistics and the absence of a pattern. Insurance companies recognizing the under responsiveness pattern would be inclined to write only the low loss ratio risks that exhibit greater than average profitability. Alternately, if the same price is charged to both groups

(after experience modification factors), the low loss ratio risks will be subsidizing the high loss ratio risks.

The third block of statistics shows the average squared difference (on a risk by risk basis) between actual and predicted (by the modification) loss ratios. The lower this statistic, the more accurately the modification predicts each individual risk's future period loss ratios. By this measure the California plan is superior to the standard NCCI formula. Not only does it result in more equitable premium for groups of risks (between quintile squared error test, above), but it produces more accurate premiums for individual risks.

Not surprisingly, the optimized NCCI plan appears better than the California plan. However, this is not a fair comparison since the parameters were optimized to produce the lowest squared error on the same data producing these results. This is not necessarily an indication that they would produce a lower squared error on another sample of data (e.g., next year's ratings).

The mean squared error of manual loss ratios for all groups combined is 4.0221. This represents a substantial amount of dispersion. The square root of this is approximately 2.0. This implies a great deal of variation in manual loss ratios. Experience rating provides a clear improvement based on the other tests, but apparently only a small improvement in the mean squared errors. However, this small improvement is persistent across all risk sizes.

The mean squared error of the smallest risk sizes is quite large, on the order of 27. This decreases as the size of risk increases. The values for the largest risk sizes are approximately .33-.40. This implies that the larger risks have much less variation in loss ratios than the smaller risks. It is interesting in that the squared error of individual loss ratios decreases slower than is implied by the increase in premium size. This is in accordance with our a priori expectations concerning the structure of the variance of the loss ratio distribution.

The percentage reduction in the mean squared error of individual risk loss ratios is largest for the largest risks. Thus, experience rating provides the greatest improvement in equity for the largest risks.

Other Results

We tested optimized NCCI-style credibility functions with the California definitions of primary and total losses. We also tested a hybrid of California primary losses with the lower per-claim limit used by NCCI. The ranking of the plans by the overall average mean squared error of actual and predicted modification factors is shown below:

Table VII – Plan Performance Results

Rank	Description	Mean Squared Error
1.	Optimized Parameters - California Primary - NCCI Loss Limits	3.9104
2.	Optimized Parameters - NCCI Primary - NCCI Loss Limits	3.9110
3.	Optimized Parameters - California Primary - California Loss Limits	3.9122
4.	Standard California Formula	3.9159
5.	Standard NCCI Formula	3.9161
6.	No Experience Modification Formula	4.0221

EXPERIENCE RATING THE SMALL INSURED

Washington state provides workers compensation insurance through an exclusive state fund. They maintain an experience rating plan that is generally similar to the California plan and the NCCI plans, but has unique features with respect to smaller risks. In Washington, all risks are experience rated regardless of size. There is no minimum eligibility level associated with the Washington experience rating plan.

The smaller risks are rated using the standard formula, with losses split into primary and excess, and W and B values derived from a table. However, there is an additional table that represents the maximum experience modification factor

applicable to a risk with no lost-time claims. Note that these maximum experience modification factors are always less than 1.00 for risks with no lost-time claims during the experience period.

There is no maximum experience modification factor for risks with one or more lost-time claims during the experience period. However, there is a limitation on the change from the prior year's experience modification factor of 25%. In addition, if the experience modification factor changes from a debit to a credit or from a credit to a debit, it is frozen at 1.00 for one year.

An abbreviated table displaying of the Washington maximum experience modification factors for lost-time claim-free experience is shown below for some specific risk sizes based on three years of expected losses:

Table VIII -- Washington Claim-Free Credits

Expected Losses	Maximum Experience Modification Factor
1,780	.90
3,000	.82
5,000	.75
8,000	.70

An experience modification can be approximated for risks with claim-free experience (both lost-time and medical only) with the following formula:

$$Mod = \frac{(1 - W)E_e + B}{E + B}$$

This formula in terms of credibilities becomes:

$$Mod = \frac{E - Z_p E_p - Z_e E_e}{E}$$

Assuming that $E_p = .30E$ (California formula averages .32, NCCI formula averages .29) and $E_e = .70E$, we have calculated a similar table based on the experience rating plan credibilities examined in this report.

Table IX --Indicated Claim-Free Credits

Expected Losses	California Experience Rating Plan	NCCI Experience Rating Plan	Optimized NCCI Experience Rating Plan
1,780	0.95	0.89	0.94
3,000	0.93	0.87	0.90
5,000	0.90	0.85	0.87
8,000	0.87	0.82	0.82

Note that the claim-free credits under the California and NCCI plans should be lower than the Washington claim-free credits, because they were calculated on the basis of no losses at all. The Washington claim-free credits apply to insureds free of lost-time claims only (a much less restrictive definition).

It appears from the Washington claim-free credits that insureds with no lost-time claims obtain inordinately high credits. If this is the case, then there are two possible consequences, both undesirable. If there is not a sufficient penalty for one or more lost-time claims, then those that receive these special credits will be subsidized by others that do not. Note that for sufficiently large insureds, one or more lost-time claims is a virtual certainty. Therefore, the larger insureds would be providing a subsidy to the smaller insureds.

If the penalty for one or more lost-time claims were sufficiently high that on average the smaller insureds did not receive a subsidy from the larger, then there would still be the problem associated with inter-temporal subsidies. Small risk credits would be alternately too high and too low.

EXPERIENCE RATING IN OPEN COMPETITION STATES

We believe that Michigan is the only state that allows individual insurance companies to file unique experience rating plans. The other open competition states utilize an experience rating plan administered by the rating bureau, generally NCCI. Given the complexity of the experience rating plans, and the need to assemble individual risk data from many different insurers, we believe that central administration of an uniform plan is reasonable.

Although there is not a uniform price level in the open competition states, the experience modification factor still conveys useful information. It is an indicator of the percentage difference between an individual risk and the average for the classification.

Allowing more individual company flexibility with regard to experience rating could generate innovations in this field that would ultimately benefit all insureds. However, if experience rating plans were not uniform and centrally administered, then almost certainly the overall costs to maintain individual systems of equivalent sophistication would increase. The danger would be a movement to less accurate but easier to administer systems.

A uniform experience rating plan is not inconsistent with an open competition environment. It is a useful piece of information that is available to all potential insurers concerning the quality of a prospective insured. In an open competition environment, there would be many other opportunities besides experience rating to adjust the price for the insurance provided.

COMPETITIVE RATING DEVICES

Schedule Rating Plans

Of the states where NCCI is the rating bureau, NCCI files a schedule rating plan in twelve states. These schedule rating plans allow the premium for a policyholder to be modified according to the filed plan based on individual risk characteristics.

