CALIFORNIA WORKERS COMPENSATION BENEFIT UTILIZATION

A STUDY OF CHANGES IN FREQUENCY AND SEVERITY IN RESPONSE TO CHANGES IN STATUTORY WORKERS COMPENSATION BENEFIT LEVELS

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Abstract

Traditionally, workers compensation insurance ratemaking in California assumed that the utilization of benefits was independent of changes in statutory benefit levels. This assumption was retained for many years in the face of growing evidence that changes in statutory benefits indirectly affected the utilization of those benefits. Because the overall level of benefit utilization is a function of many factors, however, it was difficult to isolate which changes in utilization resulted from changes in statutory benefits and which resulted from changes in economic or social variables, randomness, or other factors. This paper explores and attempts to quantify the causal link between changes in statutory benefit levels and changes in the utilization of workers compensation benefits.

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1. INTRODUCTION

Historically the Workers' Compensation Insurance Rating Bureau of California (the Bureau) has assumed frequency will not change in response to benefit level changes and severity will change by exactly the change in benefits.[1] If benefits are increased 10%, we expect no change in frequency and a 10% increase in severity, all other things being equal. However, if benefits are increased 10% and frequency increases 1% in response, then we say we have observed a 1% change in *frequency benefit utilization*, again, all other things being equal. If severity increases 12%, perhaps because durations have increased as workers stay on claim longer, then we say we have observed a 2% change in *severity benefit utilization*.

If we chronically over- or underestimate changes in frequency or severity by failing to recognize changes in utilization, then this error will be reflected in the residual trend component of the ratemaking process. We should be able to increase the accuracy of the ratemaking process by quantifying changes in benefit utilization and incorporating them into our on-leveling procedure, thereby removing them from the residual trend. The accuracy of both our on-leveling and trend procedures will be improved as well as our understanding of the workers compensation system.

Some changes are administrative rather than statutory. When we refer to statutory benefit levels, we mean both those promulgated by statute and those effected administratively.[2] Each

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[1]For the purposes of this paper, a change in *benefit utilization* means an indirect effect of the benefit change. That is, a change in frequency or severity that is related to the change in benefit level but not measured by the direct effect. The direct effect is measured by the Bureau's benefit level change estimate. Note that this definition is broader than that used for utilization in other contexts. For an overview of workers compensation ratemaking, including the role of benefit change estimates and their potential indirect effects, the reader should consult Feldblum [1]. In particular, Sections 5.C and 10 will be helpful to the reader not familiar with the issue of the indirect effects of benefit changes.

[2]As an example of an administrative change, in 1997 California's Division of Industrial Relations (DIR) revised the official Permanent Disability Rating Schedule (PDRS). The PDRS is used to evaluate an injured worker's loss of functional work capacity and culminates in the assignment of a permanent disability rating. The injured worker's weekly indemnity benefit is based on this permanent disability rating according to a schedule promulgated in California statute. The estimated impact of the DIR's revisions became controversial, highlighting the fact that these estimated cost impacts are just that, *estimates*. Sometimes they are revised ex post facto, as more information becomes available.

year the Bureau evaluates the expected impact of legislative and administrative changes on the cost of benefits. For the more common changes, the Bureau uses a model to estimate the impact. For the less common changes, the Bureau typically conducts a special study. In both cases, the estimated impact is used in the Bureau's pure premium ratemaking to adjust historical accident year indemnity losses to a current or prospective level. This estimated impact is for direct effects only.[3] It assumes there will be no change in benefit utilization. In economics parlance, it assumes that the utilization of benefits is inelastic.

Finally, we note that benefit utilization is internal to the workers compensation system. Changes in costs that result from changes in statutory benefits are a matter of public policy. California legislators and the administrators of the California workers compensation system routinely solicit the Bureau's estimated cost impacts for proposed changes. Public policy decision making will be enhanced if actuaries can estimate both the expected direct and indirect fiscal impacts of proposed changes in benefits.

2. HISTORY

In 1996 the Bureau's Governing Committee directed the Bureau to conduct a study to determine an appropriate loading in pure premium rates for changes in benefit utilization. The Bureau had commissioned two prior studies: Meyer [2] in 1991 and Appel [3] in 1992. Based on these studies, the Bureau incorporated into its pure premium ratemaking an adjustment to losses to reflect expected changes in utilization resulting from benefit level changes. The California Commissioner of Insurance, however, questioned the accuracy and method of incorporation of this utilization adjustment in his October 13, 1995 decision (Ruling

[3]For indemnity costs, this is no longer true. An earlier version of this paper was accepted by the California Department of Insurance as the basis for an adjustment to losses to reflect expected changes in utilization resulting from benefit level changes. This adjustment has been incorporated in the Bureau's filing for pure premium rates effective January 1, 1998.

No. 287). The Commissioner directed that a more in-depth study of utilization be undertaken before such an adjustment would be acceptable in pure premium ratemaking. This paper documents the findings of that study.

3. METHODOLOGY

The goal of this study is to quantify changes in frequency and severity that occur in response to changes in benefit levels. The model design selected assumes that the indirect effects of benefit changes are a function of the direct effects. That is, changes in benefit utilization are assumed to be a function of the Bureau's estimated changes in benefit levels. We will attempt to quantify this relationship using multivariate regression supplemented by nonparametric techniques where appropriate. Following is an outline of the methodology we will use to investigate indemnity frequency utilization. We will discuss medical frequency utilization along the way. Severity utilization will be discussed in a later section.

We will start by surveying graphically the candidate dependent and independent variables. We will look at the level of each variable over time and its annual percentage changes. We will then look at the correlations among variables. Here we are looking for combinations of the independent variables that are highly correlated with the dependent variable but not highly correlated with each other. We want to avoid highly correlated independent variables in a regression to avoid multicollinearity with its attendant risk of unstable and distorted least-squares estimates. It will happen that we will encounter a group of highly correlated independent variables that we wish to retain in the model. We will apply a special transformation, principal components extraction, to retain the explanatory variance while removing the multicollinearity. We will discuss this further at that time.[4]

[4]Readers wanting a review or more information on analysis of variance, multicollinearity, transformations, analysis of residuals, and other topics in regression analysis should see Miller [4].

The first correlations we will consider are the standard Pearson Product Moment Correlations. (These are the familiar correlations obtained using the appropriate function in Lotus or Excel.) The Pearson Product Moment Correlation between two variables assumes each is drawn from a normally distributed population. The significance of the Pearson correlation is only as strong as this assumption is valid. Because of this, we will also look at a nonparametric statistic, the Spearman Rank Correlation Coefficient. This statistic relies on much weaker assumptions. Intuitively, we will be most comfortable when these two measures of correlation are in agreement. Before proceeding, let us consider the common interpretation when these statistics are not in agreement.

If there is a significant correlation indicated by the nonparametric statistic but not the parametric statistic, then we propose that a correlation exists, but that it cannot be precisely measured. If there is a significant correlation indicated by the parametric statistic but not the nonparametric statistic, then we propose that the parametric statistic is erroneous, probably because of a violation of the underlying assumptions, though sometimes because of an outlier.[5]

Following this examination of the variables (Exhibits 1 through 4), a series of candidate regression models will be postulated. Each will be regressed and we will diagnose each model (Exhibit 5). We will first look to see if the coefficients make sense. We will compare the models' relative performance, adjusted for degrees of freedom. We will test each model for bias and the normality of its residuals. For the better models we will look more closely at performance and the appropriateness of the model's specification (Exhibit 6).

Following this, for the best models we will look at projected performance in practice (Exhibits 7 through 10, and 12). We will

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[5]Readers interested in more information on nonparametric statistics should see Ferguson [5] or Siegel [6].

do some sensitivity testing on our most novel variable (Exhibit 11). Finally, we will present the best model with confidence intervals for our point estimates. The best model will be presented along with three other models as a form of sensitivity testing of our economic variables (Exhibit 13).

Before proceeding to the main analysis, a technical aside is in order. During the following discussion the reader might wonder if a transformation of the data relating to workers compensation reporting bases was considered. It was. But to cut down on the volume of analysis to be presented and discussed, we will deal with this issue here, summarily.

Reporting Bases

In California, workers compensation rate level indications are based on calendar-accident year data while classification relativities are based on policy year data. Variables that are collected outside of the workers compensation system—economic variables, for example—are generally on a calendar year basis. Therefore, variables of interest may be on different reporting bases. Because there is a timing difference between variables with different reporting bases, the correlations between variables can be affected. This is essentially the same issue as whether there is a lagged correlation between two variables; here the lag would be due to the timing difference of the reporting bases.

To eliminate this lag, we explored transforming calendar year variables into policy year variables. For example, suppose premiums are written and losses occur uniformly over a year. (We used more exact distributions for our transformations.) Also, suppose real gross state product increased 0.01% in 1982 and 4.93% in 1983. Then policy year 1982 real gross state product increased 2.47% [(0.0001 + 0.0493)/2]. It turned out, however, that matching variables' reporting bases delivered inferior results. This implies that a slight lag exists between the calendar year events and their policy year manifestation.[6] That is, there is a higher correlation between a calendar year 1982 economic event and a policy year 1982 (not transformed) event, with an implicit six-month lag, than between the calendar year event and the policy year event transformed to match average dates of occurrence.

The policy year variables used in this paper are developed from the Bureau's Unit Statistical Reporting (USR) system. Incurred claim counts and exposures are defined per the California Workers' Compensation Uniform Statistical Reporting Plan. Frequencies are developed from the USR data in Appendix A; severities are developed in Appendix I. The benefit level variables, which are used to adjust historical losses to a current or projected benefit level, are calendar-accident year.

4. THE VARIABLES

We begin the analysis of indemnity frequency utilization by reviewing all available candidate variables. We preface this section by noting the importance of accounting for all significant factors that affect indemnity frequency. In the end, we would like to have accounted for as much variation as possible and we would like the variation unaccounted for to be purely random noise. We do not want any significant factors to be omitted from the final regression model. If they are omitted, then the model is misspecified. This misspecification may bias the estimates or lead to erroneous conclusions about the confidence we have in the estimates.

The variables considered in the analysis are presented graphically in Exhibit 1. The top graph of each part of Exhibit 1 displays the value of each variable over time. The bottom graph shows the annual percentage change in the original variable. A tabular presentation of the variables and their annual percentage

[6]The average date of occurrence for both calendar year and accident year variables is about July 1st. The average date of occurrence of a policy year variable is December 31st.

changes is presented in Exhibit 2. Following is a discussion of each variable.

Indemnity Claim Frequency

This is the dependent variable—our first target.

All frequencies are policy year claims per million dollars of reported payroll, adjusted to a 1987 wage level. Claim counts were taken from the Bureau's USR system at third report level. Payrolls were adjusted to a 1987 wage level using average wages developed from the California Statistical Abstract (Appendix A).

Part 1 of Exhibit 1 shows the history of indemnity claim frequency from policy year 1961 through 1994.

Medical-Only Claim Frequency

Medical-only claim frequency has exhibited a persistent long-term downward trend for over three decades (Exhibit 1, Part 2). This trend is counter-intuitive, as we would expect indemnity and medical-only claim frequencies to move together. There is a wide range of speculation regarding the causes of this trend. Suspect causes include changes in medical-only reporting patterns, the decreasing hazardousness of the California insured mix of business, or an increasing tendency for all claims to have an indemnity component. In any case, since medical-only claims represent less than 5% of workers compensation costs and there is a lack of consensus about this long-term trend's causation, no attempt was made to model medical-only utilization.

Total Claim Frequency

Total claim frequency (Exhibit 1, Part 3) was not analyzed. Total claim frequency is dominated by medical-only claims, which in policy year 1992 outnumbered indemnity claims by roughly two-to-one.

Indemnity Benefit Level

This is the key independent variable. The coefficient on this variable will measure frequency benefit utilization. If benefit level estimates are accurate and unbiased, then our a priori expectation is that the coefficient on this variable will be zero if no utilization effect is present. Absent a utilization effect, a change in benefit level will produce no change in frequency. If the coefficient was 0.3 and significant, then in response to a 10% benefit level increase we would expect a 3% ($0.3 \times 10\%$) increase in frequency. The null hypothesis is that this coefficient equals zero. If we can reject this hypothesis, then we can conclude a utilization effect is present and that the coefficient measures it as a function of the benefit level change.

Because the indemnity benefit level variable is key, it is critical that it be as accurate as possible and, perhaps more importantly, be unbiased. The process for quantifying the cost impact of benefit level changes was discussed earlier. Clearly, if the process is biased, we could inadvertently capture this bias in our model and falsely conclude there is a utilization effect where there is only systematic bias in our estimates of legislative changes. Some preliminary analysis suggested that historical benefit level estimates were indeed biased, and the Bureau revised its law amendment evaluation models to remove the bias.[7]

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[7]What was this bias? It was related to the Bureau's prior use of an average wage level intended to reflect the insured population. This has been replaced by an average wage level intended to reflect the expected insured *claimant* population, based on the Bureau's Individual Case Report data. This change addressed the fact that the average wage and wage distribution of the population of insured workers and the population of insured claimants are different. The latter is a subset of the former. The author has experimented with projecting the distribution of *insured* wages by fitting insured claimant wage distributions for successively higher levels of permanent partial disability. The underlying assumption here—though unproven—is that a primary cause of the difference between the insured and claimant wage distributions is self-selection and that the effect of self-selection diminishes with the seriousness of injury. Further improvements in the procedure to evaluate legislative changes may be possible by quantifying the relationship between the insured and claimant wage distributions as a function of benefit levels. Also, we note that the Bureau's evaluation methodology and the tables underlying the calculations were substantially the same throughout the period under study, so no bias was introduced by a change in methodology.

The calendar year indemnity benefit level history, revised to correct the bias discussed above, is presented in Exhibit 1, Part 4 and developed in Appendix B.

Medical Benefit Level

The medical benefit level index captures changes in California's Official Medical Fee Schedule and an index of hospital inflation costs. Unlike indemnity benefit level changes, however, a great many other factors affect medical costs in addition to the costs of medical procedures and hospital costs. Examples include the advent of managed care and the development of new technologies, such as magnetic resonance imaging and new arthroscopic surgery techniques. Indeed, these other factors are widely believed to have dominated changes in medical costs over the last several decades. For the task at hand, it may be impossible to isolate utilization effects out of this larger body of factors.

The calendar year medical benefit level history is presented in Exhibit 1, Part 5 and developed in Appendix B.

Total Benefit Level

The total benefit level combines the indemnity and medical benefit levels, weighted by their respective partial pure premiums. The calendar year total benefit level history is presented in Exhibit 1, Part 6 and developed in Appendix B.

Economic Variables

The general state of the economy is important in workers compensation. As an economy nears capacity, employees work longer hours, less skilled workers are pulled into the production cycle and the opportunity cost of safety measures may increase. As a result, claim frequency per worker varies with the economic cycle. We considered three economic variables in our analysis: aggregate employment, real gross state product, and the unemployment rate. The economic variables are shown graphically in

Exhibit 1, Parts 7 through 9. Each variable is specific to California, and its development is presented in Appendix C. These variables, which are broad measures of the robustness of the state's economy and labor market, serve to quantify changes in utilization that are a natural consequence of the economic cycle.

We note that the importance of economic influences in workers compensation systems is an on-going area of research. In this paper, we assume a priori that economic variables should be considered in the model.

Hazardousness Indices

The prior utilization studies commissioned by the Bureau examined only a subset of classifications. Only 50 classes were analyzed over a 22-year period in the 1992 study. Unfortunately, the selected classes may not be representative of the mix of business throughout the experience period. Changes in the mix of business may explain some of the changes in the overall utilization level over time. So, as California shifted from a predominantly manufacturing economy to a service economy over the last several decades, the level of hazardousness shifted concurrently. In 1970, for example, manufacturing classifications accounted for 16.9% of total workers compensation payroll; in 1990, 13.6%. The clerical standard classification 8810 grew from 20.7% of payroll in 1970 to 28.5% in 1990. To capture this phenomenon, we examined the entire insured population of classifications.

Additionally, two indices were developed to measure changes in the hazardousness of the insured California workers compensation population from policy year to policy year. The first index, the indemnity frequency hazardousness index, captures changes in frequency attributable to changes in the mix of business. The second index, the pure premium hazardousness index, captures changes in frequency and severity attributable to changes in the mix of business. These indices are developed in Appendix D.

These indices capture the subtle, long-term transformation of the California economy's level of hazardousness (Exhibit 1, Parts 10 and 11). Both illustrate the growing dominance of the service sector in the California economy. Because manufacturing is both more highly cyclical and more hazardous, the insured population's hazardousness fluctuates with the state's economic cycles. Throughout the period studied, the indemnity pure premium index fell sharply with the onset of recessions. This relationship may change in the future if the relative frequency and severity of claims among economic sectors changes.

Annual changes in these indices, however, were not highly correlated with annual changes in indemnity frequency (Exhibit 4, Parts 7 and 8). Indeed, indemnity frequency persistently increased over the period studied in spite of the decreasing hazardousness of the insured population. This does not mean the hazardousness indices are invalid or inaccurate. The hazardousness indices capture a long-term trend, while we are looking at annual changes. Further, the divergent trends in hazardousness due to changes in the mix of business and in indemnity frequency merely suggest there are other factors that are pushing indemnity frequency from different directions. In any complex system there may be a variety of forces that push in different directions at the same time. Though annual changes in the hazardousness indices did not prove relevant in the final model, we have included them here for their relevance to the utilization phenomenon and to introduce the concept of a metric for changes in mix of business.

Litigation Rates

Discretion makes benefit utilization possible and litigiousness is commonly considered a proxy for discretion in the workers compensation system. Benefit utilization exists because workers can exercise some discretion in the filing of workers compensation claims. In a textbook world, benefit utilization might not exist. No one would use workers compensation instead of vacation time, health insurance or unemployment insurance. Highly paid workers would not opt to use sick pay and health insurance benefits instead of workers compensation benefits.[8] But in the real world, many workers are presented with the choice to utilize their workers compensation benefit, or not, and this discretionary act is anecdotally correlated with litigation. To examine this, a variable measuring litigiousness was developed.

From 1972 to 1992 (except 1990) the California Workers' Compensation Institute (CWCI) collected information on the number of Applications for Adjudication filed with the Workers' Compensation Appeals Board (Appendix E). The CWCI ratioed the number of applications to the total number of claims to arrive at a litigation rate. This litigation rate might serve as a proxy for litigiousness. The denominator of this ratio, however, includes medical-only claims, which are rarely litigated. A ratio to indemnity claims would be a better measure. The litigation rate history, adjusted to an indemnity claim basis, is presented in Exhibit 1, Part 12. When the litigation rate is adjusted to an indemnity claim basis, the marked upward trend in the litigation rate disappears and the rate is fairly flat.

This result was surprising. The phenomenon of medical-only claims decreasing as a share of total claims is the obvious mathematical "cause" of the flattening of the litigation rate. When earlier years are adjusted to account for the lesser share of indemnity claims to total, the litigation rate for indemnity claims soars. The level of litigation suggested by this data is much higher than for other states. Some of this magnitude may be due to peculiarities associated with the survey method or California's adjudication process. Nevertheless, this data suggest the level of litigiousness in California not only is high, but also has been so for several decades. Still more surprising, changes in the litigation rate proved to be negatively correlated with changes in

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[8]The higher a worker's income over the maximum benefit, the lower the percentage of pre-injury income workers compensation benefits replace. The benefit, therefore, decreases as a worker's income increases, and at some point may actually present an additional burden.

indemnity frequency, a result counter to our a priori expectation. This raised uncertainty as to whether this variable is accurately measuring litigiousness or some other phenomenon. Because of this uncertainty, this variable was dropped from consideration in the analysis.

Ratio of Cumulative Injuries to Total Indemnity Claims

This is the ratio of incurred claims coded as cumulative injury as defined by the Unit Statistical Reporting system to total incurred indemnity claims for each policy year.[9] Note that this ratio does not necessarily rise or fall with changes in the frequency or absolute number of cumulative injury or total indemnity claims. Cumulative injuries never comprised more than 10% of indemnity claims. Therefore, it is not appreciably correlated with indemnity frequency by definition. This variable is probably a more direct measure of changes in the discretionary element than litigiousness because cumulative injury claims have a higher degree of discretion available. For example, if you have an accident on the job, a nasty cut say, you are more likely to be seen and sent to the human resources department to fill out a form. But initiating a carpal tunnel or stress claim is much more within a worker's sole control. Note that in the presence of a benefit level variable we expect the ratio to capture discretion *unrelated* to changes in benefit levels.

The ratio of cumulative injuries to total indemnity claims is presented in Exhibit 1, Part 13 and developed in Appendix F.

Principal Components of Economic Variables

The economic variables are highly correlated among themselves. The Pearson Product Moment Correlation between annual changes in real gross state product (rGSP) and aggregate employment (AggE) is 0.655; between rGSP and the unemployment rate

[9]This variable was suggested by Mr. James J. Gebhard, FCAS, MAAA, following the failure of the litigiousness proxy.

(Unemp), −0.892; between AggE and Unemp, −0.677. If regression is to be used, these correlations are too high to use more than one variable without risking multicollinearity—that is, the linear dependence of the independent variables. If independent variables in a model are linearly dependent, then least squares estimates tend to be unstable and may be far from their expected values. To extract any additional explanatory information lost by using only one economic variable while not introducing multicollinearity, the principal components of the economic variables were formed. Principal components are the uncorrelated linear combinations of the subject variables that maximize variability.[10]

The first and second principal components of two sets of economic variables were formed. The first set was annual changes in rGSP and AggE. The second set was annual changes in rGSP, AggE and Unemp. The principal components are presented in Exhibit 1, Parts 14 through 17. Their development is presented in Appendix G.

Self-Insurance Share Index

A complicating issue in virtually all analyses of the California workers compensation market is the changing composition of the insured population. The data collected by the Bureau represents only the insured population. When an employer exits the insured market by self-insuring, his experience under self-insurance is lost to the Bureau while his insured history cannot be isolated from the Bureau's historical experience. The reverse is true when an employer returns to the insured market from self-insurance. Clearly, the comings and goings of employers has the potential to distort the insured experience. This is particularly true when large groups of employers with unique experience come and go en masse.

[10]For more information on principal components see Chapter 8 of Johnson [7]. This is also a good general reference for multivariate regression.

This problem is neither unique to this analysis, nor to California. In fact, the potential exists for changes in the self-insured population to affect aggregate pure premium ratemaking. As an example, if a group of risks with poorer experience than the aggregate begins to exit the insured market over a period of time, an improving loss ratio will be picked up by the residual trend procedure. Not knowing that the improvement is due to a change in the mix of insureds, the trend might be forecast to continue beyond the time the insured population has stabilized. To address this problem, a variable was developed to measure changes in the self-insured market.

The self-insurance share index was developed to capture annual changes in self-insurance costs as a share of total California workers compensation costs. This variable is developed from information reported by the state and federal governments and the Bureau and compiled by the Social Security Administration. This variable is presented in Exhibit 1, Part 18; the development is presented in Appendix H. This variable captures only changes in the net volume of the self-insured market. Qualitative changes are not captured (i.e., whether the experience of the self-insured market is improving or deteriorating, absolutely or relatively).

There is no appreciable correlation between annual changes in the self-insurance share index and indemnity frequency (Exhibit 3 and Exhibit 4, Part 15). On this basis, we conclude that change in the level of self-insurance is not a candidate independent variable nor likely to affect the analysis.

5. THE MODELS

We first examined the correlations among the variables. The Pearson Product Moment Correlations among the variables' annual changes and the significance of these correlations are summarized in Exhibit 3. In all cases, the analysis was conducted on the least common denominator of years for a given set of subject variables. Note that the analysis was on the annual changes in these variables—not their absolute levels. For example, the annual change in the unemployment rate is an independent variable—not the unemployment rate itself. Further references to variables will mean their annual percentage changes unless otherwise stated.

The candidate variables were tested for normality (using Kolmogorov–Smirnov). All variables except the changes in indemnity and total benefit levels, which are clearly skewed, passed tests for normality. Note that interpretation of the significance of the Pearson Product Moment Correlation between two variables assumes both to be distributed normally and that our key independent variable is not.

Exhibit 4 presents a graph of each candidate independent variable against indemnity frequency as well as the regression of indemnity frequency on the independent variable and the Spearman Rank Correlation Coefficients. The normality assumption is not required of the Spearman Rank Correlation Coefficient. For the benefit level changes, Exhibit 4 also presents regressions with a dummy variable. The dummy variable is 1 for years with an indemnity benefit change and 0 otherwise. Introduction of the dummy variable did not improve the amount of variation explained by benefit changes alone. Note, however, that the nonparametric Spearman Rank Correlation is strong and highly significant.

We examined these variables to select candidates for multivariate regression. As discussed above, candidates should be reasonably correlated with frequency but not highly correlated with other variables in the model. From a review of the information in Exhibits 3 and 4, and other exploratory analysis, we chose models with the following structure.

Y-Intercept

Models with or without a constant term.

Benefit Level

Calendar year indemnity benefit level changes, total benefit level changes, or indemnity and medical benefit level changes separately. The coefficient on the benefit level variable measures frequency utilization. We will conclude there is no utilization effect if this variable is not significantly different from zero.

Economic Variable

We considered models with the following economic variables:

1. Real gross state product (rGSP);
2. Aggregate employment (AggE);
3. Real gross state product and aggregate employment (for comparison purposes only);
4. The first principal component of rGSP and AggE;
5. The first and second principal components of rGSP and AggE;
6. The first principal component of rGSP, AggE and the unemployment rate (Unemp);
7. The first and second principal components of rGSP, AggE and Unemp.

Ratio of Cumulative Injury Claims to Total Indemnity Claims

Models with or without the cumulative injury index.

A simple multivariate linear structure was selected, as no strong nonlinear or lagged patterns were present. We next performed multivariate regressions using Manugistic's STATGRAPHICS Plus (1995) statistical software. Kalmia's WinSTAT, Version 3.1 (1995) was also used for certain diagnostic tests and to confirm results obtained using STATGRAPHICS Plus.

6. THE RESULTS

Eighty-four multivariate regressions are possible with the selected variables. A summary of selected statistics for these eighty-four models is presented in Exhibit 5. Part 1 of Exhibit 5 summarizes all models using the indemnity benefit level; Part 2 summarizes all models using the total benefit level; Part 3, the indemnity and medical benefit levels separately. For the better models (as judged by R^2 adjusted for degrees of freedom), the indemnity benefit level consistently outperforms both the total and component benefit level models. This is not surprising, because, as discussed above, the medical benefit level measures only a narrow component of medical benefit costs and the connection between changes in medical costs and indemnity benefit utilization is tenuous.

The models are ordered by adjusted R^2 on each part of Exhibit 5. The mean residual error is presented for each model. This indicates whether or not the model is biased. We want a model whose mean residual error is very close to zero. The normality of the residual errors for each model was tested using the Kolmogorov–Smirnov and Shapiro–Wilks tests. A low p-value on these tests means we can conclude the residuals are not distributed normally. The primary concern is that the residuals are skew. A low p-value on the skewness test would indicate a model's residuals are more skew than the normal distribution's. A low p-value on the kurtosis test would indicate a model's residuals are not as kurtotic as a normal distribution. A few models fail ($p < 0.10$) both the Shapiro–Wilks and kurtosis tests—but neither the Kolmogorov–Smirnov nor skewness tests. These models' residuals are more highly kurtotic than a normal distribution's. This is not bad—it means the actual data are more tightly distributed about the fitted line than if they were normally distributed.

The seven models with the highest adjusted R^2 include the cumulative injury index variable and a constant term. The regression output for these seven models is presented in Exhibit

6. All seven models are significant based on an analysis of variance. The model with the highest adjusted R^2 explains 91.4% of the variance in annual changes in indemnity claim frequency. However, the second principal component of this model is not significant at a 90% or higher confidence level. The model excluding this term (with the second highest adjusted R^2) explains 88.7% of the variance and all terms are significant at a 95% confidence level. This model, Model 2, includes the indemnity benefit level, a constant term, the first principal component of rGSP, AggE and Unemp, and the cumulative injury index.

Three other models have terms that are all significant at a 95% confidence level, each differing in the choice of economic variable. The fifth model includes the first principal component of rGSP and AggE. The sixth model includes AggE. The seventh model includes rGSP. These models explain 86.1%, 84.2% and 82.9% of the variance, respectively, as compared to the second model, which explains 88.7%. Exhibits 7 through 10 present a graphical analysis of each of the four models (Models 2, 5, 6 and 7).

The graph on Part 1 of Exhibits 7 through 10 shows the actual and fitted annual percentage changes. Part 2 of each exhibit demonstrates application of the model to predict annual frequency changes presuming we have past or estimated frequency information. That is, Part 2 is analogous to the graph on Part 1, but with a one, two or three period projection interval. For example, in the first graph of Part 2 of Exhibit 7, if we are projecting policy year 1997 we must know or have estimated the indemnity frequency for policy year 1996 and the benefit level changes and economic variable changes for 1997. The second graph, again projecting policy year 1997, assumes we have the frequency for policy year 1995 and the benefit level and economic variable changes for 1996 and 1997. These graphs illustrate how the fitted models would perform in practice. Part 3 of Exhibits 7 through 10 parallels Part 2, but for the level of indemnity claim frequency—not the annual changes in it.

These results are promising. A large portion of the annual variation in indemnity frequency is explained. The overall models are highly significant (based on an analysis of variance) and all the variables in the models are significant at a 95% level of confidence. The estimates of the coefficient on the indemnity benefit level range from 0.221 to 0.321, with the estimate for the most powerful model squarely inside this range at 0.262. So our best estimates using a variety of economic variables fall within a fairly narrow range.

One weakness of these results is the limited time frame of observation. Only sixteen years of data were available concurrently for the included variables. This limitation was imposed by the cumulative injury index, which was available beginning with policy year 1977. A key concern here is the number of economic cycles over which the economic variables were observed. With economic variables we would like to include several economic cycles to have greater confidence in our findings. To examine what impact this limitation may have had, we look now to the same models, but exclude the cumulative injury index.

Models Excluding the Ratio of Cumulative Injuries to Total Indemnity Claims

Thirty years of data are available for models including the indemnity benefit level, a constant term and the economic variables presented in Exhibits 7 through 10. Selected results for these regressions appear on Exhibit 5, Part 1 and the regression output is included in Exhibit 11. Although the models explain only 18.8% to 20.3% of the total variation (adjusted for the degrees of freedom), all four are significant at the 95% confidence level based on an analysis of variance. The coefficients on the indemnity benefit level range from 0.287 to 0.330. This range overlaps considerably the range of the models that include the cumulative injury index. Additionally, these coefficients are significant at the 90% confidence level in two models and the 95% confidence level in the other two.

Clearly, the introduction of the cumulative injury index does not significantly affect the estimated indemnity benefit level coefficient. The estimates would be only a few points higher without this variable. The cumulative injury index does, however, explain over 60% of the variance and allows us to be confident our utilization estimates are not distorted due to a misspecified model with a large portion of unaccounted-for variance.

Interpretation of the Negative Constant Term

The constant term in the final model is statistically significant. It is also negative, implying that, all other things equal, indemnity frequency will fall 3.58% per year. Why might this be?

Note that the coefficient on the first principal component of the three economic variables is negative. It happens here that a negative first principal component corresponds to an expanding economy while a positive first principal component corresponds to a recessionary economy.

Consider the median value of the first principal component over the fifteen-year fitting range. This value corresponds to 1989 and is −4.7881 (Exhibit 2, Part 2). In 1989 California's real gross state product grew 3.8%, aggregate employment grew 3.6% and the unemployment rate fell to 5.1% from 5.3% the prior year. The increase in frequency for 1989 due to the state of the economy is about 1.03% [-0.214998×-4.7881]. Indeed, 1989 seems representative of what we might expect for long-term economic growth.

But long-term, frequency, which is a rate and not an absolute number, cannot increase without bound. If it did, at some point our model would project every insured to file a claim on average! If our future were a series of 1989s without end, we would project annual increases of 1.03% in frequency, without end. Clearly the model would be misspecified. To balance the economic variable, the model must have some offset for the long-term level of economic growth. This offset is reflected in the constant term.

The situation with the indemnity benefit level is similar. In California, statutory benefit levels are not indexed to inflation. To maintain the real (inflation adjusted) value of indemnity benefits, periodic increases must be made. Over the years, we expect some portion of benefit level increases reflect adjustments to maintain purchasing power. But these adjustments have been made sporadically. In the intervening years, the *real* purchasing power of indemnity benefits is decreasing. It is being deflated by inflation. If frequency is sensitive to changes in *real* benefit levels, then we expect frequency to decline on average during the years when real benefit levels are falling (i.e., in years when benefit level changes are less than inflation). This phenomenon is reflected in the constant term.

Finally, as discussed above in the development of the hazardousness indices, the mix of business in California has been changing over the last several decades. Although annual changes in hazardousness did not predict annual changes in indemnity frequency, this does not mean the long-term trend in hazardousness is absent from our model. Both the average and median change in indemnity frequency as measured by the indemnity frequency hazardousness index are about −0.75% per year over 1978–1992. This long-term trend is reflected in the constant term.

Returning to our fitted models, Exhibit 12 presents additional performance information for the seven models in Exhibit 6. The average absolute error and adjusted R^2 are presented for the fitted model and the projection interval models. The relative performance of the projection interval models is consistent with the performance of the original models. The accuracy of the models does not deteriorate excessively with the increasing projection interval.

These results indicate that we can be highly confident that an indemnity frequency benefit utilization response exists and is statistically significant. Our estimates of this response are remarkably stable over different time periods, a variety of economic variables, and the inclusion or exclusion of a variable to capture changes in the non-benefit-related discretionary element in the workers compensation system.

7. APPLICATION

Exhibit 13 presents the indemnity frequency benefit utilization point estimates and confidence intervals for the four models in Exhibits 7 through 10. The best estimate of indemnity frequency benefit utilization, Model 2's estimate, is from Exhibit 7. The model indicates that indemnity frequency would increase 2.6% in response to a 10% increase in the indemnity benefit level. The model is linear and might be interpreted also as implying that a 10% decrease in the indemnity benefit level would produce a 2.6% decrease in indemnity frequency. However, no benefit level decreases were included in the parameterization of the models, so any conclusions about the utilization response to benefit level decreases would be extrapolating beyond the data, with its attendant risks.

We should stress that the Bureau's goal here was quantifying the utilization effect—*not* forecasting the future level of indemnity frequency. Although the models developed here can be used to project future levels of indemnity frequency (and we tested their performance to do so), the Bureau's first concern was with the benefit level coefficient to estimate expected utilization effects. We examined whole models under the theory that our confidence would be higher if both the whole and its parts were sound and because a regression approach is always sounder when most of the variance is explained by the model.

8. SEVERITY

Two analyses parallel to the above analysis of indemnity frequency were performed for indemnity severity—one using calendar year benefit level changes and one using policy year benefit level changes. Exhibit 14 graphically presents indemnity severity and real indemnity severity (adjusted to a 1982-84 level using the California Consumer Price Index). Exhibit 15 tabulates the value of each variable and its annual percentage changes. Exhibit 16 shows the Pearson Product Moment Correlations among the variables. Exhibit 17 shows a graph of the indemnity benefit level against indemnity severity and real indemnity severity as well as the regression of the severities on the indemnity benefit level and the Spearman Rank Correlation Coefficients.

Note that while the Pearson Product Moment Correlations appear respectable, the nonparametric correlations are small and insignificant. Nor do the graphs reveal any relationship between changes in severities and changes in indemnity benefit levels. The lack of any nonparametric correlation suggests that the parametric statistics are spurious. This is bolstered by our visual inspection.

Because we can find no correlation with our target independent variable—benefit level changes—our analysis stops here. This does not mean, however, that we could not build a model for changes in severity that are a function of economic or other factors. Since we are reasonably confident that our approach will not work here, today, with this data, we have tried to do no more. We do not imply more could not be done. Remember, our goal was to quantify changes in utilization as a function of changes in benefit levels—not to create a model for severity.

This situation highlights a common trap in regression analyses. Had we not looked at the dependent variable and target independent variable graphically and used a nonparametric test, it might have seemed appropriate to cobble together a model with a deceptively satisfying R^2. In fact, one can be put together. Would the model have passed an analysis of variance or would the t-statistics on the individual parameters have been significant? Perhaps. Would we have examined the mean residual error for bias or tested the residuals for normality? Hopefully.

To summarize, we found no relationship between changes in calendar year indemnity benefit levels and changes in indemnity severities. As discussed earlier in the text, we also looked at the policy year transformation of the indemnity benefit levels to confirm that the results were not a result of a poor matching between the dependent and independent variables.[11] Using policy year changes, we were able to develop models with high adjusted R^2, though they were very skew and, for the better models, the coefficients on the benefit level changes were not significantly different from zero. We also explored adding the self-insurance share index. This variable never reached statistical significance in any of the regressions.

9. CONCLUSION

We found no evidence of a benefit utilization effect for either medical costs or indemnity severity. The lack of correlation for medical costs did not surprise us. The delivery of medical benefits in the California workers compensation market has been in a state of flux for some time and will likely continue to be so in the near future. Because of this, isolating medical benefit utilization will likely be very challenging, if even possible, at present.

We were surprised to find no correlation between changes in indemnity severity, real or nominal, and changes in indemnity benefit levels. We had been conditioned by anecdotal evidence to expect a relationship. But we found none. A difference in statistical approach and rigor may be involved. We remind the reader of the importance of the visual inspection and nonparametric tests in rejecting the seemingly significant parametric findings. Also,

[11] These results were presented at the March 31, 1997 Actuarial Committee meeting of the Workers' Compensation Insurance Rating Bureau of California. They are not reproduced here but are available from the author or the Bureau.

the experimental design assumed that indirect effects could be modeled on the direct effects. Perhaps there is a relationship, but it is just too complex for a linear model. Or perhaps there was simply too much noise in California over this period of time. Our findings are, of course, temporal and local and we do not imply a relationship might not exist in the future or in other states. Nevertheless, seeing how we cannot support a severity utilization effect may be as important to our understanding as finding one, though perhaps not as gratifying.

We have developed two metrics which measure changes in hazardousness due to changes in mix of business—the indemnity frequency hazardousness index and the indemnity pure premium hazardousness index. As discussed above, although annual changes in hazardousness did not predict annual changes in indemnity frequency, this does not mean the long-term trend in hazardousness is absent from our model. This long-term trend is reflected in the constant term, and our metric has allowed us to quantify this trend. The hazardousness index may have other applications and may yet prove to be a significant variable in a model of a future, more stable economy and workers compensation system.

We have succeeded in developing a sound model of indemnity claim frequency. We can be highly confident that an indemnity frequency benefit utilization response exists and is statistically significant. This response is remarkably stable over different time periods, a variety of economic variables, and the inclusion or exclusion of a variable that captures changes in the non-benefit-related discretionary element in the workers compensation system. Our estimate of the utilization response to changes in indemnity benefit levels does not differ significantly from those of prior studies, yet the model has improved on the accuracy of the estimate and the level of confidence in the pure premium ratemaking adjustment. While there is still much to be learned, we are pleased to have made one solid step forward to a better understanding of workers compensation benefit utilization.

REFERENCES

[1] Feldblum, Sholom, “Workers Compensation Ratemaking,” Casualty Actuarial Society Part 6 Study Note, September 1993.

[2] Meyer, Robert E., “A Study of Workers’ Compensation Benefit Utilization,” submitted to the Workers’ Compensation Insurance Rating Bureau of California, October 1991.

[3] Appel, David, and David Durbin, “Impact of Economic Conditions on Workers’ Compensation Benefit Utilization,” Report to the Workers’ Compensation Insurance Rating Bureau, August 1992.

[4] Miller, Robert B., and Dean W. Wichern, *Intermediate Business Statistics: Analysis of Variance, Regression, and Time Series*, New York: Holt, Rinehart and Winston, 1977.

[5] Ferguson, George, *Nonparametric Trend Analysis*, Montreal: McGill University Press, 1965. Available from UMI Books on Demand, Ann Arbor, Michigan.

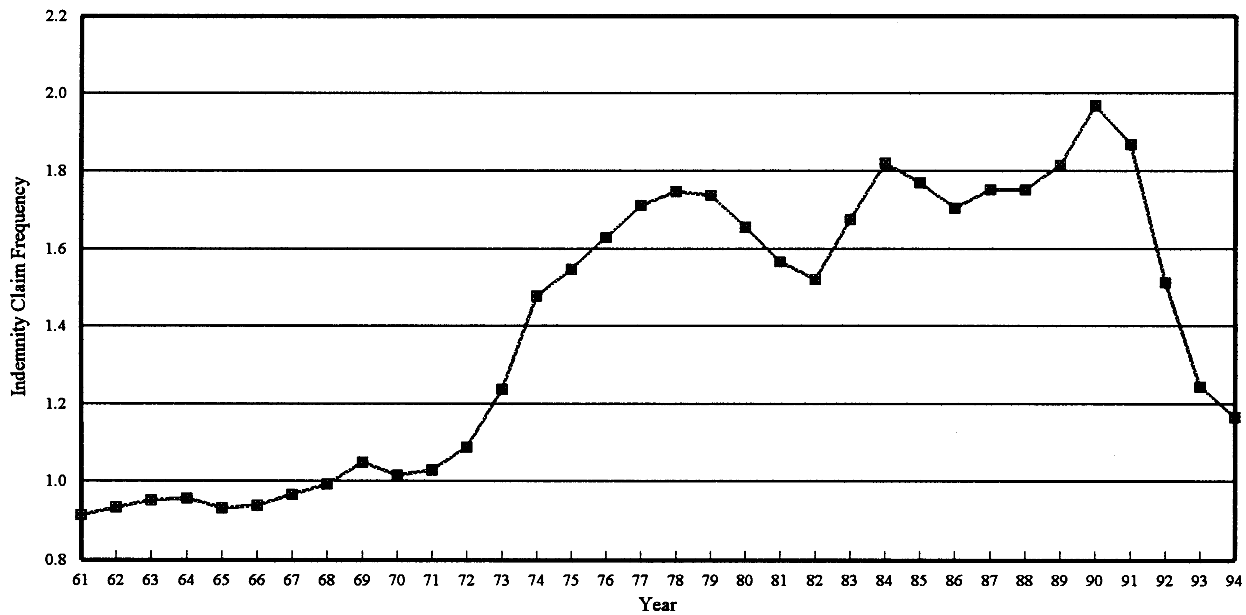
[6] Siegel, Sidney, and John N. Castellan, Jr., *Nonparametric Statistics for the Behavioral Sciences*, Second Edition, Boston: McGraw Hill, 1988.

[7] Johnson, Richard A., and Dean W. Wichern, *Applied Multivariate Statistical Analysis*, Third Edition, Englewood Cliffs, New Jersey: Prentice Hall, 1992.

EXHIBIT 1

PART 1—PAGE 1

INDEMNITY CLAIM FREQUENCY



Source: W.C.I.R.B. of California Unit Statistical Reporting Plan.
California Class Experience at 3rd report except 1992 - 1994 at latest report level as of 11/12/96.
Frequency is claims per $1 Million Payroll at 1987 wage level - see Appendix A.

EXHIBIT 1

PART 1—PAGE 2

ANNUAL PERCENT CHANGE: INDEMNITY CLAIM FREQUENCY

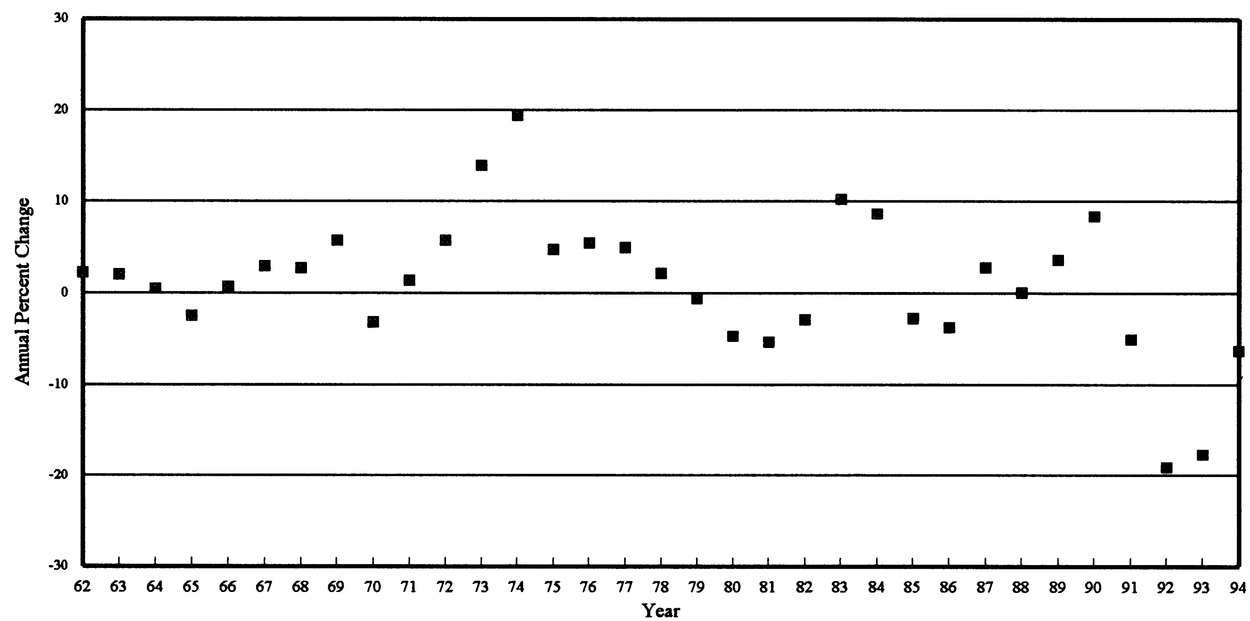
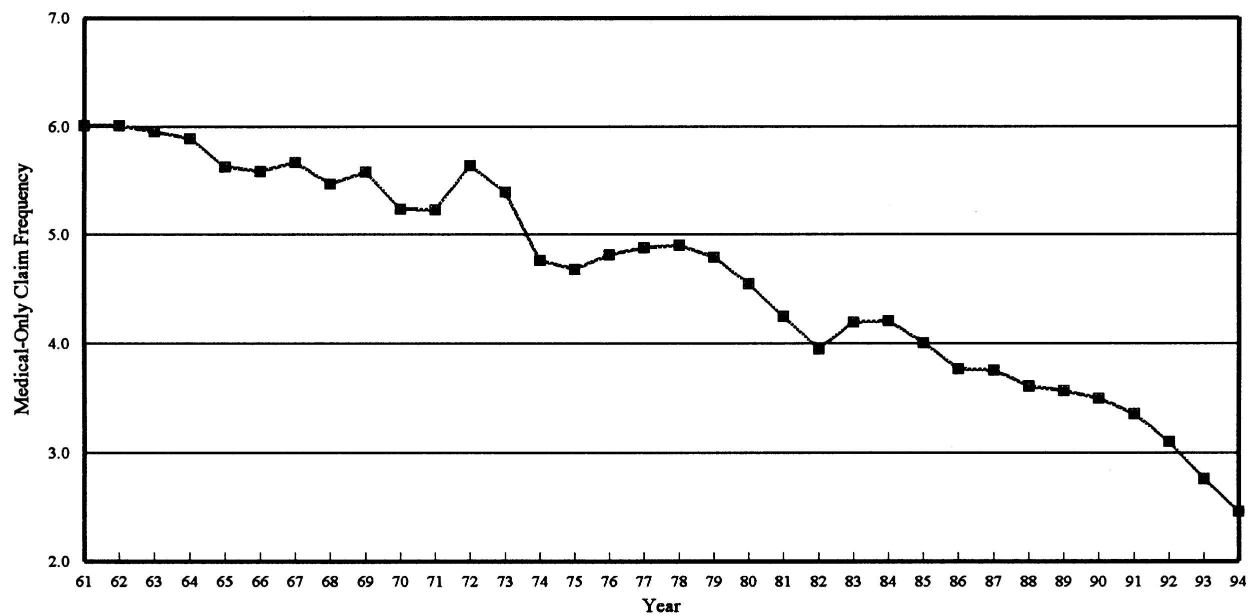


EXHIBIT 1

PART 2—PAGE 1

MEDICAL-ONLY CLAIM FREQUENCY



Source: W.C.I.R.B. of California Unit Statistical Reporting Plan.
California Class Experience at 3rd report except 1992 - 1994 at latest report level as of 11/12/96.
Frequency is claims per $1 Million Payroll at 1987 wage level - see Appendix A.