There is a minimum and maximum charge or discount for each of the following risk characteristics: premises; classification peculiarities; medical facilities; safety devices; employee selection, training, and supervision; management cooperation with the insurer; and management-safety organization. The overall schedule modification is subject to maximum and minimum values. The schedule rating plans contain minimum eligibility requirements based on premium at manual rates.

The schedule rating program (as filed by NCCI) can be used only on risks which are rated in compliance with NCCI's filed and approved rates without deviation. Thus, under the NCCI plans, it is not possible to use both deviations and schedule rating.

Table X shows the minimum annual premium at manual rates by state needed for a risk to be eligible for the schedule rating plan filed by NCCI.

Table X – Schedule Rating Minimum Eligibility by State

State	Eligibility (Minimum Annual Premium at Manual Rates)
Alabama	\$1,000
Arizona	\$2,500
Colorado	\$2,500
District of Columbia	\$2,500
Indiana	\$ 0
Mississippi	\$2,500
New Mexico	\$1,500
Rhode Island	\$2,500
South Carolina	\$2,500
South Dakota	\$ 750
Tennessee	\$2,500
Utah	\$2,500

The following table shows a typical NCCI schedule rating plan. The ranges of credits and debits vary from state to state, however. In addition, there is a maximum credit or debit that is applicable, typically 25%. For further details,

please consult the NCCI Experience Rating Plan Manual. In addition to the NCCI Schedule Rating Plans, individual companies are permitted to file their own plans in approximately half the states.

Table XI -- Typical Schedule Rating Plan Range of Modification

Category	Range of Modification (Credit to Debit)
Premises	10% - 10%
Classification Peculiarities	10% - 10%
Medical Facilities	5% - 5%
Safety Devices	5% - 5%
Employees: Selection, Training, Supervision	10% - 10%
Management: Cooperation with Insurance Carrier	5% - 5%
Management: Safety Organization	5% - 5%

The following table identifies states where schedule rating is prohibited or has not been approved by the regulator:

Table XII -- States Prohibiting Schedule Rating

California	Connecticut
Florida	Hawaii
Idaho	Iowa
Kansas	Louisiana
Maine	Maryland
Massachusetts	Nebraska
New Hampshire	New Jersey
New York	North Carolina
Oklahoma	Oregon
Pennsylvania	Texas
Vermont	Virginia
Wisconsin	

Deviations

The use of deviations, or departures from bureau rates is another form of competitive pricing. The meaning of deviations is less clear in a state where the rating bureau files loss costs or advisory rates. In these circumstances, deviation-like results can occur, even if the statute does not specifically mention deviations. Exhibit II shows a summary of state rating laws.

The impact of competitive pricing mechanisms in NCCI states is shown in Exhibit III. Note that in loss cost states, the impact of rate departures is unknown as there is no final rate from which to depart.

PERFORMANCE OF EXPERIENCE RATING PLANS
(By Loss Ratio)
AVERAGE ALL EXPECTED LOSS SIZE GROUPS

Future Period - Manual Loss Ratios and Modified Loss Ratios ¹					
Loss Ratio Quintile ²	Number of Risks	Manual ³	California Plan	NCCI Plan	NCCI Plan - Optimized ⁴
First 20%	30,281	0.6206	0.9217	0.8354	0.8903
Next 20%	30,286	0.8033	1.0029	0.9490	0.9803
Middle 20%	30,281	0.9478	1.0105	0.9991	1.0119
Next 20%	30,286	1.1438	1.0242	1.0485	1.0344
Last 20%	30,288	1.5150	1.0247	1.0850	1.0262
All Quintiles	151,422	1.0000	1.0050	1.0005	0.9997
Between Quintile-Squared Error of Average Loss Ratios ⁵					
Loss Ratio Quintile ²	Expected Losses(000)	Manual ³	California Plan	NCCI Plan	NCCI Plan - Optimized ⁴
First 20%	640,493	1,439	61	271	120
Next 20%	724,907	387	0	26	4
Middle 20%	740,642	27	1	0	1
Next 20%	710,322	207	6	24	12
Last 20%	625,422	2,652	6	72	7
All Quintiles	3,441,786	4,712	74	393	144
Within Quintile - Mean Squared Errors of Individual Risk Loss Ratios ⁶					
Loss Ratio Quintile ²	Average Risk Size	Manual ³	California Plan	NCCI Plan	NCCI Plan - Optimized ⁴
First 20%	21,152	2.3445	2.1925	2.2051	2.1981
Next 20%	23,935	2.1922	2.1451	2.1493	2.1502
Middle 20%	24,459	5.0108	4.9992	4.9998	5.0015
Next 20%	23,454	3.8478	3.8235	3.8191	3.8173
Last 20%	20,649	6.8884	6.5553	6.5432	6.5211
All Quintiles	22,730	4.0221	3.9159	3.9161	3.9110
Notes:					
1. Subsequent Period Loss ratios are the ratio of actual losses to modified expected losses. Modified expected losses are expected losses multiplied by experience modification factors calculated with several different formulas.					
2. Quintiles are based on the ratio of actual to unmodified expected losses during the experience period.					
3. Manual refers to the ratio of actual to unmodified expected losses of the subsequent period.					
4. This is the NCCI Revised Plan with the credibility formulas re-calculated to minimize the sum of squared differences between the subsequent period ratio of actual to modified expected loss ratios and 1.000.					
5. The squared difference between the quintile ratio of actual to modified expected loss ratios (first table) and 1.000 multiplied by 10,000. The value for the all quintiles group represents the sum of the values for each quintile.					
6. The mean squared difference between an individual risk's subsequent period ratio of actual to unmodified expected losses and its experience modification factor.					