EXHIBIT 1

PART 2—PAGE 2

ANNUAL PERCENT CHANGE: MEDICAL-ONLY CLAIM FREQUENCY

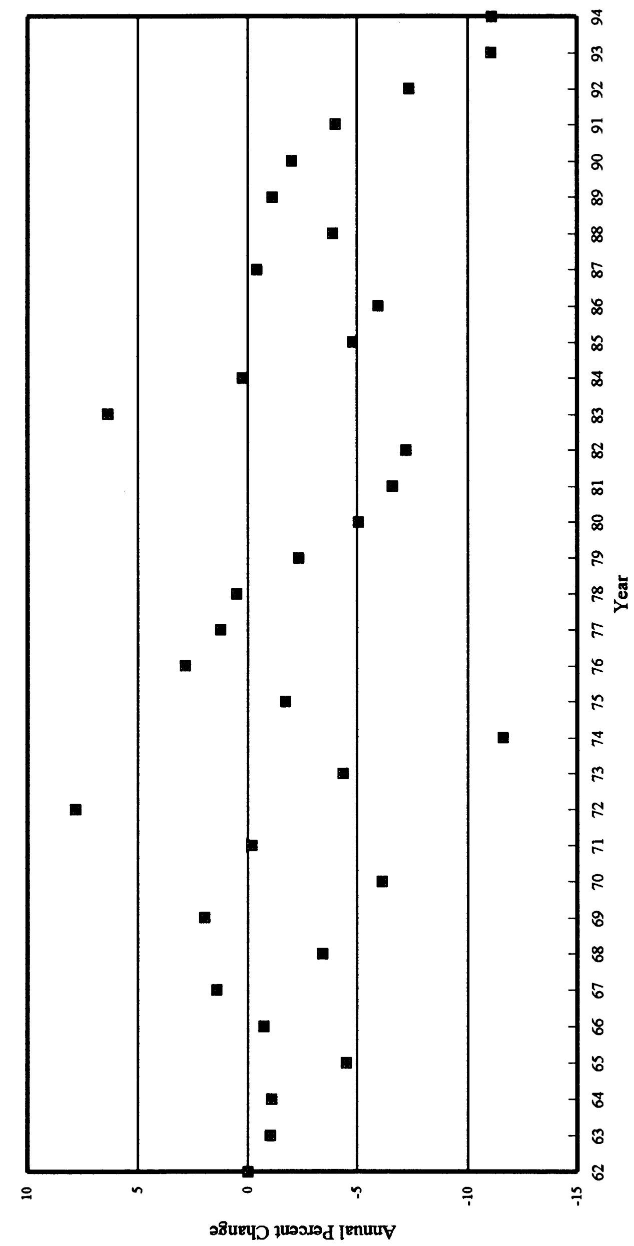
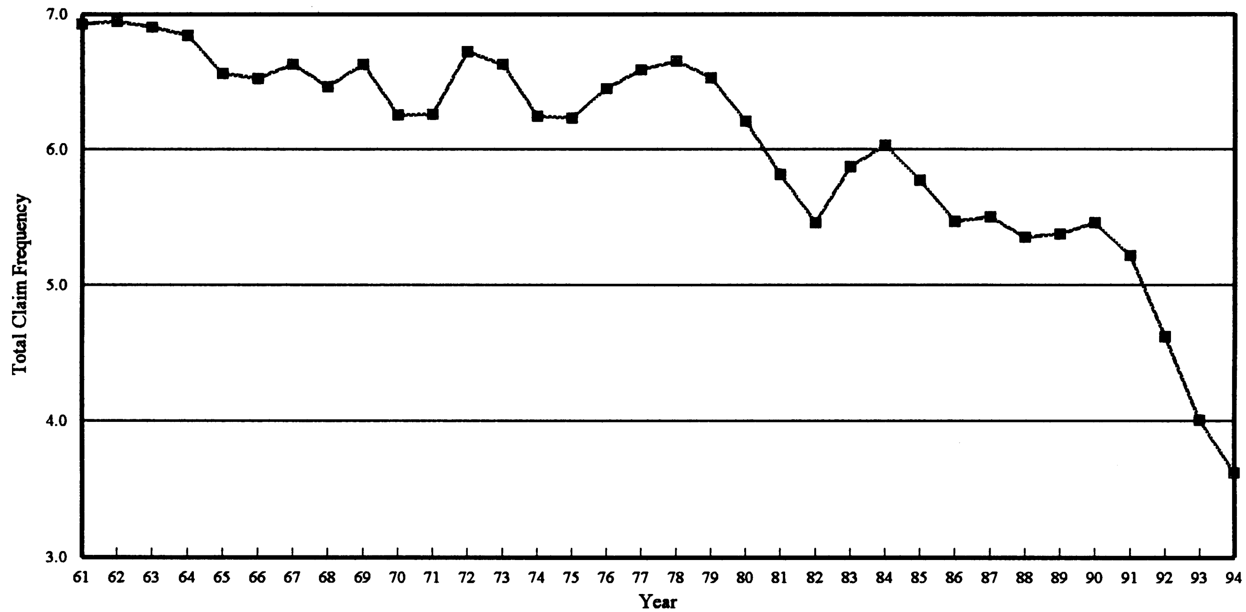


EXHIBIT 1

PART 3—PAGE 1

TOTAL CLAIM FREQUENCY



Source: W.C.I.R.B. of California Unit Statistical Reporting Plan.
California Class Experience at 3rd report except 1992 - 1994 at latest report level as of 11/12/96.
Frequency is claims per $1 Million Payroll at 1987 wage level - see Appendix A.

EXHIBIT 1

PART 3—PAGE 2

ANNUAL PERCENT CHANGE: TOTAL CLAIM FREQUENCY

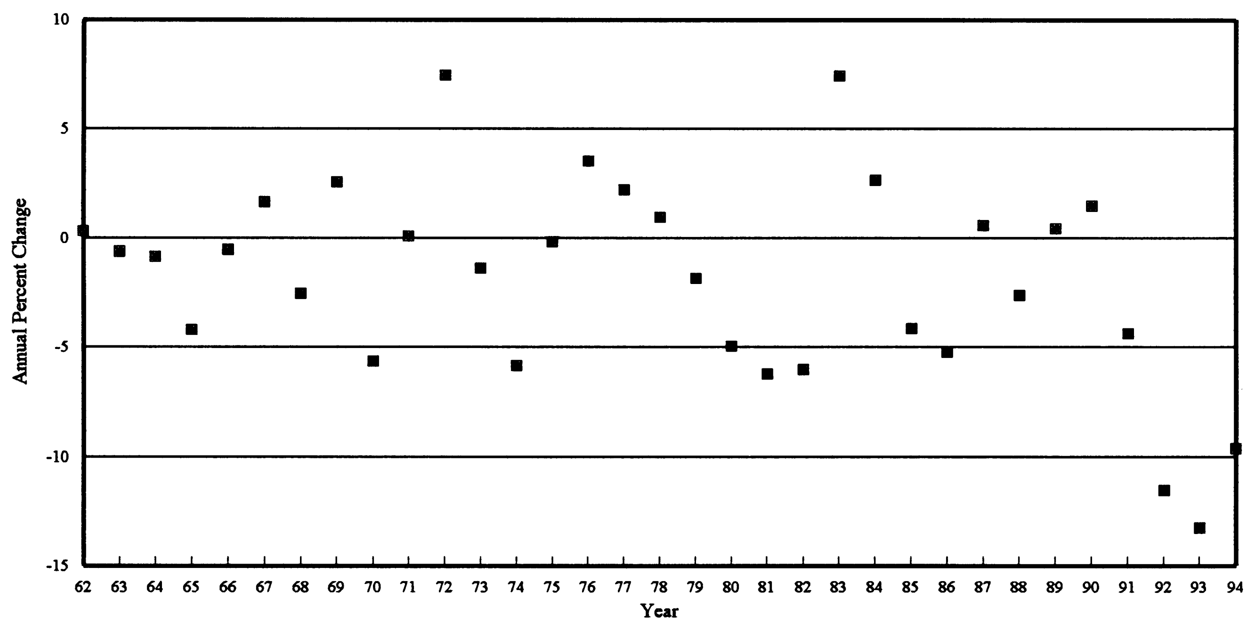
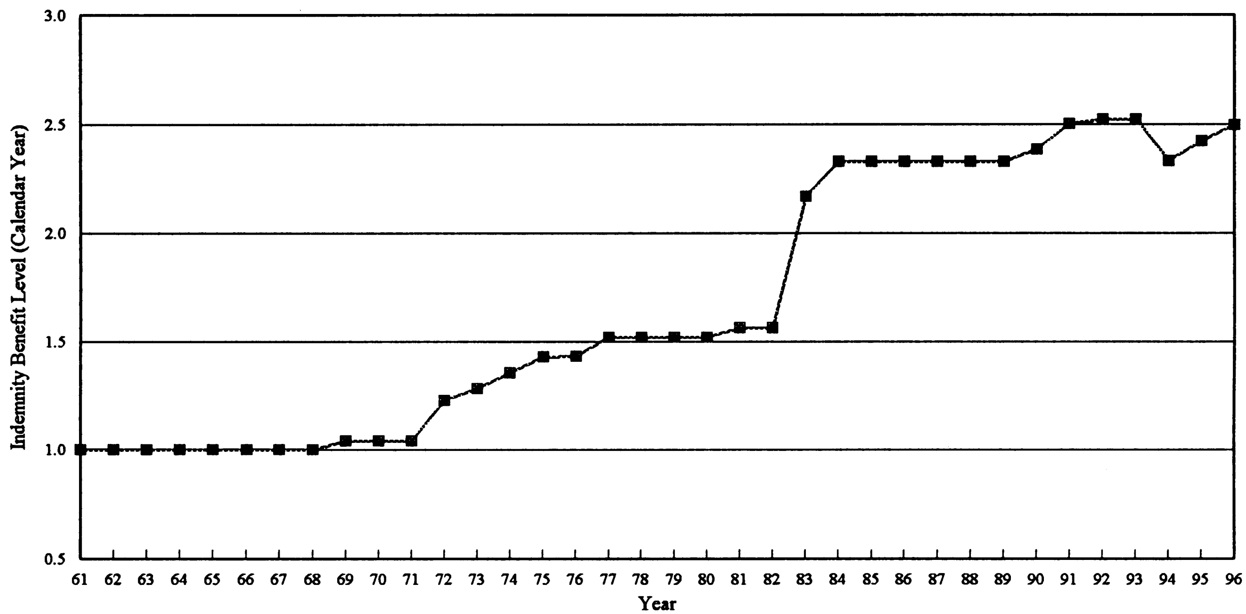


EXHIBIT 1

PART 4—PAGE 1

INDEMNITY BENEFIT LEVEL



Source: W.C.I.R.B. of California Analysis of Legislative Benefit Level Changes - see Appendix B.

EXHIBIT 1

PART 4—PAGE 2

ANNUAL PERCENT CHANGE: INDEMNITY BENEFIT LEVEL

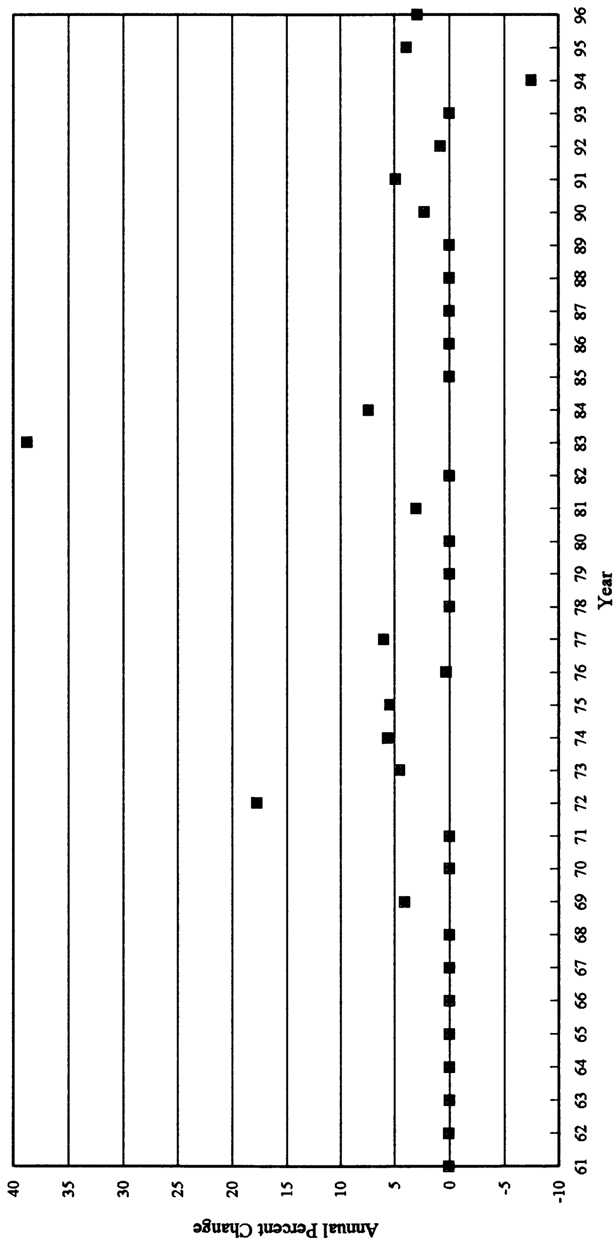
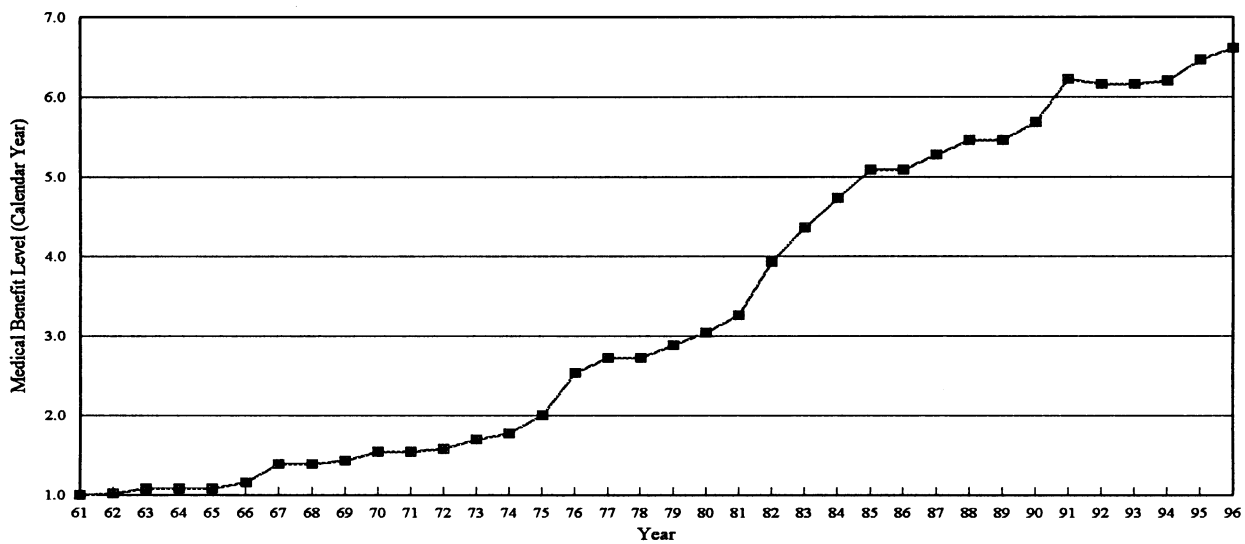


EXHIBIT 1

PART 5—PAGE 1

MEDICAL BENEFIT LEVEL



Source: W.C.I.R.B. of California Analysis of Legislative Benefit Level Changes - see Appendix B.

EXHIBIT 1

PART 5—PAGE 2

ANNUAL PERCENT CHANGE: MEDICAL BENEFIT LEVEL

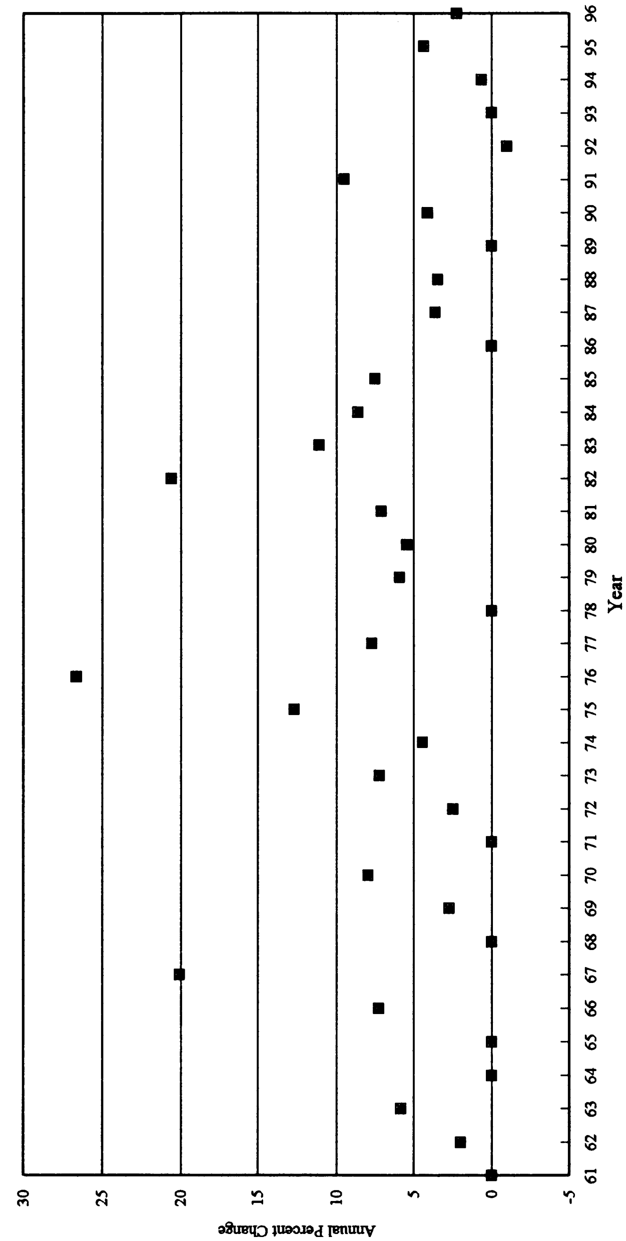
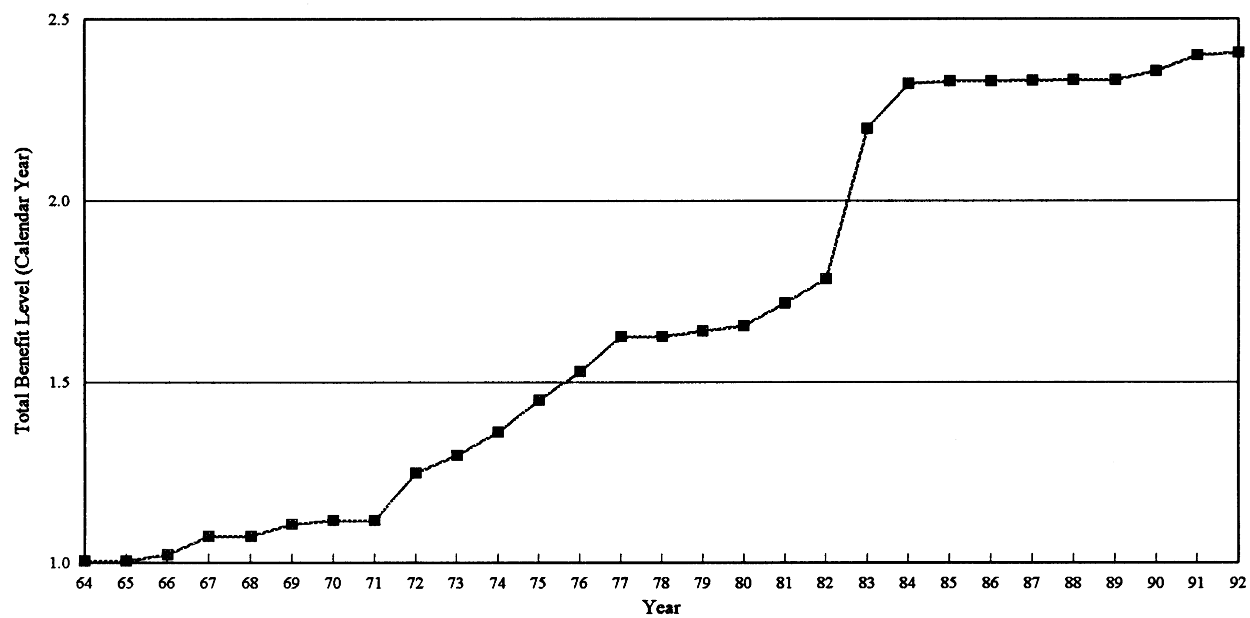


EXHIBIT 1

PART 6—PAGE 1

TOTAL BENEFIT LEVEL



Source: W.C.I.R.B. of California Analysis of Legislative Benefit Level Changes - see Appendix B.

EXHIBIT 1

PART 6—PAGE 2

ANNUAL PERCENT CHANGE: TOTAL BENEFIT LEVEL

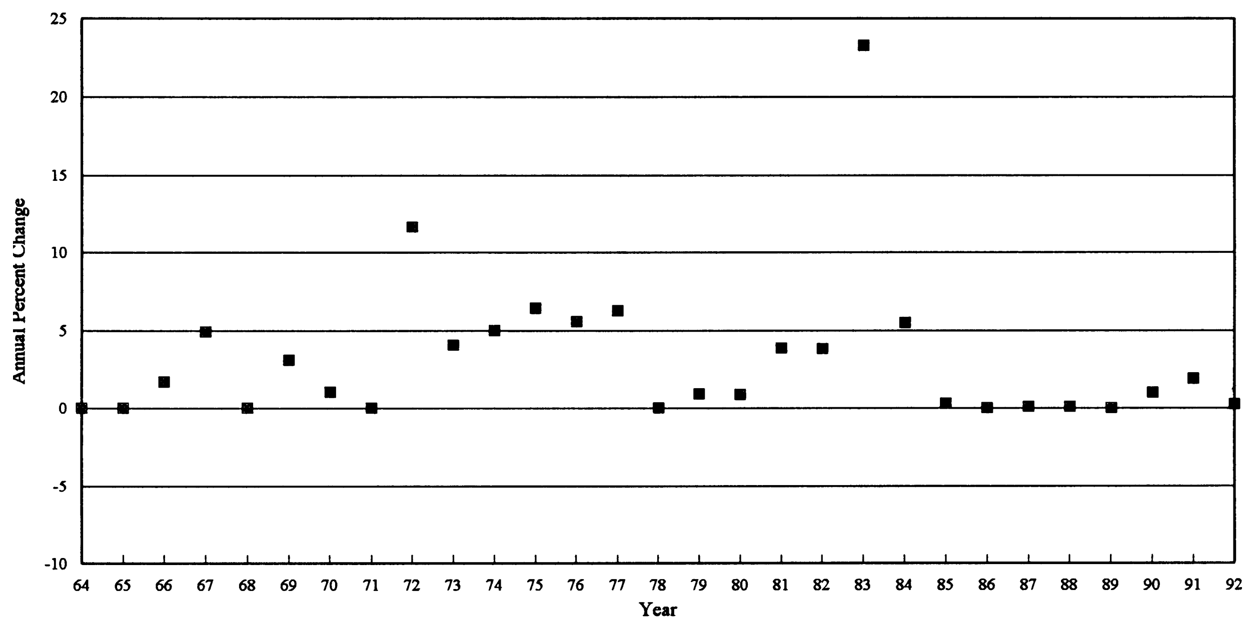
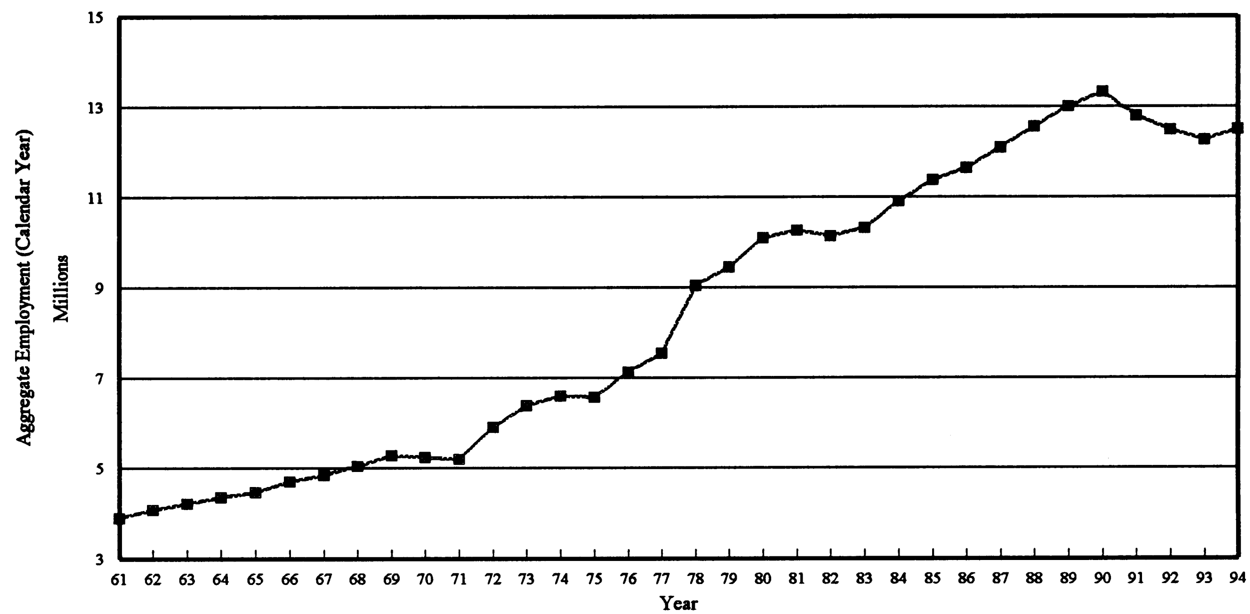


EXHIBIT 1

PART 7—PAGE 1

CALIFORNIA AGGREGATE EMPLOYMENT



Source: 1995 California Statistical Abstract - (Average Monthly Employees Covered by Unemployment Insurance)
See Appendix C, Part 1.

EXHIBIT 1

PART 7—PAGE 2

ANNUAL PERCENT CHANGE: CALIFORNIA AGGREGATE EMPLOYMENT

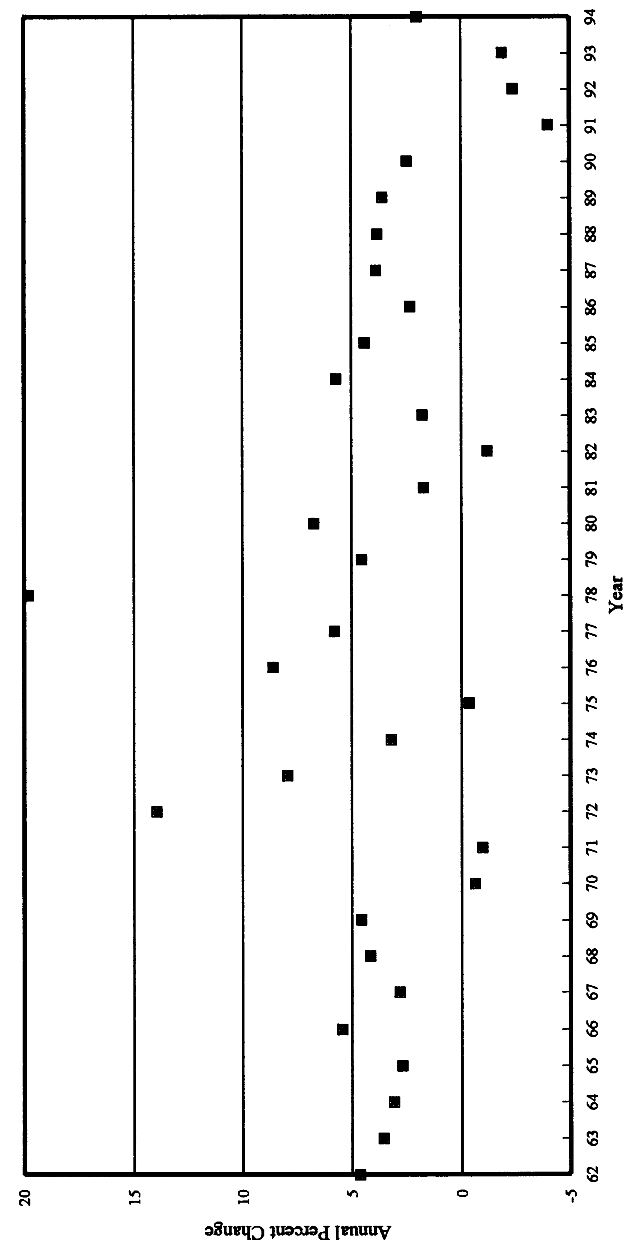
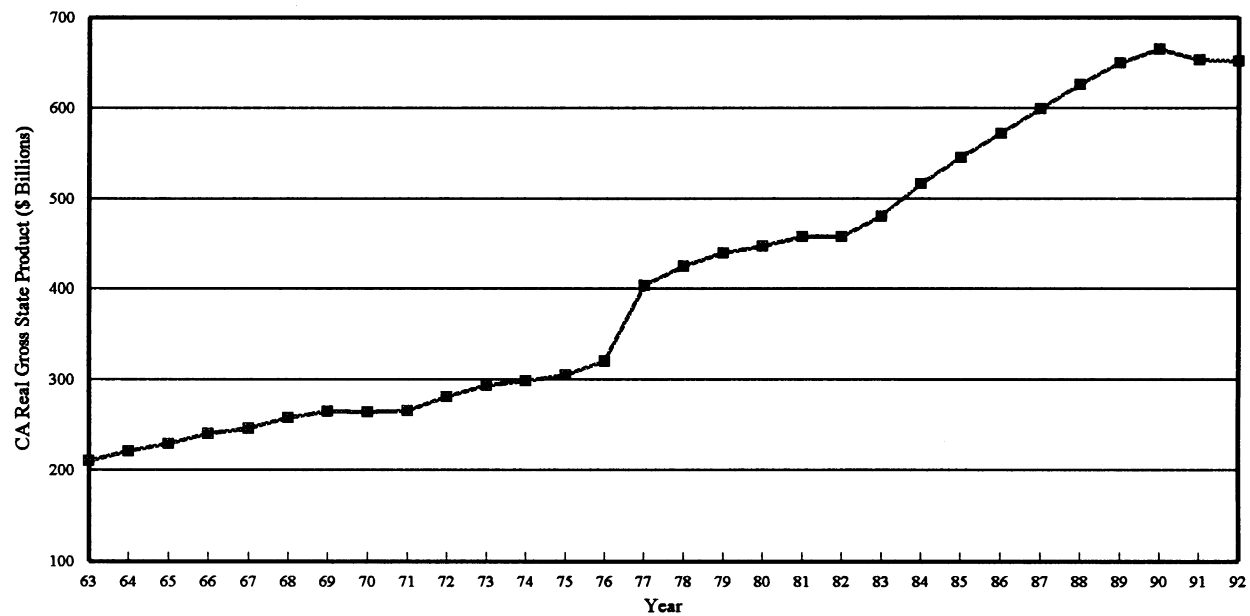


EXHIBIT 1

PART 8—PAGE 1

CALIFORNIA REAL GROSS STATE PRODUCT



Source: U.S. Department of Commerce, Bureau of Economic Analysis - (1995 California Statistical Abstract)
See Appendix C, Part 2.

EXHIBIT 1

PART 8—PAGE 2

ANNUAL PERCENT CHANGE: CALIFORNIA REAL GROSS STATE PRODUCT

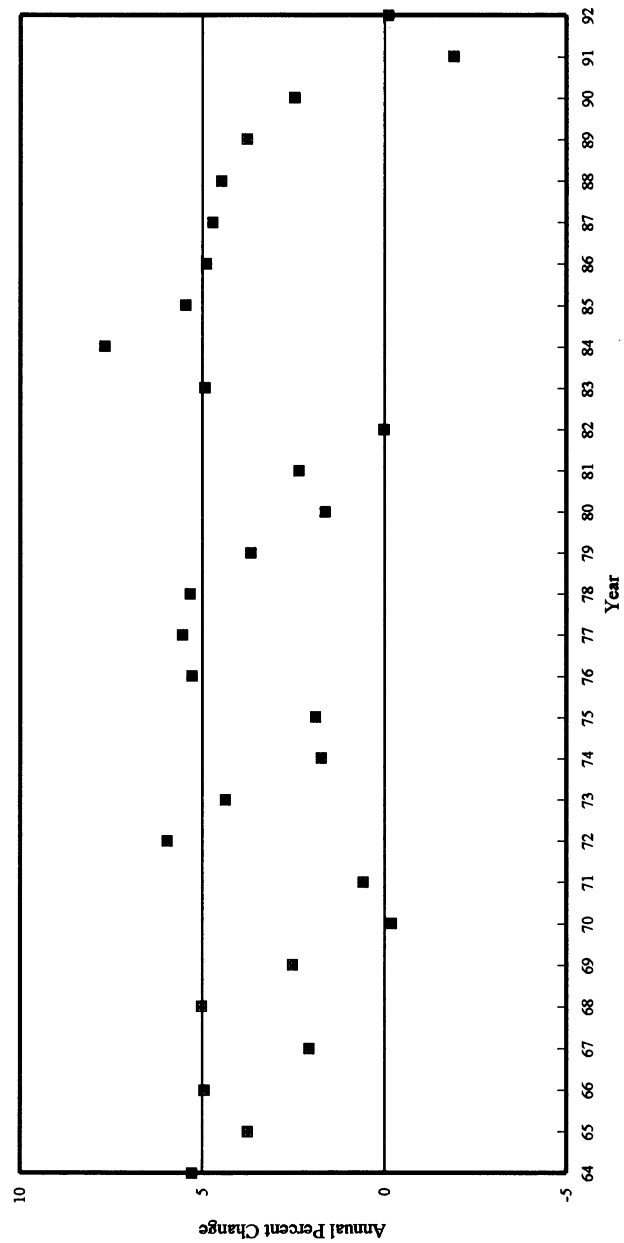
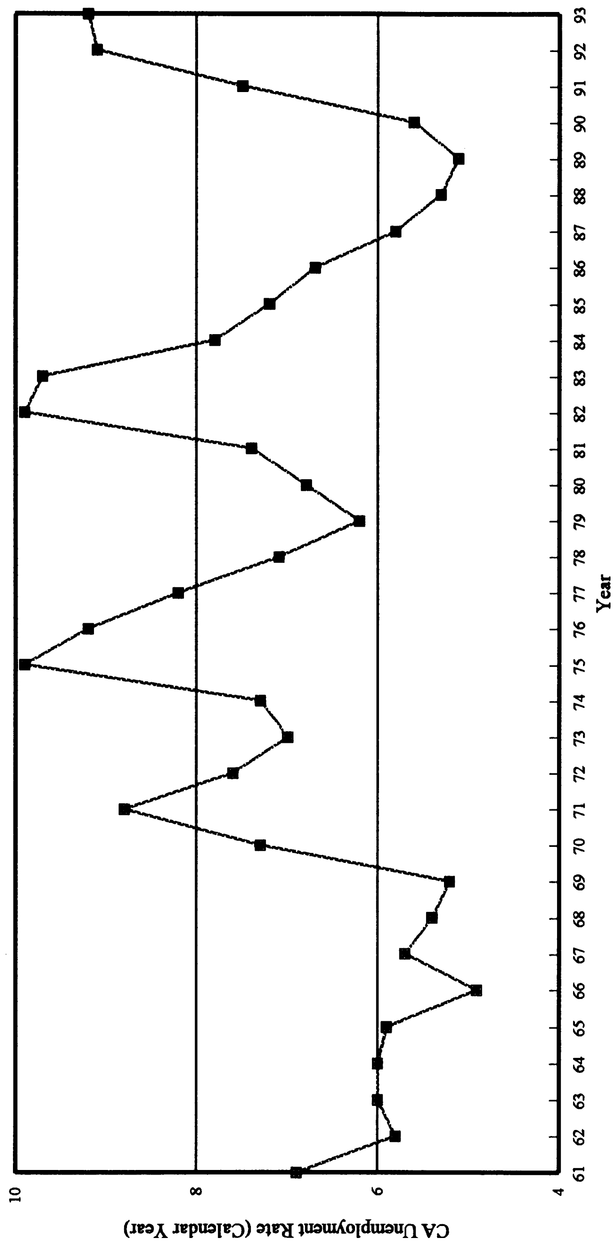


EXHIBIT 1

PART 9—PAGE 1

CALIFORNIA UNEMPLOYMENT RATE



Source: 1995 California Statistical Abstract - see Appendix C, Part 3.

EXHIBIT 1

PART 9—PAGE 2

ANNUAL PERCENT CHANGE: CALIFORNIA UNEMPLOYMENT RATE

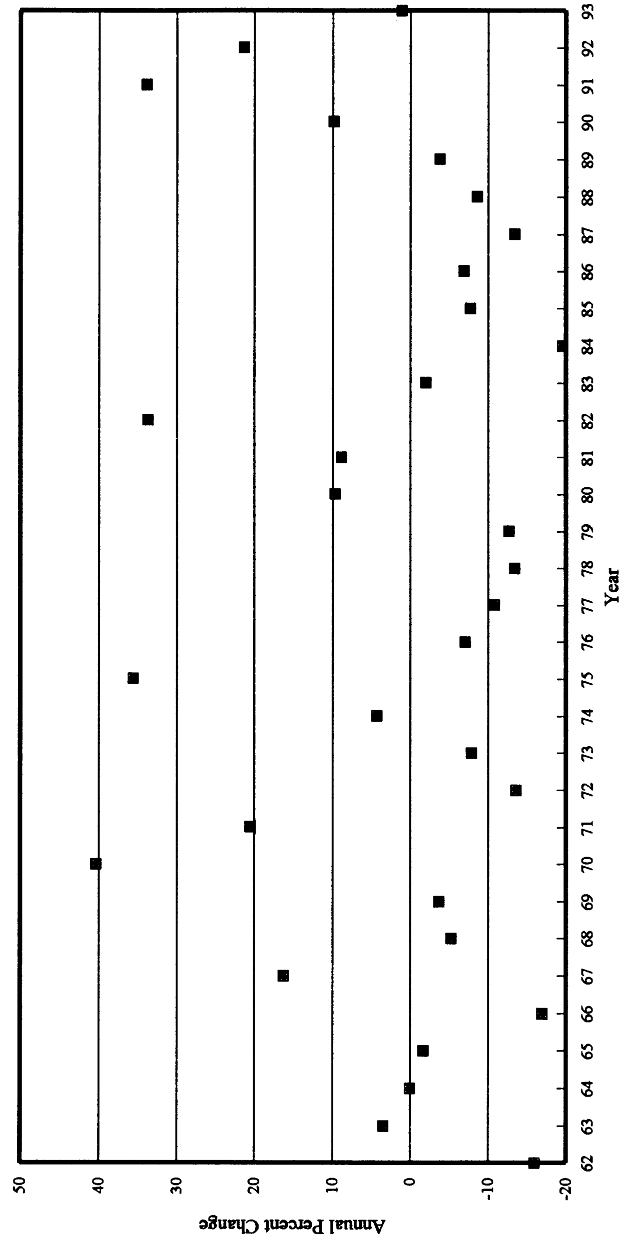
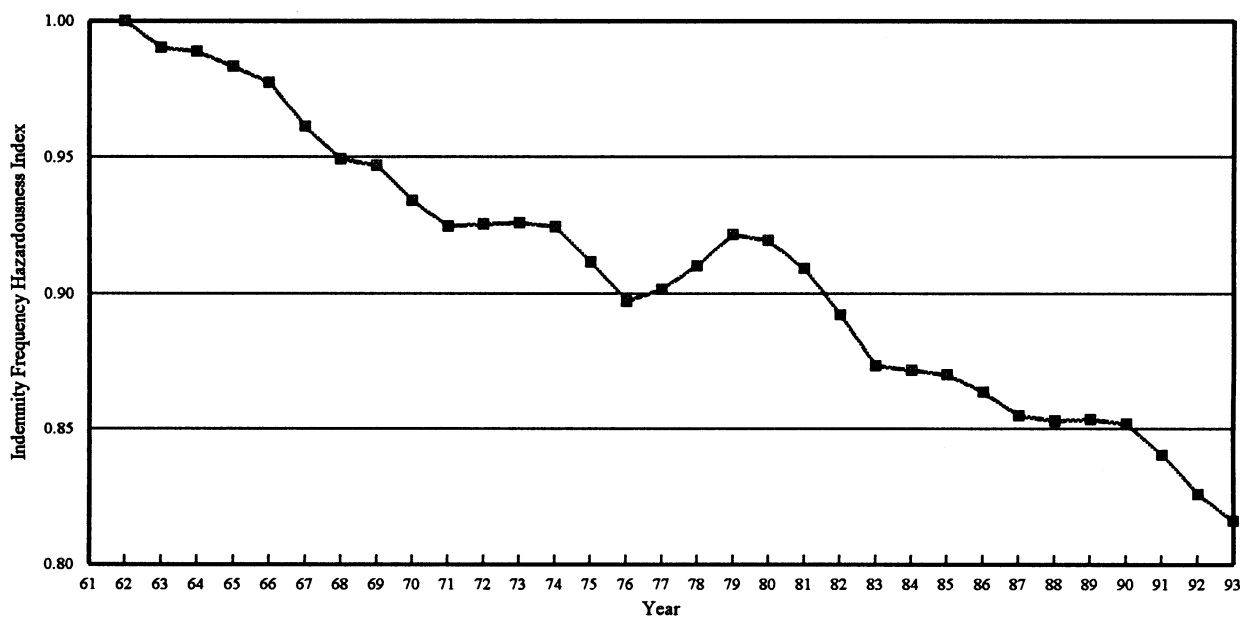


EXHIBIT 1

PART 10—PAGE 1

INDEMNITY FREQUENCY HAZARDOUSNESS INDEX



Source: W.C.I.R.B. of California Unit Statistical Reporting Plan.
California Class Experience at 3rd report except 1992 at 2nd and 1993 at 1st report - see Appendix D, Part 1.

EXHIBIT 1

PART 10—PAGE 2

ANNUAL PERCENT CHANGE: INDEMNITY FREQUENCY HAZARDOUSNESS INDEX

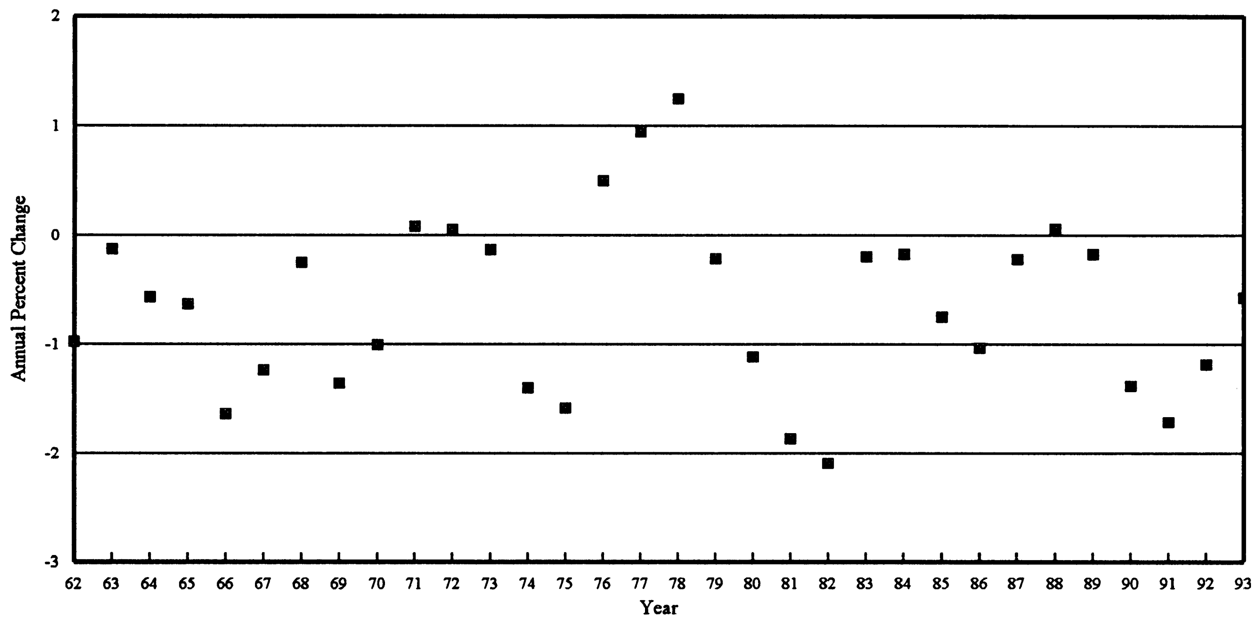
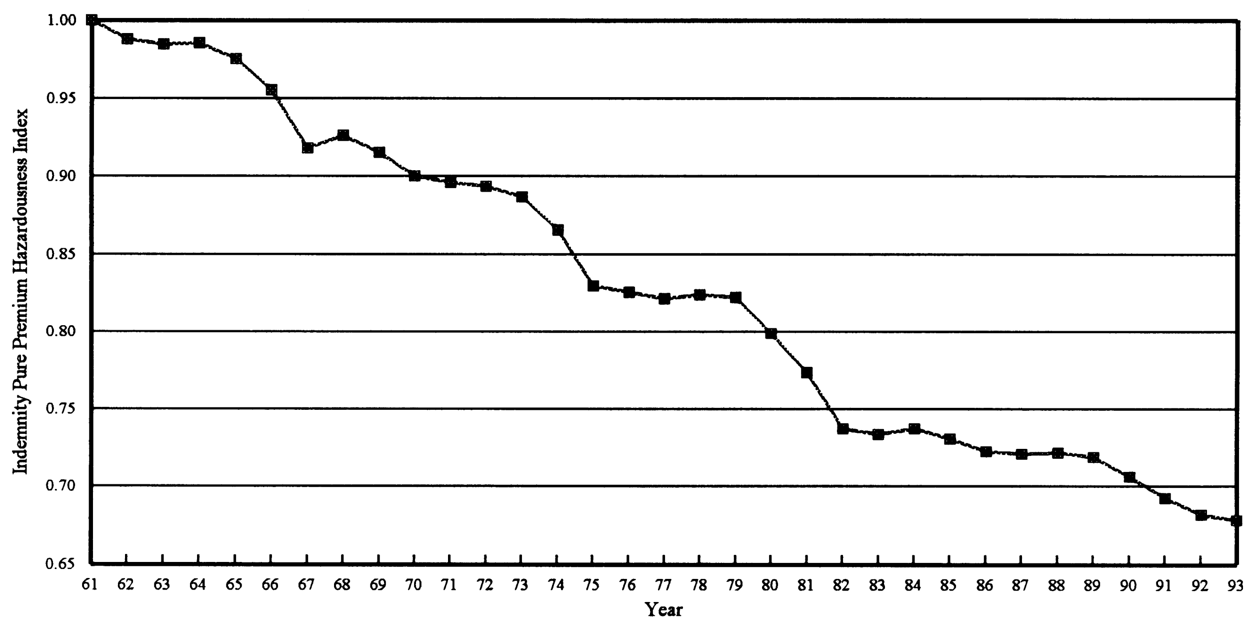


EXHIBIT 1

PART 11—PAGE 1

INDEMNITY PURE PREMIUM HAZARDOUSNESS INDEX



Source: W.C.I.R.B. of California Unit Statistical Reporting Plan.
California Class Experience at 3rd report except 1992 at 2nd and 1993 at 1st report - see Appendix D, Part 2.

EXHIBIT 1

PART 11—PAGE 2

ANNUAL PERCENT CHANGE: INDEMNITY PURE PREMIUM HAZARDOUSNESS INDEX

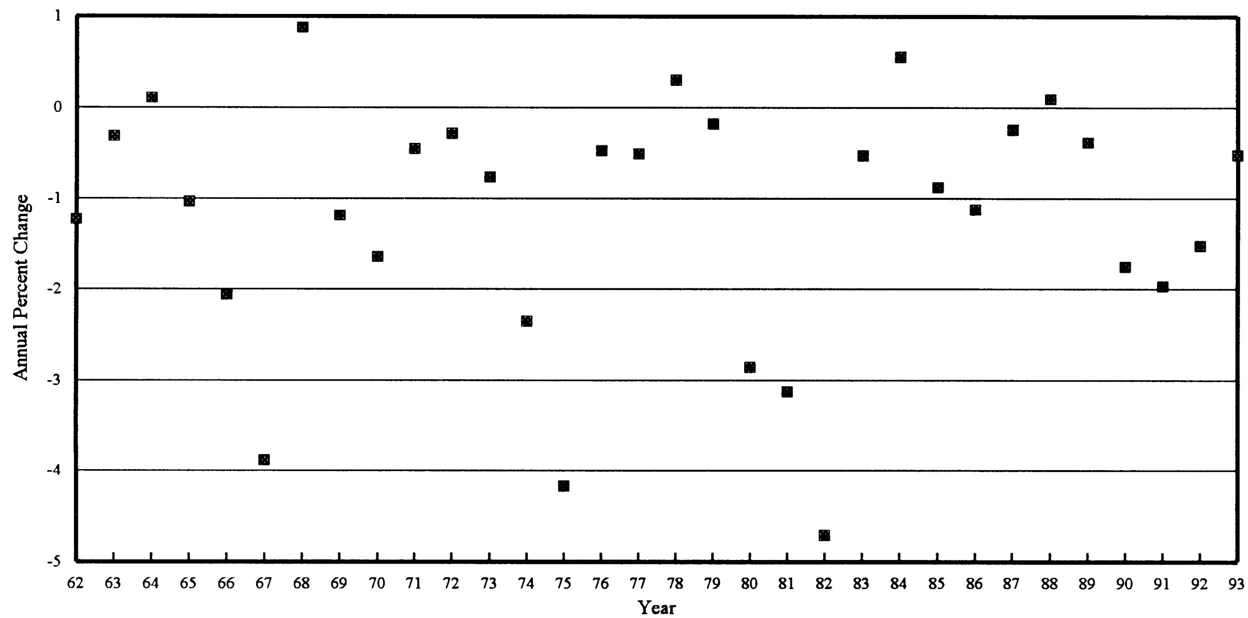
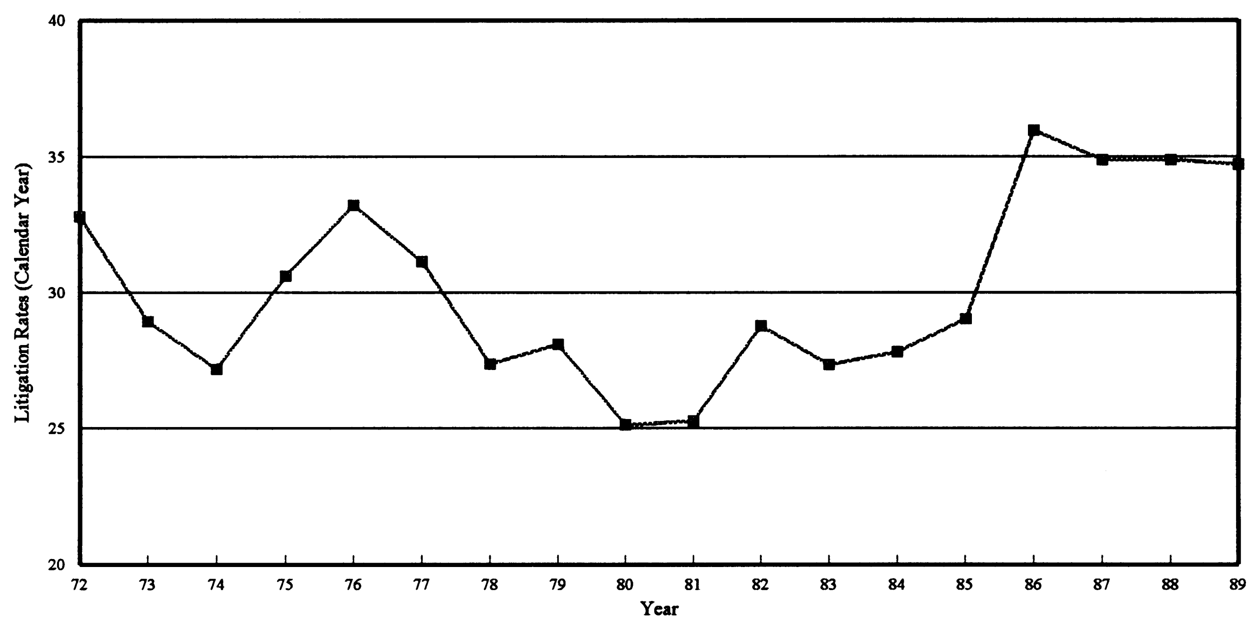


EXHIBIT 1

PART 12—PAGE 1

LITIGATION RATES



Source: C.W.C.I. Litigation Incidence Survey - see Appendix E, Part 1.

EXHIBIT 1

PART 12—PAGE 2

ANNUAL PERCENT CHANGE: LITIGATION RATES

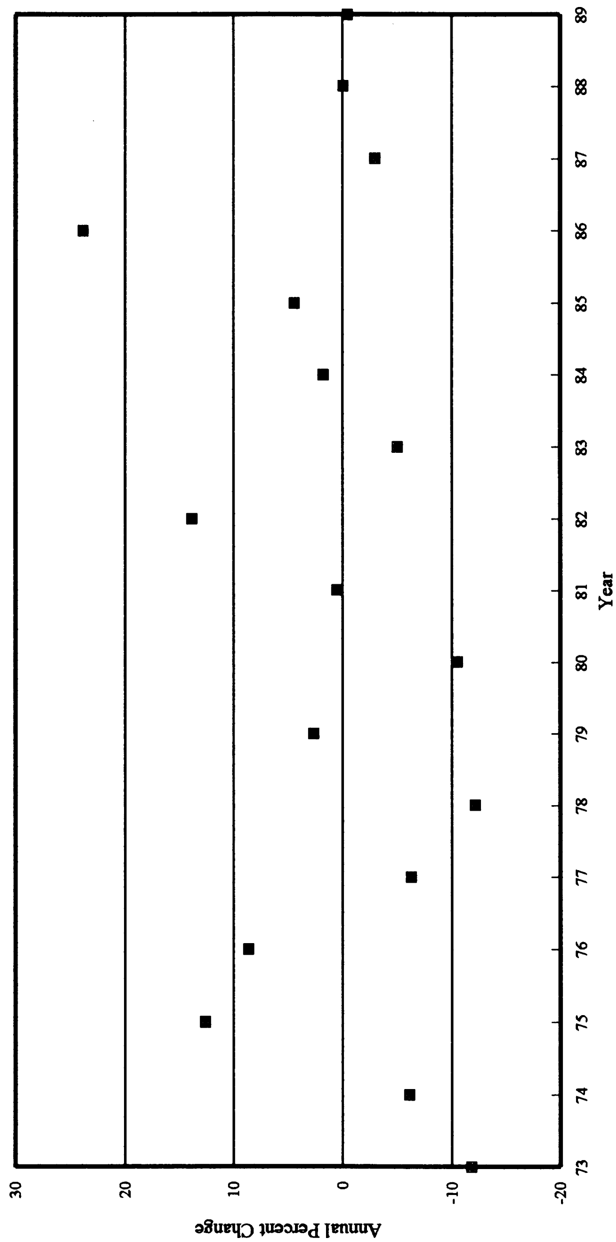
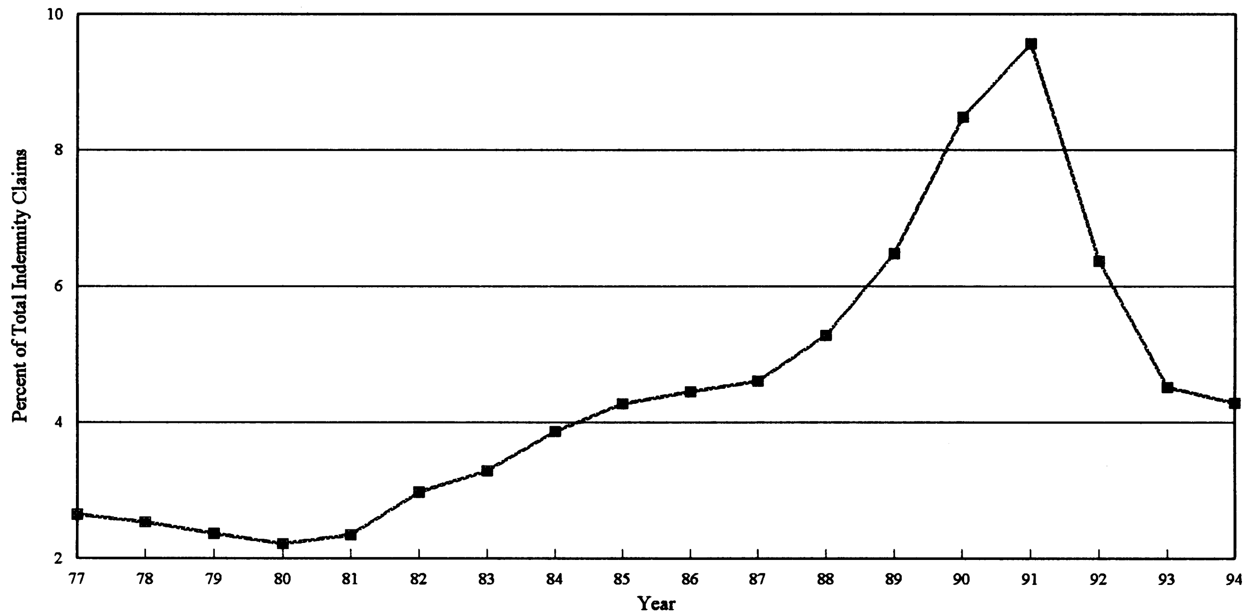


EXHIBIT 1

PART 13—PAGE 1

RATIO OF CUMULATIVE INJURIES TO TOTAL INDEMNITY CLAIMS



Source: W.C.I.R.B. of California Unit Statistical Reporting Plan.
California Class Experience at most current report level as of 4/22/97 - see Appendix F.

EXHIBIT 1

PART 13—PAGE 2

ANNUAL PERCENT CHANGE: RATIO OF CUMULATIVE INJURIES TO TOTAL INDEMNITY CLAIM

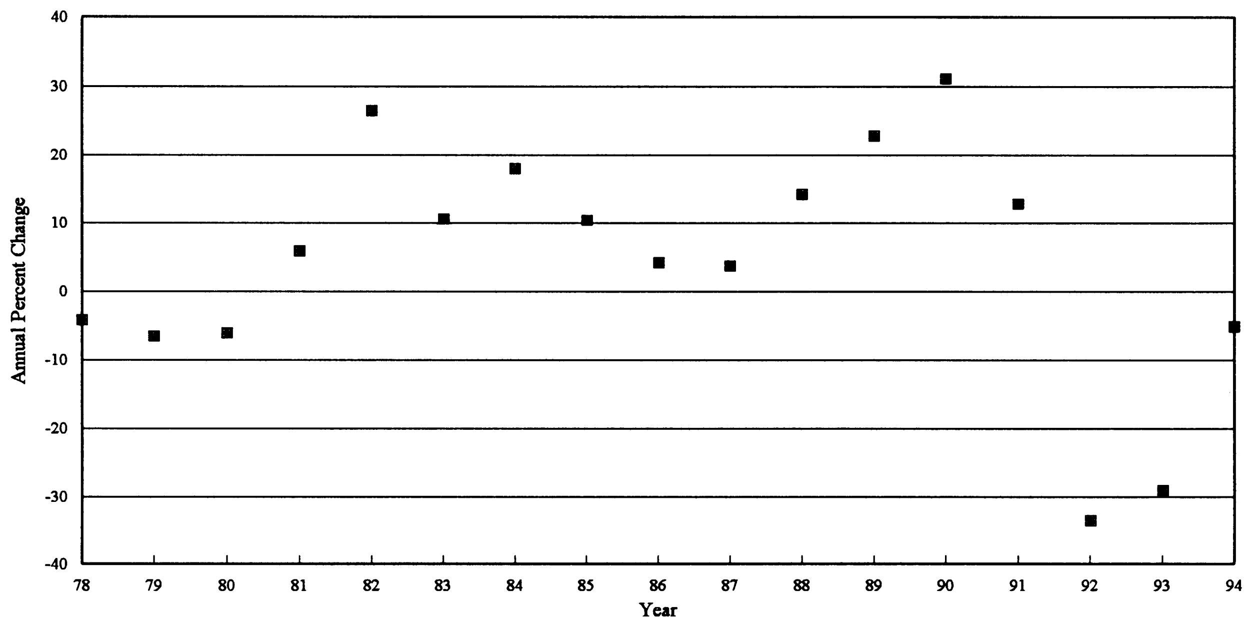
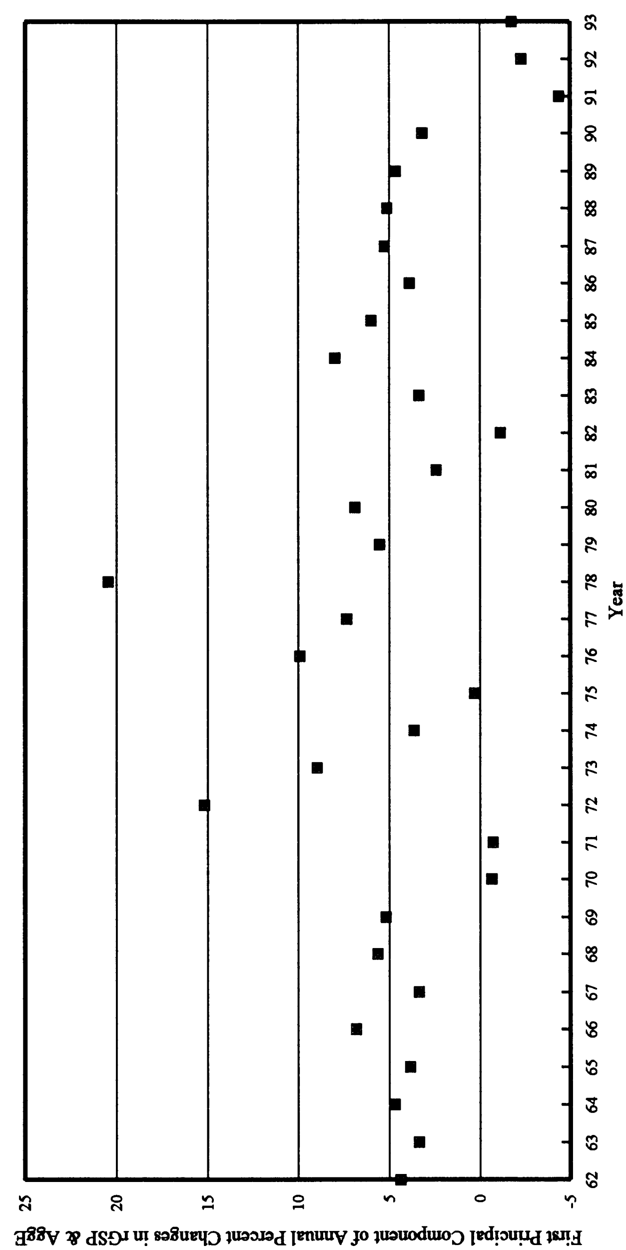


EXHIBIT 1

PART 14

FIRST PRINCIPAL COMPONENT OF ANNUAL PERCENT CHANGES IN rGSP & AggE

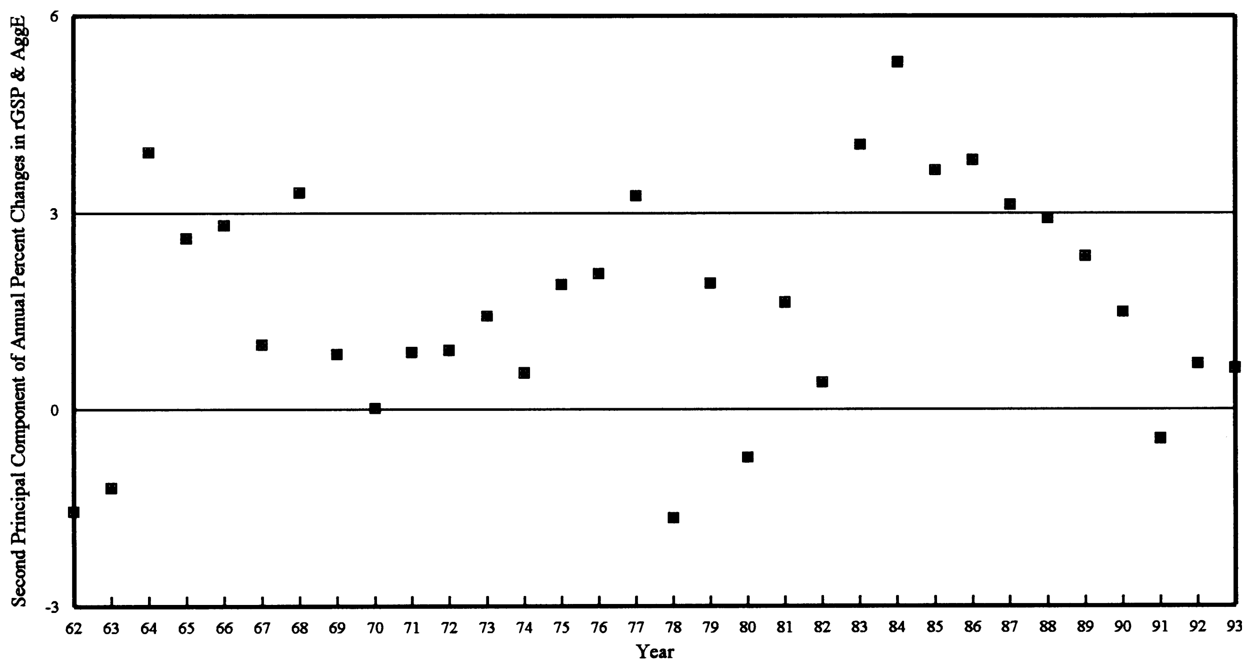


Source: W.C.I.R.B. of California Unit Statistical Reporting Plan.
California Class Experience at most current report level as of 4/22/97 - see Appendix G, Part 1.

EXHIBIT 1

PART 15

SECOND PRINCIPAL COMPONENT OF ANNUAL PERCENT CHANGES IN rGSP & AggE

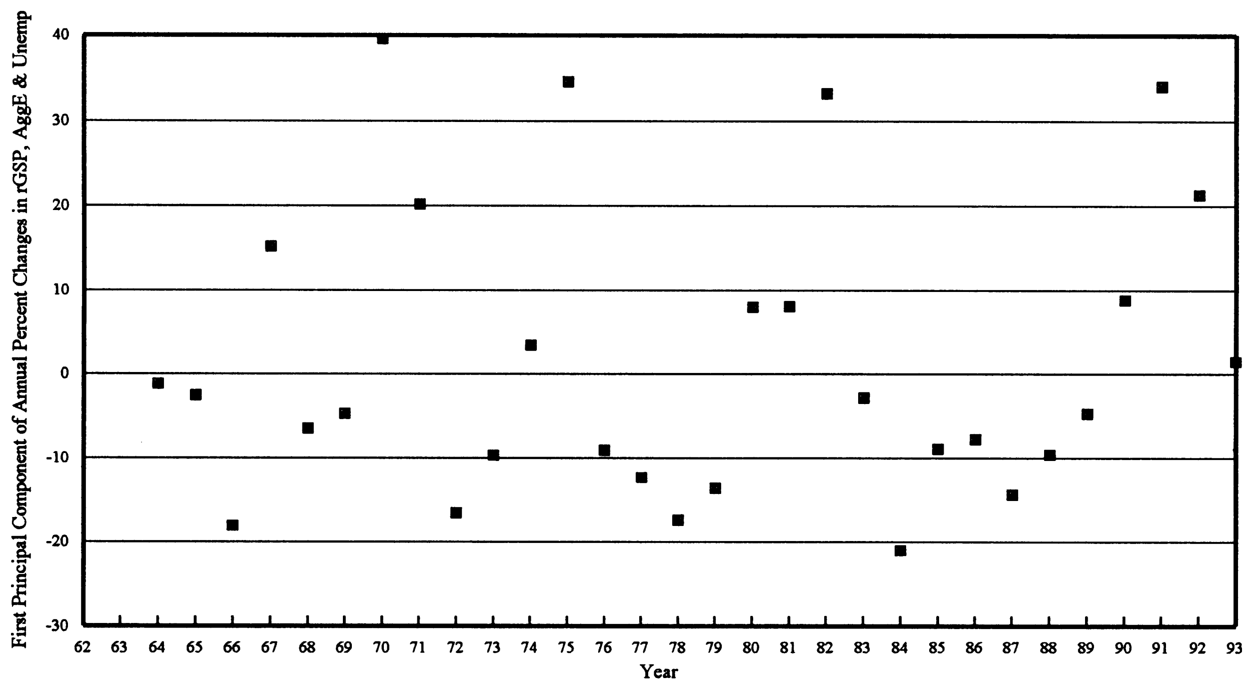


Source: W.C.I.R.B. of California Unit Statistical Reporting Plan.
California Class Experience at most current report level as of 4/22/97 - see Appendix G, Part 1.

EXHIBIT 1

PART 16

FIRST PRINCIPAL COMPONENT OF ANNUAL PERCENT CHANGES IN rGSP, AggE & Unemp

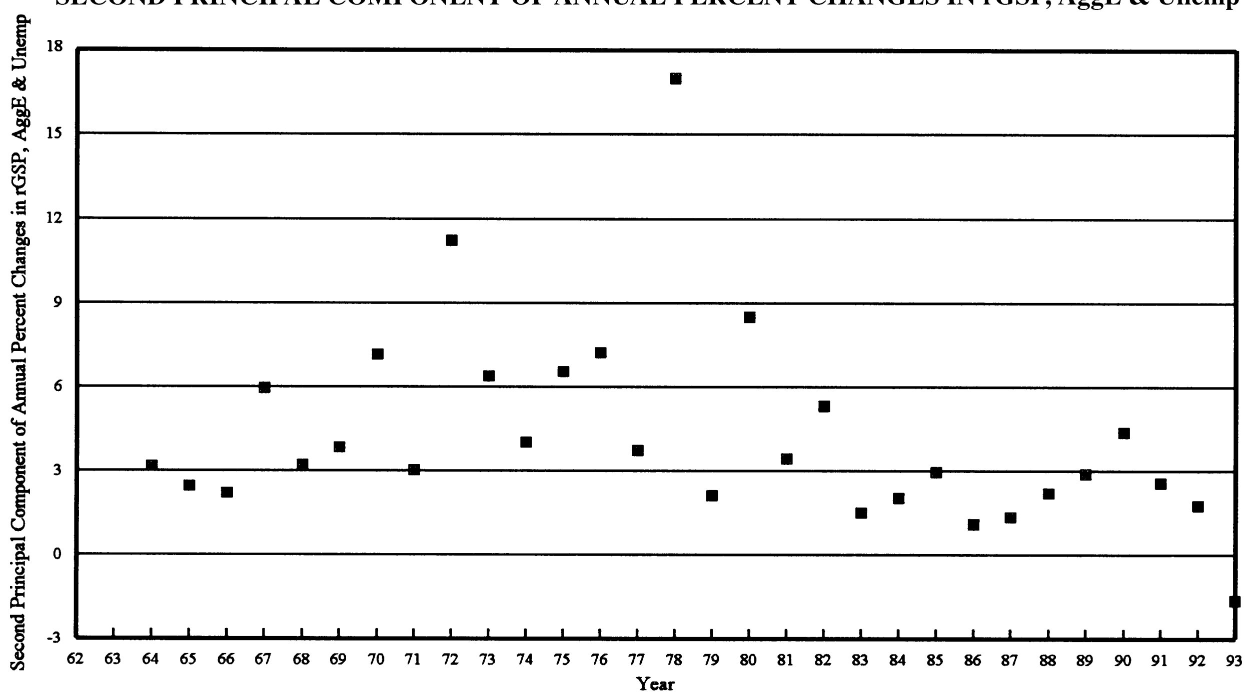


Source: W.C.I.R.B. of California Unit Statistical Reporting Plan.
California Class Experience at most current report level as of 4/22/97 - see Appendix G, Part 2.

EXHIBIT 1

PART 17

SECOND PRINCIPAL COMPONENT OF ANNUAL PERCENT CHANGES IN rGSP, AggE & Unemp

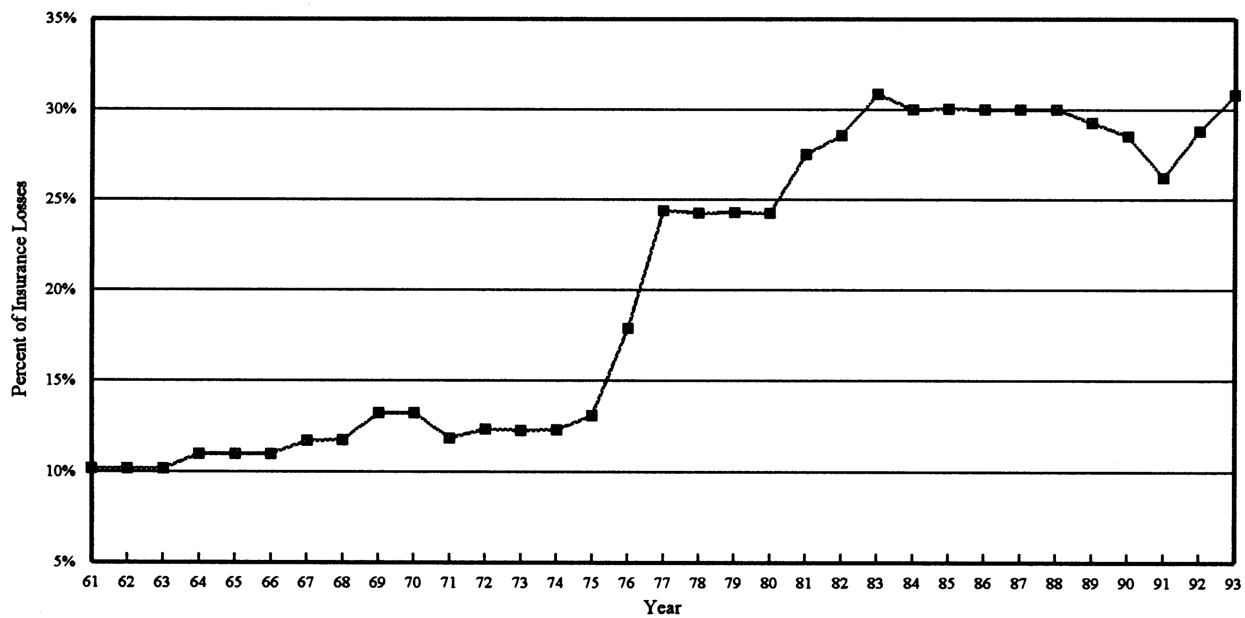


Source: W.C.I.R.B. of California Unit Statistical Reporting Plan.
California Class Experience at most current report level as of 4/22/97 - see Appendix G, Part 2.

EXHIBIT 1

PART 18—PAGE 1

INSURANCE LOSSES PAID BY SELF-INSUREDS



Source: Social Security Bulletin - Estimates of Workers' Compensation Payments, by State and Type of Insurance.
Note: Series change in Self-Insurance Share Index in 1976. See Appendix H. Series change does not affect annual percent change presented on the following page.

EXHIBIT 1

PART 18—PAGE 2

ANNUAL PERCENT CHANGE IN SELF-INSURANCE SHARE INDEX

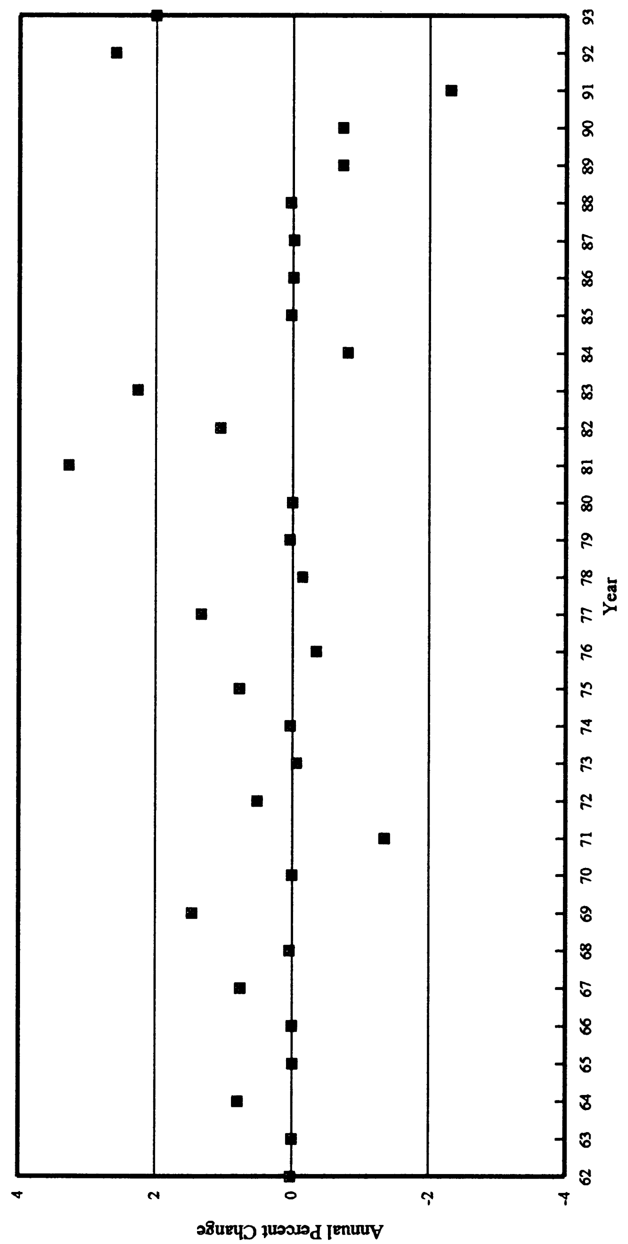


EXHIBIT 2

PART 1

CANDIDATE VARIABLES—TABULAR PRESENTATION ORIGINAL VARIABLES

Year	Claim Frequency per $1M Payroll (1987)			Cumulative Benefit Level			California Aggregate Emplmt	Real California GSP
	Indemnity	Med-Only	Total	Indemnity	Medical	Total		
1961	0.914	6.012	6.926	1.000	1.000	1.001	3,891,683	—
1962	0.934	6.013	6.947	1.001	1.020	1.004	4,071,877	—
1963	0.952	5.952	6.904	1.001	1.080	1.005	4,216,436	210,153
1964	0.956	5.889	6.845	1.001	1.080	1.005	4,346,448	220,848
1965	0.932	5.624	6.557	1.001	1.080	1.005	4,464,625	229,125
1966	0.938	5.583	6.521	1.001	1.158	1.022	4,707,406	240,495
1967	0.966	5.664	6.629	1.001	1.391	1.073	4,840,158	245,762
1968	0.991	5.470	6.461	1.001	1.391	1.073	5,041,894	257,843
1969	1.048	5.579	6.626	1.042	1.429	1.105	5,272,325	264,621
1970	1.014	5.236	6.251	1.042	1.542	1.117	5,240,190	263,933
1971	1.028	5.228	6.255	1.042	1.542	1.117	5,189,637	265,600
1972	1.086	5.636	6.722	1.227	1.581	1.247	5,913,892	281,159
1973	1.237	5.391	6.629	1.283	1.695	1.297	6,383,331	293,735
1974	1.476	4.763	6.240	1.355	1.771	1.362	6,588,356	298,408
1975	1.546	4.682	6.228	1.428	1.995	1.450	6,564,524	304,518
1976	1.630	4.816	6.446	1.433	2.527	1.530	7,130,103	320,160
1977	1.710	4.877	6.588	1.519	2.721	1.626	7,543,268	403,192
1978	1.746	4.904	6.650	1.519	2.721	1.626	9,036,931	424,809
1979	1.736	4.790	6.527	1.519	2.882	1.641	9,448,087	439,868
1980	1.654	4.548	6.203	1.519	3.040	1.655	10,083,911	447,341
1981	1.566	4.249	5.815	1.564	3.256	1.719	10,256,167	457,877
1982	1.520	3.944	5.464	1.564	3.927	1.785	10,131,806	458,036
1983	1.675	4.195	5.870	2.171	4.363	2.200	10,312,305	480,484
1984	1.820	4.206	6.025	2.332	4.738	2.321	10,900,212	517,192
1985	1.770	4.004	5.774	2.332	5.093	2.328	11,378,074	545,612
1986	1.705	3.766	5.470	2.332	5.093	2.328	11,644,237	572,257
1987	1.751	3.751	5.502	2.332	5.278	2.331	12,094,751	599,088
1988	1.752	3.605	5.357	2.332	5.460	2.333	12,556,920	626,079
1989	1.815	3.566	5.380	2.332	5.460	2.333	13,005,986	649,583
1990	1.966	3.495	5.461	2.385	5.684	2.356	13,328,057	665,298
1991	1.867	3.355	5.222	2.502	6.224	2.401	12,796,072	653,197
1992	1.511	3.108	4.619	2.522	6.162	2.407	12,490,570	652,328
1993	1.243	2.763	4.007	2.522	6.162	2.413	12,253,883	—
1994	1.165	2.456	3.621	2.334	6.202	2.186	12,500,754	—
1995	—	—	—	2.425	6.473	2.232	—	—
1996	—	—	—	2.495	6.618	2.268	—	—

Notes: The Principal Components variables are linear combinations of annual percentage changes. Series change in Self-Insurance Share Index in 1976. See Appendix H. Value given for 1976 is average of self-insured share under both series.

California Unemplmt Rate	Indemnity Frequency Haz'ness	Indemnity Pure Premium Haz'ness	Litigation Rate	Cumulative ÷ Indemnity Claims	Principal Components				Self-Insurance Share Index
					PCGA_1	PCGA_2	PCUGA_1	PCUGA_2	
6.9	1.000	1.000	—	—					0.1018
5.8	0.990	0.988	—	—					0.1019
6.0	0.989	0.985	—	—					0.1019
6.0	0.983	0.986	—	—					0.1097
5.9	0.977	0.975	—	—					0.1095
4.9	0.961	0.955	—	—					0.1095
5.7	0.949	0.918	—	—					0.1171
5.4	0.947	0.926	—	—					0.1174
5.2	0.934	0.915	—	—					0.1319
7.3	0.925	0.900	—	—					0.1319
8.8	0.925	0.896	—	—					0.1184
7.6	0.926	0.893	32.81	—					0.1235
7.0	0.925	0.886	28.93	—					0.1228
7.3	0.912	0.866	27.17	—					0.1230
9.9	0.897	0.829	30.59	—					0.1307
9.2	0.902	0.825	33.22	—					0.1788
8.2	0.910	0.821	31.15	2.6375					0.2437
7.1	0.922	0.824	27.37	2.5254	**NOT APPLICABLE**				0.2422
6.2	0.920	0.822	28.09	2.3588					0.2426
6.8	0.909	0.799	25.12	2.2147					0.2425
7.4	0.892	0.774	25.26	2.3447					0.2752
9.9	0.874	0.737	28.76	2.9650					0.2857
9.7	0.872	0.733	27.33	3.2780					0.3083
7.8	0.870	0.737	27.81	3.8679					0.3002
7.2	0.864	0.731	29.03	4.2713					0.3003
6.7	0.855	0.723	35.94	4.4500					0.3001
5.8	0.853	0.721	34.87	4.6127					0.2999
5.3	0.854	0.721	34.86	5.2685					0.3002
5.1	0.852	0.719	34.70	6.4725					0.2927
5.6	0.840	0.706	—	8.4853					0.2853
7.5	0.826	0.692	38.20	9.5761					0.2621
9.1	0.816	0.682	42.85	6.3594					0.2880
9.2	0.811	0.678	—	4.5128					0.3080
—	—	—	—	4.2813					—
—	—	—	—	—					—
—	—	—	—	—					—

EXHIBIT 2

PART 2

CANDIDATE VARIABLES—TABULAR PRESENTATION ANNUAL PERCENT CHANGES

	Claim Frequency per $1M Payroll (1987)			Benefit Level			California Aggregate Emplmt	Real California GSP
Year	Indemnity	Med-Only	Total	Indemnity	Medical	Total		
1961	—	—	—	0.032	0.000	0.092	—	—
1962	2.185	0.015	0.301	0.075	2.012	0.272	4.630	—
1963	1.956	−1.013	−0.614	0.000	5.852	0.158	3.550	—
1964	0.426	−1.063	−0.857	0.000	0.000	0.000	3.083	5.275
1965	−2.484	−4.491	−4.211	0.000	0.000	0.000	2.719	3.759
1966	0.623	−0.731	−0.538	0.000	7.259	1.689	5.438	4.942
1967	2.920	1.441	1.654	0.000	20.083	4.928	2.820	2.069
1968	2.675	−3.423	−2.535	0.000	0.000	0.000	4.168	5.011
1969	5.693	1.992	2.559	4.100	2.747	3.062	4.570	2.533
1970	−3.193	−6.135	−5.670	0.000	7.935	1.043	−0.610	−0.194
1971	1.321	−0.169	0.073	0.000	0.000	0.000	−0.965	0.590
1972	5.659	7.811	7.458	17.732	2.489	11.635	13.956	5.957
1973	13.951	−4.342	−1.387	4.553	7.232	4.049	7.938	4.358
1974	19.315	−11.647	−5.867	5.623	4.461	4.974	3.212	1.747
1975	4.700	−1.707	−0.191	5.418	12.673	6.438	−0.362	1.897
1976	5.430	2.870	3.505	0.300	26.650	5.560	8.616	5.283
1977	4.951	1.263	2.196	6.000	7.702	6.268	5.795	5.545
1978	2.089	0.545	0.946	0.000	0.000	0.000	19.801	5.322
1979	−0.566	−2.309	−1.851	0.000	5.898	0.907	4.550	3.672
1980	−4.716	−5.051	−4.962	0.000	5.479	0.885	6.730	1.633
1981	−5.362	−6.577	−6.253	3.000	7.119	3.842	1.708	2.354
1982	−2.918	−7.188	−6.038	0.000	20.599	3.812	−1.213	0.013
1983	10.225	6.365	7.439	38.800	11.100	23.300	1.782	4.931
1984	8.611	0.257	2.641	7.400	8.600	5.500	5.701	7.665
1985	−2.723	−4.789	−4.165	0.000	7.500	0.300	4.384	5.453
1986	−3.706	−5.957	−5.267	0.000	0.000	0.000	2.339	4.887
1987	2.739	−0.395	0.582	0.000	3.630	0.101	3.869	4.711
1988	0.024	−3.883	−2.639	0.000	3.445	0.099	3.821	4.476
1989	3.597	−1.098	0.438	0.000	0.000	0.000	3.576	3.770
1990	8.353	−1.995	1.495	2.300	4.100	1.000	2.476	2.475
1991	−5.055	−4.003	−4.382	4.900	9.500	1.900	−3.991	−1.900
1992	−19.058	−7.352	−11.537	0.800	−1.000	0.251	−2.387	−0.106
1993	−17.720	−11.090	−13.259	0.000	0.000	0.248	−1.895	—
1994	−6.330	−11.124	−9.637	−7.469	0.646	−9.428	2.015	—
1995	—	—	—	3.919	4.374	2.141	—	—
1996	—	—	—	2.894	2.242	1.596	—	—

Notes: The Principal Components variables are linear combinations of annual percentage changes.
PCGA_1(2) = First (second) principal component of CA Real GSP and Aggregate Employment
PCUGA_1(2) = First (second) principal component of CA Real GSP, Unemployment Rate, and Aggregate Employment
Series change in Self-Insurance Share Index in 1976. See Appendix H. Series change does not affect annual percent change.

California Unemplmt Rate	Indemnity Frequency Haz'ness	Indemnity Pure Premium Haz'ness	Litigation Rate	Cumulative ÷ Indemnity Claims	Principal Components PCGA_1	PCGA_2	PCUGA_1	PCUGA_2	Self-Insurance Share Index
—	—	—	—	—	—	—	—	—	0.002
−15.942	−0.974	−1.233	—	—	4.360	−1.560	—	—	0.009
3.448	−0.128	−0.318	—	—	3.343	−1.196	—	—	−0.000
0.000	−0.565	0.107	—	—	4.680	3.928	−1.188	3.164	0.787
−1.667	−0.629	−1.040	—	—	3.826	2.624	−2.571	2.446	−0.020
−16.949	−1.642	−2.062	—	—	6.785	2.822	−18.124	2.203	−0.000
16.327	−1.237	−3.883	—	—	3.352	0.998	15.155	5.962	0.755
−5.263	−0.249	0.875	—	—	5.612	3.314	−6.495	3.208	0.032
−3.704	−1.361	−1.188	—	—	5.157	0.846	−4.765	3.837	1.455
40.385	−1.003	−1.650	—	—	−0.639	0.023	39.526	7.167	−0.000
20.548	0.082	−0.456	—	—	−0.709	0.881	20.155	3.023	−1.356
−13.636	0.051	−0.287	—	—	15.147	0.907	−16.613	11.223	0.513
−7.895	−0.137	−0.772	−11.834	—	8.942	1.429	−9.696	6.383	−0.071
4.286	−1.398	−2.363	−6.085	—	3.613	0.563	3.374	4.021	0.019
35.616	−1.589	−4.173	12.615	—	0.299	1.908	34.588	6.548	0.769
−7.071	0.500	−0.474	8.598	—	9.892	2.072	−9.127	7.231	−0.358
−10.870	0.949	−0.513	−6.250	—	7.324	3.268	−12.331	3.739	1.331
−13.415	1.249	0.302	−12.133	−4.248	20.437	−1.660	−17.424	16.983	−0.151
−12.676	−0.216	−0.182	2.621	−6.598	5.521	1.925	−13.643	2.121	0.034
9.677	−1.116	−2.861	−10.557	−6.108	6.886	−0.730	7.984	8.507	−0.003
8.824	−1.866	−3.130	0.537	5.871	2.401	1.641	8.013	3.436	3.271
33.784	−2.097	−4.711	13.867	26.453	−1.137	0.421	33.177	5.311	1.047
−2.020	−0.201	−0.534	−4.964	10.556	3.338	4.042	−2.874	1.489	2.261
−19.588	−0.173	0.549	1.773	17.998	7.950	5.297	−21.061	2.026	−0.816
−7.692	−0.748	−0.882	4.382	10.430	5.965	3.658	−8.956	2.964	0.015
−6.944	−1.033	−1.126	23.803	4.183	3.849	3.814	−7.777	1.087	−0.017
−13.433	−0.225	−0.248	−2.974	3.655	5.230	3.132	−14.373	1.335	−0.021
−8.621	0.057	0.090	−0.032	14.219	5.106	2.927	−9.643	2.208	0.026
−3.774	−0.179	−0.384	−0.456	22.853	4.637	2.344	−4.788	2.881	−0.746
9.804	−1.382	−1.756	—	31.096	3.165	1.496	8.811	4.381	−0.746
33.929	−1.718	−1.977	—	12.856	−4.398	−0.444	34.062	2.563	−2.312
21.333	−1.185	−1.526	12.183	−33.591	−2.284	0.704	21.269	1.760	2.590
1.099	−0.572	−0.527	—	−29.038	−1.784	0.638	1.428	−1.647	1.999
—	—	—	—	−5.130	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—

EXHIBIT 3

PART 1

CORRELATIONS AMONG VARIABLES
SAMPLE PERIOD: 1964–1992
PEARSON PRODUCT MOMENT CORRELATION AT LAG = 0

	Claim Frequency per $1M Payroll (1987)			Benefit Level			California Aggregate Emplmt	Real California GSP
	Indemnity	Med-Only	Total	Indemnity	Medical	Total		
Indemnity Claim Frequency	1.000	0.298	0.615	0.385	0.158	0.437	0.343	0.392
Med-Only Claim Frequency	0.298	1.000	0.928	0.521	0.155	0.544	0.445	0.490
Total Claim Frequency	0.615	0.928	1.000	0.552	0.195	0.588	0.484	0.559
Indemnity Benefit Level	0.385	0.521	0.552	1.000	0.110	0.945	0.060	0.204
Medical Benefit Level	0.158	0.155	0.195	0.110	1.000	0.384	−0.102	−0.113
Total Benefit Level	0.437	0.544	0.588	0.945	0.384	1.000	0.082	0.199
California Aggregate Employment	0.343	0.445	0.484	0.060	−0.102	0.082	1.000	0.655
Real California Gross State Product	0.392	0.490	0.559	0.204	−0.113	0.199	0.655	1.000
California Unemployment Rate	−0.347	−0.389	−0.448	−0.110	0.267	−0.059	−0.677	−0.892
Indemnity Frequency Haz'ness	0.260	0.510	0.502	0.127	−0.176	0.093	0.643	0.617
Indemnity Pure Premium Haz'ness	0.169	0.370	0.356	0.105	−0.493	−0.067	0.431	0.638
Litigation Rates	−0.390	−0.155	−0.239	−0.197	0.325	−0.109	−0.543	−0.122
Cumulative ÷ Indemnity Claims	0.690	0.219	0.483	0.112	0.466	0.153	−0.110	0.153
1st PC (rGSP, AggE)	0.367	0.472	0.518	0.085	−0.108	0.104	0.993	0.739
2nd PC (rGSP, AggE)	0.179	0.210	0.262	0.210	−0.049	0.182	−0.116	0.674
1st PC (rGSP, AggE, Unemp)	−0.353	−0.400	−0.459	−0.110	0.261	−0.063	−0.705	−0.897
2nd PC (rGSP, AggE, Unemp)	0.136	0.234	0.231	−0.022	0.119	0.058	0.710	0.040
Self-Insurance Share Index	−0.210	0.014	−0.099	0.317	0.061	0.388	−0.063	0.024

Note: Pearson Product Moment Correlation assumes the variables to be normally distributed.

California Unemplmt Rate	Indemnity Frequency Haz'ness	Indemnity Pure Premium Haz'ness	Litigation Rate	Cumulative ÷ Indemnity Claims	Principal Components				Self-Insurance Share Index
					PCGA_1	PCGA_2	PCUGA_1	PCUGA_2	
−0.347	0.260	0.169	−0.390	0.690	0.367	0.179	−0.353	0.136	−0.210
−0.389	0.510	0.370	−0.155	0.219	0.472	0.210	−0.400	0.234	0.014
−0.448	0.502	0.356	−0.239	0.483	0.518	0.262	−0.459	0.231	−0.099
−0.110	0.127	0.105	−0.197	0.112	0.085	0.210	−0.110	−0.022	0.317
0.267	−0.176	−0.493	0.325	0.466	−0.108	−0.049	0.261	0.119	0.061
−0.059	0.093	−0.067	−0.109	0.153	0.104	0.182	−0.063	0.058	0.388
−0.677	0.643	0.431	−0.543	−0.110	0.993	−0.116	−0.705	0.710	−0.063
−0.892	0.617	0.638	−0.122	0.153	0.739	0.674	−0.897	0.040	0.024
1.000	−0.587	−0.683	0.353	0.025	−0.741	−0.511	0.999	0.038	0.027
−0.587	1.000	0.781	−0.448	−0.156	0.668	0.183	−0.600	0.312	−0.182
−0.683	0.781	1.000	−0.327	−0.116	0.483	0.417	−0.681	−0.068	−0.265
0.353	−0.448	−0.327	1.000	0.374	−0.522	0.357	0.369	−0.368	−0.002
0.025	−0.156	−0.116	0.374	1.000	−0.076	0.286	0.028	−0.119	−0.407
−0.741	0.668	0.483	−0.522	−0.076	1.000	0.000	−0.767	0.639	−0.052
−0.511	0.183	0.417	0.357	0.286	0.000	1.000	−0.490	−0.642	0.094
0.999	−0.600	−0.681	0.369	0.028	−0.767	−0.490	1.000	−0.000	0.029
0.038	0.312	−0.068	−0.368	−0.119	0.639	−0.642	−0.000	1.000	−0.058
0.027	−0.182	−0.265	−0.002	−0.407	−0.052	0.094	0.029	−0.058	1.000

EXHIBIT 3

PART 2

CORRELATIONS AMONG VARIABLES
SAMPLE PERIOD: 1964–1992
SIGNIFICANCE OF CORRELATION AT LAG = 0

	Claim Frequency per $1M Payroll (1987)			Benefit Level			California Aggregate Emplmt	Real California GSP
	Indemnity	Med-Only	Total	Indemnity	Medical	Total		
Indemnity Claim Frequency		0.116	0.000	0.039	0.413	0.018	0.068	0.036
Med-Only Claim Frequency	0.116		0.000	0.004	0.422	0.002	0.016	0.007
Total Claim Frequency	0.000	0.000		0.002	0.310	0.001	0.008	0.002
Indemnity Benefit Level	0.039	0.004	0.002		0.569	0.000	0.758	0.288
Medical Benefit Level	0.413	0.422	0.310	0.569		0.040	0.599	0.560
Total Benefit Level	0.018	0.002	0.001	0.000	0.040		0.673	0.300
California Aggregate Employment	0.068	0.016	0.008	0.758	0.599	0.673		0.000
Real California Gross State Product	0.036	0.007	0.002	0.288	0.560	0.300	0.000	
California Unemployment Rate	0.065	0.037	0.015	0.572	0.162	0.763	0.000	0.000
Indemnity Frequency Haz'ness	0.174	0.005	0.006	0.513	0.361	0.632	0.000	0.000
Indemnity Pure Premium Haz'ness	0.382	0.048	0.058	0.588	0.007	0.732	0.020	0.000
Litigation Rates	0.121	0.553	0.355	0.448	0.203	0.676	0.024	0.640
Cumulative ÷ Indemnity Claims	0.004	0.432	0.068	0.690	0.080	0.587	0.696	0.587
1st PC (rGSP, AggE)	0.050	0.010	0.004	0.662	0.576	0.592	0.000	0.000
2nd PC (rGSP, AggE)	0.353	0.275	0.169	0.274	0.803	0.344	0.549	0.000
1st PC (rGSP, AggE, Unemp)	0.060	0.032	0.012	0.569	0.172	0.746	0.000	0.000
2nd PC (rGSP, AggE, Unemp)	0.483	0.222	0.229	0.911	0.538	0.766	0.000	0.838
Self-Insurance Share Index	0.275	0.942	0.610	0.094	0.753	0.038	0.746	0.900

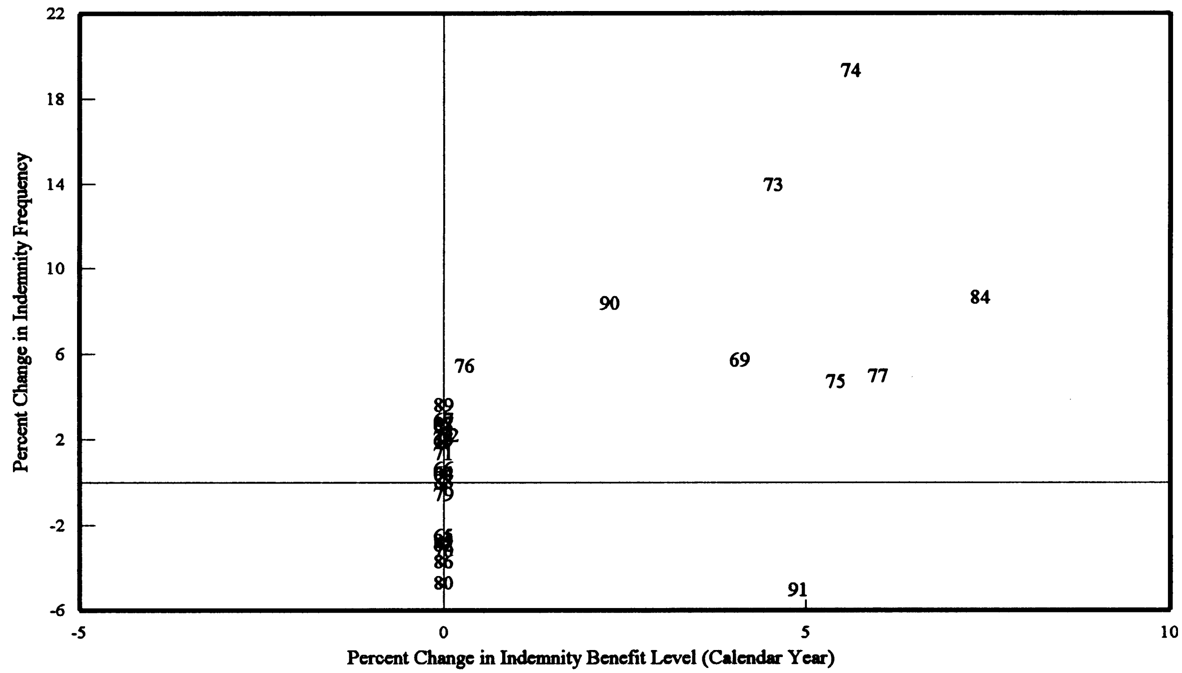
Note: P Value is the probability of observing the indicated SAMPLE correlation coefficient if the True correlation coefficient was actually zero.