PERFORMANCE OF EXPERIENCE RATING PLANS
(By Loss Ratio)
EXPECTED LOSS SIZE GROUP \$2,501 TO \$5,000

Future Period - Manual Loss Ratios and Modified Loss Ratios ¹					
Loss Ratio Quintile ²	Number of Risks	Manual ³	California Plan	NCCI Plan	NCCI Plan - Optimized ⁴
First 20%	3,669	0.9359	1.0367	1.0689	1.0607
Next 20%	3,670	0.9476	1.0498	1.0825	1.0742
Middle 20%	3,669	0.9104	1.0013	1.0305	1.0225
Next 20%	3,670	1.3142	1.3787	1.4024	1.3913
Last 20%	3,670	1.8056	1.3322	1.2363	1.2620
All Quintiles	18,348	1.1953	1.1834	1.1796	1.1805
Between Quintile-Squared Error of Average Loss Ratios ⁵					
Loss Ratio Quintile ²	Expected Losses(000)	Manual ³	California Plan	NCCI Plan	NCCI Plan - Optimized ⁴
First 20%	9,603	41	13	47	37
Next 20%	10,226	27	25	68	55
Middle 20%	9,938	80	0	9	5
Next 20%	10,599	987	1,434	1,619	1,531
Last 20%	10,804	6,490	1,104	558	686
All Quintiles	51,171	7,625	2,576	2,301	2,314
Within Quintile - Mean Squared Errors of Individual Risk Loss Ratios ⁶					
Loss Ratio Quintile ²	Average Risk Size	Manual ³	California Plan	NCCI Plan	NCCI Plan - Optimized ⁴
First 20%	2,617	24.5277	24.5244	24.5268	24.5261
Next 20%	2,786	16.8528	16.8502	16.8533	16.8523
Middle 20%	2,709	20.5945	20.5854	20.5859	20.5854
Next 20%	2,888	30.2784	30.3093	30.3215	30.3158
Last 20%	2,944	44.7066	44.0154	43.8809	43.9073
All Quintiles	2,789	27.6817	27.5393	27.5146	27.5186
Notes:					
1. Subsequent Period Loss ratios are the ratio of actual losses to modified expected losses. Modified expected losses are expected losses multiplied by experience modification factors calculated with several different formulas.					
2. Quintiles are based on the ratio of actual to unmodified expected losses during the experience period.					
3. Manual refers to the ratio of actual to unmodified expected losses of the subsequent period.					
4. This is the NCCI Revised Plan with the credibility formulas re-calculated to minimize the sum of squared differences between the subsequent period ratio of actual to modified expected loss ratios and 1.000.					
5. The squared difference between the quintile ratio of actual to modified expected loss ratios (first table) and 1.000 multiplied by 10,000. The value for the all quintiles group represents the sum of the values for each quintile.					
6. The mean squared difference between an individual risk's subsequent period ratio of actual to unmodified expected losses and its experience modification factor.					

PERFORMANCE OF EXPERIENCE RATING PLANS
(By Loss Ratio)
EXPECTED LOSS SIZE GROUP \$5,001 TO \$10,000

Future Period - Manual Loss Ratios and Modified Loss Ratios ¹					
Loss Ratio Quintile ²	Number of Risks	Manual ³	California Plan	NCCI Plan	NCCI Plan - Optimized ⁴
First 20%	8,992	0.7620	0.8759	0.9044	0.9023
Next 20%	8,993	0.8114	0.9321	0.9620	0.9601
Middle 20%	8,992	0.9693	1.0895	1.1186	1.1167
Next 20%	8,993	1.2404	1.2527	1.2504	1.2449
Last 20%	8,993	1.7315	1.2297	1.1608	1.1695
All Quintiles	44,963	1.1201	1.1037	1.1000	1.1005
Between Quintile-Squared Error of Average Loss Ratios ⁵					
Loss Ratio Quintile ²	Expected Losses(000)	Manual ³	California Plan	NCCI Plan	NCCI Plan - Optimized ⁴
First 20%	35,781	566	154	91	95
Next 20%	35,880	356	46	14	16
Middle 20%	36,895	9	80	141	136
Next 20%	38,867	578	639	627	600
Last 20%	40,524	5,351	528	259	287
All Quintiles	187,948	6,860	1,447	1,132	1,134
Within Quintile - Mean Squared Errors of Individual Risk Loss Ratios ⁶					
Loss Ratio Quintile ²	Average Risk Size	Manual ³	California Plan	NCCI Plan	NCCI Plan - Optimized ⁴
First 20%	3,979	11.3198	11.2727	11.2676	11.2678
Next 20%	3,990	12.7718	12.7386	12.7361	12.7362
Middle 20%	4,103	29.0451	29.0488	29.0529	29.0524
Next 20%	4,322	17.2689	17.2738	17.2801	17.2780
Last 20%	4,506	28.5936	27.9273	27.8763	27.8741
All Quintiles	4,180	20.0313	19.8741	19.8638	19.8628
Notes:					
1. Subsequent Period Loss ratios are the ratio of actual losses to modified expected losses. Modified expected losses are expected losses multiplied by experience modification factors calculated with several different formulas.					
2. Quintiles are based on the ratio of actual to unmodified expected losses during the experience period.					
3. Manual refers to the ratio of actual to unmodified expected losses of the subsequent period.					
4. This is the NCCI Revised Plan with the credibility formulas re-calculated to minimize the sum of squared differences between the subsequent period ratio of actual to modified expected loss ratios and 1.000.					
5. The squared difference between the quintile ratio of actual to modified expected loss ratios (first table) and 1.000 multiplied by 10,000. The value for the all quintiles group represents the sum of the values for each quintile.					
6. The mean squared difference between an individual risk's subsequent period ratio of actual to unmodified expected losses and its experience modification factor.					

PERFORMANCE OF EXPERIENCE RATING PLANS
(By Loss Ratio)
EXPECTED LOSS SIZE GROUP \$10,001 TO \$20,000

Future Period - Manual Loss Ratios and Modified Loss Ratios ¹					
Loss Ratio Quintile ²	Number of Risks	Manual ³	California Plan	NCCI Plan	NCCI Plan - Optimized ⁴
First 20%	7,045	0.7084	0.8665	0.8835	0.9066
Next 20%	7,046	0.7638	0.9168	0.9330	0.9562
Middle 20%	7,045	1.0201	1.1473	1.1613	1.1818
Next 20%	7,046	1.3291	1.2542	1.2407	1.2376
Last 20%	7,046	1.6025	1.1464	1.1251	1.0867
All Quintiles	35,228	1.0930	1.0896	1.0899	1.0900
Between Quintile-Squared Error of Average Loss Ratios ⁵					
Loss Ratio Quintile ²	Expected Losses(000)	Manual ³	California Plan	NCCI Plan	NCCI Plan - Optimized ⁴
First 20%	50,206	850	178	136	87
Next 20%	51,450	558	69	45	19
Middle 20%	54,123	4	217	260	331
Next 20%	54,712	1,083	646	579	565
Last 20%	53,537	3,630	214	157	75
All Quintiles	264,029	6,125	1,324	1,177	1,077
Within Quintile - Mean Squared Errors of Individual Risk Loss Ratios ⁶					
Loss Ratio Quintile ²	Average Risk Size	Manual ³	California Plan	NCCI Plan	NCCI Plan - Optimized ⁴
First 20%	7,126	6.5449	6.4694	6.4666	6.4627
Next 20%	7,302	6.9436	6.8922	6.8902	6.8885
Middle 20%	7,682	8.1972	8.2087	8.2116	8.2154
Next 20%	7,765	11.1029	11.0617	11.0591	11.0583
Last 20%	7,598	14.3365	14.2940	14.3802	14.4373
All Quintiles	7,495	9.4857	9.4465	9.4631	9.4743
Notes:					
1. Subsequent Period Loss ratios are the ratio of actual losses to modified expected losses. Modified expected losses are expected losses multiplied by experience modification factors calculated with several different formulas.					
2. Quintiles are based on the ratio of actual to unmodified expected losses during the experience period.					
3. Manual refers to the ratio of actual to unmodified expected losses of the subsequent period.					
4. This is the NCCI Revised Plan with the credibility formulas re-calculated to minimize the sum of squared differences between the subsequent period ratio of actual to modified expected loss ratios and 1.000.					
5. The squared difference between the quintile ratio of actual to modified expected loss ratios (first table) and 1.000 multiplied by 10,000. The value for the all quintiles group represents the sum of the values for each quintile.					
6. The mean squared difference between an individual risk's subsequent period ratio of actual to unmodified expected losses and its experience modification factor.					