California Unemplmt Rate	Indemnity Frequency Haz`ness	Indemnity Pure Premium Haz`ness	Litigation Rate	Cumulative ÷ Indemnity Claims	Principal Components				Self-Insurance Share Index
					PCGA_1	PCGA_2	PCUGA_1	PCUGA_2	
0.065	0.174	0.382	0.121	0.004	0.050	0.353	0.060	0.483	0.275
0.037	0.005	0.048	0.553	0.432	0.010	0.275	0.032	0.222	0.942
0.015	0.006	0.058	0.355	0.068	0.004	0.169	0.012	0.229	0.610
0.572	0.513	0.588	0.448	0.690	0.662	0.274	0.569	0.911	0.094
0.162	0.361	0.007	0.203	0.080	0.576	0.803	0.172	0.538	0.753
0.763	0.632	0.732	0.676	0.587	0.592	0.344	0.746	0.766	0.038
0.000	0.000	0.020	0.024	0.696	0.000	0.549	0.000	0.000	0.746
0.000	0.000	0.000	0.640	0.587	0.000	0.000	0.000	0.838	0.900
	0.001	0.000	0.165	0.928	0.000	0.005	0.000	0.844	0.888
0.001		0.000	0.071	0.578	0.000	0.342	0.001	0.099	0.345
0.000	0.000		0.201	0.680	0.008	0.024	0.000	0.726	0.164
0.165	0.071	0.201		0.232	0.031	0.160	0.145	0.146	0.994
0.928	0.578	0.680	0.232		0.788	0.301	0.921	0.672	0.132
0.000	0.000	0.008	0.031	0.788		1.000	0.000	0.000	0.787
0.005	0.342	0.024	0.160	0.301	1.000		0.007	0.000	0.629
0.000	0.001	0.000	0.145	0.921	0.000	0.007		1.000	0.882
0.844	0.099	0.726	0.146	0.672	0.000	0.000	1.000		0.764
0.888	0.345	0.164	0.994	0.132	0.787	0.629	0.882	0.764	

EXHIBIT 4

PART 1

INDEMNITY FREQUENCY VS INDEMNITY BENEFIT LEVEL



Outliers 1972, 1983 and 1994 used in regression but are not shown in graph

Spearman Rank Correlation Coefficient:	0.58449
Valid Cases	33
Two-tailed Significance	0.00035

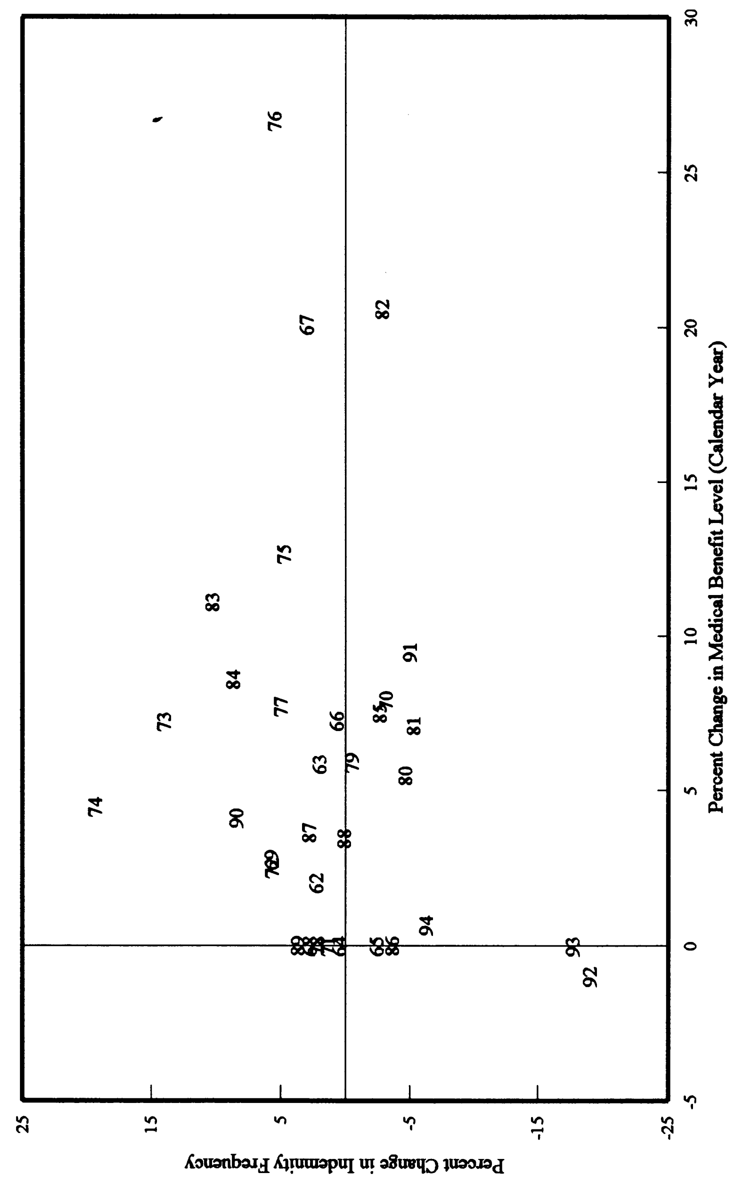
Regression Output With Constant		Regression With Dummy Variable and Constant		
Constant	−0.10398	Constant		−1.40102
Std Err of Y Est	7.01511	Std Err of Y Est		6.98836
R Squared	0.15903	R Squared		0.19235
No. of Observations	33	No. of Observations		33
Degrees of Freedom	31	Degrees of Freedom		30
			Ind BL	Dummy
X Coefficient(s)	0.39609	X Coefficient(s)	0.32425	2.91302
Std Err of Coef.	0.16359	Std Err of Coef.	0.17529	2.61825
P-Value	0.02152	P-Value	0.07422	0.27472
Regression Output Without Constant		**Regression With Dummy Variable and No Constant**		
Constant	0.00000	Constant		0.00000
Std Err of Y Est	6.90534	Std Err of Y Est		6.94801
R Squared	0.15886	R Squared		0.17504
No. of Observations	33	No. of Observations		33
Degrees of Freedom	32	Degrees of Freedom		31
			Ind BL	Dummy
X Coefficient(s)	0.39146	X Coefficient(s)	0.32425	1.51200
Std Err of Coef.	0.15054	Std Err of Coef.	0.17428	1.93884
P-Value	0.01398	P-Value	0.07233	0.44139

Note: Dummy variable is one for calendar years during which there was a medical benefit change and zero otherwise.

EXHIBIT 4

PART 2

INDEMNITY FREQUENCY VS MEDICAL BENEFIT LEVEL



Spearman Rank Correlation Coefficient:	0.26843
Valid Cases	33
Two-tailed Significance	0.13092

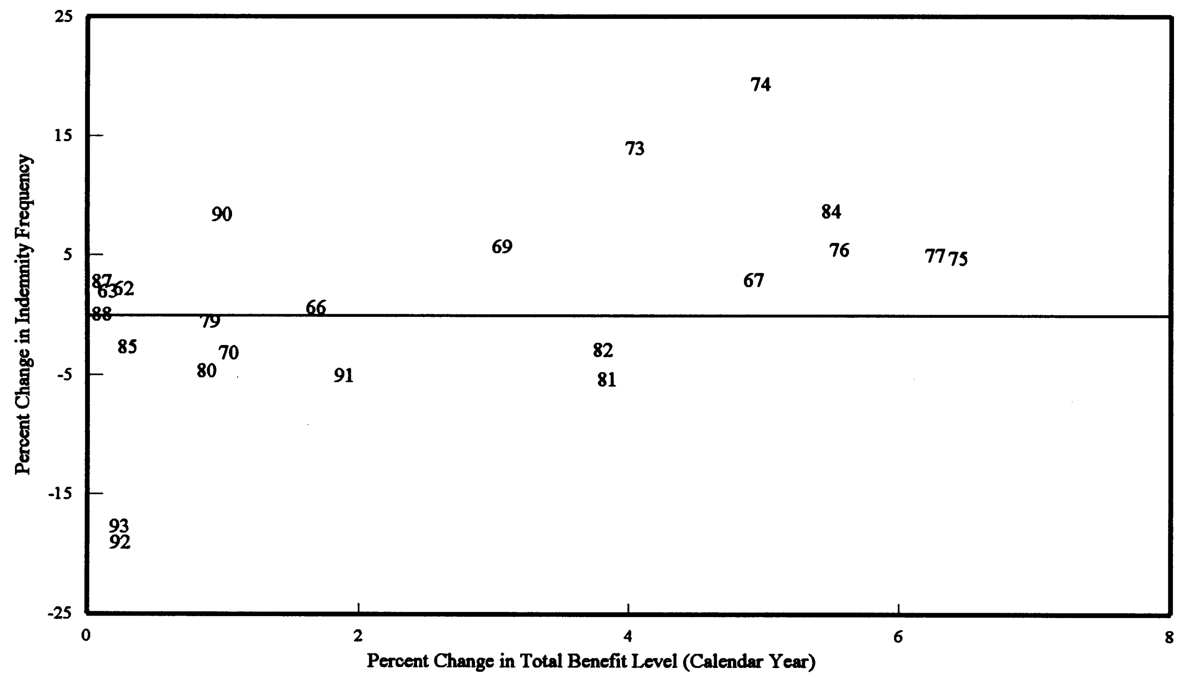
Regression Output With Constant:		Regression With Dummy Variable and Constant		
Constant	−0.55947	Constant		−1.72494
Std Err of Y Est	7.43909	Std Err of Y Est		7.51880
R Squared	0.05431	R Squared		0.06509
No. of Observations	33	No. of Observations		33
Degrees of Freedom	31	Degrees of Freedom		30
			Ind BL	Dummy
X Coefficient(s)	0.26884	X Coefficient(s)	0.19654	2.09867
Std Err of Coef.	0.20150	Std Err of Coef.	0.23786	3.56718
P-Value	0.19185	P-Value	0.41518	0.56072
Regression Output Without Constant:		**Regression With Dummy Variable and No Constant**		
Constant	0.00000	Constant		0.00000
Std Err of Y Est	7.33394	Std Err of Y Est		7.44826
R Squared	0.05120	R Squared		0.05197
No. of Observations	33	No. of Observations		33
Degrees of Freedom	32	Degrees of Freedom		31
			Ind BL	Dummy
X Coefficient(s)	0.22550	X Coefficient(s)	0.19654	0.37373
Std Err of Coef.	0.14668	Std Err of Coef.	0.23563	2.35638
P-Value	0.13403	P-Value	0.41061	0.87501

Note: Dummy variable is one for calendar years during which there was a medical benefit change and zero otherwise.

EXHIBIT 4

PART 3

INDEMNITY FREQUENCY VS TOTAL BENEFIT LEVEL



Outliers 1972, 1983 and 1994 used in regression but are not shown in graph

Spearman Rank Correlation Coefficient:	0.50840
Valid Cases	33
Two-tailed Significance	0.00252

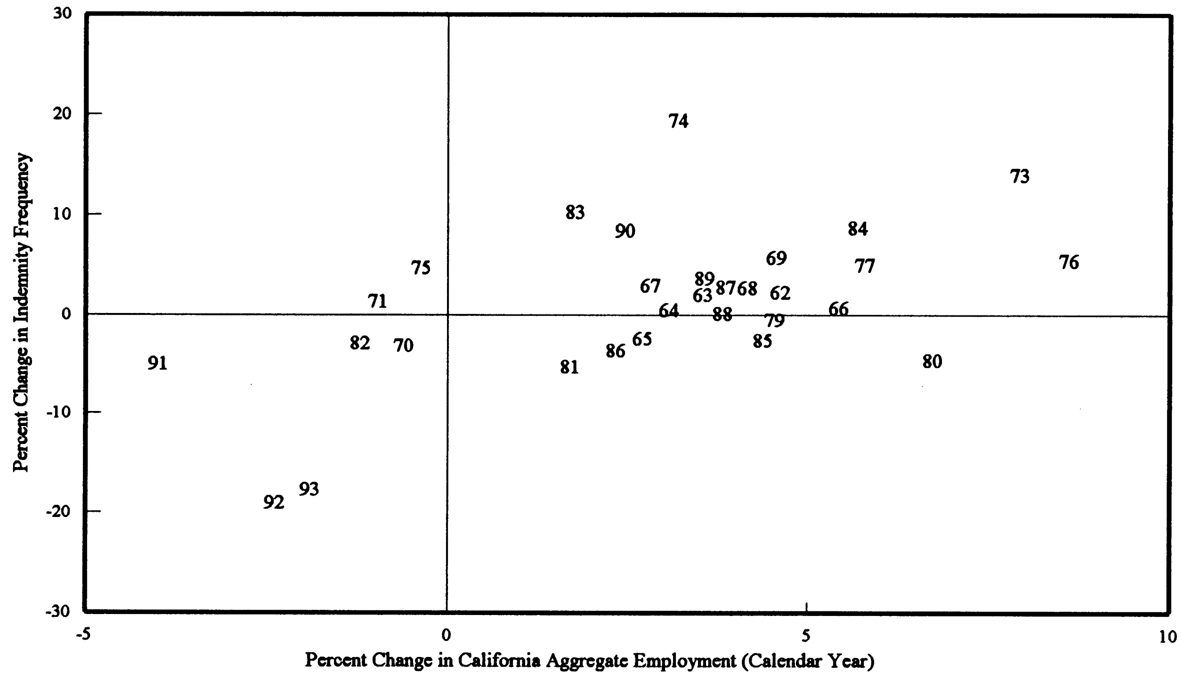
Regression Output With Constant:		Regression With Dummy Variable and Constant		
Constant	−0.68463	Constant		0.56004
Std Err of Y Est	6.81082	Std Err of Y Est		6.88774
R Squared	0.20730	R Squared		0.21544
No. of Observations	33	No. of Observations		33
Degrees of Freedom	31	Degrees of Freedom		30
			Ind BL	Dummy
X Coefficient(s)	0.67889	X Coefficient(s)	0.71540	−1.69602
Std Err of Coef.	0.23844	Std Err of Coef.	0.24985	3.03890
P-Value	0.00776	P-Value	0.00758	0.58092
Regression Output Without Constant:		**Regression With Dummy Variable and No Constant**		
Constant	0.00000	Constant		0.00000
Std Err of Y Est	6.73223	Std Err of Y Est		6.78096
R Squared	0.20050	R Squared		0.21423
No. of Observations	33	No. of Observations		33
Degrees of Freedom	32	Degrees of Freedom		31
			Ind BL	Dummy
X Coefficient(s)	0.62352	X Coefficient(s)	0.71540	−1.13598
Std Err of Coef.	0.21042	Std Err of Coef.	0.24597	1.54338
P-Value	0.00570	P-Value	0.00666	0.46724

Note: Dummy variable is one for calendar years during which there was an indemnity or medical benefit change and zero otherwise.

EXHIBIT 4

PART 4

INDEMNITY FREQUENCY VS CALIFORNIA AGGREGATE EMPLOYMENT



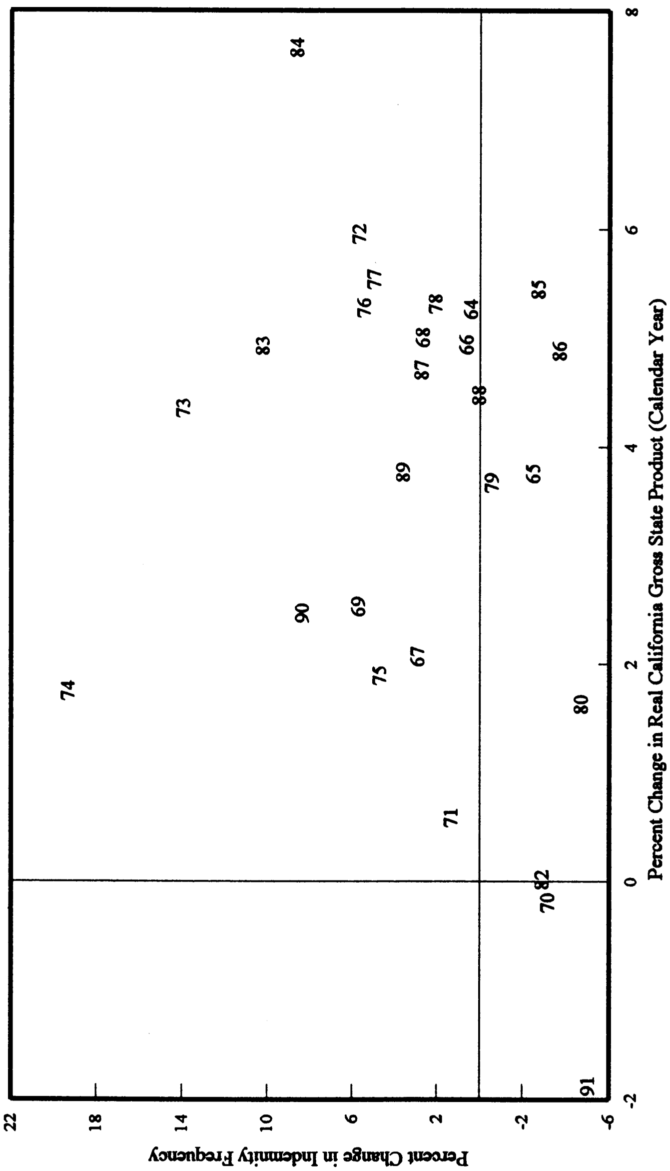
Outliers 1972 and 1978 are used in the regressions but are not shown in the graph

Spearman Rank Correlation Coefficient:	0.47947
Valid Cases	32
Two-tailed Significance	0.00548
Regression Output With Constant:	
Constant	−1.21341
Std Err of Y Est	7.01544
R Squared	0.16030
No. of Observations	32
Degrees of Freedom	30
X Coefficient(s)	0.65749
Std Err of Coef.	0.27474
P-Value	0.02320
Regression Output Without Constant:	
Constant	0.00000
Std Err of Y Est	6.96629
R Squared	0.14443
No. of Observations	32
Degrees of Freedom	31
X Coefficient(s)	0.52540
Std Err of Coef.	0.20998
P-Value	0.01783

EXHIBIT 4

PART 5

INDEMNITY FREQUENCY VS REAL CALIFORNIA GROSS STATE PRODUCT



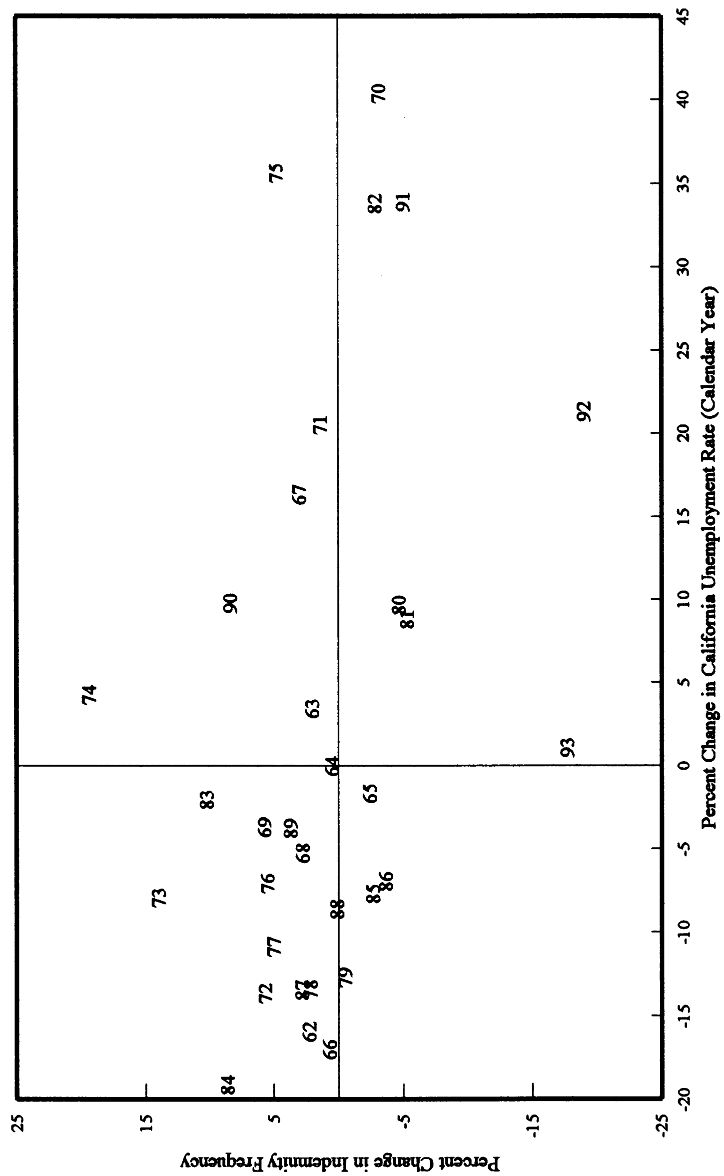
Outlier 1992 is used in the regressions but is not shown in the graph

Spearman Rank Correlation Coefficient:	0.40246
Valid Cases	29
Two-tailed Significance	0.03042
Regression Output With Constant:	
Constant	−2.27752
Std Err of Y Est	6.59466
R Squared	0.15332
No. of Observations	29
Degrees of Freedom	27
X Coefficient(s)	1.21851
Std Err of Coef.	0.55107
P-Value	0.03570
Regression Output Without Constant:	
Constant	0.00000
Std Err of Y Est	6.59963
R Squared	0.12064
No. of Observations	29
Degrees of Freedom	28
X Coefficient(s)	0.74826
Std Err of Coef.	0.30273
P-Value	0.01979

EXHIBIT 4

PART 6

INDEMNITY FREQUENCY VS CALIFORNIA UNEMPLOYMENT RATE

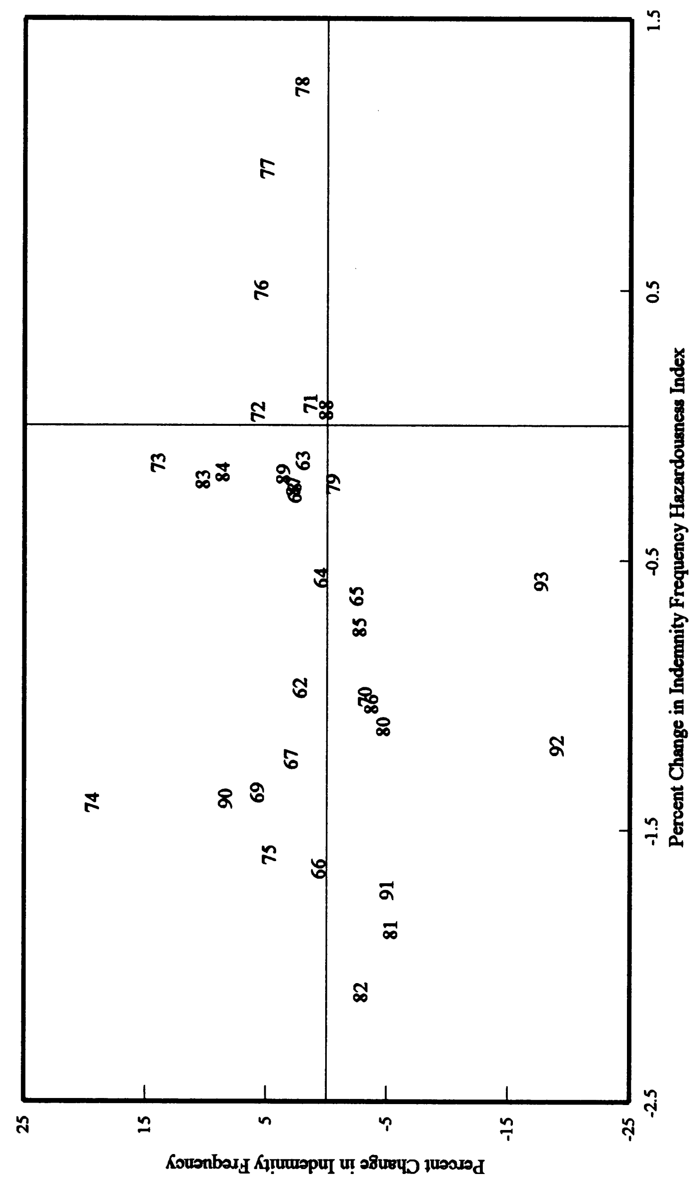


Spearman Rank Correlation Coefficient:	−0.34054
Valid Cases	32
Two-tailed Significance	0.05648
Regression Output With Constant:	
Constant	1.53439
Std Err of Y Est	7.30768
R Squared	0.08889
No. of Observations	32
Degrees of Freedom	30
X Coefficient(s)	−0.13483
Std Err of Coef.	0.07881
P-Value	0.09740
Regression Output Without Constant:	
Constant	0.00000
Std Err of Y Est	7.35321
R Squared	0.04675
No. of Observations	32
Degrees of Freedom	31
X Coefficient(s)	−0.12291
Std Err of Coef.	0.07865
P-Value	0.12824

EXHIBIT 4

PART 7

INDEMNITY FREQUENCY VS INDEMNITY FREQUENCY HAZARDOUSNESS INDEX

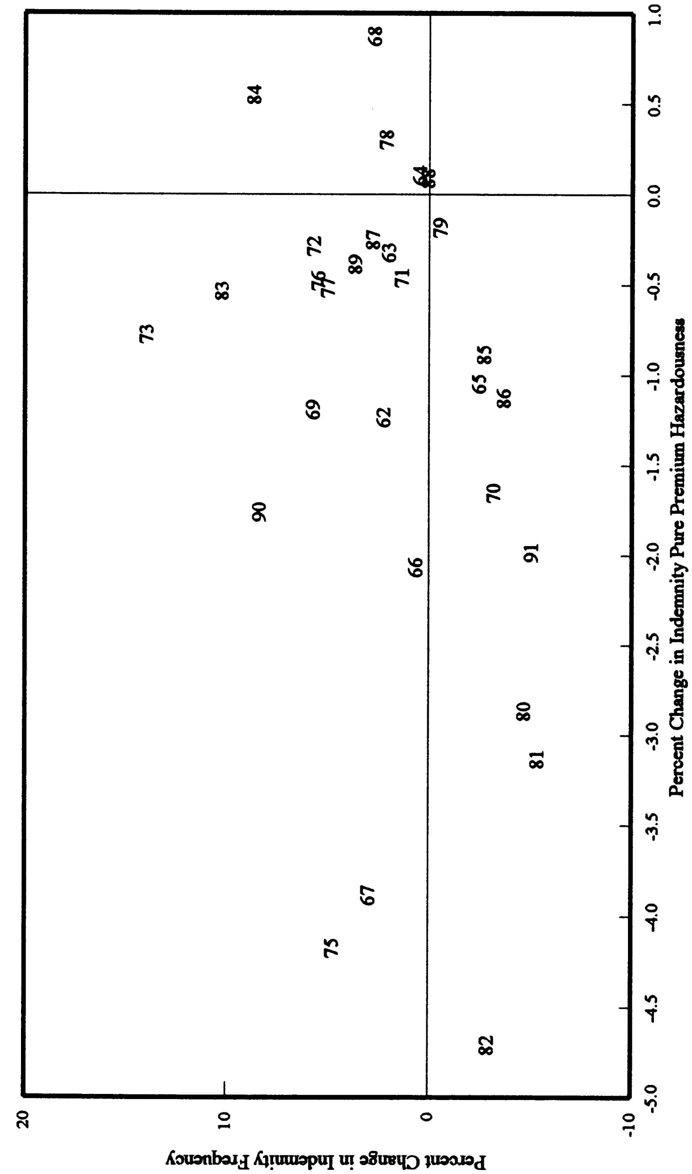


Spearman Rank Correlation Coefficient:	0.32148
Valid Cases	32
Two-tailed Significance	0.07278
Regression Output With Constant:	
Constant	2.58046
Std Err of Y Est	7.46806
R Squared	0.04846
No. of Observations	32
Degrees of Freedom	30
X Coefficient(s)	2.05597
Std Err of Coef.	1.66336
P-Value	0.22600
Regression Output Without Constant:	
Constant	0.00000
Std Err of Y Est	7.62216
R Squared	0.04609
No. of Observations	32
Degrees of Freedom	31
X Coefficient(s)	0.46323
Std Err of Coef.	1.31509
P-Value	0.72703

EXHIBIT 4

PART 8

INDEMNITY FREQUENCY VS INDEMNITY PURE PREMIUM HAZARDOUSNESS INDEX

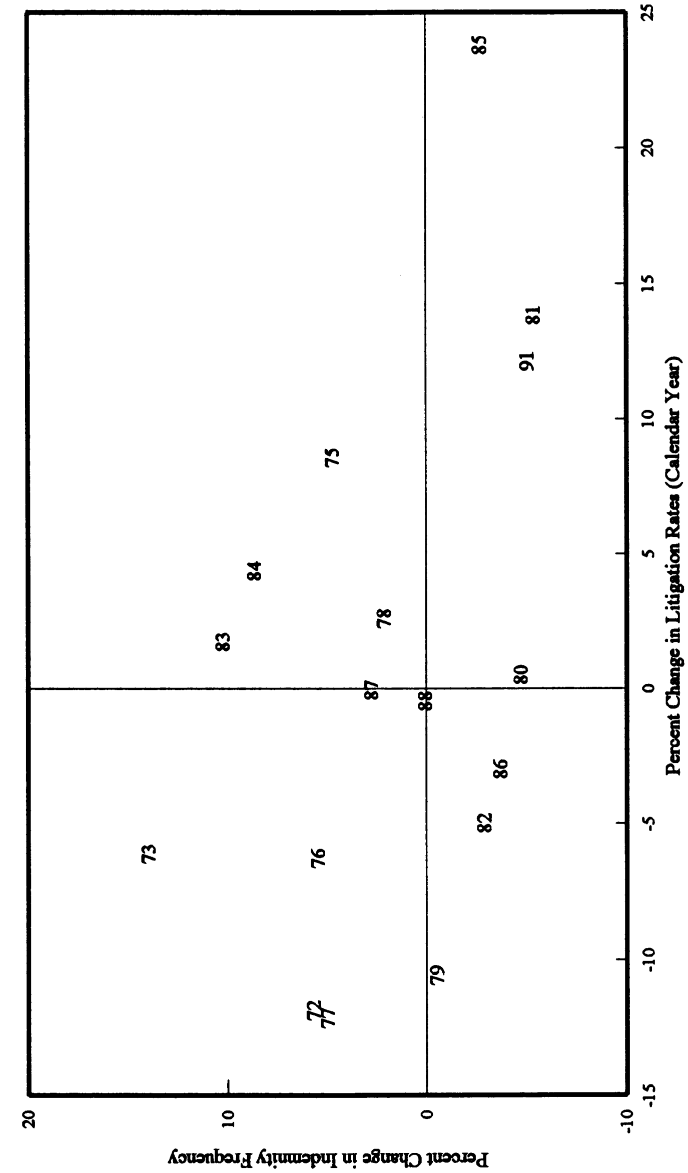


Spearman Rank Correlation Coefficient:	0.20860
Valid Cases	32
Two-tailed Significance	0.24550
Regression Output With Constant:	
Constant	1.95477
Std Err of Y Est	7.61169
R Squared	0.01150
No. of Observations	32
Degrees of Freedom	30
X Coefficient(s)	0.58979
Std Err of Coef.	0.99820
P-Value	0.55904
Regression Output Without Constant:	
Constant	0.00000
Std Err of Y Est	7.63367
R Squared	0.02227
No. of Observations	32
Degrees of Freedom	31
X Coefficient(s)	−0.13025
Std Err of Coef.	0.74832
P-Value	0.86296

EXHIBIT 4

PART 9

INDEMNITY FREQUENCY VS LITIGATION RATE



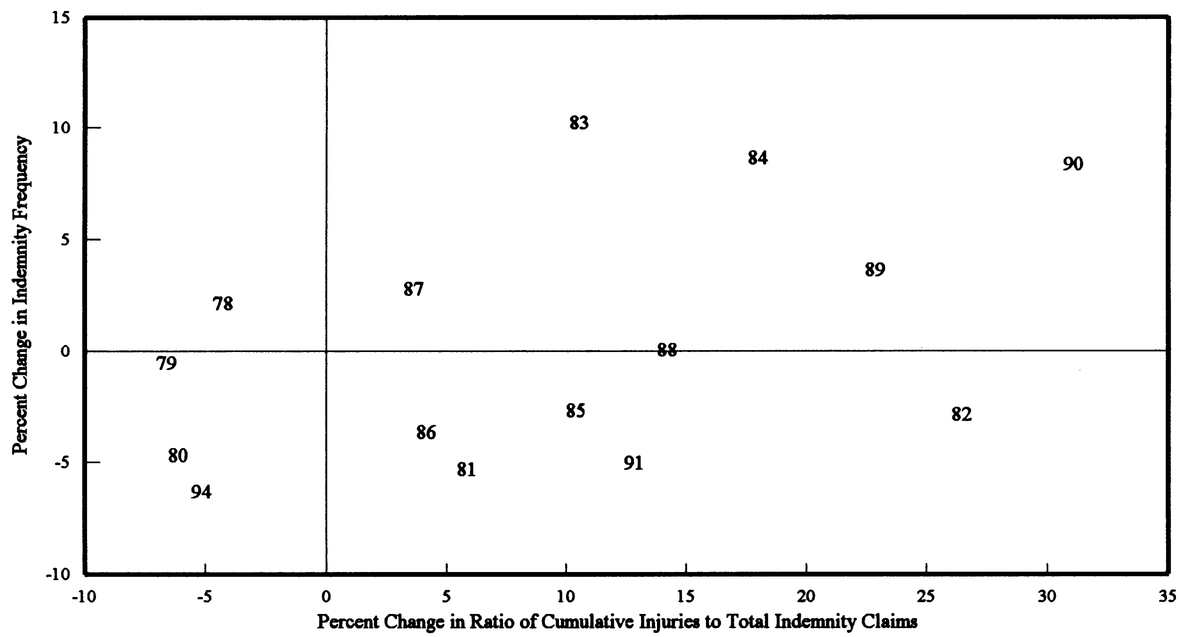
Outliers 1974 and 1985 are NOT used in regressions but are shown on graph

Spearman Rank Correlation Coefficient:	–0.35000
Valid Cases	16
Two-tailed Significance	0.18386
Regression Output With Constant:	
Constant	2.08448
Std Err of Y Est	5.71497
R Squared	0.10549
No. of Observations	16
Degrees of Freedom	14
X Coefficient(s)	–0.23892
Std Err of Coef.	0.18595
P-Value	0.21968
Regression Output Without Constant:	
Constant	0.00000
Std Err of Y Est	7.94003
R Squared	0.26223
No. of Observations	16
Degrees of Freedom	15
X Coefficient(s)	–0.26371
Std Err of Coef.	0.19190
P-Value	0.18956

EXHIBIT 4

PART 10

INDEMNITY FREQUENCY VS RATIO OF CUMULATIVE INJURIES TO TOTAL INDEMNITY CLAIMS



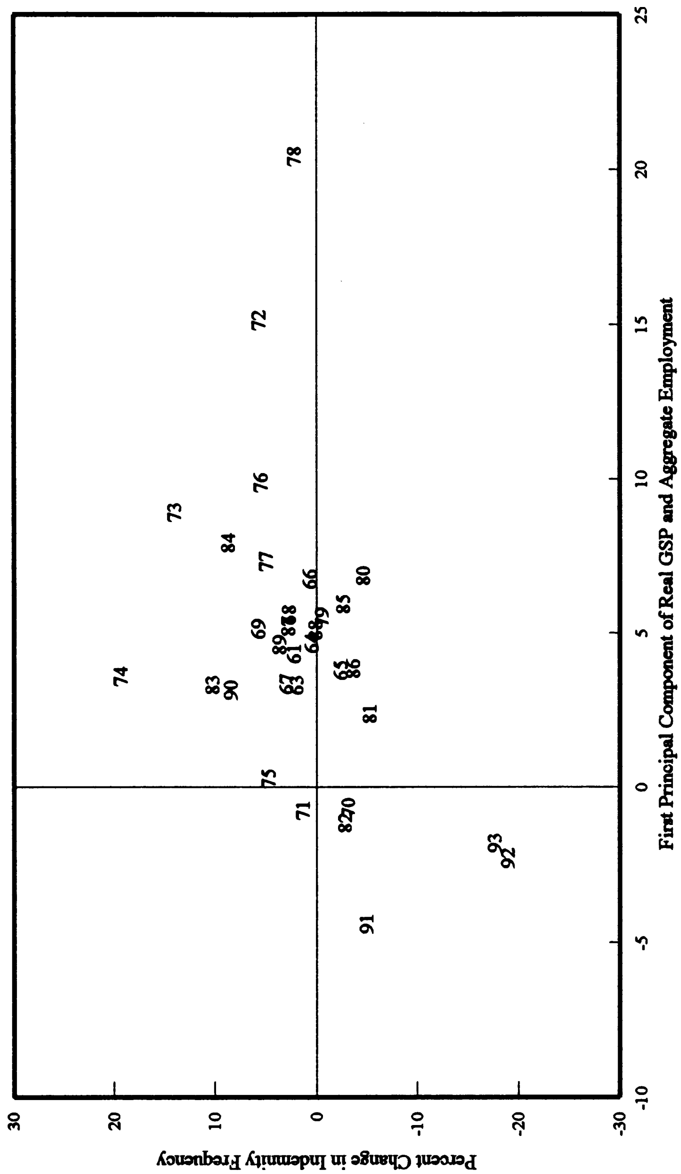
Outliers 1992 and 1993 are used in the regressions but not shown in graph

Spearman Rank Correlation Coefficient:	0.61029
Valid Cases	17
Two-tailed Significance	0.00926
Regression Output With Constant:	
Constant	−3.49152
Std Err of Y Est	5.23706
R Squared	0.60247
No. of Observations	17
Degrees of Freedom	15
X Coefficient(s)	0.35571
Std Err of Coef.	0.07460
P-Value	0.00025
Regression Output Without Constant:	
Constant	0.00000
Std Err of Y Est	6.15150
R Squared	0.41496
No. of Observations	17
Degrees of Freedom	16
X Coefficient(s)	0.30564
Std Err of Coef.	0.08480
P-Value	0.00238

EXHIBIT 4

PART 11

INDEMNITY FREQUENCY VS FIRST PRINCIPAL COMPONENT OF CA REAL GSP AND CA AGGREGATE EMPLOYMENT

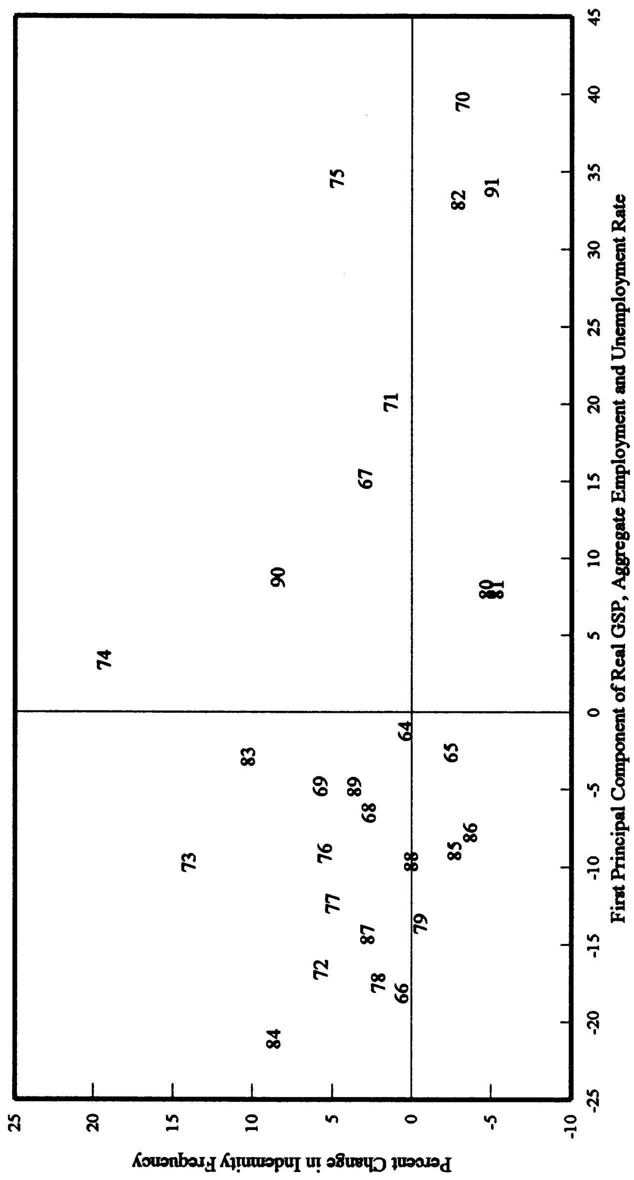


Spearman Rank Correlation Coefficient:	0.43181
Valid Cases	32
Two-tailed Significance	0.01358
Regression Output With Constant:	
Constant	−1.75361
Std Err of Y Est	6.93017
R Squared	0.18059
No. of Observations	32
Degrees of Freedom	30
X Coefficient(s)	0.65856
Std Err of Coef.	0.25612
P-Value	0.01533
Regression Output Without Constant:	
Constant	0.00000
Std Err of Y Est	6.93842
R Squared	0.15126
No. of Observations	32
Degrees of Freedom	31
X Coefficient(s)	0.47547
Std Err of Coef.	0.18563
P-Value	0.01551

EXHIBIT 4

PART 12

INDEMNITY FREQUENCY VS FIRST PRINCIPAL COMPONENT OF CA REAL GSP, CA AGGREGATE EMPLOYMENT AND UNEMPLOYMENT RATE



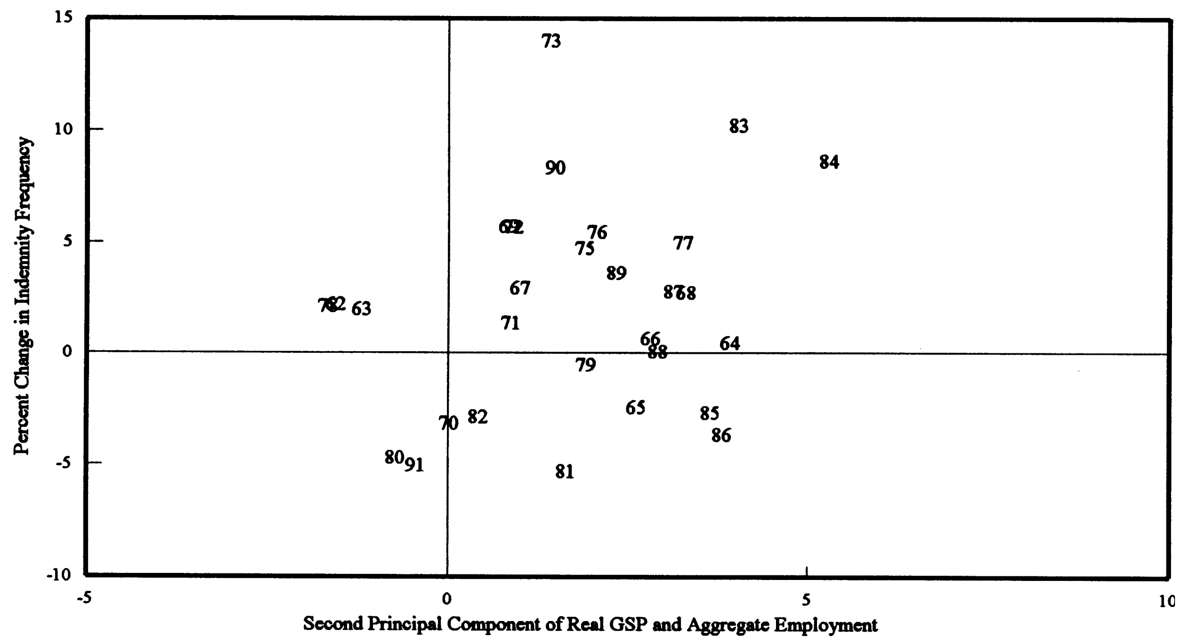
Outliers 1992 and 1993 used in regressions but are not shown in the graph

Spearman Rank Correlation Coefficient:	−0.36418
Valid Cases	30
Two-tailed Significance	0.04786
Regression Output With Constant:	
Constant	1.41012
Std Err of Y Est	7.52272
R Squared	0.09809
No. of Observations	30
Degrees of Freedom	28
X Coefficient(s)	−0.14101
Std Err of Coef.	0.08080
P-Value	0.09121
Regression Output Without Constant:	
Constant	0.00000
Std Err of Y Est	7.52863
R Squared	0.06441
No. of Observations	30
Degrees of Freedom	29
X Coefficient(s)	−0.13357
Std Err of Coef.	0.08054
P-Value	0.10731

EXHIBIT 4

PART 13

INDEMNITY FREQUENCY VS SECOND PRINCIPAL COMPONENT OF CA REAL GSP AND CA AGGREGATE EMPLOYMENT



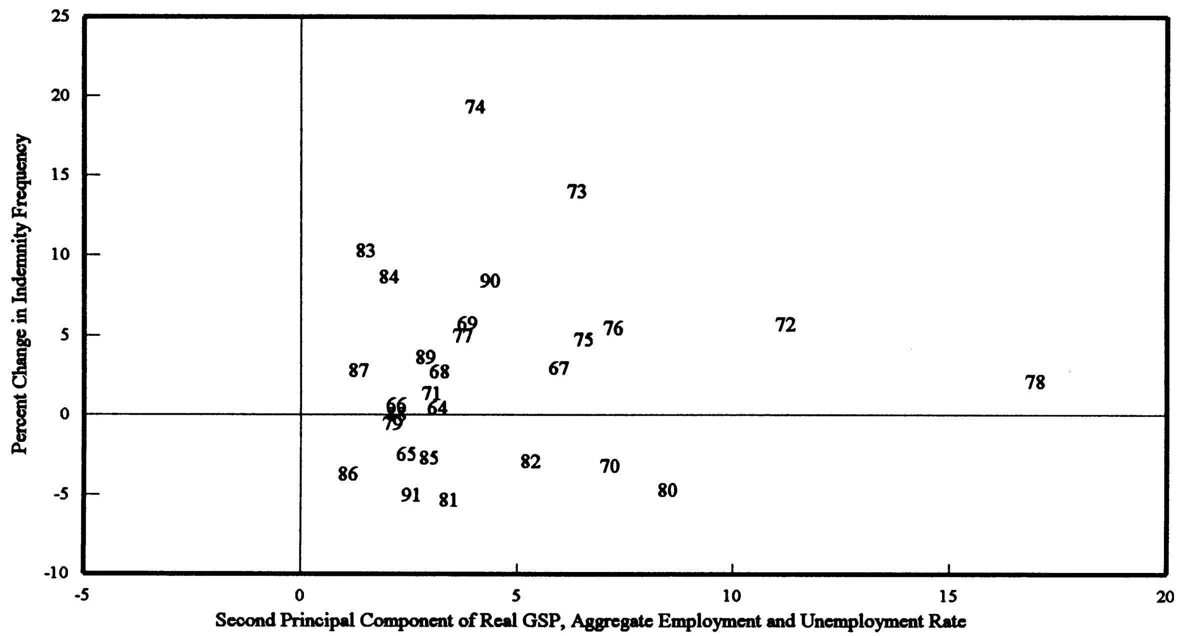
Outliers 1974, 1992 and 1993 used in regression but are not shown in graph

Spearman Rank Correlation Coefficient:	0.22360
Valid Cases	32
Two-tailed Significance	0.21860
Regression Output With Constant:	
Constant	−0.04754
Std Err of Y Est	7.52449
R Squared	0.03402
No. of Observations	32
Degrees of Freedom	30
X Coefficient(s)	0.79696
Std Err of Coef.	0.77531
P-Value	0.31220
Regression Output Without Constant:	
Constant	0.00000
Std Err of Y Est	7.40222
R Squared	0.03400
No. of Observations	32
Degrees of Freedom	31
X Coefficient(s)	0.78313
Std Err of Coef.	0.55359
P-Value	0.16714

EXHIBIT 4

PART 14

INDEMNITY FREQUENCY VS SECOND PRINCIPAL COMPONENT OF CA REAL GSP, CA AGGREGATE EMPLOYMENT AND UNEMPLOYMENT RATE



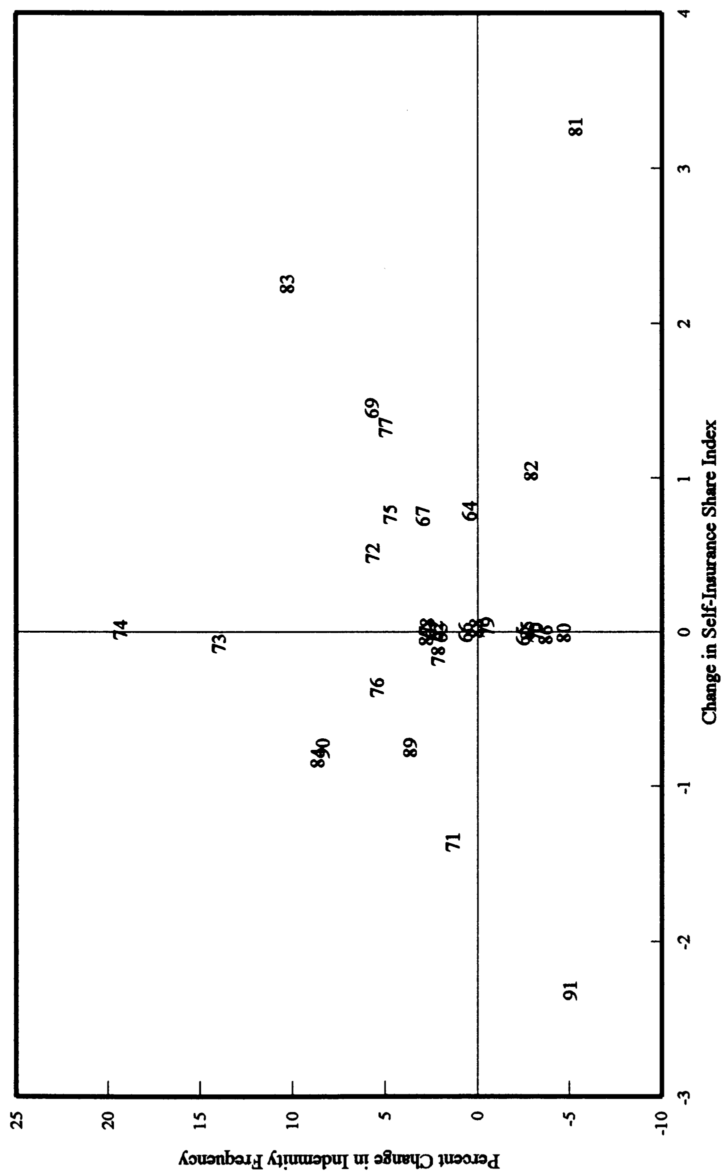
Outliers 1992 and 1993 used in regressions but are not shown in the graph

Spearman Rank Correlation Coefficient:	0.28275
Valid Cases	30
Two-tailed Significance	0.13002
Regression Output With Constant:	
Constant	−1.24561
Std Err of Y Est	7.64980
R Squared	0.06736
No. of Observations	30
Degrees of Freedom	28
X Coefficient(s)	0.57363
Std Err of Coef.	0.40336
P-Value	0.16530
Regression Output Without Constant:	
Constant	0.00000
Std Err of Y Est	7.55920
R Squared	0.05680
No. of Observations	30
Degrees of Freedom	29
X Coefficient(s)	0.39749
Std Err of Coef.	0.25168
P-Value	0.12442

EXHIBIT 4

PART 15

INDEMNITY FREQUENCY VS SELF-INSURANCE SHARE INDEX



Spearman Rank Correlation Coefficient:	–0.10320
Valid Cases	32
Two-tailed Significance	0.56550
Regression Output With Constant:	
Constant	1.55043
Std Err of Y Est	7.54764
R Squared	0.02807
No. of Observations	30
Degrees of Freedom	28
X Coefficient(s)	–1.16260
Std Err of Coef.	1.24904
P-Value	0.35939
Regression Output Without Constant:	
Constant	0.00000
Std Err of Y Est	0.00000
R Squared	0.02807
No. of Observations	30
Degrees of Freedom	29
X Coefficient(s)	–0.82922
Std Err of Coef.	1.21901
P-Value	0.50140

EXHIBIT 5

PART 1

SUMMARY OF SELECTED REGRESSION RESULTS INDEMNITY BENEFIT LEVEL

Independent Variables			Coefficient of Indemnity Benefit Level	Adjusted R^2 (×100)	Mean Residual Error	P-Values for Tests of Normality in Residuals			
						K-S Test	Shapiro-Wilks	Skewness	Kurtosis
Constant	PCUGA_1 & PCUGA_2	Cum Inj Index	0.286573	87.9086	−0.000001	0.98557	0.726754	0.881409	0.704214
Constant	PCUGA_1	Cum Inj Index	0.261897	85.6142	−0.000001	0.94783	0.748869	0.886143	0.343503
Constant	PCGA_1 & PCGA_2	Cum Inj Index	0.272918	83.4069	−0.000000	0.78244	0.423384	0.548331	0.813895
Constant	rGSP & AggE	Cum Inj Index	0.272919	83.4069	−0.000001	0.78245	0.423383	0.548330	0.813897
Constant	PCGA_1	Cum Inj Index	0.309052	82.2782	0.000000	0.50538	0.105146	0.386600	0.849528
Constant	AggE	Cum Inj Index	0.321087	79.8728	0.000000	0.66497	0.257688	0.398509	0.826385
Constant	rGSP	Cum Inj Index	0.220530	78.2211	−0.000000	0.90252	0.335510	0.997070	0.148195
Origin	PCUGA_1 & PCUGA_2	Cum Inj Index	0.174378	66.0923	−1.821382	0.92753	0.330178	0.930584	0.411106
Origin	PCUGA_1	Cum Inj Index	0.164625	64.4638	−2.660440	0.70927	0.205739	0.925496	0.625992
Origin	AggE	Cum Inj Index	0.168924	32.8023	−3.249618	0.76309	0.425381	0.632718	0.418103
Origin	PCGA_1	Cum Inj Index	0.166104	32.1664	−3.202778	0.74136	0.339507	0.610755	0.411451
Origin	PCGA_1 & PCGA_2	Cum Inj Index	0.236292	31.8970	−2.675669	0.99048	0.736900	0.858949	0.404446
Origin	rGSP & AggE	Cum Inj Index	0.236293	31.8970	−2.675668	0.99048	0.736900	0.858948	0.404446
Origin	rGSP	Cum Inj Index	0.181181	30.8825	−2.692286	0.71617	0.417545	0.613256	0.349558
Origin	PCUGA_1 & PCUGA_2	None	0.310626	26.1143	−0.129588	0.60045	0.113746	0.727394	0.018431
Origin	PCGA_1	None	0.285431	26.0075	−0.745032	0.62419	0.060441	0.890201	0.011669
Origin	AggE	None	0.296739	25.9621	−0.631326	0.74362	0.095821	0.945521	0.014194
Origin	PCUGA_1	None	0.363330	25.5120	0.765343	0.79254	0.116257	0.880094	0.018651
Origin	rGSP	None	0.272067	23.3272	−0.776528	0.52080	0.025223	0.889271	0.007354
Origin	rGSP & AggE	None	0.288721	23.1740	−0.712893	0.64107	0.068267	0.905894	0.012398
Origin	PCGA_1 & PCGA_2	None	0.288721	23.1740	−0.712893	0.64107	0.068266	0.905893	0.012398
Constant	PCGA_1	None	0.321818	20.3379	−0.000000	0.70653	0.169706	0.712973	0.020484
Constant	AggE	None	0.330217	19.3274	0.000001	0.78895	0.207190	0.845635	0.023023
Constant	rGSP	None	0.287312	19.2424	−0.000001	0.71529	0.032419	0.400785	0.008683
Constant	PCUGA_1	None	0.316254	18.7551	0.000001	0.75395	0.091303	0.844291	0.016314
Constant	PCGA_1 & PCGA_2	None	0.300944	18.4262	0.000001	0.68396	0.067943	0.443847	0.013336
Constant	rGSP & AggE	None	0.300945	18.4262	0.000001	0.68396	0.067943	0.443848	0.013336
Constant	PCUGA_1 & PCUGA_2	None	0.319097	17.8047	0.000002	0.56930	0.137531	0.718970	0.020284

PCGA_1(2) = First (second) principal component of California Real GSP and Aggregate Employment.
PCUGA_1(2) = First (second) principal component of California Unemployment Rate, California Real GSP, and Aggregate Employment.