PERFORMANCE OF EXPERIENCE RATING PLANS
(By Loss Ratio)
EXPECTED LOSS SIZE GROUP \$20,001 TO \$50,000

Future Period - Manual Loss Ratios and Modified Loss Ratios ¹					
Loss Ratio Quintile ²	Number of Risks	Manual ³	California Plan	NCCI Plan	NCCI Plan - Optimized ⁴
First 20%	5,801	0.6620	0.8595	0.8661	0.9249
Next 20%	5,802	0.8580	1.0442	1.0494	1.1092
Middle 20%	5,801	1.0703	1.1475	1.1434	1.1800
Next 20%	5,802	1.2006	1.1141	1.1242	1.1165
Last 20%	5,802	1.5622	1.1727	1.1613	1.0803
All Quintiles	29,008	1.0782	1.0885	1.0891	1.0916
Between Quintile-Squared Error of Average Loss Ratios ⁵					
Loss Ratio Quintile ²	Expected Losses(000)	Manual ³	California Plan	NCCI Plan	NCCI Plan - Optimized ⁴
First 20%	84,405	1,142	197	179	56
Next 20%	88,337	202	20	24	119
Middle 20%	96,985	49	218	206	324
Next 20%	95,813	402	130	154	136
Last 20%	90,077	3,161	298	260	64
All Quintiles	455,616	4,956	863	823	699
Within Quintile - Mean Squared Errors of Individual Risk Loss Ratios ⁶					
Loss Ratio Quintile ²	Average Risk Size	Manual ³	California Plan	NCCI Plan	NCCI Plan - Optimized ⁴
First 20%	14,550	2.8253	2.7217	2.7208	2.7130
Next 20%	15,225	3.3131	3.2885	3.2902	3.2947
Middle 20%	16,719	15.6191	15.6126	15.6118	15.6180
Next 20%	16,514	4.8441	4.7859	4.7880	4.7853
Last 20%	15,525	7.8542	7.4019	7.4051	7.3570
All Quintiles	15,707	7.0620	6.9350	6.9361	6.9267
Notes:					
1. Subsequent Period Loss ratios are the ratio of actual losses to modified expected losses. Modified expected losses are expected losses multiplied by experience modification factors calculated with several different formulas.					
2. Quintiles are based on the ratio of actual to unmodified expected losses during the experience period.					
3. Manual refers to the ratio of actual to unmodified expected losses of the subsequent period.					
4. This is the NCCI Revised Plan with the credibility formulas re-calculated to minimize the sum of squared differences between the subsequent period ratio of actual to modified expected loss ratios and 1.000.					
5. The squared difference between the quintile ratio of actual to modified expected loss ratios (first table) and 1.000 multiplied by 10,000. The value for the all quintiles group represents the sum of the values for each quintile.					
6. The mean squared difference between an individual risk's subsequent period ratio of actual to unmodified expected losses and its experience modification factor.					

PERFORMANCE OF EXPERIENCE RATING PLANS
(By Loss Ratio)
EXPECTED LOSS SIZE GROUP \$50,001 TO \$100,000

Future Period - Manual Loss Ratios and Modified Loss Ratios ¹					
Loss Ratio Quintile ²	Number of Risks	Manual ³	California Plan	NCCI Plan	NCCI Plan - Optimized ⁴
First 20%	2,402	0.6462	0.9189	0.8627	0.9613
Next 20%	2,402	0.8454	1.0350	0.9875	1.0601
Middle 20%	2,402	1.0179	1.0854	1.0676	1.0980
Next 20%	2,402	1.2386	1.1337	1.1491	1.1243
Last 20%	2,403	1.6373	1.1445	1.2181	1.1078
All Quintiles	12,011	1.0783	1.0819	1.0820	1.0829
Between Quintile-Squared Error of Average Loss Ratios ⁵					
Loss Ratio Quintile ²	Expected Losses(000)	Manual ³	California Plan	NCCI Plan	NCCI Plan - Optimized ⁴
First 20%	78,467	1,252	66	189	15
Next 20%	80,169	239	12	2	36
Middle 20%	83,839	3	73	46	96
Next 20%	82,742	569	179	222	155
Last 20%	79,418	4,062	209	476	116
All Quintiles	404,635	6,125	539	935	418
Within Quintile - Mean Squared Errors of Individual Risk Loss Ratios ⁶					
Loss Ratio Quintile ²	Average Risk Size	Manual ³	California Plan	NCCI Plan	NCCI Plan - Optimized ⁴
First 20%	32,667	1.4548	1.3287	1.3365	1.3261
Next 20%	33,376	1.5201	1.4847	1.4847	1.4861
Middle 20%	34,904	1.7828	1.7636	1.7604	1.7640
Next 20%	34,447	3.3613	3.2823	3.2888	3.2812
Last 20%	33,050	7.8480	7.2125	7.2844	7.1944
All Quintiles	33,689	3.1803	3.0040	3.0203	3.0001
Notes:					
1. Subsequent Period Loss ratios are the ratio of actual losses to modified expected losses. Modified expected losses are expected losses multiplied by experience modification factors calculated with several different formulas.					
2. Quintiles are based on the ratio of actual to unmodified expected losses during the experience period.					
3. Manual refers to the ratio of actual to unmodified expected losses of the subsequent period.					
4. This is the NCCI Revised Plan with the credibility formulas re-calculated to minimize the sum of squared differences between the subsequent period ratio of actual to modified expected loss ratios and 1.000.					
5. The squared difference between the quintile ratio of actual to modified expected loss ratios (first table) and 1.000 multiplied by 10,000. The value for the all quintiles group represents the sum of the values for each quintile.					
6. The mean squared difference between an individual risk's subsequent period ratio of actual to unmodified expected losses and its experience modification factor.					

PERFORMANCE OF EXPERIENCE RATING PLANS
(By Loss Ratio)
EXPECTED LOSS SIZE GROUP \$100,001 TO \$250,000

Future Period - Manual Loss Ratios and Modified Loss Ratios ¹					
Loss Ratio Quintile ²	Number of Risks	Manual ³	California Plan	NCCI Plan	NCCI Plan - Optimized ⁴
First 20%	1,522	0.6217	0.9304	0.8367	0.9487
Next 20%	1,523	0.8170	1.0148	0.9571	1.0227
Middle 20%	1,522	1.0235	1.0844	1.0636	1.0830
Next 20%	1,523	1.1355	1.0233	1.0462	1.0181
Last 20%	1,523	1.6538	1.0975	1.1979	1.0880
All Quintiles	7,613	1.0461	1.0430	1.0437	1.0428
Between Quintile-Squared Error of Average Loss Ratios ⁵					
Loss Ratio Quintile ²	Expected Losses	Manual ³	California Plan	NCCI Plan	NCCI Plan - Optimized ⁴
First 20%	103,934	1,431	48	267	26
Next 20%	115,750	335	2	18	5
Middle 20%	113,793	6	71	40	69
Next 20%	114,441	184	5	21	3
Last 20%	103,632	4,275	95	392	77
All Quintiles	551,551	6,231	221	738	180
Within Quintile - Mean Squared Errors of Individual Risk Loss Ratios ⁶					
Loss Ratio Quintile ²	Average Risk Size	Manual ³	California Plan	NCCI Plan	NCCI Plan - Optimized ⁴
First 20%	68,288	0.7262	0.5828	0.5946	0.5813
Next 20%	76,001	0.7763	0.7310	0.7327	0.7312
Middle 20%	74,765	1.0650	1.0508	1.0493	1.0521
Next 20%	75,142	1.5809	1.5332	1.5349	1.5331
Last 20%	68,045	3.4468	2.8760	2.9327	2.8740
All Quintiles	72,449	1.4951	1.3385	1.3518	1.3381
Notes:					
1. Subsequent Period Loss ratios are the ratio of actual losses to modified expected losses. Modified expected losses are expected losses multiplied by experience modification factors calculated with several different formulas.					
2. Quintiles are based on the ratio of actual to unmodified expected losses during the experience period.					
3. Manual refers to the ratio of actual to unmodified expected losses of the subsequent period.					
4. This is the NCCI Revised Plan with the credibility formulas re-calculated to minimize the sum of squared differences between the subsequent period ratio of actual to modified expected loss ratios and 1.000.					
5. The squared difference between the quintile ratio of actual to modified expected loss ratios (first table) and 1.000 multiplied by 10,000. The value for the all quintiles group represents the sum of the values for each quintile.					
6. The mean squared difference between an individual risk's subsequent period ratio of actual to unmodified expected losses and its experience modification factor.					

PERFORMANCE OF EXPERIENCE RATING PLANS
(By Loss Ratio)
EXPECTED LOSS SIZE GROUP \$250,001 TO \$500,000

Future Period - Manual Loss Ratios and Modified Loss Ratios ¹					
Loss Ratio Quintile ²	Number of Risks	Manual ³	California Plan	NCCI Plan	NCCI Plan - Optimized ⁴
First 20%	497	0.6253	0.9806	0.8590	0.9515
Next 20%	497	0.8879	1.0978	1.0324	1.0796
Middle 20%	497	0.9548	1.0000	0.9857	0.9953
Next 20%	497	1.1580	1.0193	1.0507	1.0268
Last 20%	498	1.4273	0.9539	1.0411	0.9719
All Quintiles	2,486	1.0066	1.0044	1.0041	1.0039
Between Quintile-Squared Error of Average Loss Ratios ⁵					
Loss Ratio Quintile ²	Expected Losses	Manual ³	California Plan	NCCI Plan	NCCI Plan - Optimized ⁴
First 20%	79,865	1,404	4	199	24
Next 20%	77,474	126	96	10	63
Middle 20%	83,132	20	0	2	0
Next 20%	82,009	250	4	26	7
Last 20%	74,989	1,826	21	17	8
All Quintiles	397,469	3,626	125	254	102
Within Quintile - Mean Squared Errors of Individual Risk Loss Ratios ⁶					
Loss Ratio Quintile ²	Average Risk Size	Manual ³	California Plan	NCCI Plan	NCCI Plan - Optimized ⁴
First 20%	160,694	0.4841	0.3464	0.3540	0.3467
Next 20%	155,883	0.5581	0.5450	0.5389	0.5431
Middle 20%	167,268	0.6487	0.6407	0.6407	0.6403
Next 20%	165,008	1.7121	1.6639	1.6625	1.6585
Last 20%	150,580	1.3778	1.1208	1.1168	1.1108
All Quintiles	159,883	0.9549	0.8646	0.8639	0.8612
Notes:					
1. Subsequent Period Loss ratios are the ratio of actual losses to modified expected losses. Modified expected losses are expected losses multiplied by experience modification factors calculated with several different formulas.					
2. Quintiles are based on the ratio of actual to unmodified expected losses during the experience period.					
3. Manual refers to the ratio of actual to unmodified expected losses of the subsequent period.					
4. This is the NCCI Revised Plan with the credibility formulas re-calculated to minimize the sum of squared differences between the subsequent period ratio of actual to modified expected loss ratios and 1.000.					
5. The squared difference between the quintile ratio of actual to modified expected loss ratios (first table) and 1.000 multiplied by 10,000. The value for the all quintiles group represents the sum of the values for each quintile.					
6. The mean squared difference between an individual risk's subsequent period ratio of actual to unmodified expected losses and its experience modification factor.					