EXHIBIT 5

PART 2

SUMMARY OF SELECTED REGRESSION RESULTS TOTAL BENEFIT LEVEL

Independent Variables			Coefficient of Indemnity Benefit Level	Adjusted R^2 ($\times 100$)	Mean Residual Error	P-Values for Tests of Normality in Residuals			
						K-S Test	Shapiro-Wilks	Skewness	Kurtosis
Constant	PCUGA_1 & PCUGA_2	Cum Inj Index	0.456894	85.9722	−0.000000	0.92907	0.874813	0.927566	0.611238
Constant	PCUGA_1	Cum Inj Index	0.422782	84.3168	−0.000001	0.95431	0.848256	0.968421	0.361423
Constant	PCGA_1 & PCGA_2	Cum Inj Index	0.420679	80.7484	−0.000000	0.89854	0.322648	0.817466	0.496837
Constant	rGSP & AggE	Cum Inj Index	0.420679	80.7484	0.000000	0.89854	0.322650	0.817465	0.496839
Constant	PCGA_1	Cum Inj Index	0.484488	79.2394	−0.000000	0.92763	0.747651	0.795915	0.775950
Constant	AggE	Cum Inj Index	0.502991	76.5814	−0.000000	0.93771	0.901157	0.842296	0.895562
Constant	rGSP	Cum Inj Index	0.337664	76.3457	0.000001	0.95764	0.381211	0.919454	0.085781
Origin	PCUGA_1 & PCUGA_2	Cum Inj Index	0.256019	64.4102	−1.800296	0.82172	0.359736	0.848332	0.372861
Origin	PCUGA_1	Cum Inj Index	0.225583	62.4887	−2.652812	0.79838	0.328497	0.879385	0.642470
Origin	PCUGA_1	None	0.621759	31.9340	0.083426	0.63017	0.092248	0.700709	0.018230
Origin	PCUGA_1 & PCUGA_2	None	0.564547	30.0771	−0.279990	0.69593	0.082883	0.626873	0.016654
Origin	AggE	Cum Inj Index	0.203652	29.6727	−3.189150	0.87257	0.536635	0.741083	0.302869
Origin	PCGA_1	Cum Inj Index	0.198961	29.1148	−3.152980	0.88414	0.475527	0.715886	0.295250
Origin	rGSP	Cum Inj Index	0.221670	27.7018	−2.714230	0.86316	0.354814	0.659300	0.238581
Origin	AggE	None	0.487566	27.4589	−0.900121	0.46532	0.059950	0.901925	0.012502
Origin	PCGA_1	None	0.472383	27.3324	−0.973372	0.44110	0.047488	0.865926	0.010582
Origin	rGSP & AggE	Cum Inj Index	0.304403	27.2065	−2.715112	0.98855	0.628836	0.823965	0.282299
Origin	PCGA_1 & PCGA_2	Cum Inj Index	0.304402	27.2065	−2.715111	0.98855	0.628837	0.823966	0.282298
Origin	rGSP	None	0.472065	24.9179	−0.931511	0.42116	0.022933	0.909797	0.007748
Origin	rGSP & AggE	None	0.492587	24.6757	−0.875043	0.47991	0.064638	0.914406	0.013135
Origin	PCGA_1 & PCGA_2	None	0.492587	24.6756	−0.875044	0.47991	0.064638	0.914405	0.013135
Constant	PCUGA_1	None	0.609784	24.3041	−0.000003	0.64948	0.086616	0.698150	0.017646
Constant	PCGA_1	None	0.590481	24.0807	−0.000001	0.54070	0.143540	0.593814	0.023128
Constant	rGSP	None	0.547191	23.2327	−0.000001	0.40620	0.024810	0.326243	0.009149
Constant	AggE	None	0.602700	23.0988	−0.000001	0.70428	0.184220	0.713578	0.026753
Constant	PCUGA_1 & PCUGA_2	None	0.600278	22.6779	0.000002	0.81060	0.128743	0.589805	0.020823
Constant	rGSP & AggE	None	0.560971	22.3380	0.000000	0.66443	0.058335	0.356940	0.013897
Constant	PCGA_1 & PCGA_2	None	0.560971	22.3380	0.000000	0.66443	0.058335	0.356940	0.013897

PCGA_1(2) = First (second) principal component of California Real GSP and Aggregate Employment.
PCUGA_1(2) = First (second) principal component of California Unemployment Rate, California Real GSP, and Aggregate Employment.

EXHIBIT 5

PART 3

SUMMARY OF SELECTED REGRESSION RESULTS INDEMNITY AND MEDICAL BENEFIT LEVELS SEPARATELY

Independent Variables			Coefficient of Indemnity Benefit Level	Adjusted R^2 (×100)	Mean Residual Error	P-Values for Tests of Normality in Residuals			
						K-S Test	Shapiro-Wilks	Skewness	Kurtosis
Constant	PCUGA_1 & PCUGA_2	Cum Inj Index	0.292514	86.6292	−0.000000	0.93713	0.469462	0.860224	0.579064
Constant	PCUGA_1	Cum Inj Index	0.265798	84.2016	−0.000001	0.91036	0.648858	0.865121	0.261407
Constant	PCGA_1 & PCGA_2	Cum Inj Index	0.295324	82.4230	−0.000000	0.92179	0.421744	0.377549	0.966732
Constant	rGSP & AggE	Cum Inj Index	0.295324	82.4230	−0.000001	0.92179	0.421743	0.377548	0.966733
Constant	PCGA_1	Cum Inj Index	0.333570	82.2312	−0.000000	0.42860	0.014267	0.168730	0.659239
Constant	AggE	Cum Inj Index	0.349063	80.3324	−0.000001	0.26057	0.005202	0.138342	0.608047
Constant	rGSP	Cum Inj Index	0.248528	77.1472	−0.000001	0.87537	0.434008	0.966419	0.149610
Origin	PCUGA_1	Cum Inj Index	0.272917	72.6089	−1.466101	0.27758	0.024815	0.631453	0.018983
Origin	PCUGA_1 & PCUGA_2	Cum Inj Index	0.264671	70.3213	−1.313504	0.37866	0.025171	0.626510	0.014782
Origin	AggE	Cum Inj Index	0.333620	61.7762	−1.517823	0.98017	0.747490	0.787201	0.379075
Origin	PCGA_1	Cum Inj Index	0.328093	61.1363	−1.520994	0.97121	0.815370	0.876925	0.332588
Origin	PCGA_1 & PCGA_2	Cum Inj Index	0.364976	59.6827	−1.263185	0.93943	0.230026	0.437066	0.726277
Origin	rGSP & AggE	Cum Inj Index	0.364976	59.6827	−1.263183	0.93942	0.230023	0.437065	0.726277
Origin	rGSP	Cum Inj Index	0.319801	57.7186	−1.243197	0.97554	0.703445	0.965119	0.209469
Origin	PCUGA_1	None	0.279791	28.4637	−0.190637	0.68344	0.083596	0.404802	0.017932
Origin	PCUGA_1 & PCUGA_2	None	0.272875	26.0173	−0.388706	0.79310	0.069573	0.414467	0.016002
Origin	AggE	None	0.284992	23.3459	−0.774986	0.62034	0.076152	0.885340	0.013112
Origin	PCGA_1	None	0.277164	23.2979	−0.846570	0.67076	0.056379	0.848956	0.010987
Constant	PCUGA_1	None	0.288158	20.4783	0.000001	0.78526	0.086808	0.367933	0.020017
Origin	rGSP	None	0.267653	20.4679	−0.835981	0.55850	0.025379	0.870139	0.007349
Origin	PCGA_1 & PCGA_2	None	0.282775	20.2872	−0.795989	0.63350	0.068830	0.874672	0.012498
Origin	rGSP & AggE	None	0.282775	20.2872	−0.795988	0.63350	0.068830	0.874672	0.012498
Constant	PCGA_1	None	0.304491	19.9140	−0.000001	0.73658	0.155005	0.392062	0.022554
Constant	rGSP	None	0.266582	18.9563	0.000001	0.26368	0.014179	0.174932	0.007352
Constant	PCUGA_1 & PCUGA_2	None	0.292522	18.7697	0.000003	0.72397	0.074620	0.310532	0.021152
Constant	AggE	None	0.313943	18.6927	−0.000002	0.67057	0.231371	0.513812	0.027657
Constant	rGSP & AggE	None	0.280121	18.2308	−0.000000	0.67307	0.038561	0.189872	0.011297
Constant	PCGA_1 & PCGA_2	None	0.280120	18.2308	0.000004	0.67306	0.038559	0.189866	0.011297

PCGA_1(2) = First (second) principal component of California Real GSP and Aggregate Employment.
PCUGA_1(2) = First (second) principal component of California Unemployment Rate, California Real GSP, and Aggregate Employment.

EXHIBIT 6

PART 1

STATGRAPHICS PLUS REGRESSION RESULTS-MODEL #1

Multiple Regression Analysis

Dependent variable: IndFrq

Parameter	Estimate	Standard Error	T Statistic	P-Value
CONSTANT	−4.911830	1.070660	−4.58767	0.0010
CYIndBL	0.286573	0.069859	4.10215	0.0021
PCUGA_1	−0.209370	0.038628	−5.42019	0.0003
PCUGA_2	0.299701	0.170568	1.75708	0.1094
CumInjNDX	0.308297	0.042620	7.23363	0.0000

Analysis of Variance

Source	Sum of Squares	Degrees of Freedom	Mean Square Error	F-Ratio	P-Value
Model	674.4880	4	168.6220	26.4462	0.0000
Residual	63.7604	10	6.3760		
Total (Corr.)	738.2484	14			

R-squared = 91.3633 percent
R-squared (adjusted for d.f.) = 87.9086 percent
Standard Error of Est. = 2.52508
Mean absolute error = 1.65922
Durbin–Watson statistic = 2.14752

The StatAdvisor

The output shows the results of fitting a multiple linear regression model to describe the relationship between IndFrq and 4 independent variables. The equation of the fitted model is

$$\text{IndFrq} = -4.91183 + 0.286573 * \text{CYIndBL} - 0.20937 * \text{PCUGA\_1} + 0.299701 * \text{PCUGA\_2} + 0.308297 * \text{CumInjNDX}.$$

Since the P-value in the ANOVA table is less than 0.01, there is a statistically significant relationship between the variables at the 99% confidence level.

The R-Squared statistic indicates that the model as fitted explains 91.3633% of the variability in IndFrq. The adjusted R-squared statistic, which is more suitable for comparing models with different numbers of independent variables, is 87.9086%. The standard error of the estimate shows the standard deviation of the residuals to be 2.52508. This value can be used to construct prediction limits for new observations by selecting the Reports option from the text menu. The mean absolute error (MAE) of 1.65922 is the average value of the residuals. The Durbin–Watson (DW) statistic tests the residuals to determine if there is any significant correlation based on the order in which they occur in your data file. Since the DW value is greater than 1.4, there is probably not any serious autocorrelation in the residuals.

In determining whether the model can be simplified, notice that the highest P-value on the independent variables is 0.1094, belonging to PCUGA_2. Since the P-value is greater or equal to 0.10, that term is not statistically significant at the 90% or higher confidence level. Consequently, you should consider removing PCUGA_2 from the model.

EXHIBIT 6

PART 2

STATGRAPHICS PLUS REGRESSION RESULTS-MODEL #2

Multiple Regression Analysis

Dependent variable: IndFrq

Parameter	Estimate	Standard Error	T Statistic	P-Value
CONSTANT	−3.580310	0.824978	−4.33988	0.0012
CYIndBL	0.261897	0.074644	3.50862	0.0049
PCUGA_1	−0.214998	0.041989	−5.12040	0.0003
CumInjNDX	0.301076	0.046272	6.50673	0.0000

Analysis of Variance

Source	Sum of Squares	Degrees of Freedom	Mean Square Error	F-Ratio	P-Value
Model	654.8030	3	218.2677	28.77271	0.0000
Residual	83.4452	11	7.5859		
Total (Corr.)	738.2480	14			

R-squared = 88.6969 percent
R-squared (adjusted for d.f.) = 85.6142 percent
Standard Error of Est. = 2.75426
Mean absolute error = 1.95774
Durbin–Watson statistic = 1.71858

The StatAdvisor

The output shows the results of fitting a multiple linear regression model to describe the relationship between IndFrq and 3 independent variables. The equation of the fitted model is

$$\text{IndFrq} = -3.58031 + 0.261897 * \text{CYIndBL} - 0.214998 * \text{PCUGA\_1} + 0.301076 * \text{CumInjNDX}$$

Since the P-value in the ANOVA table is less than 0.01, there is a statistically significant relationship between the variables at the 99% confidence level.

The R-Squared statistic indicates that the model as fitted explains 88.6969% of the variability in IndFrq. The adjusted R-squared statistic, which is more suitable for comparing models with different numbers of independent variables, is 85.6142%. The standard error of the estimate shows the standard deviation of the residuals to be 2.75426. This value can be used to construct prediction limits for new observations by selecting the Reports option from the text menu. The mean absolute error (MAE) of 1.95774 is the average value of the residuals. The Durbin–Watson (DW) statistic tests the residuals to determine if there is any significant correlation based on the order in which they occur in your data file. Since the DW value is greater than 1.4, there is probably not any serious autocorrelation in the residuals.

In determining whether the model can be simplified, notice that the highest P-value on the independent variables is 0.0049, belonging to CYIndBL. Since the P-value is less than 0.01, the highest order term is statistically significant at the 99% confidence level. Consequently, you probably don't want to remove any variables from the model.

EXHIBIT 6

PART 3

STATGRAPHICS PLUS REGRESSION RESULTS-MODEL #3

Multiple Regression Analysis

Dependent variable: IndFrq

Parameter	Estimate	Standard Error	T Statistic	P-Value
CONSTANT	−7.726190	1.297840	−5.95310	0.0001
CYIndBL	0.272918	0.084933	3.21332	0.0093
PCGA_1	0.649210	0.141971	4.57282	0.0010
PCGA_2	0.584624	0.442156	1.32221	0.2155
CumInjNDX	0.290403	0.051592	5.62879	0.0002

Analysis of Variance

Source	Sum of Squares	Degrees of Freedom	Mean Square Error	F-Ratio	P-Value
Model	650.7490	4	162.6873	18.5931	0.0001
Residual	87.4989	10	8.7499		
Total (Corr.)	738.2479	14			

R-squared = 88.1478 percent
R-squared (adjusted for d.f.) = 83.4069 percent
Standard Error of Est. = 2.95802
Mean absolute error = 1.9507
Durbin–Watson statistic = 2.07557

The StatAdvisor

The output shows the results of fitting a multiple linear regression model to describe the relationship between IndFrq and 4 independent variables. The equation of the fitted model is

$$\text{IndFrq} = -7.72619 + 0.272918 * \text{CYIndBL} + 0.64921 * \text{PCGA\_1}$$
$$+ 0.584624 * \text{PCGA\_2} + 0.290403 * \text{CumInjNDX}$$

Since the P-value in the ANOVA table is less than 0.01, there is a statistically significant relationship between the variables at the 99% confidence level.

The R-Squared statistic indicates that the model as fitted explains 88.1478% of the variability in IndFrq. The adjusted R-squared statistic, which is more suitable for comparing models with different numbers of independent variables, is 83.4069%. The standard error of the estimate shows the standard deviation of the residuals to be 2.95802. This value can be used to construct prediction limits for new observations by selecting the Reports option from the text menu. The mean absolute error (MAE) of 1.9507 is the average value of the residuals. The Durbin–Watson (DW) statistic tests the residuals to determine if there is any significant correlation based on the order in which they occur in your data file. Since the DW value is greater than 1.4, there is probably not any serious autocorrelation in the residuals.

In determining whether the model can be simplified, notice that the highest P-value on the independent variables is 0.2155, belonging to PCGA_2. Since the P-value is greater or equal to 0.10, that term is not statistically significant at the 90% or higher confidence level. Consequently, you should consider removing PCGA_2 from the model.

EXHIBIT 6

PART 4

STATGRAPHICS PLUS REGRESSION RESULTS-MODEL #4

Multiple Regression Analysis

Dependent variable: IndFrq

Parameter	Estimate	Standard Error	T Statistic	P-Value
CONSTANT	−7.726180	1.297840	−5.95310	0.0001
CYIndBL	0.272919	0.084933	3.21332	0.0093
CYrGSP	0.769158	0.420688	1.82834	0.0974
CYAggE	0.414309	0.196672	2.10660	0.0614
CumInjNDX	0.290403	0.051592	5.62879	0.0002

Analysis of Variance

Source	Sum of Squares	Degrees of Freedom	Mean Square Error	F-Ratio	P-Value
Model	650.7490	4	162.6873	18.5931	0.0001
Residual	87.4989	10	8.7499		
Total (Corr.)	738.2479	14			

R-squared = 88.1478 percent
R-squared (adjusted for d.f.) = 83.4069 percent
Standard Error of Est. = 2.95802
Mean absolute error = 1.9507
Durbin–Watson statistic = 2.07557

The StatAdvisor

The output shows the results of fitting a multiple linear regression model to describe the relationship between IndFrq and 4 independent variables. The equation of the fitted model is

$$\text{IndFrq} = -7.72618 + 0.272919*\text{CYIndBL} + 0.769158*\text{CYrGSP}$$
$$+ 0.414309*\text{CYAggE} + 0.290403*\text{CumInjNDX}.$$

Since the P-value in the ANOVA table is less than 0.01, there is a statistically significant relationship between the variables at the 99% confidence level.

The R-Squared statistic indicates that the model as fitted explains 88.1478% of the variability in IndFrq. The adjusted R-squared statistic, which is more suitable for comparing models with different numbers of independent variables, is 83.4069%. The standard error of the estimate shows the standard deviation of the residuals to be 2.95802. This value can be used to construct prediction limits for new observations by selecting the Reports option from the text menu. The mean absolute error (MAE) of 1.9507 is the average value of the residuals. The Durbin–Watson (DW) statistic tests the residuals to determine if there is any significant correlation based on the order in which they occur in your data file. Since the DW value is greater than 1.4, there is probably not any serious autocorrelation in the residuals.

In determining whether the model can be simplified, notice that the highest P-value on the independent variables is 0.0974, belonging to CYrGSP. Since the P-value is less than 0.10, that term is statistically significant at the 90% confidence level. Depending on the confidence level at which you wish to work, you may or may not decide to remove CYrGSP from the model.

EXHIBIT 6

PART 5

STATGRAPHICS PLUS REGRESSION RESULTS-MODEL #5

Multiple Regression Analysis

Dependent variable: IndFrq

Parameter	Estimate	Standard Error	T Statistic	P-Value
CONSTANT	−6.852850	1.154560	−5.93544	0.0001
CYIndBL	0.309052	0.083107	3.71872	0.0034
PCGA_1	0.642720	0.146633	4.38319	0.0011
CumInjNDX	0.308337	0.051443	5.99380	0.0001

Analysis of Variance

Source	Sum of Squares	Degrees of Freedom	Mean Square Error	F-Ratio	P-Value
Model	635.4530	3	211.8177	22.6662	0.0001
Residual	102.7960	11	9.3451		
Total (Corr.)	738.2490	14			

R-squared = 86.0757 percent
R-squared (adjusted for d.f.) = 82.2782 percent
Standard Error of Est. = 3.05697
Mean absolute error = 2.09204
Durbin–Watson statistic = 2.27098

The StatAdvisor

The output shows the results of fitting a multiple linear regression model to describe the relationship between IndFrq and 3 independent variables. The equation of the fitted model is

$$\text{IndFrq} = -6.85285 + 0.309052 * \text{CYIndBL} + 0.64272 * \text{PCGA\_1} + 0.308337 * \text{CumInjNDX}$$

Since the P-value in the ANOVA table is less than 0.01, there is a statistically significant relationship between the variables at the 99% confidence level.

The R-Squared statistic indicates that the model as fitted explains 86.0757% of the variability in IndFrq. The adjusted R-squared statistic, which is more suitable for comparing models with different numbers of independent variables, is 82.2782%. The standard error of the estimate shows the standard deviation of the residuals to be 3.05697. This value can be used to construct prediction limits for new observations by selecting the Reports option from the text menu. The mean absolute error (MAE) of 2.09204 is the average value of the residuals. The Durbin–Watson (DW) statistic tests the residuals to determine if there is any significant correlation based on the order in which they occur in your data file. Since the DW value is greater than 1.4, there is probably not any serious autocorrelation in the residuals.

In determining whether the model can be simplified, notice that the highest P-value on the independent variables is 0.0034, belonging to CYIndBL. Since the P-value is less than 0.01, the highest order term is statistically significant at the 99% confidence level. Consequently, you probably don't want to remove any variables from the model.

EXHIBIT 6

PART 6

STATGRAPHICS PLUS REGRESSION RESULTS-MODEL #6

Multiple Regression Analysis

Dependent variable: IndFrq

Parameter	Estimate	Standard Error	T Statistic	P-Value
CONSTANT	−6.384760	1.179070	−5.41509	0.0002
CYIndBL	0.321087	0.088928	3.61065	0.0041
CYAggE	0.648742	0.164242	3.94990	0.0023
CumInjNDX	0.314359	0.054959	5.71994	0.0001

Analysis of Variance

Source	Sum of Squares	Degrees of Freedom	Mean Square Error	F-Ratio	P-Value
Model	621.5000	3	207.1667	19.5192	0.0001
Residual	116.7480	11	10.6135		
Total (Corr.)	738.2480	14			

R-squared = 84.1858 percent
R-squared (adjusted for d.f.) = 79.8728 percent
Standard Error of Est. = 3.25783
Mean absolute error = 2.23537
Durbin–Watson statistic = 2.22488

The StatAdvisor

The output shows the results of fitting a multiple linear regression model to describe the relationship between IndFrq and 3 independent variables. The equation of the fitted model is

$$\text{IndFrq} = -6.38476 + 0.321087 * \text{CYIndBL} + 0.648742 * \text{CYAggE} + 0.314359 * \text{CumInjNDX}$$

Since the P-value in the ANOVA table is less than 0.01, there is a statistically significant relationship between the variables at the 99% confidence level.

The R-Squared statistic indicates that the model as fitted explains 84.1858% of the variability in IndFrq. The adjusted R-squared statistic, which is more suitable for comparing models with different numbers of independent variables, is 79.8728%. The standard error of the estimate shows the standard deviation of the residuals to be 3.25783. This value can be used to construct prediction limits for new observations by selecting the Reports option from the text menu. The mean absolute error (MAE) of 2.23537 is the average value of the residuals. The Durbin–Watson (DW) statistic tests the residuals to determine if there is any significant correlation based on the order in which they occur in your data file. Since the DW value is greater than 1.4, there is probably not any serious autocorrelation in the residuals.

In determining whether the model can be simplified, notice that the highest P-value on the independent variables is 0.0041, belonging to CYIndBL. Since the P-value is less than 0.01, the highest order term is statistically significant at the 99% confidence level. Consequently, you probably don't want to remove any variables from the model.

EXHIBIT 6

PART 7

STATGRAPHICS PLUS REGRESSION RESULTS-MODEL #7

Multiple Regression Analysis

Dependent variable: IndFrq

Parameter	Estimate	Standard Error	T Statistic	P-Value
CONSTANT	−7.771980	1.486670	−5.22778	0.0003
CYIndBL	0.220530	0.093040	2.37028	0.0371
CYAggE	1.346940	0.365450	3.68569	0.0036
CumInjNDX	0.264735	0.057435	4.60930	0.0008

Analysis of Variance

Source	Sum of Squares	Degrees of Freedom	Mean Square Error	F-Ratio	P-Value
Model	611.9200	3	203.9733	17.7608	0.0002
Residual	126.3290	11	11.4845		
Total (Corr.)	738.2490	14			

R-squared = 82.888 percent
R-squared (adjusted for d.f.) = 78.2211 percent
Standard Error of Est. = 3.38887
Mean absolute error = 2.47812
Durbin–Watson statistic = 1.39268

The StatAdvisor

The output shows the results of fitting a multiple linear regression model to describe the relationship between IndFrq and 3 independent variables. The equation of the fitted model is

$$\text{IndFrq} = -7.77198 + 0.22053 * \text{CYIndBL} + 1.34694 * \text{CYrGSP} + 0.264735 * \text{CumInjNDX}$$

Since the P-value in the ANOVA table is less than 0.01, there is a statistically significant relationship between the variables at the 99% confidence level.

The R-Squared statistic indicates that the model as fitted explains 82.888% of the variability in IndFrq. The adjusted R-squared statistic, which is more suitable for comparing models with different numbers of independent variables, is 78.2211%. The standard error of the estimate shows the standard deviation of the residuals to be 3.38887. This value can be used to construct prediction limits for new observations by selecting the Reports option from the text menu. The mean absolute error (MAE) of 2.47812 is the average value of the residuals. The Durbin–Watson (DW) statistic tests the residuals to determine if there is any significant correlation based on the order in which they occur in your data file. Since the DW value is less than 1.4, there may be some indication of serial correlation. Plot the residuals versus row order to see if there is any pattern which can be seen.

In determining whether the model can be simplified, notice that the highest P-value on the independent variables is 0.0371, belonging to CYIndBL. Since the P-value is less than 0.05, that term is statistically significant at the 95% confidence level. Consequently, you probably don't want to remove any variables from the model.

EXHIBIT 7

PART 1

GRAPHICAL ANALYSIS OF FITTED MODELS: MODEL #2
ACTUAL VS FITTED CHANGES

PERCENT CHANGE INDEMNITY FREQUENCY = f(Ind BL, PCUGA_1, Cum Inj Index)

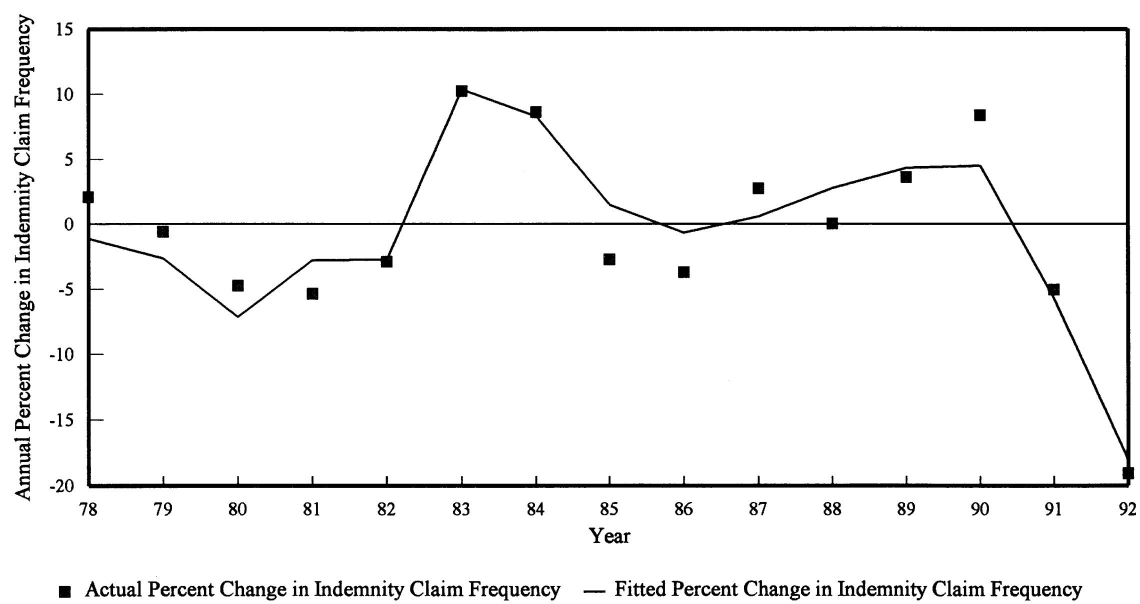


EXHIBIT 7

PART 2—PAGE 1

GRAPHICAL ANALYSIS OF FITTED MODELS: MODEL #2
ACTUAL VS FITTED ANNUAL CHANGES AT SELECTED PROJECTION INTERVALS

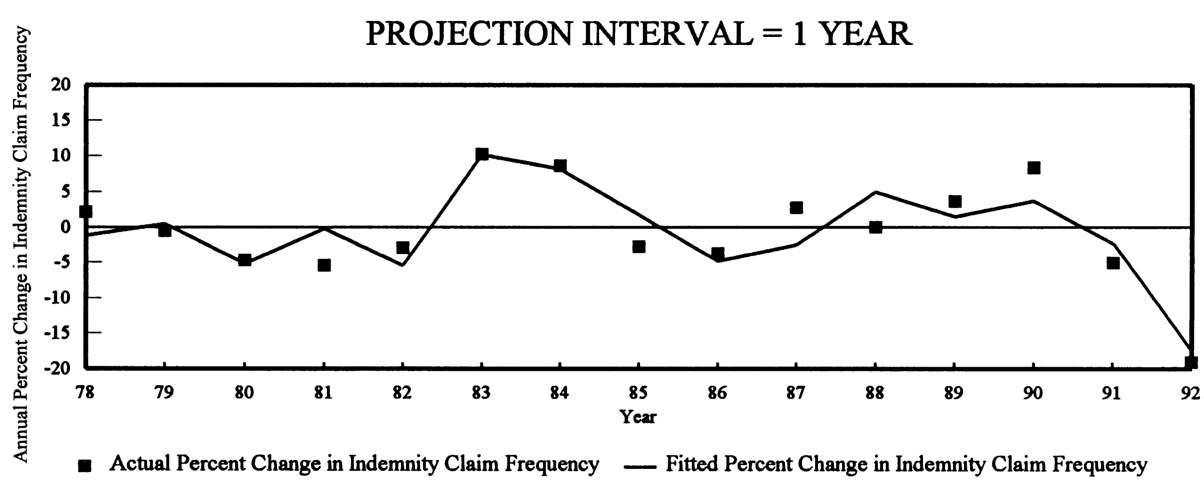


EXHIBIT 7

PART 2—PAGE 2

GRAPHICAL ANALYSIS OF FITTED MODELS: MODEL #2
ACTUAL VS FITTED ANNUAL CHANGES AT SELECTED PROJECTION INTERVALS

PROJECTION INTERVAL = 2 YEARS

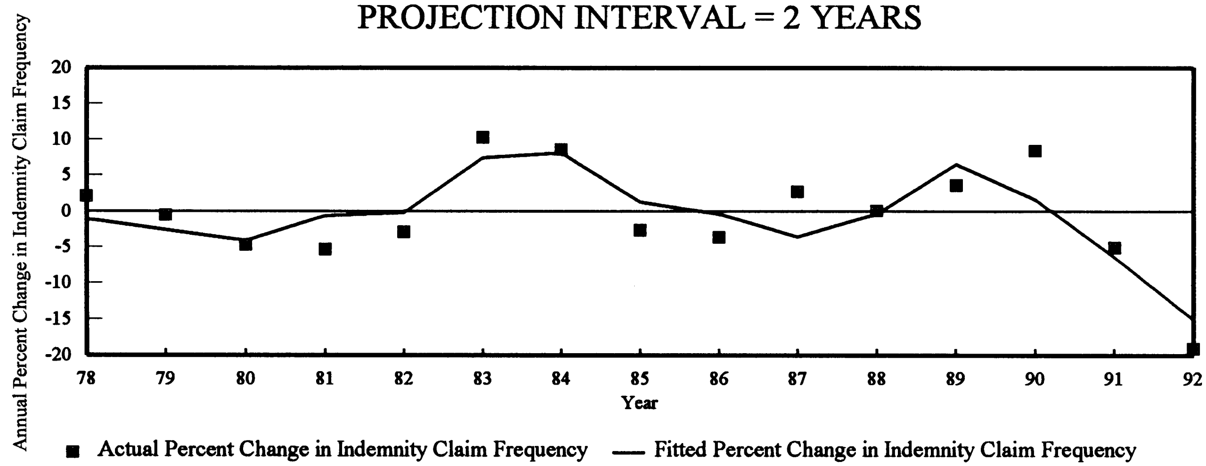


EXHIBIT 7

PART 2—PAGE 3

GRAPHICAL ANALYSIS OF FITTED MODELS: MODEL #2
ACTUAL VS FITTED ANNUAL CHANGES AT SELECTED PROJECTION INTERVALS

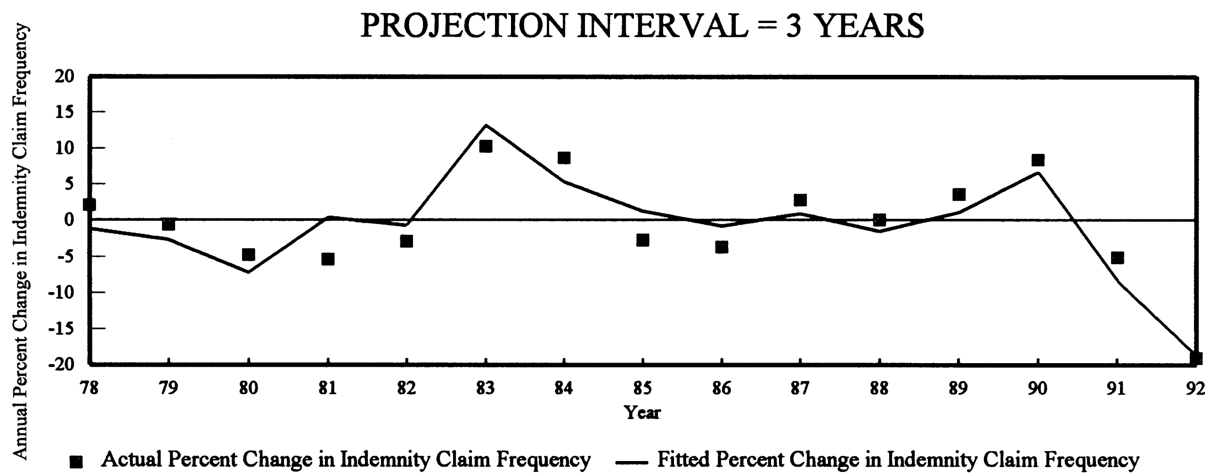


EXHIBIT 7

PART 3—PAGE 1

GRAPHICAL ANALYSIS OF FITTED MODELS: MODEL #2
ACTUAL VS FITTED INDEMNITY CLAIM FREQUENCY AT SELECTED PROJECTION INTERVALS

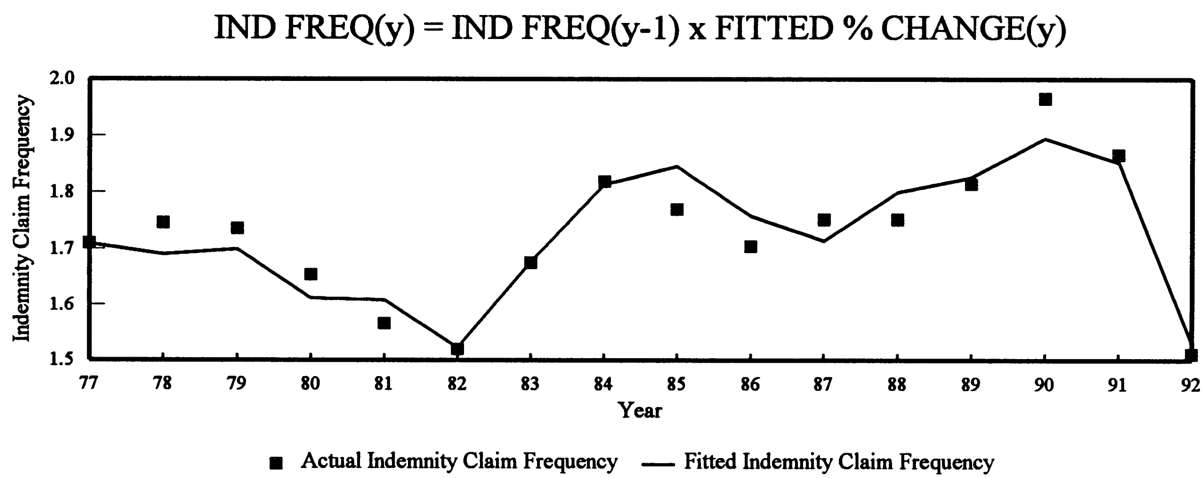


EXHIBIT 7

Part 3—Page 2

Graphical Analysis of Fitted Models: Model #2
Actual vs Fitted Indemnity Claim Frequency at Selected Projection Intervals

IND FREQ(y) = IND FREQ(y-2) x FITTED {% CHG(y-1) x % CHG(y)}

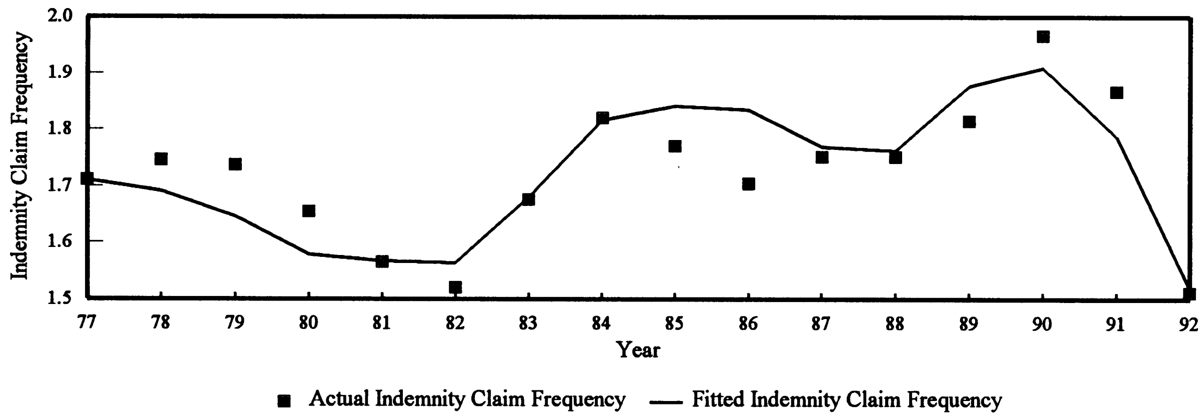


EXHIBIT 7

PART 3—PAGE 3

GRAPHICAL ANALYSIS OF FITTED MODELS: MODEL #2
ACTUAL VS FITTED INDEMNITY CLAIM FREQUENCY AT SELECTED PROJECTION INTERVALS

IND FREQ(y) = IND FREQ(y-3) x FITTED {% CHG(y-2) x % CHG(y-1) x % CHG(y)}

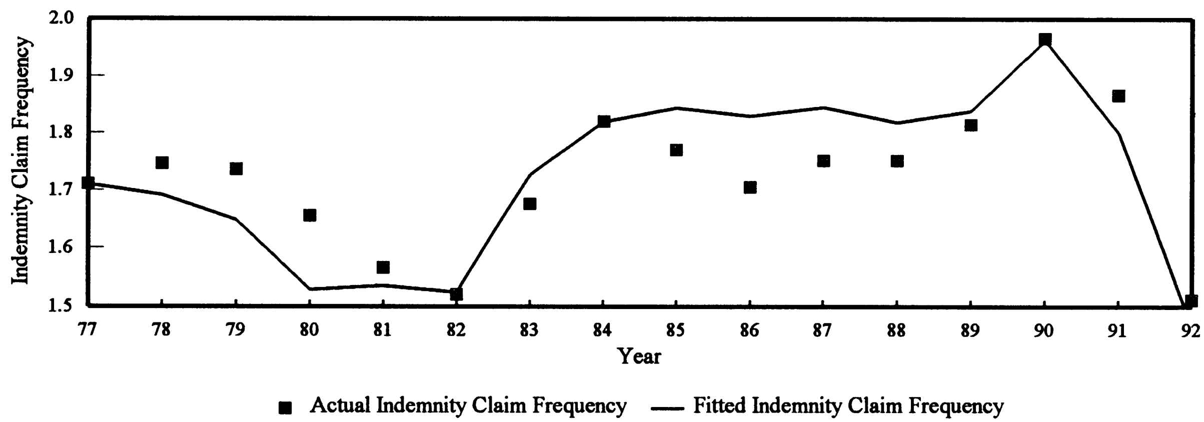


EXHIBIT 8

PART 1

GRAPHICAL ANALYSIS OF FITTED MODELS: MODEL #5
ACTUAL VS FITTED CHANGES

PERCENT CHANGE INDEMNITY FREQUENCY = f(Ind BL, PCGA_1, Cum Inj Index)

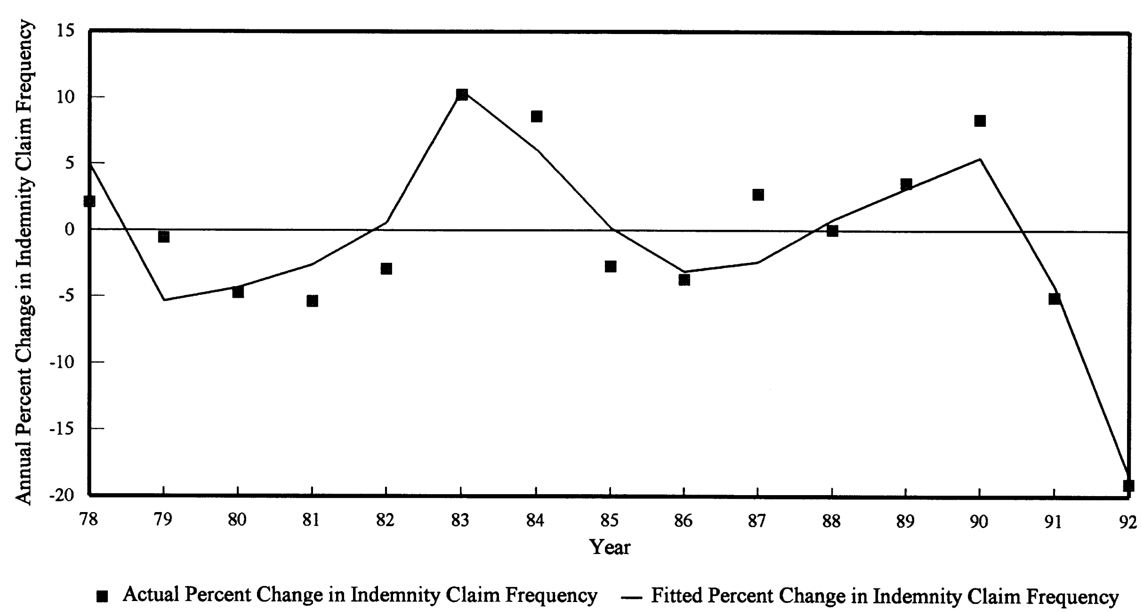


EXHIBIT 8

PART 2—PAGE 1

GRAPHICAL ANALYSIS OF FITTED MODELS: MODEL #5
ACTUAL VS FITTED ANNUAL CHANGES AT SELECTED PROJECTION INTERVALS

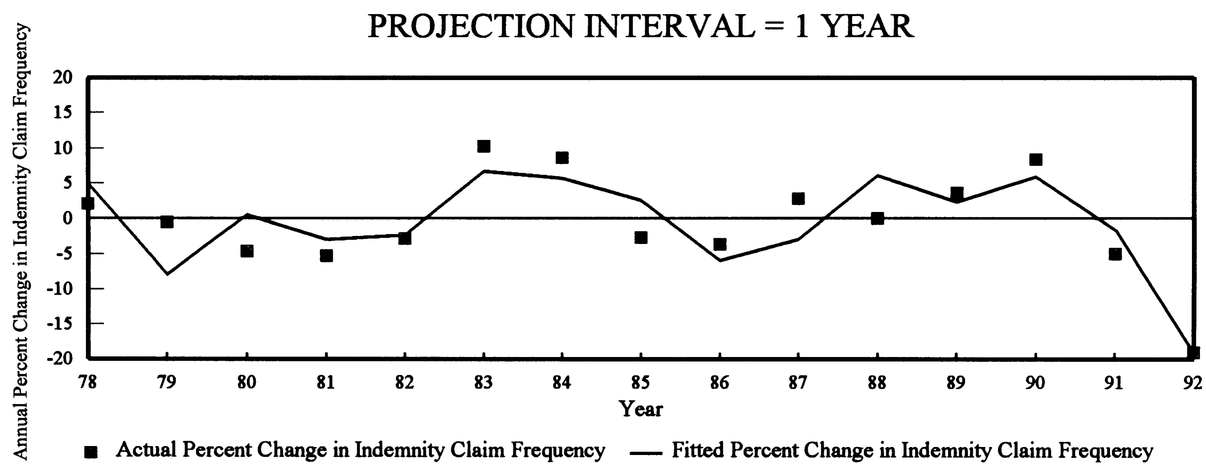


EXHIBIT 8

Part 2—Page 2

Graphical Analysis of Fitted Models: Model #5
Actual vs Fitted Annual Changes at Selected Projection Intervals