PERFORMANCE OF EXPERIENCE RATING PLANS
(By Loss Ratio)
EXPECTED LOSS SIZE GROUP OVER \$500,000

Future Period - Manual Loss Ratios and Modified Loss Ratios ¹					
Loss Ratio Quintile ²	Number of Risks	Manual ³	California Plan	NCCI Plan	NCCI Plan - Optimized ⁴
First 20%	353	0.5274	0.9518	0.7557	0.7755
Next 20%	353	0.7427	0.9700	0.8731	0.8764
Middle 20%	353	0.8283	0.8718	0.8557	0.8570
Next 20%	353	1.0176	0.8618	0.8989	0.8921
Last 20%	353	1.2926	0.8072	0.9022	0.8788
All Quintiles	1,765	0.8650	0.8792	0.8671	0.8642
Between Quintile-Squared Error of Average Loss Ratios ⁵					
Loss Ratio Quintile ²	Expected Losses	Manual ³	California Plan	NCCI Plan	NCCI Plan - Optimized ⁴
First 20%	198,233	2,234	23	597	504
Next 20%	265,621	662	9	161	153
Middle 20%	261,935	295	164	208	204
Next 20%	231,139	3	191	102	116
Last 20%	172,440	856	372	96	147
All Quintiles	1,129,368	4,050	759	1,164	1,124
Within Quintile - Mean Squared Errors of Individual Risk Loss Ratios ⁶					
Loss Ratio Quintile ²	Average Risk Size	Manual ³	California Plan	NCCI Plan	NCCI Plan - Optimized ⁴
First 20%	561,567	0.3315	0.0928	0.1229	0.1188
Next 20%	752,467	0.2021	0.1304	0.1430	0.1435
Middle 20%	742,025	0.5796	0.5616	0.5641	0.5637
Next 20%	654,785	0.3031	0.3288	0.3109	0.3122
Last 20%	488,499	0.6241	0.6128	0.4952	0.5008
All Quintiles	639,869	0.3975	0.3381	0.3253	0.3257
Notes:					
1. Subsequent Period Loss ratios are the ratio of actual losses to modified expected losses. Modified expected losses are expected losses multiplied by experience modification factors calculated with several different formulas.					
2. Quintiles are based on the ratio of actual to unmodified expected losses during the experience period.					
3. Manual refers to the ratio of actual to unmodified expected losses of the subsequent period.					
4. This is the NCCI Revised Plan with the credibility formulas re-calculated to minimize the sum of squared differences between the subsequent period ratio of actual to modified expected loss ratios and 1.000.					
5. The squared difference between the quintile ratio of actual to modified expected loss ratios (first table) and 1.000 multiplied by 10,000. The value for the all quintiles group represents the sum of the values for each quintile.					
6. The mean squared difference between an individual risk's subsequent period ratio of actual to unmodified expected losses and its experience modification factor.					

PERFORMANCE OF EXPERIENCE RATING PLANS
(By Loss Ratio)
SAMPLE CALCULATION OF EXHIBIT I SHEET 1 VALUES

1. Calculation of between Quintile Squared Error of Average Loss Ratio

a. Average Loss Ratio for California Plan - First 20% Quintile	.9217
b. Target Average Loss Ratio	1.000
c. Squared Error (a-b) ²	0.006131
d. (c)x10,000	61

2. Hypothetical example of Within Quintile Mean Squared Errors of Individual Risk Loss Ratios - California Plan - First 20%

(a) Risk Name	(b) Subsequent Period Expected Losses	(c) Subsequent Period Actual to Expected Loss Ratio	(d) RERP Experience Modification Factor	(e) Squared Error ((c)-(d)) ²	(f) Weight (b)/SUM(b)	(g) Weighted Squared Error (e) x (f)
Risk 1	20,551	.8765	.98	0.010712	0.194317	0.002082
Risk 2	29,988	.9286	.97	0.001714	0.283548	0.000486
Risk 3	12,645	.8879	.98	0.008482	0.119563	0.001014
Risk 4	10,911	1.5561	1.05	0.256137	0.103168	0.026425
Risk 5	31,665	3.8875	1.20	7.222656	0.299404	2.162494
Total	105,760				Sum:	2.1925

Summary of State Rating Laws

State	Role of Rating Organization	Adherence*	Deviations
Alabama	Rates	Advisory	Uniform %
Alaska	Rates	Required	Uniform %
Arizona	Rates	Required	Uniform %
Arkansas	Rates	Required	Yes**
California	Rates	Required	Min. Rate
Colorado	Loss Costs	Advisory	No Provision
Connecticut	Loss Costs	Advisory	No Provision
Delaware	Rates	Required	Yes**
Dist. of Columbia	Rates	Advisory	
Florida	Rates	Required	Uniform %
Georgia	Rates	Advisory	No Provision
Hawaii	Loss Costs	Required	Yes**
Idaho	Rates	Required	Uniform %
Illinois	Rates	Advisory	Upon Notice
Indiana	Rates	Advisory	Yes**
Iowa	Rates	Required	Yes**
Kansas	Rates	Required	Yes**
Kentucky	Loss Costs	Advisory	Yes**
Louisiana	Loss Costs	Advisory	Uniform %
Maine	Rates	Required	N/A
Maryland	Loss Costs	Advisory	Uniform %
Massachusetts	Rates	Required	Yes**
Michigan	Loss Costs	Advisory	N/A
Minnesota	Loss Costs	Advisory	N/A
Mississippi	Rates	Advisory	Uniform %
Missouri	Rates	Required	Yes****
Montana	Rates	Advisory	Permitted
Nebraska	Rates	Required	Uniform %
Nevada	++	++	++
New Hampshire	Rates	Required	Uniform %
New Jersey	Rates	Required	No Provision
New Mexico	Loss Costs	Advisory	Uniform %
New York	Rates	Required	Uniform %
North Carolina	Rates	Required	Uniform %
North Dakota	++	++	++
Ohio	++	++	++
Oklahoma	Rates	Required	Uniform
Oregon	Loss Costs	Advisory	N/A
Pennsylvania	Rates	Advisory	No Provision
Rhode Island	Loss Costs	Advisory	Uniform
South Carolina	Loss Costs	Required	Uniform %
South Dakota	Rates	Required	Yes**
Tennessee	Rates	Required	Uniform %
Texas	Rates	Required	None Permitted
Utah	Rates	Required	Uniform
Vermont	Rates	Advisory	N/A
Virginia	Rates	Required	Yes**
Washington	++	++	++
West Virginia	++	++	++
Wisconsin	Rates	Required	None Permitted
Wyoming	++	++	++

* Classified as required when adherence is required for all companies or bureau members. Classified as advisory when adherence is either prohibited or there is no provision for adherence.

** Deviations from class rates, schedules, rating plans or rules respecting any kind or combination of insurance are prohibited.

*** Company may adopt by reference with or without bureau rates.

**** Uniform % downward with support, unlimited upward.

++ Monopolistic State Fund.

SOURCES: National Council on Compensation Insurance and
National Association of Insurance Commissioners

Competitive Pricing 1989 - "NCCI" States

State	(a) 1989 Written Premium (in 1,000s)	(b) Rate Deprt. %	(c) Sched Rating %	(d) Divid. %	(e) Total Comp Pricing %	(f) Total Excl. Divid. %
Alabama	409,233	0.2	2.0	2.2	4.4	2.2
Alaska	179,250	5.9	1.5	2.6	10.0	7.4
Arizona	247,798	2.6	7.4	3.4	13.4	10.0
Arkansas	223,197	0.0	2.1	2.5	4.6	2.1
Dist. of Col.	144,394	0.6	3.9	6.4	10.9	4.5
Florida	1,558,042	1.3	0.0	3.6	4.9	1.3
Georgia	866,476	16.4	1.9	1.8	20.1	18.3
Idaho	89,562	1.3	0.0	4.9	6.2	1.3
Illinois	1,819,772	4.4	4.0	2.6	11.0	8.4
Indiana	446,060	0.1	0.0	2.3	2.4	0.1
Iowa	302,516	3.3	0.0	3.1	6.4	3.3
Kansas	264,446	3.4	0.0	3.6	7.0	3.4
Maine	319,406	0.0	0.0	5.4	5.4	0.0
Mississippi	248,738	0.2	2.5	2.7	5.4	2.7
Missouri	533,311	1.4	0.0	3.8	5.2	1.4
Montana	48,109	7.6	0.1	3.0	10.7	7.7
Nebraska	148,432	2.1	0.0	2.4	4.5	2.1
New Hamp.	229,318	2.8	0.0	3.6	6.4	2.8
N. Carolina	508,401	1.9	0.0	2.6	4.5	1.9
Oklahoma	234,961	0.5	0.0	2.8	3.3	0.5
S. Dakota	67,455	0.7	2.4	3.0	6.1	3.1
Tennessee	543,766	0.4	2.1	2.4	4.9	2.5
Texas	3,418,425	0.0	0.0	2.3	2.3	0.0
Utah	48,203	0.0	2.4	4.5	6.9	2.4
Vermont	83,593	3.2	0.0	3.7	6.9	3.2
Virginia	614,291	3.2	0.0	5.1	8.3	3.2
Wisconsin	748,949	0.0	0.0	7.1	7.1	0.0

All figures are shown as percentages of standard earned premium.

All percentages are downward departures unless otherwise indicated.

(a) Best's Executive Data Service - 1990 Edition.

(b) NCCI Policy Year Call; Data valued as of 12/31/89.

(c) NCCI Supplemental Call for Schedule Rating Adjustments as of 12/31/89.

(d) Best's Executive Data Service - 1990 Edition. The data available for dividends is on a calendar year basis.

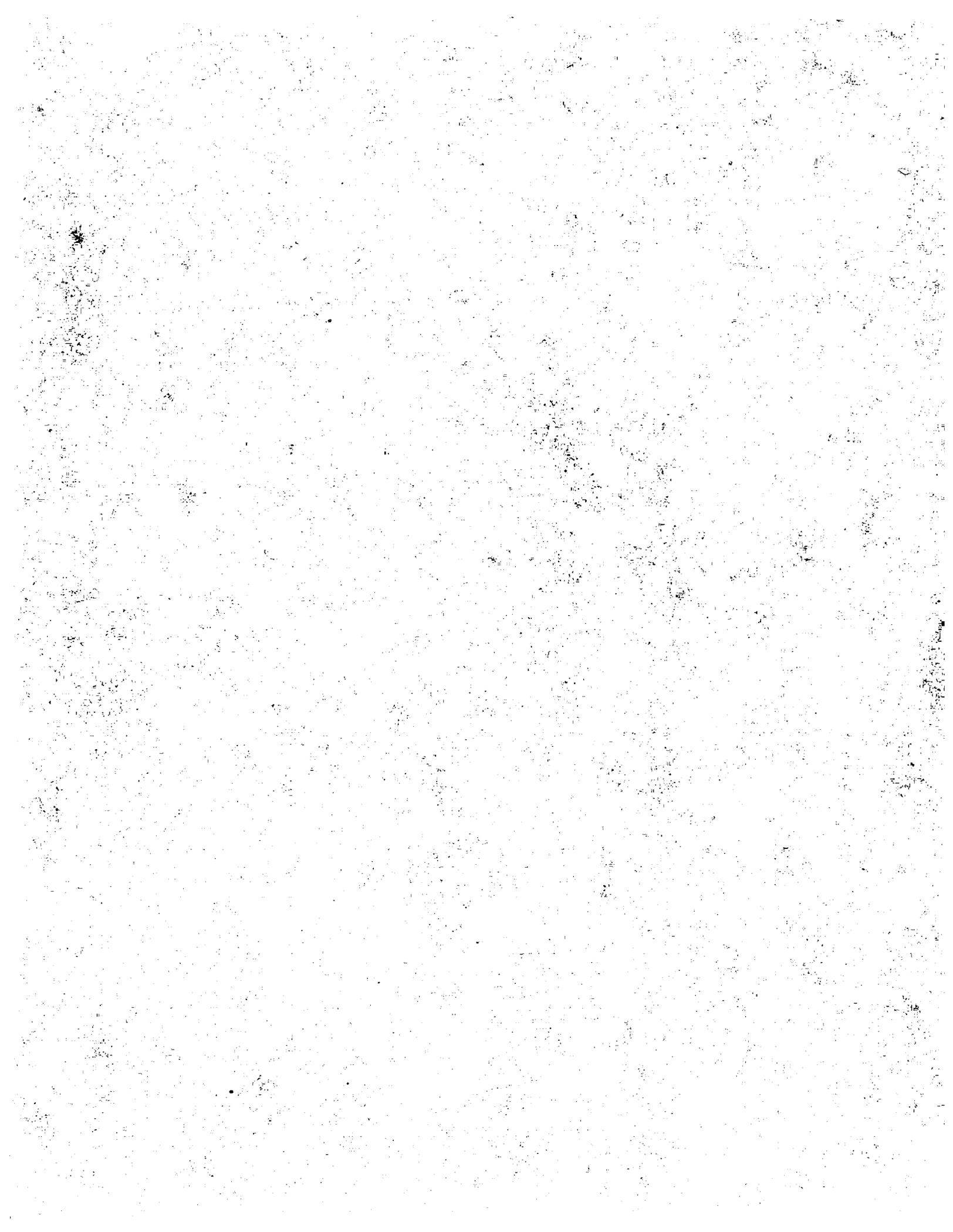
(e) Sum of Columns (b), (c), and (d).

(f) Sum of Columns (b) and (c).

APPENDICES

VOLUME IV

A.	ANALYSIS OF NET COST OF WORKERS' COMPENSATION	IV-APPENDIX-1
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**APPENDICES
VOLUME IV**

APPENDIX A

ANALYSIS OF NET COST OF WORKERS' COMPENSATION

SPECIAL NOTE:

This is supplemental data to the original report requested by the Commissioners.