PROJECTION INTERVAL = 2 YEARS

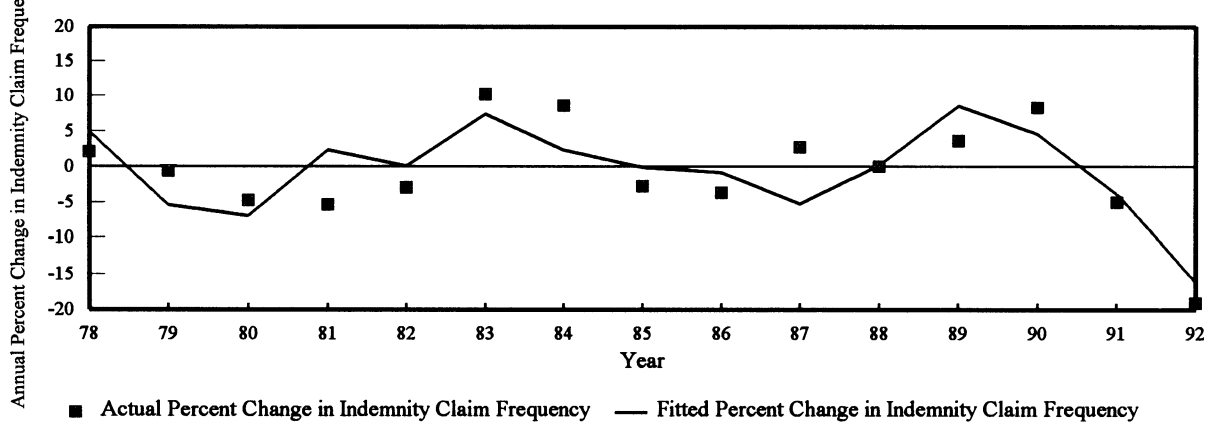


EXHIBIT 8

PART 2—PAGE 3

GRAPHICAL ANALYSIS OF FITTED MODELS: MODEL #5
ACTUAL VS FITTED ANNUAL CHANGES AT SELECTED PROJECTION INTERVALS

PROJECTION INTERVAL = 3 YEARS

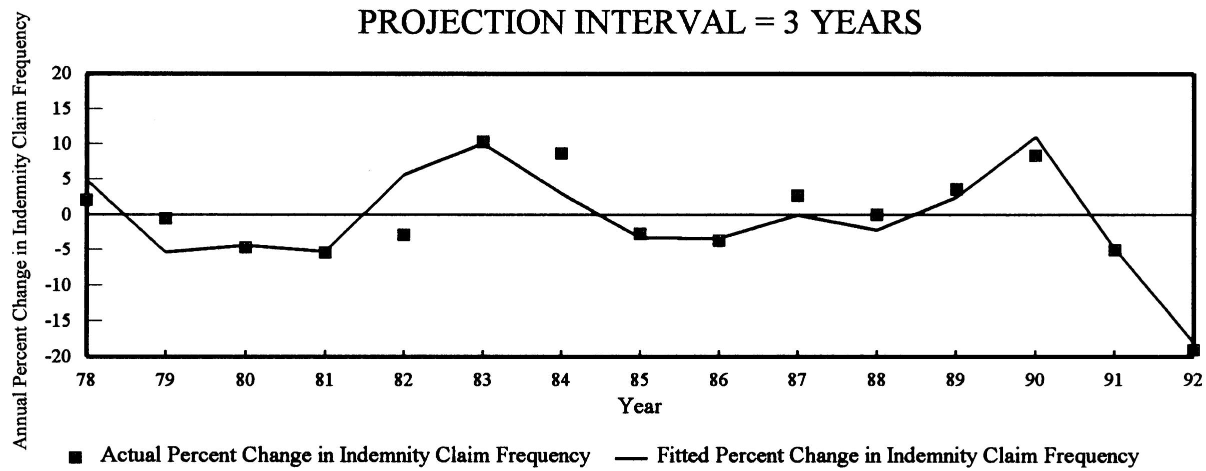


EXHIBIT 8

PART 3—PAGE 1

GRAPHICAL ANALYSIS OF FITTED MODELS: MODEL #5
ACTUAL VS FITTED INDEMNITY CLAIM FREQUENCY AT SELECTED PROJECTION INTERVALS

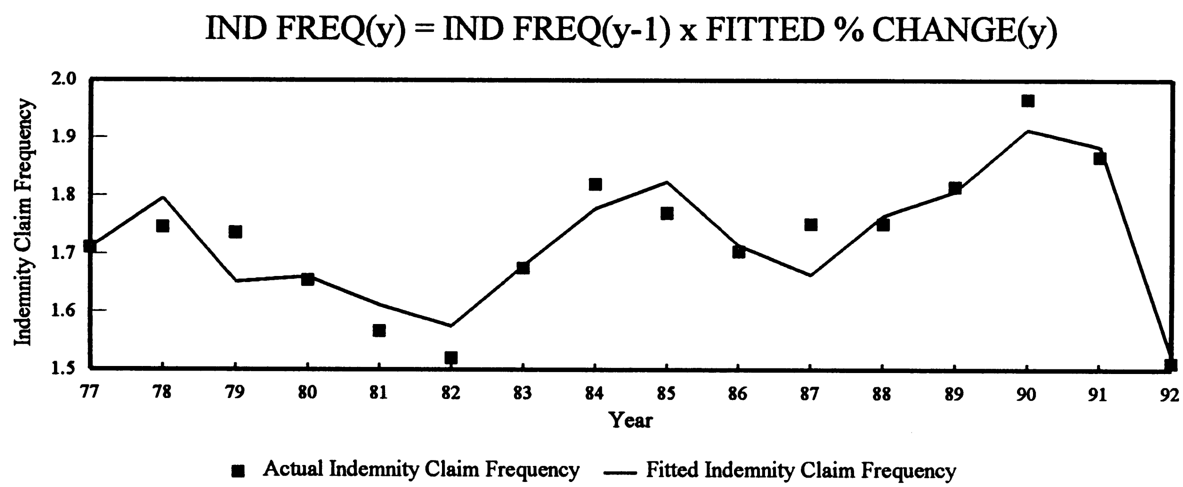


EXHIBIT 8

PART 3—PAGE 2

GRAPHICAL ANALYSIS OF FITTED MODELS: MODEL #5
ACTUAL VS FITTED INDEMNITY CLAIM FREQUENCY AT SELECTED PROJECTION INTERVALS

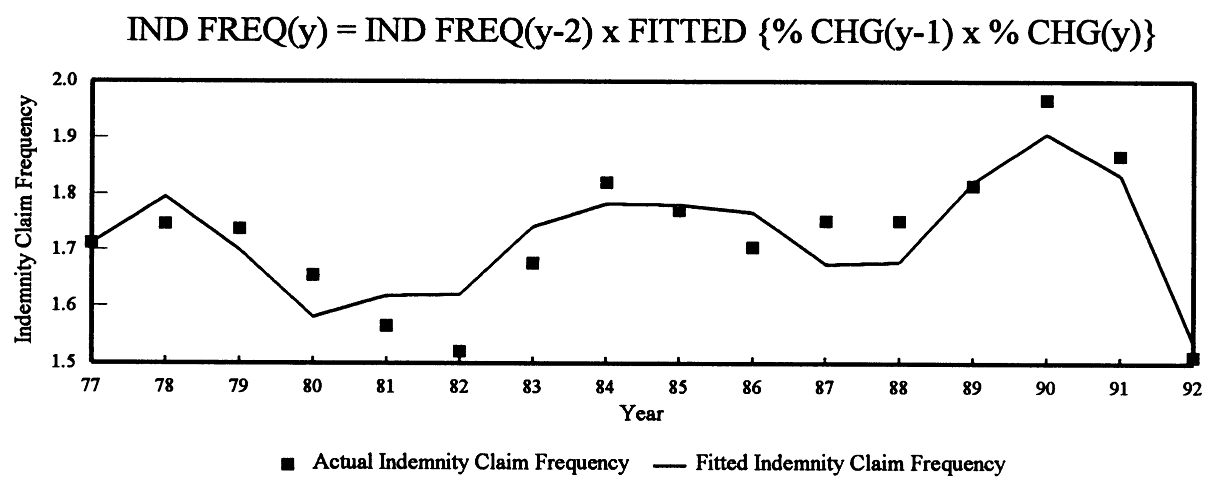


EXHIBIT 8

PART 3—PAGE 3

GRAPHICAL ANALYSIS OF FITTED MODELS: MODEL #5
ACTUAL VS FITTED INDEMNITY CLAIM FREQUENCY AT SELECTED PROJECTION INTERVALS

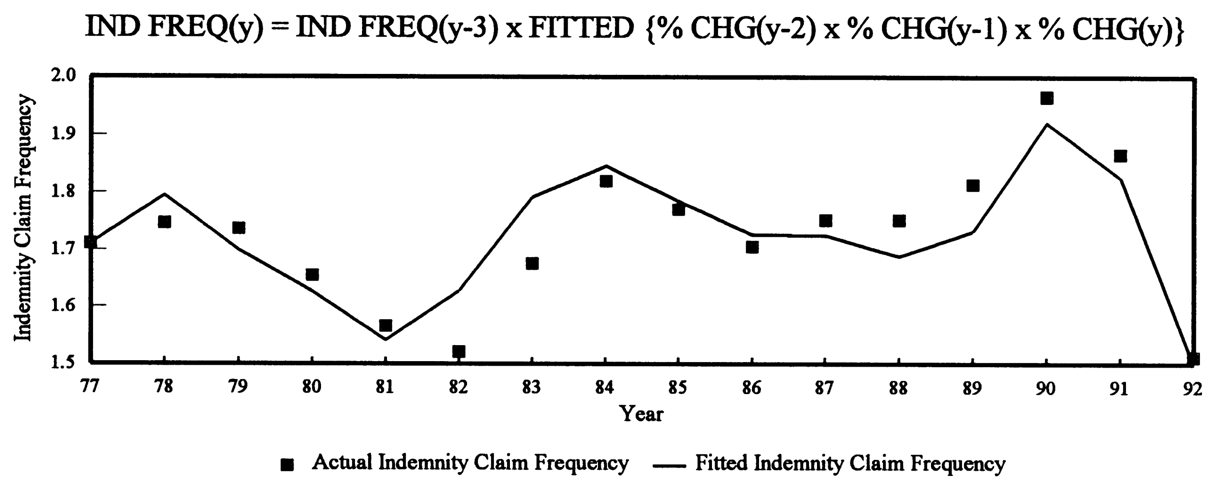


EXHIBIT 9

PART 1

GRAPHICAL ANALYSIS OF FITTED MODELS: MODEL #6
ACTUAL VS FITTED CHANGES

PERCENT CHANGE INDEMNITY FREQUENCY = f(Ind BL, AggE, Cum Inj Index)

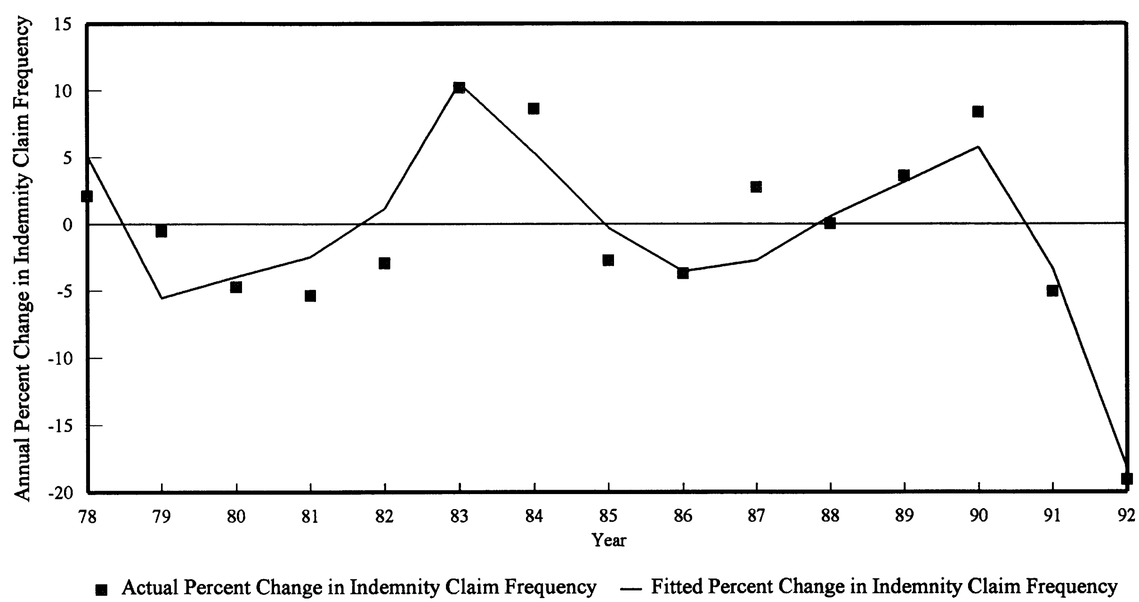


EXHIBIT 9

PART 2—PAGE 1

GRAPHICAL ANALYSIS OF FITTED MODELS: MODEL #6
ACTUAL VS FITTED ANNUAL CHANGES AT SELECTED PROJECTION INTERVALS

PROJECTION INTERVAL = 1 YEAR

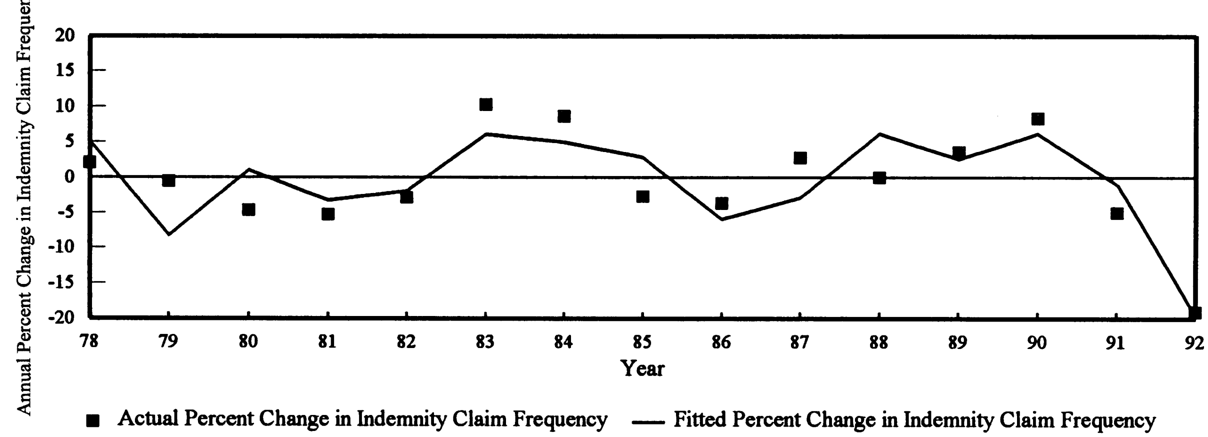


EXHIBIT 9

PART 2—PAGE 2

GRAPHICAL ANALYSIS OF FITTED MODELS: MODEL #6
ACTUAL VS FITTED ANNUAL CHANGES AT SELECTED PROJECTION INTERVALS

PROJECTION INTERVAL = 2 YEARS

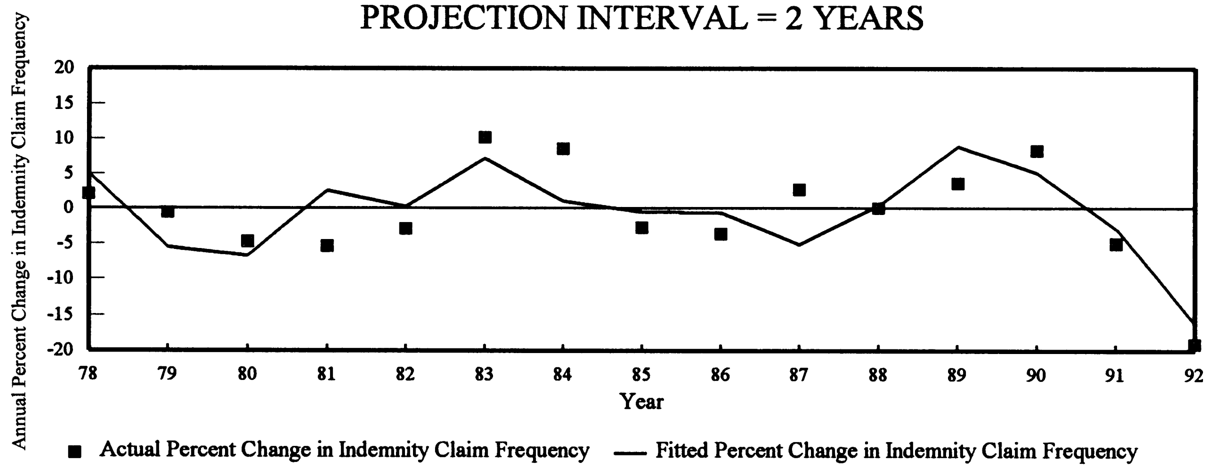


EXHIBIT 9

PART 2—PAGE 3

GRAPHICAL ANALYSIS OF FITTED MODELS: MODEL #6
ACTUAL VS FITTED ANNUAL CHANGES AT SELECTED PROJECTION INTERVALS

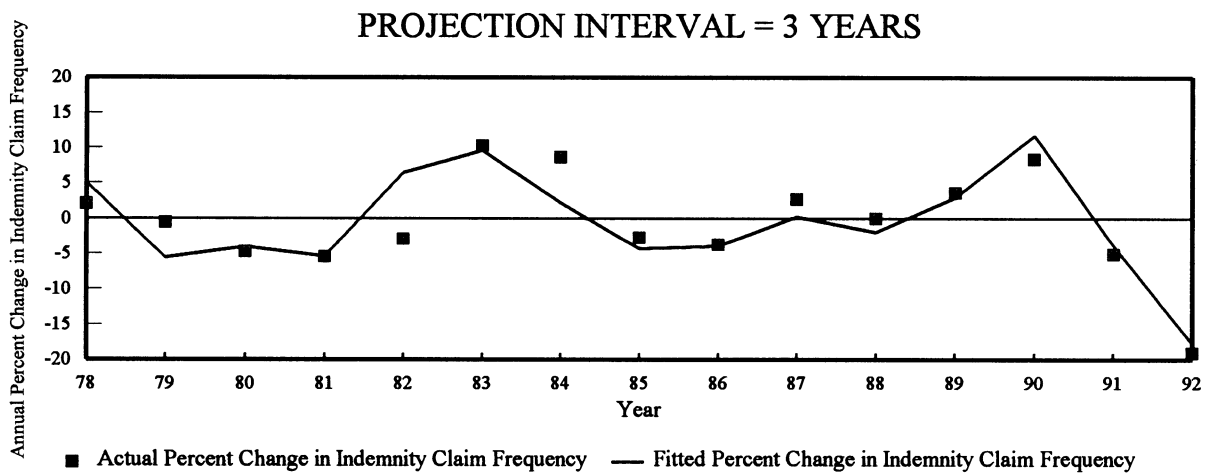


EXHIBIT 9

PART 3—PAGE 1

GRAPHICAL ANALYSIS OF FITTED MODELS: MODEL #6
ACTUAL VS FITTED INDEMNITY CLAIM FREQUENCY AT SELECTED PROJECTION INTERVALS

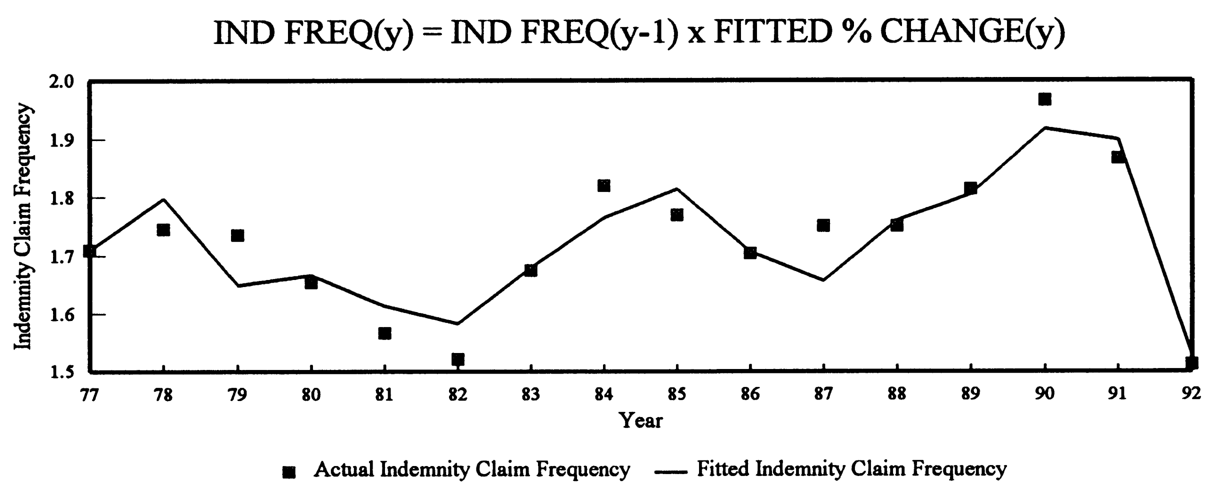


EXHIBIT 9

PART 3—PAGE 2

GRAPHICAL ANALYSIS OF FITTED MODELS: MODEL #6
ACTUAL VS FITTED INDEMNITY CLAIM FREQUENCY AT SELECTED PROJECTION INTERVALS

IND FREQ(y) = IND FREQ(y-2) x FITTED {% CHG(y-1) x % CHG(y)}

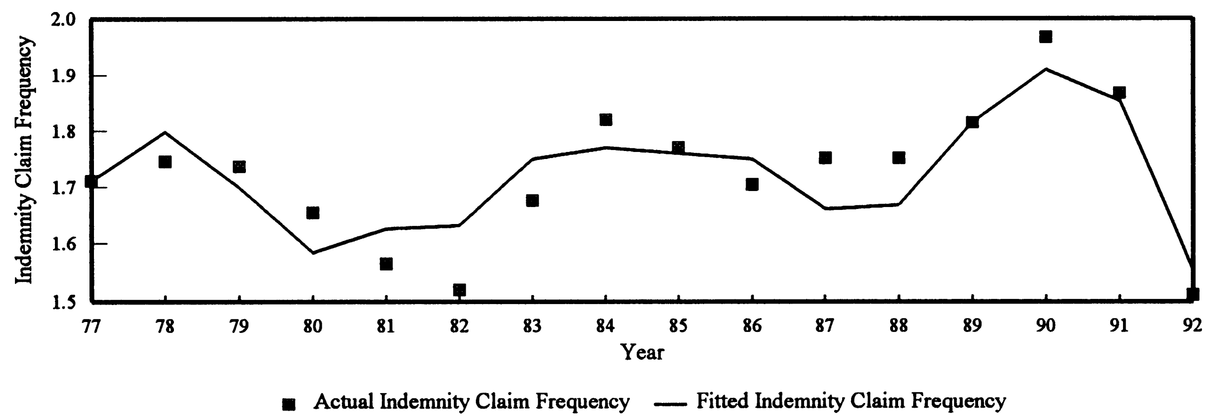


EXHIBIT 9

PART 3—PAGE 3

GRAPHICAL ANALYSIS OF FITTED MODELS: MODEL #6
ACTUAL VS FITTED INDEMNITY CLAIM FREQUENCY AT SELECTED PROJECTION INTERVALS

IND FREQ(y) = IND FREQ(y-3) x FITTED {% CHG(y-2) x % CHG(y-1) x % CHG(y)}

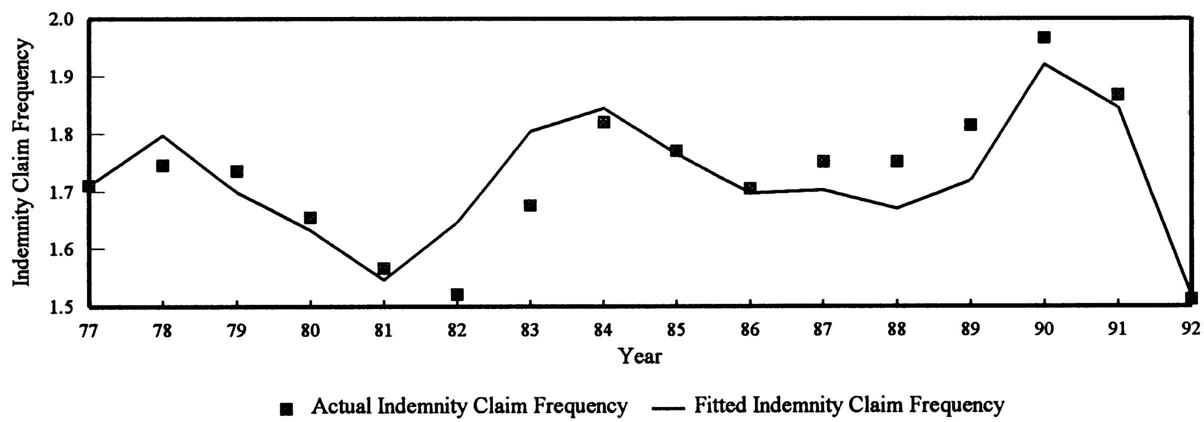


EXHIBIT 10

PART 1

GRAPHICAL ANALYSIS OF FITTED MODELS: MODEL #7
ACTUAL VS FITTED CHANGES

PERCENT CHANGE INDEMNITY FREQUENCY = f(Ind BL, rGSP, Cum Inj Index)

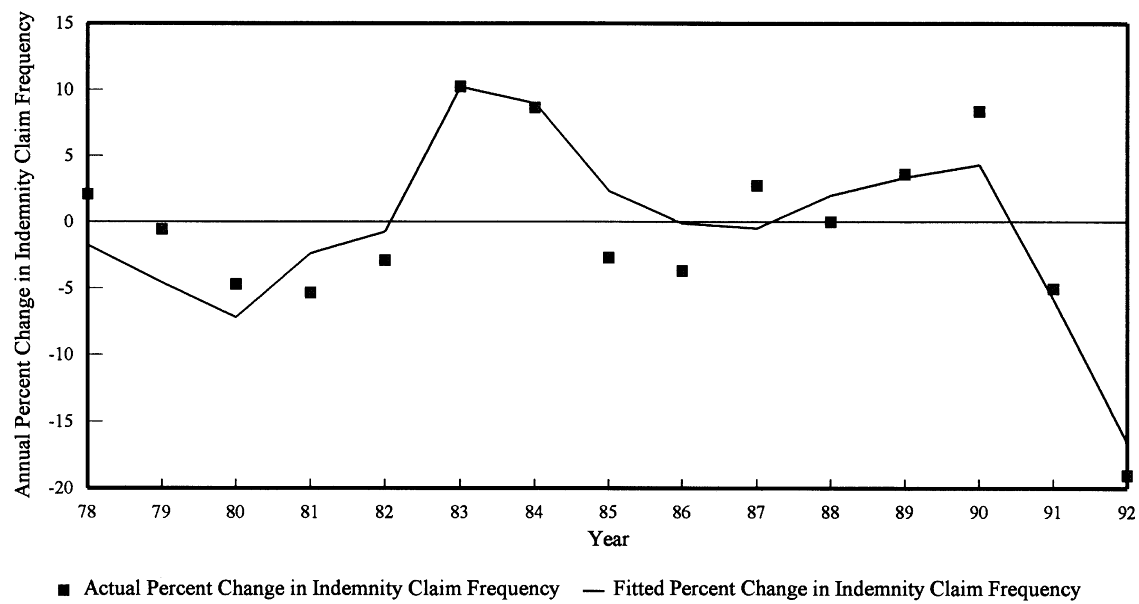


EXHIBIT 10

PART 2—PAGE 1

GRAPHICAL ANALYSIS OF FITTED MODELS: MODEL #7
ACTUAL VS FITTED ANNUAL CHANGES AT SELECTED PROJECTION INTERVALS

PROJECTION PERIOD = 1 YEAR

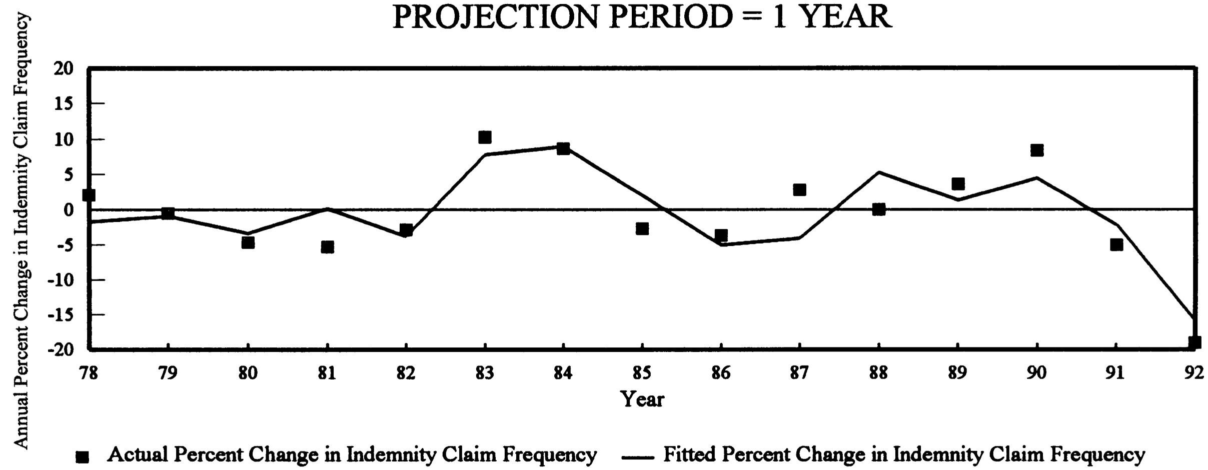


EXHIBIT 10

PART 2—PAGE 2

GRAPHICAL ANALYSIS OF FITTED MODELS: MODEL #7
ACTUAL VS FITTED ANNUAL CHANGES AT SELECTED PROJECTION INTERVALS

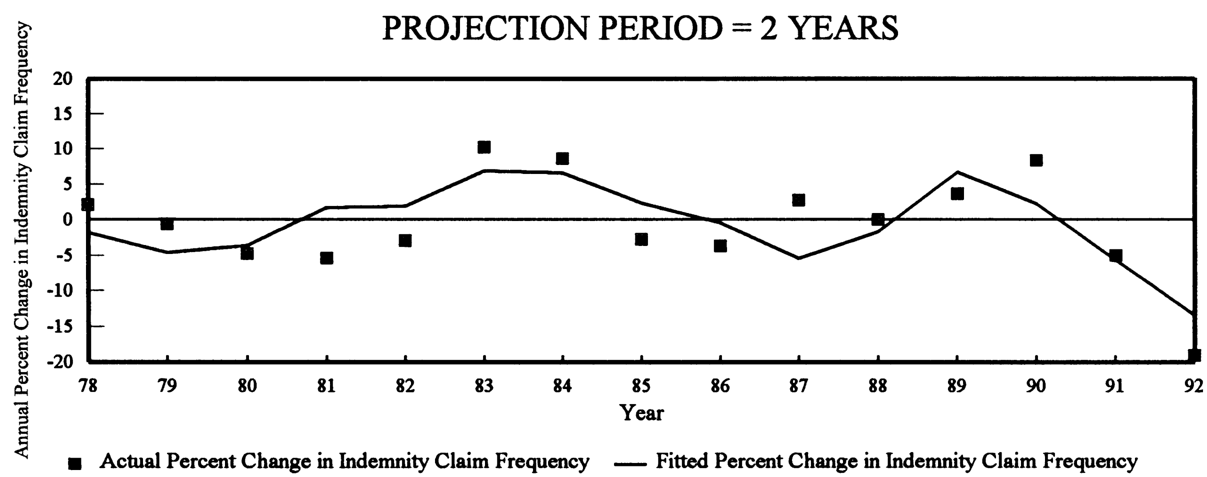


EXHIBIT 10

PART 2—PAGE 3

GRAPHICAL ANALYSIS OF FITTED MODELS: MODEL #7
ACTUAL VS FITTED ANNUAL CHANGES AT SELECTED PROJECTION INTERVALS

PROJECTION PERIOD = 3 YEARS

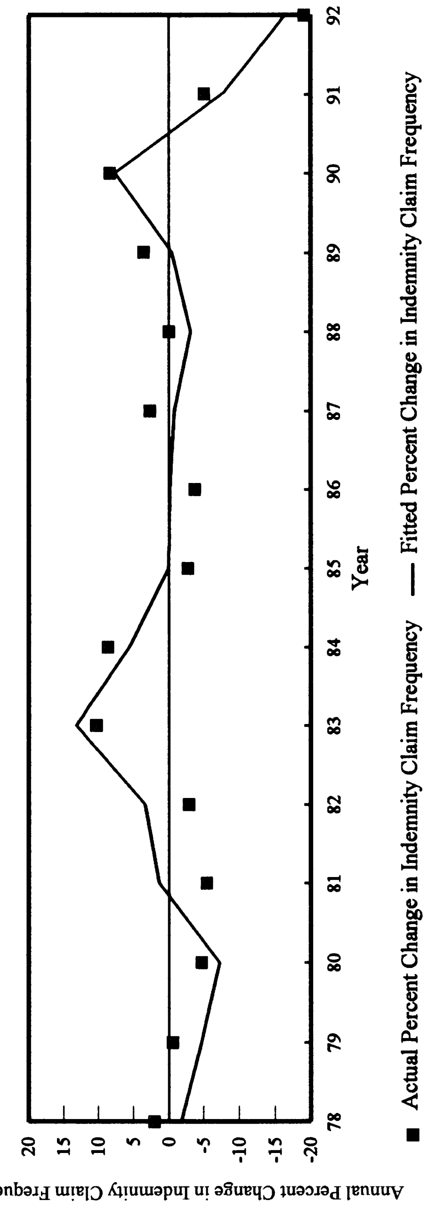


EXHIBIT 10

PART 3—PAGE 1

GRAPHICAL ANALYSIS OF FITTED MODELS: MODEL #7
ACTUAL VS FITTED INDEMNITY CLAIM FREQUENCY AT SELECTED PROJECTION INTERVALS

IND FREQ(y) = IND FREQ(y-1) x FITTED % CHANGE(y)

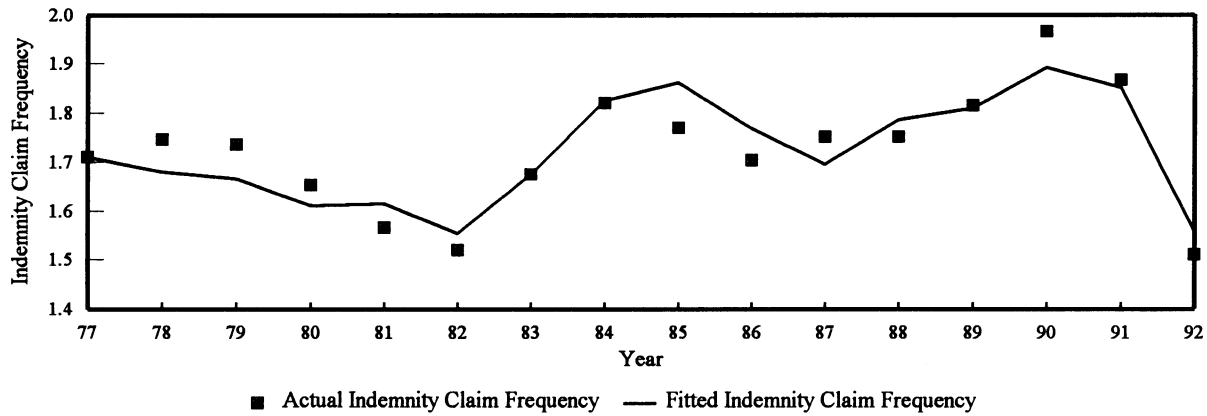


EXHIBIT 10

PART 3—PAGE 2

GRAPHICAL ANALYSIS OF FITTED MODELS: MODEL #7
ACTUAL VS FITTED INDEMNITY CLAIM FREQUENCY AT SELECTED PROJECTION INTERVALS

IND FREQ(y) = IND FREQ(y-2) x FITTED {% CHG(y-1) x % CHG(y)}

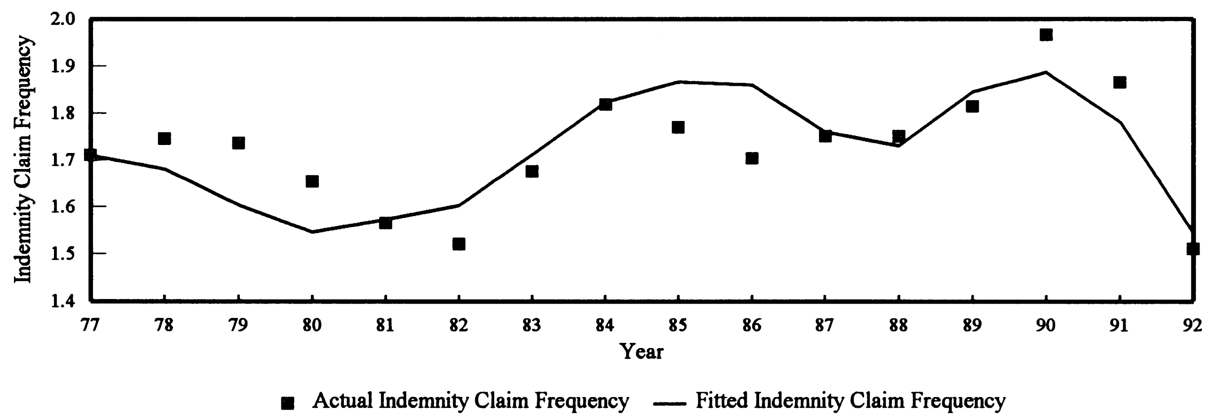


EXHIBIT 10

PART 3—PAGE 3

GRAPHICAL ANALYSIS OF FITTED MODELS: MODEL #7
ACTUAL VS FITTED INDEMNITY CLAIM FREQUENCY AT SELECTED PROJECTION INTERVALS

IND FREQ(y) = IND FREQ(y-3) x FITTED {% CHG(y-2) x % CHG(y-1) x % CHG(y)}

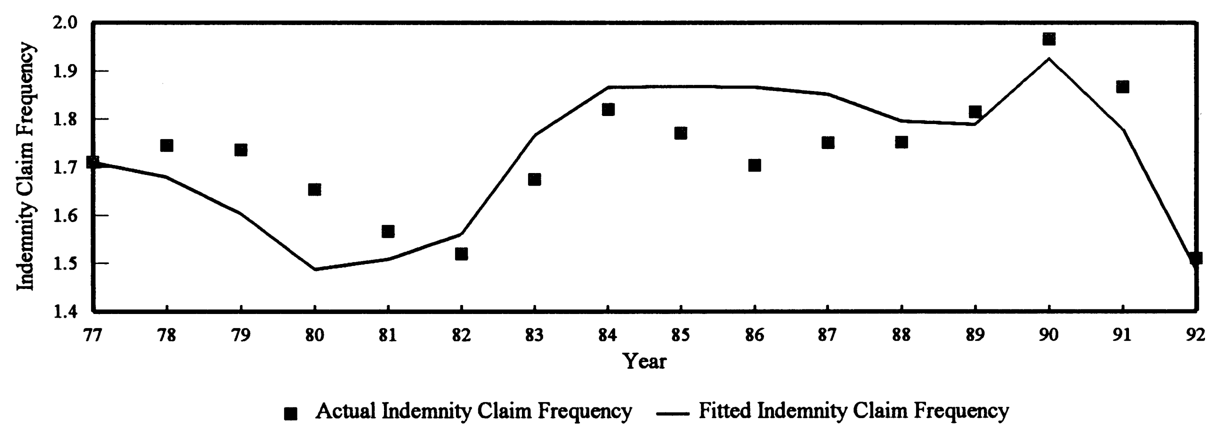


EXHIBIT 11

PART 1

STATGRAPHICS PLUS REGRESSION RESULTS

Multiple Regression Analysis

Dependent variable: IndFrq

Parameter	Estimate	Standard Error	T Statistic	P-Value
CONSTANT	−1.579230	1.698230	−0.92993	0.3610
CYIndBL	0.321818	0.153038	2.10287	0.0453
PCGA_1	0.477622	0.240282	1.98775	0.0575

Analysis of Variance

Source	Sum of Squares	Degrees of Freedom	Mean Square Error	F-Ratio	P-Value
Model	360.9690	2	180.4845	4.574216	0.0199
Residual	1025.8800	26	39.4569		
Total (Corr.)	1386.8490	28			

R-squared = 26.028 percent
R-squared (adjusted for d.f.) = 20.3379 percent
Standard Error of Est. = 6.28147
Mean absolute error = 4.3111
Durbin–Watson statistic = 1.19885

The StatAdvisor

The output shows the results of fitting a multiple linear regression model to describe the relationship between IndFrq and 2 independent variables. The equation of the fitted model is

$$\text{IndFrq} = -1.57923 + 0.321818 * \text{CYIndBL} + 0.477622 * \text{PCGA\_1}$$

Since the P-value in the ANOVA table is less than 0.05, there is a statistically significant relationship between the variables at the 95% confidence level.

The R-Squared statistic indicates that the model as fitted explains 26.028% of the variability in IndFrq. The adjusted R-squared statistic, which is more suitable for comparing models with different numbers of independent variables, is 20.3379%. The standard error of the estimate shows the standard deviation of the residuals to be 6.28147. This value can be used to construct prediction limits for new observations by selecting the Reports option from the text menu. The mean absolute error (MAE) of 4.3111 is the average value of the residuals. The Durbin–Watson (DW) statistic tests the residuals to determine if there is any significant correlation based on the order in which they occur in your data file. Since the DW value is less than 1.4, there may be some indication of serial correlation. Plot the residuals versus row order to see if there is any pattern which can be seen.

In determining whether the model can be simplified, notice that the highest P-value on the independent variables is 0.0575, belonging to PCGA_1. Since the P-value is less than 0.10, that term is statistically significant at the 90% confidence level. Depending on the confidence level at which you wish to work, you may or may not decide to remove PCGA_1 from the model.

EXHIBIT 11

PART 2

STATGRAPHICS PLUS REGRESSION RESULTS

Multiple Regression Analysis

Dependent variable: IndFrq

Parameter	Estimate	Standard Error	T Statistic	P-Value
CONSTANT	−1.188410	1.610480	−0.73792	0.4672
CYIndBL	0.330217	0.153726	2.14809	0.0412
CYAggE	0.481486	0.254616	1.89103	0.0698

Analysis of Variance

Source	Sum of Squares	Degrees of Freedom	Mean Square Error	F-Ratio	P-Value
Model	347.9560	2	173.9780	4.354097	0.0234
Residual	1038.8900	26	39.9573		
Total (Corr.)	1386.8460	28			

R-squared = 25.0897 percent
R-squared (adjusted for d.f.) = 19.3274 percent
Standard Error of Est. = 6.32119
Mean absolute error = 4.36516
Durbin–Watson statistic = 1.19294

The StatAdvisor

The output shows the results of fitting a multiple linear regression model to describe the relationship between IndFrq and 2 independent variables. The equation of the fitted model is

$$\text{IndFrq} = -1.18841 + 0.330217 * \text{CYIndBL} + 0.481486 * \text{CYAggE}.$$

Since the P-value in the ANOVA table is less than 0.05, there is a statistically significant relationship between the variables at the 95% confidence level.

The R-Squared statistic indicates that the model as fitted explains 25.0897% of the variability in IndFrq. The adjusted R-squared statistic, which is more suitable for comparing models with different numbers of independent variables, is 19.3274%. The standard error of the estimate shows the standard deviation of the residuals to be 6.32119. This value can be used to construct prediction limits for new observations by selecting the Reports option from the text menu. The mean absolute error (MAE) of 4.36516 is the average value of the residuals. The Durbin–Watson (DW) statistic tests the residuals to determine if there is any significant correlation based on the order in which they occur in your data file. Since the DW value is less than 1.4, there may be some indication of serial correlation. Plot the residuals versus row order to see if there is any pattern which can be seen.

In determining whether the model can be simplified, notice that the highest P-value on the independent variables is 0.0698, belonging to CYAggE. Since the P-value is less than 0.10, that term is statistically significant at the 90% confidence level. Depending on the confidence level at which you wish to work, you may or may not decide to remove CYAggE from the model.

EXHIBIT 11

PART 3

STATGRAPHICS PLUS REGRESSION RESULTS

Multiple Regression Analysis

Dependent variable: IndFrq

Parameter	Estimate	Standard Error	T Statistic	P-Value
CONSTANT	−2.593800	2.146440	−1.20842	0.2378
CYIndBL	0.287312	0.156838	1.83191	0.0784
CYrGSP	1.016480	0.539883	1.88279	0.0710

Analysis of Variance

Source	Sum of Squares	Degrees of Freedom	Mean Square Error	F-Ratio	P-Value
Model	346.8620	2	173.4310	4.3358	0.0237
Residual	1039.9850	26	39.9994		
Total (Corr.)	1386.8470	28			

R-squared = 25.0108 percent
R-squared (adjusted for d.f.) = 19.2424 percent
Standard Error of Est. = 6.32451
Mean absolute error = 4.08829
Durbin–Watson statistic = 1.09492

The StatAdvisor

The output shows the results of fitting a multiple linear regression model to describe the relationship between IndFrq and 2 independent variables. The equation of the fitted model is

$$\text{IndFrq} = -2.5938 + 0.287312 * \text{CYIndBL} + 1.01648 * \text{CYrGSP}.$$

Since the P-value in the ANOVA table is less than 0.05, there is a statistically significant relationship between the variables at the 95% confidence level.

The R-Squared statistic indicates that the model as fitted explains 25.0108% of the variability in IndFrq. The adjusted R-squared statistic, which is more suitable for comparing models with different numbers of independent variables, is 19.2424%. The standard error of the estimate shows the standard deviation of the residuals to be 6.32451. This value can be used to construct prediction limits for new observations by selecting the Reports option from the text menu. The mean absolute error (MAE) of 4.08829 is the average value of the residuals. The Durbin–Watson (DW) statistic tests the residuals to determine if there is any significant correlation based on the order in which they occur in your data file. Since the DW value is less than 1.4, there may be some indication of serial correlation. Plot the residuals versus row order to see if there is any pattern which can be seen.

In determining whether the model can be simplified, notice that the highest P-value on the independent variables is 0.0784, belonging to CYIndBL. Since the P-value is less than 0.10, that term is statistically significant at the 90% confidence level. Depending on the confidence level at which you wish to work, you may or may not decide to remove CYIndBL from the model.

EXHIBIT 11

PART 4

STATGRAPHICS PLUS REGRESSION RESULTS

Multiple Regression Analysis

Dependent variable: IndFrq

Parameter	Estimate	Standard Error	T Statistic	P-Value
CONSTANT	0.938789	1.304640	0.71958	0.4782
CYIndBL	0.316254	0.154940	2.04114	0.0515
PCUGA_1	−0.125809	0.068556	−1.83512	0.0780

Analysis of Variance

Source	Sum of Squares	Degrees of Freedom	Mean Square Error	F-Ratio	P-Value
Model	340.5860	2	170.2930	4.2319	0.0256
Residual	1046.2600	26	40.2408		
Total (Corr.)	1386.8460	28			

R-squared = 24.5583 percent
R-squared (adjusted for d.f.) = 18.7551 percent
Standard Error of Est. = 6.34357
Mean absolute error = 4.26624
Durbin–Watson statistic = 0.989726

The StatAdvisor

The output shows the results of fitting a multiple linear regression model to describe the relationship between IndFrq and 2 independent variables. The equation of the fitted model is

$$\text{IndFrq} = 0.938789 + 0.316254 * \text{CYIndBL} - 0.125809 * \text{PCUGA\_1}.$$

Since the P-value in the ANOVA table is less than 0.05, there is a statistically significant relationship between the variables at the 95% confidence level.

The R-Squared statistic indicates that the model as fitted explains 24.5583% of the variability in IndFrq. The adjusted R-squared statistic, which is more suitable for comparing models with different numbers of independent variables, is 18.7551%. The standard error of the estimate shows the standard deviation of the residuals to be 6.34357. This value can be used to construct prediction limits for new observations by selecting the Reports option from the text menu. The mean absolute error (MAE) of 4.26624 is the average value of the residuals. The Durbin–Watson (DW) statistic tests the residuals to determine if there is any significant correlation based on the order in which they occur in your data file. Since the DW value is less than 1.4, there may be some indication of serial correlation. Plot the residuals versus row order to see if there is any pattern which can be seen.

In determining whether the model can be simplified, notice that the highest P-value on the independent variables is 0.0780, belonging to PCUGA_1. Since the P-value is less than 0.10, that term is statistically significant at the 90% confidence level. Depending on the confidence level at which you wish to work, you may or may not decide to remove PCUGA_1 from the model.