TO: CALIFORNIA RATE STUDY COMMISSION

DATE: 2/14/92

FROM: DAVID APPEL

RE: ANALYSIS OF NET COST OF WORKERS' COMPENSATION

At the January 24, 1992 meeting several questions were raised regarding the analysis presented in Table 6 of our report on the Net Cost of Workers' Compensation insurance. Specifically, members of the Committee were interested in the results for the variable RATE4, which represents those states with administered pricing that allow rate deviations. This memo summarizes our findings. To facilitate comparisons, the analysis replicates the approach presented in the report. That is, descriptive statistics, trend regressions, and multivariate regressions were performed with the data disaggregated into two categories -- administered pricing states with deviations and all other types of rating systems.

Exhibit A contains the results of T-tests of the differences in means of the adjusted manual rate between administered pricing states with deviations and all other states. The tests were performed for each year in the sample and all years combined. In every instance, the mean adjusted manual rate was lower for administered pricing states that allow deviations. However, the differences are not statistically significant for the individual years. Only when all years are combined is the difference statistically significant ($T=1.89$, significant at .10).

Exhibit B contains the results of trend regressions which investigate the difference in the growth of the adjusted manual rate between the two categories of states. In the first panel of Exhibit B all the data have been pooled and a dummy variable introduced which takes the value of one for the administered pricing states allowing deviations. The coefficient on the dummy variable is $-.105$ ($T=2.07$) indicating that the net costs to policyholders for workers' compensation insurance is 10% lower for the indicator group. However, please note that due to the nature of the data, the regression models can not be estimated with individual state controls, and thus, the RATE4 measure may be capturing other systematic effects across states.

In the second and third panels of Exhibit B the data have been split into individual groups and separate trend regressions estimated. Curiously, the time trend coefficient is higher for the administered pricing states allowing deviations (.097 versus .082) indicating higher growth in costs for the indicator group. However, an F test confirms that the two categories of rating systems are not structurally different ($F=2.229$) and that it is inappropriate to consider separate regressions.

Exhibit C contains the results from multivariate analysis that seeks to assess the marginal impact of the rate system on the adjusted manual rate after controlling for a number of other significant factors. Similar to the previous work, the models explain a significant portion of the variability in the net cost variable, and the average benefit measure is once again the most significant and important explanatory variable. In these models, the coefficient on Rate4 is negative, and in model (3) -- the full model specification -- the coefficient is statistically significant. Once again models can not be estimated with individual state controls.

The findings of this supplemental analysis are somewhat inconclusive. The results indicate that costs might be lower for administered pricing states that allow deviations, although the results are only statistically significant for one regression model. Another way of viewing the results is that there is no evidence to suggest that costs are higher for administered pricing states allowing deviations.

However, while the results from this analysis may be of interest, it is not entirely clear that comparing administered pricing states that allow deviations with all other rating states is as clear a distinction as comparing competitive rating states with other rating systems. In our view, the finding that administered pricing states that allow deviations may have lower costs than other systems is somewhat difficult to interpret since the comparison group includes rating systems that are both more and less competitive. As a consequence, we urge caution in drawing any inferences from this analysis.

Further, given our prior findings concerning the significance of the individual state controls, we are not comfortable drawing any definitive conclusions from the analysis contained herein. The inability to control for the state effects will in some sense contaminate the effects attributable to the dummy variable. To the extent that the dummy variable is correlated with factors that may vary systematically across states, it is not clear that any differences in the adjusted manual rate may be attributed solely to differences in rate systems. The other caveats mentioned in the report regarding the imprecision of dummy variables in capturing differences in the intensity of regulation, and not explicitly modelling the rate systems themselves remain.

**CALIFORNIA RATE STUDY COMMISSION
DIFFERENCES IN MEANS (S.D.): NET COST TO POLICYHOLDERS**

Adjusted Manual Rate	
Panel A: All Years Combined (N = 229)	
Administered Pricing With Deviations	1.628
	(.716)
All Other	1.809
	(.737)
T	1.887***
Panel B: 1983 (N = 41)	
Administered Pricing With Deviations	1.092
	(.379)
All Other	1.357
	(.698)
T	1.584
Panel C: 1986 (N = 47)	
Administered Pricing With Deviations	1.522
	(.596)
All Other	1.713
	(.699)
T	1.000
Panel D: 1987 (N = 47)	
Administered Pricing With Deviations	1.632
	(.615)
All Other	1.816
	(.666)
T	.981
Panel E: 1988 (N = 47)	
Administered Pricing With Deviations	1.841
	(.755)
All Other	1.965
	(.650)
T	.603
Panel F: 1989 (N = 47)	
Administered Pricing With Deviations	1.981
	(.844)
All Other	2.178
	(.760)
T	.842

*** Significant at .10

**CALIFORNIA RATE STUDY COMMISSION
TIME TREND REGRESSION COEFFICIENTS (T-STATISTICS)
LN (ADJUSTED MANUAL RATE) = DEP VARIABLES**

VARIABLE	(1)
Panel A: All Data (N = 229)	
	Coefficients
Intercept	.095
Time	.089* (7.035)
Administered Pricing With Deviations	-.105** (2.071)
Adj. R ²	.184
Panel B: All Other States (N = 122)	
Intercept	.127
Time	.082* (4.412)
Adj R ²	.132
Panel C: Administered Pricing With Deviation (N - 107)	
Intercept	-.047
Time	.097* (4.412)
Adj R ²	.234

• Significant at .01

** Significant at .05

**CALIFORNIA RATE STUDY COMMISSION
DETERMINANTS OF NET COSTS OF WORKERS' COMPENSATION
LN (ADJUSTED MANUAL RATE) = DEP VARIABLE**

MODEL

VARIABLE	(1)	(2)	(3)
Intercept	-3.005	-2.581	-2.784
Rate 4	-.048 (1.243)	-.052 (1.048)	-.087*** (1.730)
Average Benefits	.689* (16.524)	.818* (10.612)	.728* (7.840)
Unemployment Rate	-.251 (.058)	-.351* (.003)	-.243* (.528)
Union Rate	.027 (.058)	-.000 .003	.038 (.528)
Treasury Bonds	.022 (.146)	.123 (.639)	-.004 (.219)
OSHA Lost Workdays	-	-.259*** (1.774)	-.171 (1.093)
Proportion P.P.	-	-	.212* (3.202)
Adj. R ²	.645	.665	.760
N	182	127	92

* Significant at .01
 ** Significant at .05
 *** Significant at .10

**STATE OF CALIFORNIA
WORKERS' COMPENSATION RATE STUDY COMMISSION**

- NOTES -

**STATE OF CALIFORNIA
WORKERS' COMPENSATION RATE STUDY COMMISSION**

- NOTES -

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- NOTES -

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