EXHIBIT 12

Summary of Performance Measures for Selected Models Indemnity Benefit Level

Independent Variables			Performance Measures		Projection Period = 1 Year		Projection Period = 2 Years		Projection Period = 3 Years	
			Average Absolute Error	Adjusted R^2 ($\times$100)	Average Absolute Error	R^2 ($\times$100)	Average Absolute Error	R^2 ($\times$100)	Average Absolute Error	R^2 ($\times$100)
Constant	PCUGA_1 & PCUGA_2	Cum Inj Index	1.6592	87.9086	2.5386	81.6704	2.8823	76.1449	1.9625	90.1574
Constant	PCUGA_1	Cum Inj Index	1.9577	85.6142	2.6385	79.3143	3.0434	74.6150	2.6673	83.3440
Constant	PCGA_1 & PCGA_2	Cum Inj Index	1.9507	83.4069	2.9959	75.5453	3.4739	66.8418	2.3567	83.9297
Constant	rGSP & AggE	Cum Inj Index	1.9507	83.4069	2.9959	75.5453	3.4739	66.8418	2.3567	83.9297
Constant	PCGA_1	Cum Inj Index	2.0920	82.2782	3.4225	69.2466	3.7406	62.9808	2.2048	79.8725
Constant	AggE	Cum Inj Index	2.2354	79.8728	3.6540	66.4066	3.9143	59.7829	2.5036	76.1922
Constant	rGSP	Cum Inj Index	2.4781	78.2211	2.9955	74.2734	3.9902	58.6875	3.4846	72.4205

PCGA_1(2) = First (second) principal component of California Real GSP and Aggregate Employment.
PCUGA_1(2) = First (second) principal component of California Unemployment Rate, California Real GSP, and Aggregate Employment.
R^2 = Square of sample correlation coefficient between the actual and fitted annual percent changes in indemnity claim frequency.

EXHIBIT 13

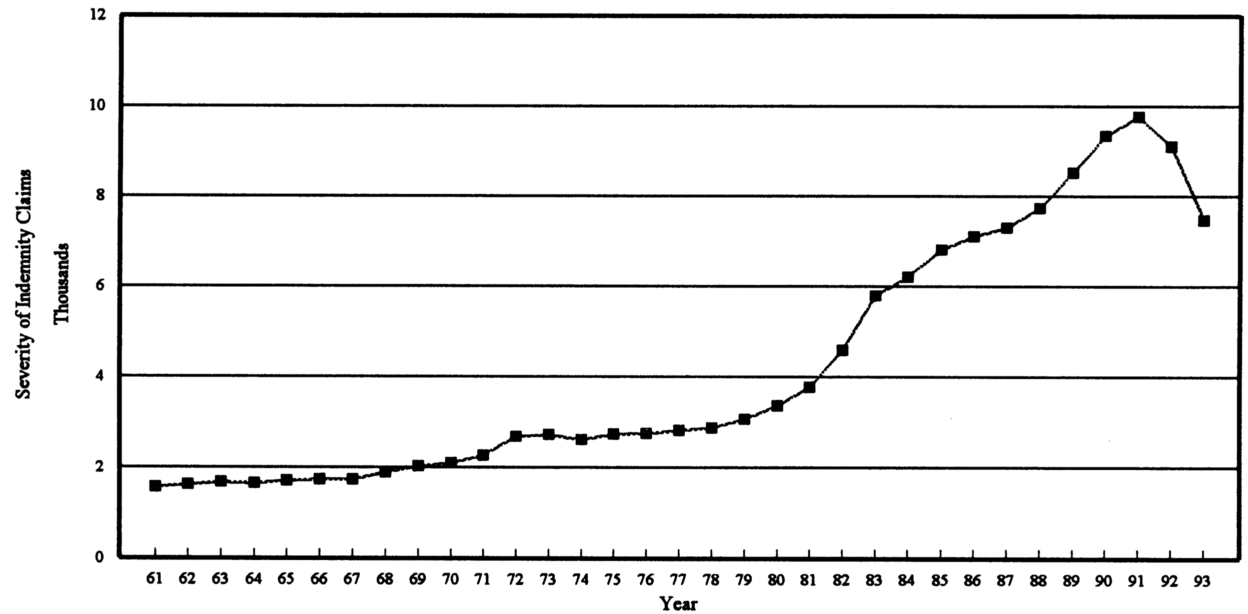
UTILIZATION POINT ESTIMATES AND CONFIDENCE INTERVALS FOR SELECTED MODELS

Model #2 (Exhibit 7) **Indemnity Benefit Level** **Ratio of Cumulative Injuries to Total Indemnity Claims** **First Principal Component of rGSP, AggE, and Unemp**	**Model #5 (Exhibit 8)** **Indemnity Benefit Level** **Ratio of Cumulative Injuries to Total Indemnity Claims** **First Principal Component of rGSP and AggE**
Point Estimate for percent change in indemnity frequency due to change in indemnity benefit level = $0.2619 \times$ Indemnity Benefit Level Change (CY) **95% Prediction Interval:** $[0.2619 \pm (2.2010 \times 0.0746)] \times$ Indemnity Benefit Level Change (CY) $(0.0977, 0.4261) \times$ Indemnity Benefit Level Change (CY) **90% Prediction Interval:** $[0.2619 \pm (1.7959 \times 0.0746)] \times$ Indemnity Benefit Level Change (CY) $(0.1279, 0.3959) \times$ Indemnity Benefit Level Change (CY)	**Point Estimate for percent change in indemnity frequency due to change in indemnity benefit level =** $0.3091 \times$ Indemnity Benefit Level Change (CY) **95% Prediction Interval:** $[0.3091 \pm (2.2010 \times 0.0831)] \times$ Indemnity Benefit Level Change (CY) $(0.1262, 0.4920) \times$ Indemnity Benefit Level Change (CY) **90% Prediction Interval:** $[0.3091 \pm (1.7959 \times 0.0831)] \times$ Indemnity Benefit Level Change (CY) $(0.1599, 0.4583) \times$ Indemnity Benefit Level Change (CY)
Model #6 (Exhibit 9) **Indemnity Benefit Level** **Ratio of Cumulative Injuries to Total Indemnity Claims** **California Aggregate Employment**	**Model #7 (Exhibit 10)** **Indemnity Benefit Level** **Ratio of Cumulative Injuries to Total Indemnity Claims** **California Real Gross State Product**
Point Estimate for percent change in indemnity frequency due to change in indemnity benefit level = $0.3211 \times$ Indemnity Benefit Level Change (CY) **95% Prediction Interval:** $[0.3211 \pm (2.2010 \times 0.0889)] \times$ Indemnity Benefit Level Change (CY) $(0.1254, 0.5168) \times$ Indemnity Benefit Level Change (CY) **90% Prediction Interval:** $[0.3211 \pm (1.7959 \times 0.0889)] \times$ Indemnity Benefit Level Change (CY) $(0.1614, 0.4808) \times$ Indemnity Benefit Level Change (CY)	**Point Estimate for percent change in indemnity frequency due to change in indemnity benefit level =** $0.2205 \times$ Indemnity Benefit Level Change (CY) **95% Prediction Interval:** $[0.2205 \pm (2.2010 \times 0.0930)] \times$ Indemnity Benefit Level Change (CY) $(0.0158, 0.4252) \times$ Indemnity Benefit Level Change (CY) **90% Prediction Interval:** $[0.2205 \pm (1.7959 \times 0.0930)] \times$ Indemnity Benefit Level Change (CY) $(0.0535, 0.3875) \times$ Indemnity Benefit Level Change (CY)

EXHIBIT 14

PART 1—PAGE 1

INDEMNITY SEVERITY



Source: W.C.I.R.B. of California Unit Statistical Reporting Plan.
California Class Experience at 3rd report except 1992 at 2nd and 1993 at 1st report. See Appendix I.

EXHIBIT 14

PART 1—PAGE 2

ANNUAL PERCENT CHANGE—INDEMNITY SEVERITY

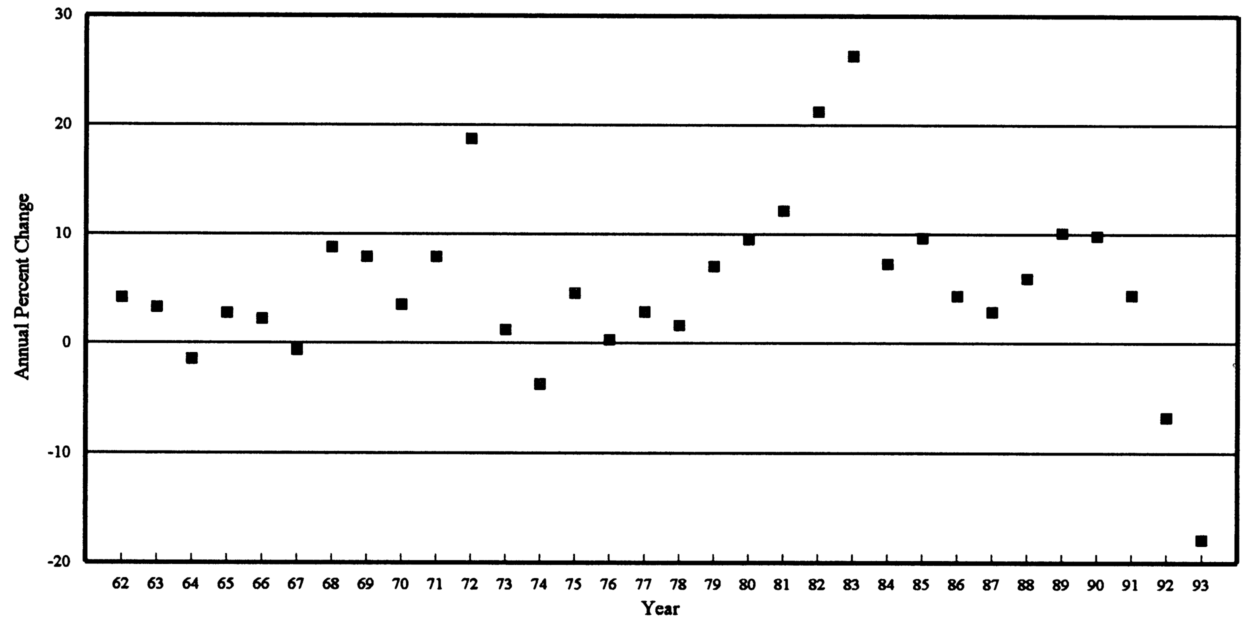
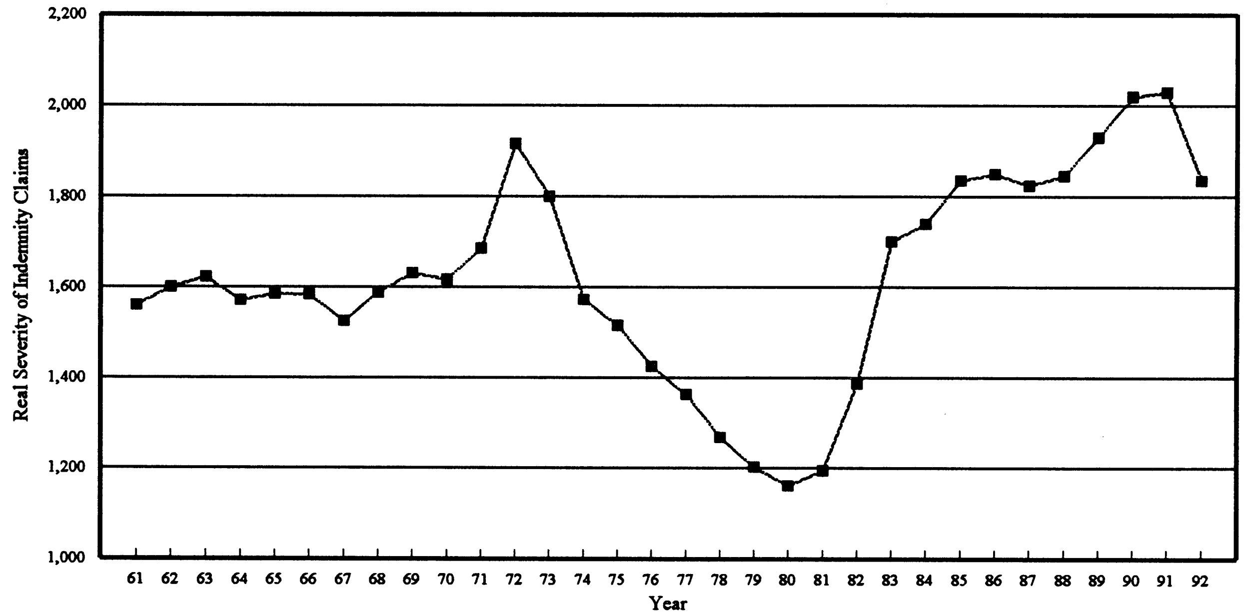


EXHIBIT 14

PART 2—PAGE 1

REAL INDEMNITY SEVERITY



Source: W.C.I.R.B. of California Unit Statistical Reporting Plan.
California Class Experience at 3rd report except 1992 at 2nd and 1993 at 1st report.
Severity brought to a 1982-1984 level using the California CPI. See Appendix I.

EXHIBIT 14

PART 2—PAGE 2

ANNUAL PERCENT CHANGE—REAL INDEMNITY SEVERITY

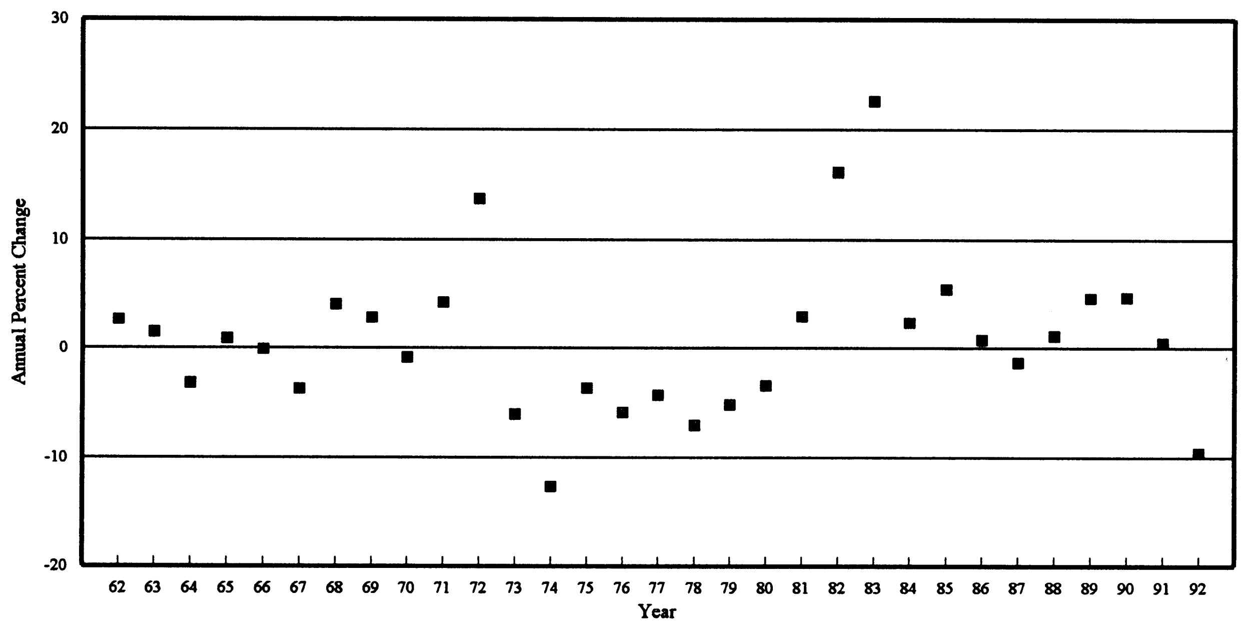


EXHIBIT 15

PART 1

CANDIDATE VARIABLES—TABULAR PRESENTATION ORIGINAL VARIABLES

		Real Severity			Cumulative Benefit Level (Calendar Year)				
		Indemnity Claims							
Year	Indemnity Severity	Indemnity	Medical	All Claims	Indemnity	Medical	Total	California Aggregate Emplmt	Real California GSP
1961	1,559.4	1,559.4	547.0	302.9	1.000	1.000	1.001	3,891,683	–
1962	1,623.8	1,600.0	560.6	315.3	1.001	1.020	1.004	4,071,877	–
1963	1,676.9	1,623.1	584.3	329.4	1.001	1.080	1.005	4,216,436	210,153
1964	1,652.8	1,571.1	581.0	325.8	1.001	1.080	1.005	4,346,448	220,848
1965	1,698.5	1,585.0	638.6	341.6	1.001	1.080	1.005	4,464,625	229,125
1966	1,736.8	1,583.8	700.5	358.5	1.001	1.158	1.022	4,707,406	240,495
1967	1,726.1	1,524.8	695.8	355.8	1.001	1.391	1.073	4,840,158	245,762
1968	1,877.6	1,586.6	725.7	386.7	1.001	1.391	1.073	5,041,894	257,843
1969	2,025.7	1,630.8	739.1	406.9	1.042	1.429	1.105	5,272,325	264,621
1970	2,097.3	1,616.8	751.5	417.3	1.042	1.542	1.117	5,240,190	263,933
1971	2,263.0	1,685.0	806.9	442.2	1.042	1.542	1.117	5,189,637	265,600
1972	2,687.2	1,916.3	830.5	475.6	1.227	1.581	1.247	5,913,892	281,159
1973	2,720.7	1,800.3	808.5	519.3	1.283	1.695	1.297	6,383,331	293,735
1974	2,619.5	1,571.8	732.8	576.8	1.355	1.771	1.362	6,588,356	298,408
1975	2,739.9	1,514.4	765.9	600.0	1.428	1.995	1.450	6,564,524	304,518
1976	2,749.0	1,425.1	783.1	595.7	1.433	2.527	1.530	7,130,103	320,160
1977	2,828.8	1,363.6	782.8	594.2	1.519	2.721	1.626	7,543,268	403,192
1978	2,874.8	1,267.7	787.2	576.1	1.519	2.721	1.626	9,036,931	424,809
1979	3,075.9	1,201.8	792.7	566.9	1.519	2.882	1.641	9,448,087	439,868
1980	3,369.4	1,160.3	824.8	565.8	1.519	3.040	1.655	10,083,911	447,341
1981	3,779.0	1,194.4	910.8	606.7	1.564	3.256	1.719	10,256,167	457,877
1982	4,581.9	1,387.5	1,023.6	714.6	1.564	3.927	1.785	10,131,806	458,036
1983	5,788.3	1,701.2	1,107.8	847.7	2.171	4.363	2.200	10,312,305	480,484
1984	6,207.9	1,740.7	1,104.5	905.7	2.332	4.738	2.321	10,900,212	517,192
1985	6,806.4	1,835.4	1,215.2	983.2	2.332	5.093	2.328	11,378,074	545,612
1986	7,100.4	1,849.1	1,308.9	1,033.2	2.332	5.093	2.328	11,644,237	572,257
1987	7,305.5	1,824.2	1,387.0	1,073.0	2.332	5.278	2.331	12,094,751	599,088
1988	7,737.6	1,844.6	1,457.0	1,131.5	2.332	5.460	2.333	12,556,920	626,079
1989	8,517.8	1,930.2	1,571.0	1,244.0	2.332	5.460	2.333	13,005,986	649,583
1990	9,352.3	2,020.3	1,641.5	1,387.8	2.385	5.684	2.356	13,328,057	665,298
1991	9,760.8	2,029.4	1,593.0	1,368.1	2.502	6.224	2.401	12,796,072	653,197
1992	9,100.9	1,834.4	1,496.2	1,158.2	2.522	6.162	2.407	12,490,570	652,328
1993	7,473.5	–	–	–	2.522	6.162	2.413	12,253,883	–
1994	–	–	–	–	2.334	6.202	2.186	12,500,754	–
1995	–	–	–	–	2.425	6.473	2.232	–	–
1996	–	–	–	–	2.495	6.618	2.268	–	–

Notes: Severity brought to 1982–1984 level using the California CPI.
Series change in Self-Insurance Share Index in 1976. See Appendix H. Value given for 1976 is average of self-insured share under both series.

California Unemplmt Rate	Indemnity Frequency Haz'ness	Indemnity Pure Premium Haz'ness	Litigation Rate	Cumulative Indemnity Claims	Principal Components PCGA_1	PCGA_2	PCUGA_1	PCUGA_2	Self-Insurance Share Index
6.9	1.000	1.000	–	–					0.1018
5.8	0.990	0.988	–	–					0.1019
6.0	0.989	0.985	–	–					0.1019
6.0	0.983	0.986	–	–					0.1097
5.9	0.977	0.975	–	–					0.1095
4.9	0.961	0.955	–	–					0.1095
5.7	0.949	0.918	–	–					0.1171
5.4	0.947	0.926	–	–					0.1174
5.2	0.934	0.915	–	–					0.1319
7.3	0.925	0.900	–	–					0.1319
8.8	0.925	0.896	–	–					0.1184
7.6	0.926	0.893	32.81	–					0.1235
7.0	0.925	0.886	28.93	–					0.1228
7.3	0.912	0.866	27.17	–					0.1230
9.9	0.897	0.829	30.59	–					0.1307
9.2	0.902	0.825	33.22	–					0.1788
8.2	0.910	0.821	31.15	2.637					0.2437
7.1	0.922	0.824	27.37	2.525		NOT			0.2422
6.2	0.920	0.822	28.09	2.359		APPLICABLE			0.2426
6.8	0.909	0.799	25.12	2.215					0.2425
7.4	0.892	0.774	25.26	2.345					0.2752
9.9	0.874	0.737	28.76	2.965					0.2857
9.7	0.872	0.733	27.33	3.278					0.3083
7.8	0.870	0.737	27.81	3.868					0.3002
7.2	0.864	0.731	29.03	4.271					0.3003
6.7	0.855	0.723	35.94	4.450					0.3001
5.8	0.853	0.721	34.87	4.613					0.2999
5.3	0.854	0.721	34.86	5.269					0.3002
5.1	0.852	0.719	34.70	6.473					0.2927
5.6	0.840	0.706	–	8.485					0.2853
7.5	0.826	0.692	38.20	9.576					0.2621
9.1	0.816	0.682	42.85	6.359					0.2880
9.2	0.811	0.678	–	4.513					0.3080
–	–	–	–	4.281					–
–	–	–	–	–					–
–	–	–	–	–					–

EXHIBIT 15

PART 2

CANDIDATE VARIABLES—TABULAR PRESENTATION ANNUAL PERCENT CHANGES

		Real Severity			Cumulative Benefit Level (Calendar Year)				
		Indemnity Claims							
Year	Indemnity Severity	Indemnity	Medical	All Claims	Indemnity	Medical	Total	California Aggregate Emplmt	Real California GSP
1961	—	—	—	—	0.032	0.000	0.092	—	—
1962	4.131	2.604	2.484	4.097	0.075	2.012	0.272	4.630	—
1963	3.271	1.446	4.226	4.479	0.000	5.852	0.158	3.550	—
1964	−1.440	−3.204	−0.556	−1.105	0.000	0.000	0.000	3.083	5.275
1965	2.768	0.882	9.916	4.866	0.000	0.000	0.000	2.719	3.759
1966	2.255	−0.076	9.693	4.934	0.000	7.259	1.689	5.438	4.942
1967	−0.616	−3.723	−0.679	−0.762	0.000	20.083	4.928	2.820	2.069
1968	8.778	4.053	4.298	8.688	0.000	0.000	0.000	4.168	5.011
1969	7.888	2.788	1.848	5.241	4.100	2.747	3.062	4.570	2.533
1970	3.533	−0.861	1.672	2.550	0.000	7.935	1.043	−0.610	−0.194
1971	7.899	4.220	7.379	5.956	0.000	0.000	0.000	−0.965	0.590
1972	18.746	13.726	2.919	7.562	17.732	2.489	11.635	13.956	5.957
1973	1.246	−6.056	−2.649	9.186	4.553	7.232	4.049	7.938	4.358
1974	−3.718	−12.692	−9.364	11.072	5.623	4.461	4.974	3.212	1.747
1975	4.595	−3.654	4.521	4.015	5.418	12.673	6.438	−0.362	1.897
1976	0.332	−5.893	2.246	−0.716	0.300	26.650	5.560	8.616	5.283
1977	2.902	−4.316	−0.032	−0.251	6.000	7.702	6.268	5.795	5.545
1978	1.629	−7.033	0.555	−3.039	0.000	0.000	0.000	19.801	5.322
1979	6.993	−5.197	0.698	−1.593	0.000	5.898	0.907	4.550	3.672
1980	9.543	−3.458	4.048	−0.205	0.000	5.479	0.885	6.730	1.633
1981	12.156	2.945	10.432	7.244	3.000	7.119	3.842	1.708	2.354
1982	21.249	16.165	12.384	17.772	0.000	20.599	3.812	−1.213	0.013
1983	26.328	22.604	8.224	18.629	38.800	11.100	23.300	1.782	4.931
1984	7.250	2.325	−0.293	6.839	7.400	8.600	5.500	5.701	7.665
1985	9.641	5.439	10.021	8.557	0.000	7.500	0.300	4.384	5.453
1986	4.319	0.747	7.708	5.084	0.000	0.000	0.000	2.339	4.887
1987	2.889	−1.348	5.969	3.851	0.000	3.630	0.101	3.869	4.711
1988	5.915	1.120	5.049	5.458	0.000	3.445	0.099	3.821	4.476
1989	10.084	4.639	7.823	9.940	0.000	0.000	0.000	3.576	3.770
1990	9.796	4.666	4.486	11.560	2.300	4.100	1.000	2.476	2.475
1991	4.368	0.455	−2.956	−1.420	4.900	9.500	1.900	−3.991	−1.900
1992	−6.761	−9.611	−6.079	−15.340	0.800	−1.000	0.251	−2.387	−0.106
1993	−17.882	—	—	—	0.000	0.000	0.248	−1.895	—
1994	—	—	—	—	−7.469	0.646	−9.428	2.015	—
1995	—	—	—	—	3.919	4.374	2.141	—	—
1996	—	—	—	—	2.894	2.242	1.596	—	—

Notes: PCGA_1(2) = First (second) principal component of CA Real GSP and Aggregate Employment

PCUGA_1(2) = First (second) principal component of CA Real GSP, Unemployment Rate, and Aggregate Employment

Series change in Self-Insurance Share Index in 1976. See Appendix H. Value given for 1976 is average of self-insured share under both series.

California Unemplmt Rate	Indemnity Frequency Haz'ness	Indemnity Pure Premium Haz'ness	Litigation Rate	Cumulative ÷ Indemnity Claims	Principal Components				Self-Insurance Share Index
					PCGA_1	PCGA_2	PCUGA_1	PCUGA_2	
—	—	—	—	—	—	—	—	—	0.002
−15.942	−0.974	−1.233	—	—	4.360	−1.560	—	—	0.009
3.448	−0.128	−0.318	—	—	3.343	−1.196	—	—	−0.000
0.000	−0.565	0.107	—	—	4.680	3.928	−1.188	3.164	0.787
−1.667	−0.629	−1.040	—	—	3.826	2.624	−2.571	2.446	−0.020
−16.949	−1.642	−2.062	—	—	6.785	2.822	−18.124	2.203	−0.000
16.327	−1.237	−3.883	—	—	3.352	0.998	15.155	5.962	0.755
−5.263	−0.249	0.875	—	—	5.612	3.314	−6.495	3.208	0.032
−3.704	−1.361	−1.188	—	—	5.157	0.846	−4.765	3.837	1.455
40.385	−1.003	−1.650	—	—	−0.639	0.023	39.526	7.167	−0.000
20.548	0.082	−0.456	—	—	−0.709	0.881	20.155	3.023	−1.356
−13.636	0.051	−0.287	—	—	15.147	0.907	−16.613	11.223	0.513
−7.895	−0.137	−0.772	−11.834	—	8.942	1.429	−9.696	6.383	−0.071
4.286	−1.398	−2.363	−6.085	—	3.613	0.563	3.374	4.021	0.019
35.616	−1.589	−4.173	12.615	—	0.299	1.908	34.588	6.548	0.769
−7.071	0.500	−0.474	8.598	—	9.892	2.072	−9.127	7.231	−0.358
−10.870	0.949	−0.513	−6.250	—	7.324	3.268	−12.331	3.739	1.331
−13.415	1.249	0.302	−12.133	−4.248	20.437	−1.660	−17.424	16.983	−0.151
−12.676	−0.216	−0.182	2.621	−6.598	5.521	1.925	−13.643	2.121	0.034
9.677	−1.116	−2.861	−10.557	−6.108	6.886	−0.730	7.984	8.507	−0.003
8.824	−1.866	−3.130	0.537	5.871	2.401	1.641	8.013	3.436	3.271
33.784	−2.097	−4.711	13.867	26.453	−1.137	0.421	33.177	5.311	1.047
−2.020	−0.201	−0.534	−4.964	10.556	3.338	4.042	−2.874	1.489	2.261
−19.588	−0.173	0.549	1.773	17.998	7.950	5.297	−21.061	2.026	−0.816
−7.692	−0.748	−0.882	4.382	10.430	5.965	3.658	−8.956	2.964	0.015
−6.944	−1.033	−1.126	23.803	4.183	3.849	3.814	−7.777	1.087	−0.017
−13.433	−0.225	−0.248	−2.974	3.655	5.230	3.132	−14.373	1.335	−0.021
−8.621	0.057	0.090	−0.032	14.219	5.106	2.927	−9.643	2.208	0.026
−3.774	−0.179	−0.384	−0.456	22.853	4.637	2.344	−4.788	2.881	−0.746
9.804	−1.382	−1.756	—	31.096	3.165	1.496	8.811	4.381	−0.746
33.929	−1.718	−1.977	—	12.856	−4.398	−0.444	34.062	2.563	−2.312
21.333	−1.185	−1.526	12.183	−33.591	−2.284	0.704	21.269	1.760	2.590
1.099	−0.572	−0.527	—	−29.038	−1.784	0.638	1.428	−1.647	1.999
—	—	—	—	−5.130	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—

EXHIBIT 16

PART 1

CORRELATIONS AMONG VARIABLES
SAMPLE PERIOD: 1964–1992
PEARSON PRODUCT MOMENT CORRELATION AT LAG = 0

	Indemnity Severity	Real Severity: Indemnity Claims		Real Severity	Benefit Level (Calendar Year)			California Aggregate Emplmt
		Indemnity	Medical	All Claims	Indemnity	Medical	Total	
Indemnity Severity								
Real Indemnity Severity	0.927	1.000	0.655	0.696	0.585	0.103	0.525	−0.117
Real Medical Severity	0.614	0.655	1.000	0.504	0.012	0.060	0.011	−0.088
Real Total Severity	0.711	0.696	0.504	1.000	0.423	0.142	0.417	−0.056
Indemnity Benefit Level	0.591	0.585	0.012	0.423	1.000	0.110	0.945	0.060
Medical Benefit Level	0.144	0.103	0.060	0.142	0.110	1.000	0.384	−0.102
Total Benefit Level	0.555	0.525	0.011	0.417	0.945	0.384	1.000	0.082
California Aggregate Employment	0.004	−0.117	−0.088	−0.056	0.060	−0.102	0.082	1.000
Real California Gross State Product	0.088	0.103	0.152	0.167	0.204	−0.113	0.199	0.655
California Unemployment Rate	0.003	0.022	−0.054	−0.074	−0.110	0.267	−0.059	−0.677
Indemnity Frequency Haz'ness	−0.061	−0.091	−0.129	−0.154	0.127	−0.176	0.093	0.643
Indemnity Pure Premium Haz'ness	−0.065	−0.001	−0.126	−0.097	0.105	−0.493	−0.067	0.431
Litigation Rates	0.146	0.255	0.476	0.143	−0.197	0.325	−0.109	−0.543
Cumulative ÷ Indemnity Claims	0.596	0.650	0.557	0.836	0.112	0.466	0.153	−0.110
1st PC (rGSP, AggE)	0.017	−0.088	−0.055	−0.024	0.085	−0.108	0.104	0.993
2nd PC (rGSP, AggE)	0.111	0.249	0.286	0.274	0.210	−0.049	0.182	−0.116
1st PC (rGSP, AggE, Unemp)	0.002	0.025	−0.049	−0.070	−0.110	0.261	−0.063	−0.705
2nd PC (rGSP, AggE, Unemp)	0.010	−0.135	−0.169	−0.145	−0.022	0.119	0.058	0.710
Self-Insurance Share Index	0.167	0.136	0.092	−0.032	0.317	0.061	0.388	−0.063

Note: Pearson Product Moment Correlation assumes the variables to be normally distributed.

Real California GSP	California Unemplmt Rate	Indemnity Frequency Haz`ness	Indemnity Pure Premium Haz`ness	Litigation Rate	Cumulative ÷ Indemnity Claims	Principal Components PCGA_1	PCGA_2	PCUGA_1	PCUGA_2	Self-Insurance Share Index
0.103	0.022	−0.091	−0.001	0.255	0.650	−0.088	0.249	0.025	−0.135	0.136
0.152	−0.054	−0.129	−0.126	0.476	0.557	−0.055	0.286	−0.049	−0.169	0.092
0.167	−0.074	−0.154	−0.097	0.143	0.836	−0.024	0.274	−0.070	−0.145	−0.032
0.204	−0.110	0.127	0.105	−0.197	0.112	0.085	0.210	−0.110	−0.022	0.317
−0.113	0.267	−0.176	−0.493	0.325	0.466	−0.108	−0.049	0.261	0.119	0.061
0.199	−0.059	0.093	−0.067	−0.109	0.153	0.104	0.182	−0.063	0.058	0.388
0.655	−0.677	0.643	0.431	−0.543	−0.110	0.993	−0.116	−0.705	0.710	−0.063
1.000	−0.892	0.617	0.638	−0.122	0.153	0.739	0.674	−0.897	0.040	0.024
−0.892	1.000	−0.587	−0.683	0.353	0.025	−0.741	−0.511	0.999	0.038	0.027
0.617	−0.587	1.000	0.781	−0.448	−0.156	0.668	0.183	−0.600	0.312	−0.182
0.638	−0.683	0.781	1.000	−0.327	−0.116	0.483	0.417	−0.681	−0.068	−0.265
−0.122	0.353	−0.448	−0.327	1.000	0.374	−0.522	0.357	0.369	−0.368	−0.002
0.153	0.025	−0.156	−0.116	0.374	1.000	−0.076	0.286	0.028	−0.119	−0.407
0.739	−0.741	0.668	0.483	−0.522	−0.076	1.000	0.000	−0.767	0.639	−0.052
0.674	−0.511	0.183	0.417	0.357	0.286	0.000	1.000	−0.490	−0.642	0.094
−0.897	0.999	−0.600	−0.681	0.369	0.028	−0.767	−0.490	1.000	−0.000	0.029
0.040	0.038	0.312	−0.068	−0.368	−0.119	0.639	−0.642	−0.000	1.000	−0.058
0.024	0.027	−0.182	−0.265	−0.002	−0.407	−0.052	0.094	0.029	−0.058	1.000

EXHIBIT 16

PART 2

CORRELATIONS AMONG VARIABLES
SAMPLE PERIOD: 1964–1992
SIGNIFICANCE OF CORRELATION AT LAG = 0

	Indemnity Severity	Real Severity			Benefit Level (Calendar Year)			California Aggregate Emplmt
		Indemnity Claims		All Claims				
		Indemnity	Medical		Indemnity	Medical	Total	
Indemnity Severity		0.000	0.000	0.000	0.001	0.456	0.002	0.983
Real Indemnity Severity	0.000		0.000	0.000	0.001	0.595	0.003	0.547
Real Medical Severity	0.000	0.000		0.005	0.952	0.756	0.953	0.649
Real Total Severity	0.000	0.000	0.005		0.022	0.461	0.024	0.774
Indemnity Benefit Level	0.001	0.001	0.952	0.022		0.569	0.000	0.758
Medical Benefit Level	0.456	0.595	0.756	0.461	0.569		0.040	0.599
Total Benefit Level	0.002	0.003	0.953	0.024	0.000	0.040		0.673
California Aggregate Employment	0.983	0.547	0.649	0.774	0.758	0.599	0.673	
Real California Gross State Product	0.650	0.595	0.432	0.387	0.288	0.560	0.300	0.000
California Unemployment Rate	0.987	0.911	0.781	0.702	0.572	0.162	0.763	0.000
Indemnity Frequency Haz'ness	0.754	0.639	0.506	0.425	0.513	0.361	0.632	0.000
Indemnity Pure Premium Haz'ness	0.738	0.997	0.515	0.617	0.588	0.007	0.732	0.020
Litigation Rates	0.577	0.323	0.053	0.584	0.448	0.203	0.676	0.024
Cumulative ÷ Indemnity Claims	0.019	0.009	0.031	0.000	0.690	0.080	0.587	0.696
1st PC (rGSP, AggE)	0.929	0.649	0.776	0.902	0.662	0.576	0.592	0.000
2nd PC (rGSP, AggE)	0.565	0.192	0.133	0.151	0.274	0.803	0.344	0.549
1st PC (rGSP, AggE, Unemp)	0.993	0.897	0.800	0.717	0.569	0.172	0.746	0.000
2nd PC (rGSP, AggE, Unemp)	0.957	0.484	0.380	0.454	0.911	0.538	0.766	0.000
Self-Insurance Share Index	0.385	0.483	0.636	0.868	0.094	0.753	0.038	0.746

Note: P Value is the probability of observing the indicated SAMPLE correlation coefficient if the TRUE correlation coefficient was actually zero.

Real California GSP	California Unemplmt Rate	Indemnity Frequency Haz'ness	Indemnity Pure Premium Haz'ness	Litigation Rate	Cumulative ÷ Indemnity Claims	Principal Components				Self-Insurance Share Index
						PCGA_1	PCGA_2	PCUGA_1	PCUGA_2	
0.650	0.987	0.754	0.738	0.577	0.019	0.929	0.565	0.993	0.957	0.385
0.595	0.911	0.639	0.997	0.323	0.009	0.649	0.192	0.897	0.484	0.483
0.432	0.781	0.506	0.515	0.053	0.031	0.776	0.133	0.800	0.380	0.636
0.387	0.702	0.425	0.617	0.584	0.000	0.902	0.151	0.717	0.454	0.868
0.288	0.572	0.513	0.588	0.448	0.690	0.662	0.274	0.569	0.911	0.094
0.560	0.162	0.361	0.007	0.203	0.080	0.576	0.803	0.172	0.538	0.753
0.300	0.763	0.632	0.732	0.676	0.587	0.592	0.344	0.746	0.766	0.038
0.000	0.000	0.000	0.020	0.024	0.696	0.000	0.549	0.000	0.000	0.746
	0.000	0.000	0.000	0.640	0.587	0.000	0.000	0.000	0.838	0.900
0.000		0.001	0.000	0.165	0.928	0.000	0.005	0.000	0.844	0.888
0.000	0.001		0.000	0.071	0.578	0.000	0.342	0.001	0.099	0.345
0.000	0.000	0.000		0.201	0.680	0.008	0.024	0.000	0.726	0.164
0.640	0.165	0.071	0.201		0.232	0.031	0.160	0.145	0.146	0.994
0.587	0.928	0.578	0.680	0.232		0.788	0.301	0.921	0.672	0.132
0.000	0.000	0.000	0.008	0.031	0.788		1.000	0.000	0.000	0.787
0.000	0.005	0.342	0.024	0.160	0.301	1.000		0.007	0.000	0.629
0.000	0.000	0.001	0.000	0.145	0.921	0.000	0.007		1.000	0.882
0.838	0.844	0.099	0.726	0.146	0.672	0.000	0.000	1.000		0.764
0.900	0.888	0.345	0.164	0.994	0.132	0.787	0.629	0.882	0.764	

EXHIBIT 17

PART 1—PAGE 1

INDEMNITY SEVERITY VS INDEMNITY BENEFIT LEVEL

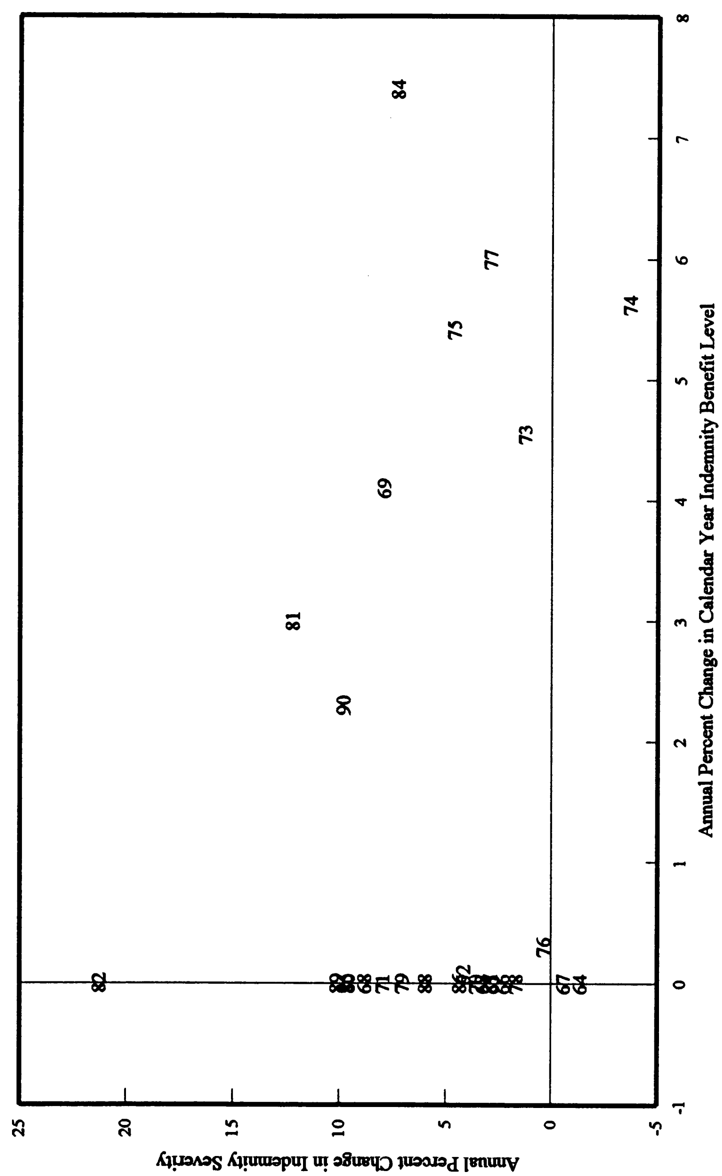


EXHIBIT 17

PART 1—PAGE 2

Outliers 1972 and 1983 used in regression but not shown in graph

Spearman Rank Correlation Coefficient:	0.12728
Valid Cases	31
Two-tailed Significance	0.49500
Regression Output With Constant:	
Constant	4.30094
Std Err of Y Est	5.61927
R Squared	0.35458
No. of Observations	31
Degrees of Freedom	29
X Coefficient(s)	0.54096
Std Err of Coef.	0.13553
P-Value	0.00041
Regression Output Without Constant:	
Constant	0.00000
Std Err of Y Est	6.82402
R Squared	0.01534
No. of Observations	31
Degrees of Freedom	30
X Coefficient(s)	0.75305
Std Err of Coef.	0.15078
P-Value	0.00002

EXHIBIT 17

PART 2—PAGE 1

REAL INDEMNITY SEVERITY VS INDEMNITY BENEFIT LEVEL

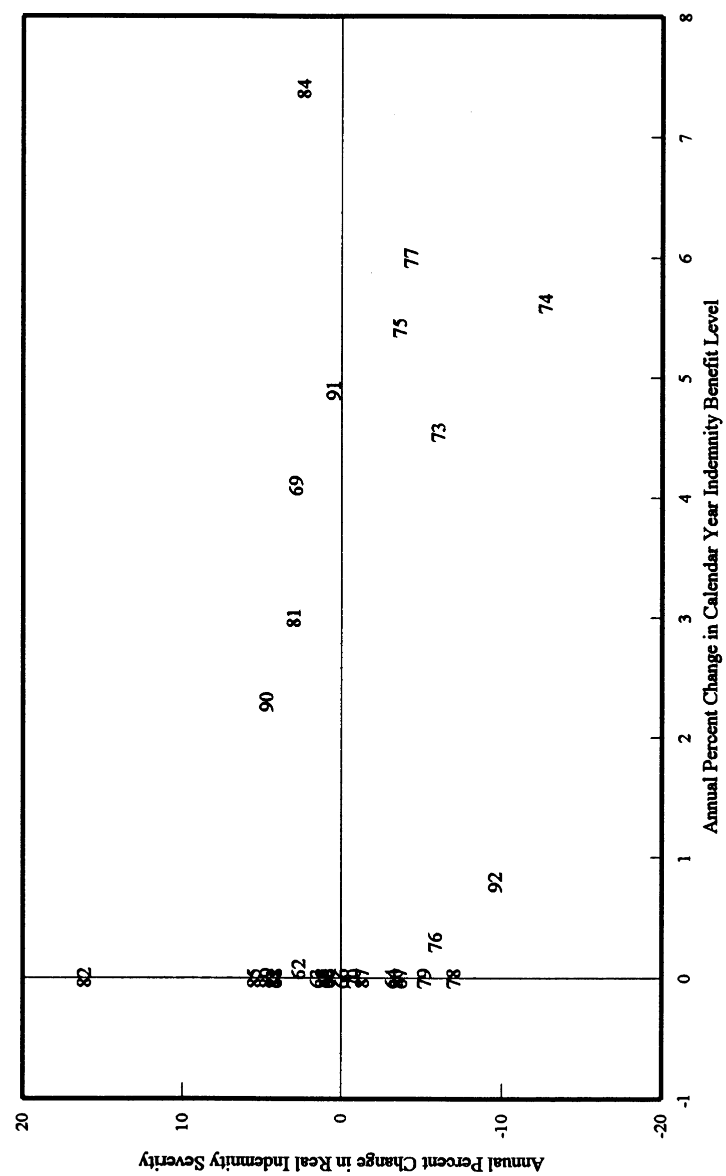


EXHIBIT 17

PART 2—PAGE 2

Outliers 1972 and 1983 used in regression but not shown in graph

Spearman Rank Correlation Coefficient:	0.00661
Valid Cases	31
Two-tailed Significance	0.97180
Regression Output With Constant:	
Constant	-1.01637
Std Err of Y Est	5.99262
R Squared	0.33033
No. of Observations	31
Degrees of Freedom	29
X Coefficient(s)	0.54665
Std Err of Coef.	0.14453
P-Value	0.00072
Regression Output Without Constant:	
Constant	0.00000
Std Err of Y Est	5.96745
R Squared	0.31304
No. of Observations	31
Degrees of Freedom	30
X Coefficient(s)	0.49653
Std Err of Coef.	0.13186
P-Value	0.00072

APPENDIX A

PART 1

DEVELOPMENT OF CANDIDATE VARIABLES CLAIM FREQUENCIES

	Total Exposure (000s)			Incurred Claim Count			Incurred Frequency per $1M (1987)			Annual % Change		
Policy Year	$ Current	Wage Index	$ 1987	Indemnity	Med-Only	Total	Indemnity Claims	Med-Only Claims	Total Claims	Indemnity Claims	Med-Only Claims	Total Claims
1961	21,877,687	22.3	98,107,006	89,647	589,817	679,464	0.9138	6.0120	6.9257	–	–	–
1962	23,612,513	23.2	101,627,186	94,893	611,070	705,963	0.9337	6.0129	6.9466	2.1853	0.0147	0.3011
1963	25,228,415	24.2	104,386,854	99,376	621,304	720,680	0.9520	5.9519	6.9039	1.9557	−1.0132	−0.6141
1964	26,203,849	25.1	104,221,777	99,642	613,730	713,372	0.9561	5.8887	6.8447	0.4265	−1.0626	−0.8573
1965	28,887,463	26.0	111,085,011	103,566	624,766	728,332	0.9323	5.6242	6.5565	−2.4836	−4.4913	−4.2108
1966	31,220,478	27.2	114,696,870	107,600	640,367	747,967	0.9381	5.5831	6.5213	0.6234	−0.7306	−0.5381
1967	33,123,452	29.1	113,908,431	109,981	645,128	755,109	0.9655	5.6636	6.6291	2.9203	1.4408	1.6536
1968	37,504,640	31.4	119,602,193	118,568	654,187	772,755	0.9914	5.4697	6.4610	2.6754	−3.4232	−2.5350
1969	39,913,331	33.7	118,280,474	123,933	659,842	783,775	1.0478	5.5786	6.6264	5.6928	1.9915	2.5594
1970	40,951,049	35.4	115,775,975	117,435	606,247	723,682	1.0143	5.2364	6.2507	−3.1933	−6.1349	−5.6698
1971	43,254,887	36.5	118,637,181	121,927	620,180	742,107	1.0277	5.2275	6.2553	1.3211	−0.1689	0.0729
1972	47,004,364	38.2	122,925,428	133,484	692,791	826,275	1.0859	5.6359	6.7218	5.6595	7.8111	7.4576
1973	50,834,927	40.6	125,208,865	154,932	675,018	829,950	1.2374	5.3911	6.6285	13.9511	−4.3423	−1.3870
1974	54,238,668	42.8	126,869,984	187,310	604,308	791,618	1.4764	4.7632	6.2396	19.3153	−11.6474	−5.8674

1975	57,738,551	46.2	124,895,945	193,063	584,751	777,814	1.5458	4.6819	6.2277	4.7005	−1.7069	−0.1908
1976	62,193,123	49.0	126,958,448	206,908	611,465	818,373	1.6297	4.8163	6.4460	5.4302	2.8697	3.5052
1977	67,671,264	51.8	130,676,822	223,511	637,325	860,836	1.7104	4.8771	6.5875	4.9505	1.2634	2.1956
1978	75,054,494	55.6	134,951,430	235,645	661,759	897,404	1.7461	4.9037	6.6498	2.0893	0.5449	0.9459
1979	82,723,286	60.9	135,929,178	236,010	651,166	887,176	1.7363	4.7905	6.5268	−0.5655	−2.3085	−1.8508
1980	89,813,215	66.6	134,908,287	223,191	613,630	836,821	1.6544	4.5485	6.2029	−4.7159	−5.0513	−4.9621
1981	98,778,141	73.1	135,218,017	211,709	574,590	786,299	1.5657	4.2494	5.8150	−5.3617	−6.5766	−6.2526
1982	103,443,974	77.3	133,843,357	203,441	527,868	731,309	1.5200	3.9439	5.4639	−2.9184	−7.1878	−6.0383
1983	114,266,699	82.0	139,404,129	233,559	584,794	818,353	1.6754	4.1950	5.8704	10.2248	6.3650	7.4387
1984	129,672,576	86.9	149,266,396	271,618	627,773	899,391	1.8197	4.2057	6.0254	8.6114	0.2567	2.6411
1985	140,891,926	91.4	154,095,929	272,771	617,051	889,822	1.7701	4.0043	5.7745	−2.7229	−4.7885	−4.1647
1986	153,916,015	95.3	161,550,696	275,370	608,364	883,734	1.7045	3.7658	5.4703	−3.7057	−5.9574	−5.2671
1987	167,173,336	100.0	167,173,336	292,759	627,052	919,811	1.7512	3.7509	5.5021	2.7390	−0.3948	0.5817
1988	181,245,258	104.9	172,810,122	302,703	623,028	925,731	1.7517	3.6053	5.3569	0.0240	−3.8826	−2.6392
1989	194,374,909	109.2	178,066,971	323,131	634,934	958,065	1.8147	3.5657	5.3804	3.5971	−1.0976	0.4375
1990	197,318,717	112.9	174,807,166	343,711	610,877	954,588	1.9662	3.4946	5.4608	8.3525	−1.9948	1.4951
1991	198,907,627	116.8	170,334,988	317,987	571,418	889,405	1.8668	3.3547	5.2215	− 5.0552	−4.0035	−4.3822
1992	200,370,929	120.5	166,281,823	251,259	516,811	768,070	1.5110	3.1080	4.6191	−19.0585	−7.3518	−11.5373
1993	202,247,504	121.2	166,835,674	207,425	461,029	668,454	1.2433	2.7634	4.0067	−17.7198	−11.0896	−13.2586
1994	210,773,228	122.4	172,186,345	200,526	422,883	623,409	1.1646	2.4560	3.6205	−6.3302	−11.1245	−9.6368

Source: WCIRB of California Class Experience at latest report level as of 11/12/96.
See Appendix A, Part 2 for development of the index to adjust for wage level changes.

APPENDIX A

PART 2

DEVELOPMENT OF INDEX TO ADJUST FOR WAGE LEVEL CHANGES

(A)	(B)	(C)	(B) × 1,000 / (C)	19yy × 100 / 1987		
					Class Experience Exposure (000s)	
Year	Wages (millions)	Employees (thousands)	Avg Wage	Index 1987 = 100	Nominal	Real
1961	30,770	6,036	5,097.75	22.3	21,877,687	98,107,006
1962	33,260	6,262	5,311.40	23.2	23,612,513	101,627,186
1963	35,674	6,457	5,524.86	24.2	25,228,415	104,386,854
1964	38,273	6,659	5,747.56	25.1	26,203,849	104,221,777
1965	40,751	6,855	5,944.71	26.0	28,887,463	111,085,011
1966	44,914	7,218	6,222.50	27.2	31,220,478	114,696,870
1967	48,141	7,242	6,647.47	29.1	33,123,452	113,908,431
1968	52,824	7,369	7,168.41	31.4	37,504,640	119,602,193
1969	57,917	7,508	7,714.04	33.7	39,913,331	118,280,474
1970	61,250	7,575	8,085.81	35.4	40,951,049	115,775,975
1971	63,919	7,669	8,334.72	36.5	43,254,887	118,637,181
1972	69,895	7,996	8,741.25	38.2	47,004,364	122,925,428
1973	76,904	8,286	9,281.20	40.6	50,834,927	125,208,865
1974	84,419	8,638	9,772.98	42.8	54,238,668	126,869,984
1975	90,864	8,598	10,568.04	46.2	57,738,551	124,895,945
1976	100,674	8,990	11,198.44	49.0	62,193,123	126,958,448
1977	112,616	9,513	11,838.12	51.8	67,671,264	130,676,822
1978	128,880	10,137	12,713.82	55.6	75,054,494	134,951,430
1979	146,995	10,566	13,912.08	60.9	82,723,286	135,929,178
1980	164,271	10,794	15,218.73	66.6	89,813,215	134,908,287
1981	182,659	10,938	16,699.49	73.1	98,778,141	135,218,017
1982	193,764	10,967	17,667.91	77.3	103,443,974	133,843,357
1983	207,897	11,095	18,737.90	82.0	114,266,699	139,404,129
1984	230,983	11,631	19,859.26	86.9	129,672,576	149,266,396
1985	251,818	12,048	20,901.23	91.4	140,891,926	154,095,929
1986	270,983	12,442	21,779.70	95.3	153,916,015	161,550,696
1987	295,946	12,946	22,860.03	100.0	167,173,336	167,173,336
1988	320,917	13,385	23,975.87	104.9	181,245,258	172,810,122
1989	343,861	13,780	24,953.63	109.2	193,896,851	177,629,021
1990	368,635	14,286	25,803.93	112.9	197,318,717	174,807,166
1991	373,138	13,978	26,694.66	116.8	198,907,627	170,334,988
1992	383,971	13,939	27,546.52	120.5	200,370,929	166,281,823
1993	384,784	13,885	27,712.21	121.2	202,247,504	166,835,674
1994	395,707	14,141	27,982.96	122.4	210,773,228	172,186,345

Sources: Wages: California Statistical Abstract 1995, "Personal Income in California by Major Source 1969 to 1994"

Employees: California Statistical Abstract, "Employment and Unemployment, California and Metropolitan Areas"

Exposure: WCIRB of California Class Experience (1961—88 3rd Report; 1989–1990 5th Report, 1991 4th Report, 1992 3rd Report, 1993 2nd Report and 1994 1st Report; 1990–1994 Preliminary Summary as of 11/12/96).

APPENDIX B

DEVELOPMENT OF CANDIDATE VARIABLES BENEFIT LEVEL CHANGES

Effective Date	Proportion of Year	Cumulative Benefit Level			Calendar Year Cumulative Benefit Level			Annual Percent Change in CY Benefit Level		
		Indemnity	Medical	Total	Indemnity	Medical	Total	Indemnity	Medical	Total
1-Jan-1961	0.704	1.0000	1.0000	1.0000						
15-Sep-1961	0.296	1.0011	1.0000	1.0031	1.0003	1.0000	1.0009	0.032	0.000	0.092
1-Jan-1962	0.748	1.0011	1.0000	1.0031						
1-Oct-1962	0.252	1.0011	1.0798	1.0052	1.0011	1.0201	1.0036	0.075	2.012	0.272
1-Jan-1963	1.000	1.0011	1.0798	1.0052	1.0011	1.0798	1.0052	0.000	5.852	0.158
1-Jan-1964	1.000	1.0011	1.0798	1.0052	1.0011	1.0798	1.0052	0.000	0.000	0.000
1-Jan-1965	1.000	1.0011	1.0798	1.0052	1.0011	1.0798	1.0052	0.000	0.000	0.000
1-Jan-1966	0.748	1.0011	1.0798	1.0052						
1-Oct-1966	0.252	1.0011	1.3908	1.0726	1.0011	1.1582	1.0222	0.000	7.259	1.689
1-Jan-1967	1.000	1.0011	1.3908	1.0726	1.0011	1.3908	1.0726	0.000	20.083	4.928
1-Jan-1968	1.000	1.0011	1.3908	1.0726	1.0011	1.3908	1.0726	0.000	0.000	0.000
1-Jan-1969	0.748	1.0421	1.3908	1.1015						
1-Oct-1969	0.252	1.0421	1.5424	1.1170	1.0421	1.4290	1.1054	4.100	2.747	3.062
1-Jan-1970	1.000	1.0421	1.5424	1.1170	1.0421	1.5424	1.1170	0.000	7.935	1.043
1-Jan-1971	1.000	1.0421	1.5424	1.1170	1.0421	1.5424	1.1170	0.000	0.000	0.000
1-Jan-1972	0.249	1.0421	1.5424	1.1170						
1-Apr-1972	0.500	1.2881	1.5424	1.2856						
1-Oct-1972	0.251	1.2881	1.6951	1.2985	1.2269	1.5808	1.2469	17.732	2.489	11.635
1-Jan-1973	0.178	1.2881	1.6951	1.2985						
7-Mar-1973	0.822	1.2816	1.6951	1.2972	1.2828	1.6951	1.2974	4.553	7.232	4.049
1-Jan-1974	0.247	1.2944	1.6951	1.3076						
1-Apr-1974	0.501	1.3747	1.6951	1.3638						
1-Oct-1974	0.252	1.3747	1.9951	1.4115	1.3549	1.7707	1.3619	5.623	4.461	4.974
1-Jan-1975	1.000	1.4283	1.9951	1.4496	1.4283	1.9951	1.4496	5.418	12.673	6.438
1-Jan-1976	0.331	1.4326	2.1328	1.4627						
1-May-1976	0.669	1.4326	2.7214	1.5636	1.4326	2.5268	1.5302	0.300	26.650	5.560

APPENDIX B

(Continued)

Effective Date	Proportion of Year	Cumulative Benefit Level			Calendar Year Cumulative Benefit Level			Annual Percent Change in CY Benefit Level		
		Indemnity	Medical	Total	Indemnity	Medical	Total	Indemnity	Medical	Total
1-Jan-1977	1.000	1.5185	2.7214	1.6261	1.5185	2.7214	1.6261	6.000	7.702	6.268
1-Jan-1978	1.000	1.5185	2.7214	1.6261	1.5185	2.7214	1.6261	0.000	0.000	0.000
1-Jan-1979	0.496	1.5185	2.7214	1.6261						
1-Jul-1979	0.504	1.5185	3.0398	1.6554	1.5185	2.8820	1.6409	0.000	5.898	0.907
1-Jan-1980	1.000	1.5185	3.0398	1.6554	1.5185	3.0398	1.6554	0.000	5.479	0.885
1-Jan-1981	0.666	1.5641	3.0398	1.6852						
1-Sep-1981	0.334	1.5641	3.6873	1.7863	1.5641	3.2563	1.7190	3.000	7.119	3.842
1-Jan-1982	1.000	1.5641	3.9270	1.7845	1.5641	3.9270	1.7845	0.000	20.599	3.812
1-Jan-1983	1.000	2.1710	4.3629	2.2003	2.1710	4.3629	2.2003	38.800	11.100	23.300
1-Jan-1984	1.000	2.3316	4.7381	2.3213	2.3316	4.7381	2.3213	7.400	8.600	5.500
1-Jan-1985	1.000	2.3316	5.0935	2.3283	2.3316	5.0935	2.3283	0.000	7.500	0.300
1-Jan-1986	1.000	2.3316	5.0935	2.3283	2.3316	5.0935	2.3283	0.000	0.000	0.000
1-Jan-1987	0.496	2.3316	5.0935	2.3283						
1-Jul-1987	0.504	2.3316	5.4602	2.3330	2.3316	5.2784	2.3307	0.000	3.630	0.101
1-Jan-1988	1.000	2.3316	5.4602	2.3330	2.3316	5.4602	2.3330	0.000	3.445	0.099
1-Jan-1989	1.000	2.3316	5.4602	2.3330	2.3316	5.4602	2.3330	0.000	0.000	0.000
1-Jan-1990	1.000	2.3852	5.6841	2.3563	2.3852	5.6841	2.3563	2.300	4.100	1.000
1-Jan-1991	1.000	2.5021	6.2241	2.4011	2.5021	6.2241	2.4011	4.900	9.500	1.900
1-Jan-1992	0.497	2.5221	6.1618	2.4011						
1-Jul-1992	0.503	2.5221	6.1618	2.4131	2.5221	6.1618	2.4071	0.800	−1.000	0.251
1-Jan-1993	1.000	2.5221	6.1618	2.4131	2.5221	6.1618	2.4131	0.000	0.000	0.248
1-Jan-1994	0.496	2.2775	6.0078	2.1573						
1-Jul-1994	0.504	2.3891	6.3923	2.2134	2.3337	6.2016	2.1856	−7.469	0.646	−9.428
1-Jan-1995	0.496	2.3891	6.3923	2.2134						
1-Jul-1995	0.504	2.4608	6.5521	2.2510	2.4252	6.4728	2.2323	3.919	4.374	2.141
1-Jan-1996	0.497	2.4608	6.5521	2.2510						
1-Jul-1996	0.503	2.5297	6.6831	2.2848	2.4954	6.6180	2.2680	2.894	2.242	1.596

Source: W.C.I.R.B. of California - Analysis of Legislative Benefit Level Changes.

APPENDIX C

PART 1

DEVELOPMENT OF CANDIDATE VARIABLES CALIFORNIA AGGREGATE EMPLOYMENT

Year	Avg Monthly Employees	Annual Percent Change
1961	3,891,683	—
1962	4,071,877	4.6302
1963	4,216,436	3.5502
1964	4,346,448	3.0835
1965	4,464,625	2.7189
1966	4,707,406	5.4379
1967	4,840,158	2.8201
1968	5,041,894	4.1680
1969	5,272,325	4.5703
1970	5,240,190	−0.6095
1971	5,189,637	−0.9647
1972	5,913,892	13.9558
1973	6,383,331	7.9379
1974	6,588,356	3.2119
1975	6,564,524	−0.3617
1976	7,130,103	8.6157
1977	7,543,268	5.7947
1978	9,036,931	19.8013
1979	9,448,087	4.5497
1980	10,083,911	6.7297
1981	10,256,167	1.7082
1982	10,131,806	−1.2125
1983	10,312,305	1.7815
1984	10,900,212	5.7010
1985	11,378,074	4.3840
1986	11,644,237	2.3393
1987	12,094,751	3.8690
1988	12,556,920	3.8212
1989	13,005,986	3.5762
1990	13,328,057	2.4763
1991	12,796,072	−3.9915
1992	12,490,570	−2.3875
1993	12,253,883	−1.8949
1994	12,500,754	2.0146

Source: CA Statistical Abstract—Average Monthly Employment
Covered by Unemployment Insurance—All Industries
(1970 for 1961–1969; 1995 for 1970–1994).

APPENDIX C

PART 2

DEVELOPMENT OF CANDIDATE VARIABLES CALIFORNIA REAL GROSS STATE PRODUCT

Year	CA GSP $ Millions	Deflator 1982 = 100	Annual Change CA GSP	Annual Change Deflator	Pct. Change CA Real GSP
1961	—	—	—	—	—
1962	—	—	—	—	—
1963	65,905	31.4	—	—	—
1964	70,928	32.1	1.0762	1.0223	5.2747
1965	75,887	33.1	1.0699	1.0312	3.7592
1966	83,006	34.5	1.0938	1.0423	4.9424
1967	88,653	36.1	1.0680	1.0464	2.0695
1968	97,995	38.0	1.1054	1.0526	5.0108
1969	105,766	40.0	1.0793	1.0526	2.5335
1970	111,631	42.3	1.0555	1.0575	−0.1936
1971	119,192	44.9	1.0677	1.0615	0.5903
1972	132,199	47.0	1.1091	1.0468	5.9570
1973	146,473	49.9	1.1080	1.0617	4.3582
1974	160,979	53.9	1.0990	1.0802	1.7474
1975	179,858	59.1	1.1173	1.0965	1.8971
1976	201,536	62.9	1.1205	1.0643	5.2834
1977	227,590	67.3	1.1293	1.0700	5.5446

Series After Department of Commerce Methodology Revised

Year	Current Dollars	Deflator 1987 = 100	Annual Change CA GSP	Annual Change Deflator	Pct. Change CA Real GSP
1977	224,501	55.7	—	—	—
1978	255,552	60.2	1.1383	1.0808	5.3221
1979	287,821	65.4	1.1263	1.0864	3.6721
1980	319,804	71.5	1.1111	1.0933	1.6326
1981	358,920	78.4	1.1223	1.0965	2.3537
1982	382,317	83.5	1.0652	1.0651	0.0128
1983	416,061	86.6	1.0883	1.0371	4.9306
1984	468,127	90.5	1.1251	1.0450	7.6654
1985	511,110	93.7	1.0918	1.0354	5.4532
1986	552,110	96.5	1.0802	1.0299	4.8874
1987	599,088	100.0	1.0851	1.0363	4.7110
1988	650,313	103.9	1.0855	1.0390	4.4759
1989	702,755	108.2	1.0806	1.0414	3.7695
1990	752,761	113.1	1.0712	1.0453	2.4750
1991	767,189	117.5	1.0192	1.0389	−1.8998
1992	787,896	120.8	1.0270	1.0281	−0.1064
1993	—	—	—	—	—
1994	—	—	—	—	—

Source: U.S. Dept of Commerce, Bureau of Economic Analysis (1995 California Statistical Abstract).

APPENDIX C

PART 3

DEVELOPMENT OF CANDIDATE VARIABLES CALIFORNIA UNEMPLOYMENT RATE

Year	Unemployment Rate	Annual Percent Change
1961	6.9	—
1962	5.8	−15.9420
1963	6.0	3.4483
1964	6.0	0.0000
1965	5.9	−1.6667
1966	4.9	−16.9492
1967	5.7	16.3265
1968	5.4	−5.2632
1969	5.2	−3.7037
1970	7.3	40.3846
1971	8.8	20.5479
1972	7.6	−13.6364
1973	7.0	−7.8947
1974	7.3	4.2857
1975	9.9	35.6164
1976	9.2	−7.0707
1977	8.2	−10.8696
1978	7.1	−13.4146
1979	6.2	−12.6761
1980	6.8	9.6774
1981	7.4	8.8235
1982	9.9	33.7838
1983	9.7	−2.0202
1984	7.8	−19.5876
1985	7.2	−7.6923
1986	6.7	−6.9444
1987	5.8	−13.4328
1988	5.3	−8.6207
1989	5.1	−3.7736
1990	5.6	9.8039
1991	7.5	33.9286
1992	9.1	21.3333
1993	9.2	1.0989

Source: CA Statistical Abstract (1970 for 1961–1967; 1974 for 1967–1969; 1995 for 1970–1994).

APPENDIX D

HAZARDOUSNESS INDICES

Indemnity Frequency Hazardousness Index

To measure the change in hazardousness from policy year to policy year, each classification was first assigned to one of fifteen groups of similar hazardousness of both frequency and severity. The fifteen groups were developed from California's nine retrospective rating hazard groups. Each of the fifteen groups is a subset of one retrospective rating hazard group. That is, all members of a group share the same retrospective rating hazard group or severity profile. Several hazard groups were not subdivided because their classifications' frequency profiles were reasonably homogenous. In all calculations, a class used the frequencies of its respective group.

The change in hazardousness for year t was then calculated in two ways. First, the exposures for year $t+1$ were extended by the indemnity frequencies for year t and this sum divided by the exposures for year t extended by the indemnity frequency for year t. This is the Laspeyres method. Second, the exposures for year $t+1$ were extended by the indemnity frequency for year $t+1$ and this sum divided by the exposures for year t extended by the indemnity frequency for year $t+1$. This is the Paasche method. The geometric mean was then taken of the Laspeyres and Paasche indices. This geometric mean is a Fisher index and the index selected to measure the change in hazardousness for year t.

Indemnity Pure Premium Hazardousness Index

The same procedure was performed to develop the indemnity pure premium hazardousness index except that, instead of using frequencies, indemnity pure premiums were used.

APPENDIX D

PART 1

INDEMNITY FREQUENCY HAZARDOUSNESS INDEX

Year	Change in Frequency Hazardousness			Frequency Hazardousness Index	Annual Percent Change	Changes in Frequency not Accounted for by Changes in Exposure Distribution		
	Method 1	Method 2	Geo Mean			Method 1	Method 2	Geo Mean
1961	1.0000	1.0000	1.0000	1.0000	—	1.0000	1.0000	1.0000
1962	0.9910	0.9895	0.9903	0.9903	–0.9738	1.0455	1.0439	1.0447
1963	0.9988	0.9986	0.9987	0.9890	–0.1282	1.0119	1.0117	1.0118
1964	1.0006	0.9882	0.9944	0.9834	–0.5649	1.0154	1.0029	1.0091
1965	0.9993	0.9882	0.9937	0.9772	–0.6289	0.9875	0.9765	0.9820
1966	0.9841	0.9830	0.9836	0.9612	–1.6416	1.0238	1.0226	1.0232
1967	0.9892	0.9861	0.9876	0.9493	–1.2374	1.0437	1.0404	1.0421
1968	0.9983	0.9967	0.9975	0.9469	–0.2488	1.0302	1.0285	1.0294
1969	0.9868	0.9859	0.9864	0.9340	–1.3610	1.0731	1.0721	1.0726
1970	0.9900	0.9899	0.9900	0.9247	–1.0034	0.9769	0.9768	0.9768
1971	1.0010	1.0007	1.0008	0.9254	0.0824	1.0150	1.0147	1.0149
1972	1.0005	1.0005	1.0005	0.9259	0.0505	1.0534	1.0534	1.0534
1973	0.9989	0.9984	0.9986	0.9246	–0.1369	1.1415	1.1408	1.1411
1974	0.9855	0.9865	0.9860	0.9117	–1.3983	1.2042	1.2054	1.2048
1975	0.9845	0.9838	0.9841	0.8972	–1.5890	1.0698	1.0691	1.0695
1976	1.0053	1.0047	1.0050	0.9017	0.4996	1.0485	1.0479	1.0482
1977	1.0102	1.0088	1.0095	0.9102	0.9490	1.0420	1.0405	1.0413
1978	1.0134	1.0116	1.0125	0.9216	1.2494	1.0376	1.0357	1.0366
1979	0.9982	0.9974	0.9978	0.9196	–0.2159	0.9718	0.9710	0.9714
1980	0.9921	0.9856	0.9888	0.9094	–1.1157	0.9631	0.9567	0.9599

APPENDIX D

PART 1

(Continued)

Year	Change in Frequency Hazardousness			Frequency Hazardousness Index	Annual Percent Change	Changes in Frequency not Accounted for by Changes in Exposure Distribution		
	Method 1	Method 2	Geo Mean			Method 1	Method 2	Geo Mean
1981	0.9818	0.9809	0.9813	0.8924	−1.8664	0.9648	0.9640	0.9644
1982	0.9797	0.9784	0.9790	0.8737	−2.0967	0.9923	0.9909	0.9916
1983	0.9977	0.9982	0.9980	0.8719	−0.2011	1.1042	1.1048	1.1045
1984	0.9984	0.9982	0.9983	0.8704	−0.1728	1.0881	1.0879	1.0880
1985	0.9929	0.9921	0.9925	0.8639	−0.7484	0.9805	0.9797	0.9801
1986	0.9888	0.9906	0.9897	0.8550	−1.0333	0.9721	0.9739	0.9730
1987	0.9981	0.9974	0.9978	0.8531	−0.2249	1.0283	1.0275	1.0279
1988	1.0002	1.0009	1.0006	0.8535	0.0574	1.0010	1.0018	1.0014
1989	0.9983	0.9981	0.9982	0.8520	−0.1788	1.0428	1.0426	1.0427
1990	0.9856	0.9867	0.9862	0.8403	−1.3816	1.0920	1.0932	1.0926
1991	0.9830	0.9826	0.9828	0.8258	−1.7178	0.9668	0.9664	0.9666
1992	0.9889	0.9874	0.9881	0.8160	−1.1852	0.8241	0.8228	0.8235
1993	0.9942	0.9944	0.9943	0.8114	−0.5717	0.8244	0.8246	0.8245

Source: W.C.I.R.B. of California Unit Statistical Reporting Plan.
California Class Experience at 3rd report except 1992 at 2nd and 1993 at 1st report.
Formulas:
Change Due to Exposure Change:
Method 1 |@SUMPRODUCT(New Exposure Dist'n, Old Claims Freq)|/ |@SUMPRODUCT(Old Exposure Dist'n, Old Claims Freq)|
Method 2 |@SUMPRODUCT(New Exposure Dist'n, New Claims Freq)|/ |@SUMPRODUCT(Old Exposure Dist'n, New Claims Freq)|
Change Due to Frequency Change:
Method 1 |@SUMPRODUCT(New Claims Freq, Old Exposure)|/|@SUMPRODUCT(Old Claims Freq, Old Exposure)|
Method 2 |@SUMPRODUCT(New Claims Freq, New Exposure)|/|@SUMPRODUCT(Old Claims Freq, New Exposure)|

APPENDIX D

PART 2

INDEMNITY PURE FREQUENCY HAZARDOUSNESS INDEX

Year	Change in Pure Premium Hazardousness			Pure Premium Hazardousness Index	Annual Percent Change	Changes in Pure Premium not Accounted for by Changes in Exposure Distribution		
	Method 1	Method 2	Geo Mean			Method 1	Method 2	Geo Mean
1961	1.0000	1.0000	1.0000	1.0000	—	1.0000	1.0000	1.0000
1962	0.9890	0.9864	0.9877	0.9877	−1.2327	1.0761	1.0733	1.0747
1963	0.9986	0.9950	0.9968	0.9845	−0.3180	1.0129	1.0093	1.0111
1964	1.0076	0.9946	1.0011	0.9856	0.1069	1.0003	0.9873	0.9938
1965	0.9950	0.9842	0.9896	0.9753	−1.0402	1.0374	1.0261	1.0317
1966	0.9800	0.9788	0.9794	0.9552	−2.0622	1.0944	1.0931	1.0938
1967	0.9670	0.9554	0.9612	0.9181	−3.8829	1.0870	1.0740	1.0805
1968	1.0110	1.0065	1.0088	0.9262	0.8754	1.0975	1.0926	1.0951
1969	0.9897	0.9865	0.9881	0.9152	−1.1882	1.1573	1.1536	1.1554
1970	0.9852	0.9818	0.9835	0.9001	−1.6498	1.0258	1.0222	1.0240
1971	0.9963	0.9946	0.9954	0.8960	−0.4560	1.1042	1.1023	1.1033
1972	0.9976	0.9966	0.9971	0.8934	−0.2865	1.2135	1.2123	1.2129
1973	0.9933	0.9912	0.9923	0.8865	−0.7718	1.1754	1.1728	1.1741
1974	0.9771	0.9756	0.9764	0.8655	−2.3630	1.1788	1.1770	1.1779
1975	0.9640	0.9526	0.9583	0.8294	−4.1725	1.1859	1.1718	1.1788
1976	0.9964	0.9941	0.9953	0.8255	−0.4744	1.1032	1.1007	1.1019
1977	0.9973	0.9924	0.9949	0.8213	−0.5134	1.1051	1.0997	1.1024
1978	1.0073	0.9988	1.0030	0.8237	0.3024	1.0771	1.0680	1.0726
1979	1.0009	0.9955	0.9982	0.8222	−0.1822	1.0972	1.0913	1.0942
1980	0.9818	0.9611	0.9714	0.7987	−2.8614	1.1201	1.0965	1.1082

APPENDIX D

PART 2

(Continued)

Year	Change in Pure Premium Hazardousness			Pure Premium Hazardousness Index	Annual Percent Change	Changes in Pure Premium not Accounted for by Changes in Exposure Distribution		
	Method 1	Method 2	Geo Mean			Method 1	Method 2	Geo Mean
1981	0.9720	0.9654	0.9687	0.7737	−3.1298	1.1370	1.1293	1.1331
1982	0.9561	0.9497	0.9529	0.7373	−4.7112	1.2180	1.2099	1.2139
1983	0.9967	0.9926	0.9947	0.7333	−0.5343	1.3230	1.3176	1.3203
1984	1.0065	1.0045	1.0055	0.7374	0.5488	1.1430	1.1407	1.1419
1985	0.9893	0.9931	0.9912	0.7308	−0.8818	1.1258	1.1302	1.1280
1986	0.9907	0.9868	0.9887	0.7226	−1.1257	1.0446	1.0405	1.0425
1987	0.9974	0.9977	0.9975	0.7208	−0.2477	1.0901	1.0904	1.0902
1988	1.0007	1.0011	1.0009	0.7215	0.0905	1.0761	1.0765	1.0763
1989	0.9986	0.9938	0.9962	0.7187	−0.3836	1.1310	1.1256	1.1283
1990	0.9815	0.9834	0.9824	0.7061	−1.7561	1.2360	1.2384	1.2372
1991	0.9806	0.9798	0.9802	0.6921	−1.9773	0.9563	0.9555	0.9559
1992	0.9856	0.9839	0.9847	0.6816	−1.5257	0.7895	0.7881	0.7888
1993	0.9943	0.9952	0.9947	0.6780	−0.5266	0.7188	0.7195	0.7191

Source: W.C.I.R.B. of California Unit Statistical Reporting Plan.
California Class Experience at 3rd report except 1992 at 2nd and 1993 at 1st report.
Formulas:
Change Due to Exposure Change:
Method 1 |@SUMPRODUCT(New Exposure Dist'n, Old Claim Severity)|/ |@SUMPRODUCT(Old Exposure Dist'n, Old Claim Severity)|
Method 2 |@SUMPRODUCT(New Exposure Dist'n, New Claim Severity)|/ |@SUMPRODUCT(Old Exposure Dist'n, New Claim Severity)|
Change Due to Frequency Change:
Method 1 |@SUMPRODUCT(New Claim Severity, Old Exposure)|/|@SUMPRODUCT(Old Claim Severity, Old Exposure)|
Method 2 |@SUMPRODUCT(New Claim Severity, New Exposure)|/|@SUMPRODUCT(Old Claim Severity, New Exposure)|

APPENDIX E

PART 1

LITIGATION RATES

A	B	C	D	E	F	G	H		I	J
		CWCI Pre-Reform		CWCI Post-Reform		Factor to Adjust Rate to Indemnity Claim Only Basis	Converted CWCI Pre-Reform			
Year	Quarter	2nd Quarter Litigation Rate	Policy Year Litigation Rate	2nd Quarter Litigation Rate	Policy Year Litigation Rate		2nd Quarter Litigation Rate	Percent Change	Policy Year Litigation Rate	Percent Change
1972	1st	5.9				6.1905	36.52			
1973	1st	5.6				5.3569	30.00			
1972	3rd	4.8				6.1905	29.71			
1972	4th	5.4				6.1905	33.43			
1972	2nd	5.3	5.36			6.1905	32.81		33.20	
1973	2nd	5.4	6.03			5.3569	28.93	−11.8335	32.28	−2.78
1974	2nd	6.4	7.15			4.2448	27.17	−6.0854	30.35	−5.96
1975	2nd	7.6	8.10			4.0255	30.59	12.6145	32.61	7.43
1976	2nd	8.4	8.21			3.9553	33.22	8.5978	32.48	−0.38
1977	2nd	8.1	7.66			3.8454	31.15	−6.2503	29.47	−9.29
1978	2nd	7.4	7.46			3.6984	27.37	−12.1332	27.60	−6.33
1979	2nd	7.5	7.00			3.7448	28.09	2.6212	26.21	−5.02
1980	2nd	6.7	6.76			3.7493	25.12	−10.5571	25.35	−3.27
1981	2nd	6.8	7.55			3.7140	25.26	0.5367	28.04	10.59
1982	2nd	8.0	7.88			3.5947	28.76	13.8667	28.31	0.95
1983	2nd	7.8	8.18			3.5038	27.33	−4.9643	28.64	1.19
1984	2nd	8.4	8.71			3.3112	27.81	1.7725	28.85	0.72
1985	2nd	8.9	10.34			3.2621	29.03	4.3817	33.72	16.89
1986	2nd	11.2	11.14			3.2093	35.94	23.8025	35.74	5.99
1987	2nd	11.1	11.29			3.1419	34.87	−2.9739	35.46	−0.78
1988	2nd	11.4	11.65			3.0582	34.86	−0.0319	35.63	0.46
1989	2nd	11.8	NA			2.9411	34.70	−0.4564	NA	NA
1990	2nd	Suspended	NA			2.7521	Suspended	NA	NA	NA
1991	2nd	13.8	13.99			2.7681	38.20	NA	38.72	NA
1992	2nd	14.1	NA			3.0393	42.85	12.1828	NA	NA

APPENDIX E

PART 1

(Continued)

A	B	C	D	E	F	G	H		I	J
		CWCI Pre-Reform		CWCI Post-Reform		Factor to Adjust Rate to Indemnity Claim Only Basis	Converted CWCI Pre-Reform			
Year	Quarter	2nd Quarter Litigation Rate	Policy Year Litigation Rate	2nd Quarter Litigation Rate	Policy Year Litigation Rate		2nd Quarter Litigation Rate	Percent Change	Policy Year Litigation Rate	Percent Change
1993	2nd			56.0	57.88	3.1553				
1994	2nd			59.0						
1995	2nd									
1996	2nd									

Notes:
C—CWCI Pre-Reform 2nd Quarter Litigation Rate
Total Number of Original Applications for Adjudication filed with the Workers Compensation Appeals Board/Total Number of Claims.
"Second Calendar Year Quarter. Definition Source: CWCI Bulletin, February 6, 1973. Total claims includes med-only claims.
D—Policy Year CWCI Pre-Reform Litigation Rate
P/Y T = 0.375 × C/Y T + 0.625 C/Y T + 1. Based on parallelogram method with no reporting lag. Note that a calendar quarter—not a calendar year—is being used to estimate a policy year.
E—CWCI Post-Reform 2nd Quarter Litigation Rate
Based on a sample of indemnity claims open during a second quarter. Determination of whether an attorney was involved is made for each claim. Med-only claims are excluded.
F—Policy Year CWCI Post-Reform Litigation Rate
P/Y T = 0.375 × C/Y T + 0.625 C/Y T + 1. Based on parallelogram method with no reporting lag.
G—Factor to Adjust Rate to Indemnity Claim Only Basis
The CWCI's Litigation Rates are the number of Applications for Adjudication ÷ Total Number of Claims. Since this is overwhelmed by medical-only claims (which are non-litigated), this factor is used to convert the CWCI's rate from an "All Claims" basis to an "Indemnity Claims" basis. This is the ratio of med-only and indemnity claims to indemnity claims only. The data is from the Bureau's class experience database covering policy years 1961–1991 at 3rd report, 1992 at 2nd report and 1993 at 1st report.
H—Converted CWCI Pre-Reform 2nd Quarter Litigation Rate
CWCI Pre-Reform 2nd Quarter Litigation Rate converted to an indemnity claim only basis: Col C × Col G
I—Converted Policy Year CWCI Pre-Reform Litigation Rate
Policy Year CWCI Pre-Reform Litigation Rate converted to an indemnity claim only basis: Col D × Col G

APPENDIX E

PART 2

FACTOR TO ADJUST LITIGATION RATE TO INDEMNITY CLAIMS ONLY BASIS

	A	B	A + B	(A + B)/B
	Incurred Claims			Correction
Year	Med-Only	Indemnity	Total	Factor
1961	590,123	89,341	679,464	7.6053
1962	610,218	95,745	705,963	7.3734
1963	621,304	99,376	720,680	7.2521
1964	613,813	99,559	713,372	7.1653
1965	624,771	103,549	728,320	7.0336
1966	640,366	107,601	747,967	6.9513
1967	645,128	109,981	755,109	6.8658
1968	654,184	118,573	772,757	6.5171
1969	659,713	124,065	783,778	6.3175
1970	606,247	117,435	723,682	6.1624
1971	619,880	122,227	742,107	6.0715
1972	692,801	133,475	826,276	6.1905
1973	675,018	154,932	829,950	5.3569
1974	605,127	186,491	791,618	4.2448
1975	584,591	193,222	777,813	4.0255
1976	611,465	206,908	818,373	3.9553
1977	636,973	223,863	860,836	3.8454
1978	654,758	242,645	897,403	3.6984
1979	650,266	236,912	887,178	3.7448
1980	613,630	223,191	836,821	3.7493
1981	574,589	211,710	786,299	3.7140
1982	527,867	203,441	731,308	3.5947
1983	584,794	233,559	818,353	3.5038
1984	627,773	271,618	899,391	3.3112
1985	617,048	272,771	889,819	3.2621
1986	608,364	275,370	883,734	3.2093
1987	627,052	292,759	919,811	3.1419
1988	623,028	302,703	925,731	3.0582
1989	630,176	324,655	954,831	2.9411
1990	602,945	344,132	947,077	2.7521
1991	562,022	317,859	879,881	2.7681
1992	514,609	252,344	766,953	3.0393
1993	447,016	207,407	654,423	3.1553

Source: W.C.I.R.B. of California Unit Statistical Reporting Plan.
California Class Experience at 3rd report except 1992 at 2nd and 1993 at 1st report.

APPENDIX F

RATIO OF CUMULATIVE INJURIES TO TOTAL INDEMNITY CLAIMS

Year	Total Cumulative Injuries	Cumulative Indemnity Injuries	Total Indemnity Claims	Cumulative ÷ Total Indemnity Claims (%)	Percent Change in Ratio
1977	6,665	5,895	223,511	2.6375	—
1978	6,811	5,951	235,645	2.5254	−4.2482
1979	6,347	5,567	236,012	2.3588	−6.5982
1980	5,862	4,943	223,191	2.2147	−6.1084
1981	5,510	4,964	211,709	2.3447	5.8714
1982	6,717	6,032	203,441	2.9650	26.4534
1983	11,122	7,656	233,559	3.2780	10.5560
1984	14,041	10,506	271,618	3.8679	17.9977
1985	16,096	11,651	272,771	4.2713	10.4298
1986	16,195	12,254	275,370	4.4500	4.1829
1987	17,648	13,504	292,759	4.6127	3.6552
1988	21,103	15,948	302,703	5.2685	14.2187
1989	29,190	20,971	324,000	6.4725	22.8527
1990	41,568	29,318	345,517	8.4853	31.0964
1991	45,805	30,437	317,842	9.5761	12.8563
1992	27,075	15,977	251,233	6.3594	−33.5908
1993	17,561	9,360	207,412	4.5128	−29.0384
1994	16,365	8,590	200,642	4.2813	−5.1299

Source: W.C.I.R.B. of California Unit Statistical Reporting Plan.
California Class Experience at most current report level as of 4/22/97.

APPENDIX G

PART 1

DEVELOPMENT OF PRINCIPAL COMPONENTS OF ECONOMIC VARIABLES

STATGRAPHICS PLUS RESULTS

CALIFORNIA AGGREGATE EMPLOYMENT AND REAL GROSS STATE PRODUCT

Analysis Summary

Data variables:
  Annual Percent Change in CY AggE
  Annual Percent Change in CY rGSP

Data input: observations
Number of complete cases: 29
Missing value treatment: listwise
Standardized: no

Number of components extracted: 2

PRINCIPAL COMPONENTS ANALYSIS

Component Number	Eigenvalue	Percent of Variance	Cumulative Percentage
1	24.5843	90.363	90.363
2	2.6220	9.637	100.000

This procedure performs a principal components analysis. The purpose of the analysis is to obtain a small number of linear combinations of the two variables which account for most of the variability in the data.

TABLE OF COMPONENT WEIGHTS

Variable (Annual Percent Change)	Component 1	Component 2
CYAggE	0.941545	−0.336888
CYrGSP	0.336888	0.941545

For example, the first principal component has the equation:

$$(0.941545 \times \text{Annual Percent Change CYAggE}) + (0.336888 \times \text{Annual Percent Change CYrGSP})$$

APPENDIX G

PART 2

DEVELOPMENT OF PRINCIPAL COMPONENTS OF ECONOMIC VARIABLES

STATGRAPHICS PLUS RESULTS

CALIFORNIA AGGREGATE EMPLOYMENT, REAL GROSS STATE PRODUCT AND UNEMPLOYMENT RATE

Analysis Summary

Data variables:
Annual Percent Change in CY AggE
Annual Percent Change in CY rGSP
Annual Percent Change in CY UnEmp

Data input: observations
Number of complete cases: 29
Missing value treatment: listwise
Standardized: no

Number of components extracted: 3

PRINCIPAL COMPONENTS ANALYSIS

Component Number	Eigenvalue	Percent of Variance	Cumulative Percentage
1	309.5550	96.098	96.098
2	11.5599	3.589	99.687
3	1.0082	0.313	100.000

This procedure performs a principal components analysis. The purpose of the analysis is to obtain a small number of linear combinations of the three variables which account for most of the variability in the data.

TABLE OF COMPONENT WEIGHTS

Variable (Annual Percent Change)	Component 1	Component 2	Component 3
CYAggE	−0.188211	0.980960	−0.047901
CYrGSP	−0.115259	0.026374	0.992985
CYUnEmp	0.975342	0.192412	0.108101

For example, the first principal component has the equation:

$$(-0.188211 \times \text{Annual Percent Change CYAggE})$$
$$-(0.115259 \times \text{Annual Percent Change CYrGSP})$$
$$+(0.975342 \times \text{Annual Percent Change CYUnEmp})$$

APPENDIX H

DEVELOPMENT OF SELF-INSURANCE SHARE INDEX

	Estimates of Workers Compensation Costs by Type of Insurance (000s)				Share of Total Workers Compensation Costs			
Year	Insurance Losses Incurred by Private Insurance	State and Federal Fund Disburse-ments	Self-Insurance Costs	Total	Insurance Losses Incurred by Private Insurance	State and Federal Fund Disburse-ments	Self-Insurance Costs	Annual Change in Self-Insurance Share Index
1960	100,894	37,124	15,635	153,653	0.6566	0.2416	0.1018	—
1961	115,756	43,813	18,080	177,649	0.6516	0.2466	0.1018	0.0000
1962	130,313	50,971	20,560	201,844	0.6456	0.2525	0.1019	0.0001
1963	147,035	56,566	23,090	226,691	0.6486	0.2495	0.1019	–0.0000
1964	163,720	63,890	28,052	255,662	0.6404	0.2499	0.1097	0.0079
1965	174,367	64,012	29,320	267,699	0.6514	0.2391	0.1095	–0.0002
1966	185,708	68,448	31,260	285,416	0.6507	0.2398	0.1095	–0.0000
1967	215,195	72,071	38,090	325,356	0.6614	0.2215	0.1171	0.0075
1968	223,513	70,615	39,120	333,248	0.6707	0.2119	0.1174	0.0003
1969	245,448	79,090	49,330	373,868	0.6565	0.2115	0.1319	0.0146
1970	278,215	87,677	55,615	421,507	0.6600	0.2080	0.1319	–0.0000
1971	286,177	92,862	50,895	429,934	0.6656	0.2160	0.1184	–0.0136
1972	306,032	105,351	57,970	469,353	0.6520	0.2245	0.1235	0.0051
1973	357,995	123,231	67,370	548,596	0.6526	0.2246	0.1228	–0.0007
1974	402,542	139,348	76,000	617,890	0.6515	0.2255	0.1230	0.0002
1975	472,406	156,161	94,500	723,067	0.6533	0.2160	0.1307	0.0077
1976	557,880	176,918	107,000	841,798	0.6627	0.2102	0.1271	–0.0036
Series After Change in Reporting of Self-Insurance Costs								
1976	557,880	176,918	220,000	954,798	0.5843	0.1853	0.2304	—
1977	658,426	194,901	275,000	1,128,327	0.5835	0.1727	0.2437	0.0133

APPENDIX H

(Continued)

	Estimates of Workers Compensation Costs by Type of Insurance (000s)				Share of Total Workers Compensation Costs			
Year	Insurance Losses Incurred by Private Insurance	State and Federal Fund Disburse-ments	Self-Insurance Costs	Total	Insurance Losses Incurred by Private Insurance	State and Federal Fund Disburse-ments	Self-Insurance Costs	Annual Change in Self-Insurance Share Index
1978	736,873	207,940	302,000	1,246,813	0.5910	0.1668	0.2422	−0.0015
1979	845,126	232,217	345,000	1,422,343	0.5942	0.1633	0.2426	0.0003
1980	950,288	233,427	379,000	1,562,715	0.6081	0.1494	0.2425	−0.0000
1981	1,068,512	242,811	498,000	1,809,323	0.5906	0.1342	0.2752	0.0327
1982	1,192,510	259,317	580,731	2,032,558	0.5867	0.1276	0.2857	0.0105
1983	1,290,575	273,063	697,000	2,260,638	0.5709	0.1208	0.3083	0.0226
1984	1,538,604	319,663	797,000	2,655,267	0.5795	0.1204	0.3002	−0.0082
1985	1,866,429	402,878	974,000	3,243,307	0.5755	0.1242	0.3003	0.0002
1986	2,096,934	523,916	1,124,000	3,744,850	0.5600	0.1399	0.3001	−0.0002
1987	2,328,020	647,921	1,275,000	4,250,941	0.5476	0.1524	0.2999	−0.0002
1988	2,548,616	817,689	1,444,000	4,810,305	0.5298	0.1700	0.3002	0.0003
1989		Data Not Available			*0.5341*	*0.1732*	*0.2927*	*− 0.0075*
1990	3,265,136	1,069,415	1,730,000	6,064,551	0.5384	0.1763	0.2853	−0.0075
1991	4,031,640	1,316,256	1,900,000	7,247,896	0.5562	0.1816	0.2621	−0.0231
1992	4,280,764	1,348,998	2,277,689	7,907,451	0.5414	0.1706	0.2880	0.0259
1993	4,074,854	1,201,452	2,348,756	7,625,062	0.5344	0.1576	0.3080	0.0200
1994	—	—	—	—	—	—	—	—
1995	—	—	—	—	—	—	—	—
1996	—	—	—	—	—	—	—	—

Source: Social Security Bulletin - Estimates of Workers' Compensation Payments, by State and Type of Insurance
All costs are incurred losses except for Self-Insurance costs prior to 1976, which are paid losses.

APPENDIX I

DEVELOPMENT OF CANDIDATE VARIABLES
REAL SEVERITY

	Nominal Claim Severity			California CPI		Real Claim Severity		
	Indemnity Claims					Indemnity Claims		
Year	Medical	Indemnity	Total	Calendar Year	Policy Year	Medical	Indemnity	Total
1961	547.00	1,559.38	302.90	29.5	29.7	547.00	1,559.38	302.90
1962	568.93	1,623.81	320.00	29.9	30.1	560.58	1,599.99	315.31
1963	603.64	1,676.92	340.35	30.4	30.7	584.27	1,623.12	329.43
1964	611.22	1,652.77	342.72	31.0	31.2	581.03	1,571.12	325.79
1965	684.39	1,698.51	366.12	31.5	31.8	638.64	1,584.98	341.64
1966	768.24	1,736.82	393.14	32.2	32.5	700.54	1,583.78	358.50
1967	787.65	1,726.13	402.74	33.0	33.6	695.79	1,524.81	355.77
1968	858.81	1,877.64	457.61	34.4	35.1	725.69	1,586.61	386.68
1969	918.08	2,025.74	505.48	36.1	36.9	739.11	1,630.85	406.94
1970	974.80	2,097.31	541.35	37.9	38.5	751.46	1,616.80	417.32
1971	1,083.67	2,262.98	593.84	39.3	39.8	806.91	1,685.04	442.18
1972	1,164.52	2,687.19	666.94	40.6	41.6	830.46	1,916.34	475.62
1973	1,221.79	2,720.69	784.80	43.0	44.8	808.46	1,800.29	519.31
1974	1,221.20	2,619.53	961.29	47.4	49.4	732.75	1,571.79	576.80
1975	1,385.69	2,739.90	1,085.50	52.3	53.7	765.88	1,514.36	599.96
1976	1,510.52	2,748.98	1,149.00	55.6	57.2	783.08	1,425.12	595.66
1977	1,623.95	2,828.77	1,232.57	59.5	61.5	782.83	1,363.62	594.16
1978	1,785.11	2,874.84	1,306.45	64.4	67.3	787.18	1,267.72	576.11
1979	2,028.72	3,075.86	1,450.95	71.3	75.9	792.68	1,201.83	566.93

APPENDIX I

(Continued)

	Nominal Claim Severity			California CPI		Real Claim Severity		
	Indemnity Claims					Indemnity Claims		
Year	Medical	Indemnity	Total	Calendar Year	Policy Year	Medical	Indemnity	Total
1980	2,395.10	3,369.39	1,642.96	82.4	86.2	824.77	1,160.27	565.76
1981	2,881.61	3,778.96	1,919.62	91.4	93.9	910.81	1,194.44	606.75
1982	3,380.19	4,581.95	2,359.72	97.3	98.0	1,023.60	1,387.52	714.58
1983	3,769.27	5,788.27	2,884.34	98.9	100.9	1,107.78	1,701.16	847.70
1984	3,939.12	6,207.89	3,229.91	103.8	105.8	1,104.54	1,740.71	905.67
1985	4,506.58	6,806.40	3,646.03	108.6	110.0	1,215.22	1,835.38	983.17
1986	5,026.02	7,100.35	3,967.23	112.0	113.9	1,308.89	1,849.10	1,033.16
1987	5,554.70	7,305.46	4,296.94	116.6	118.8	1,387.01	1,824.18	1,072.95
1988	6,111.86	7,737.58	4,746.32	121.9	124.4	1,457.05	1,844.62	1,131.51
1989	6,932.90	8,517.84	5,489.64	128.0	130.9	1,571.04	1,930.19	1,243.98
1990	7,598.95	9,352.25	6,424.39	135.0	137.3	1,641.52	2,020.26	1,387.79
1991	7,661.59	9,760.76	6,579.85	140.6	142.7	1,592.99	2,029.45	1,368.08
1992	7,422.81	9,100.86	5,746.17	145.6	147.2	1,496.16	1,834.39	1,158.21
1993	6,889.82	7,473.47	4,834.73	149.4	—	—	—	—
1994	—	—	—	—	—	—	—	—
1995	—	—	—	—	—	—	—	—
1996	—	—	—	—	—	—	—	—

Nominal Claim Severity from WCIRB of California's Unit Statistical Reports.
Calendar Year California CPI from the California Statistical Abstract—1995 (1982 – 1984 = 100).
Policy Year California CPI = $[(0.5832 \times CPI(t)) + (0.4168 \times CPI(t+1))]$.
Real Severity (t) = Real Severity $(t-1) \times [(\text{Nominal Severity } (t)/\text{Nominal Severity}(t-1)) \div (\text{PY CPI } (t)/\text{PY CPI}(t-1))]$.