INCORPORATION OF FIXED EXPENSES

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Abstract

When setting rates, actuaries must include all of the costs of doing business, including underwriting expenses. Actuaries generally divide the underwriting expenses into two groups: fixed and variable. This paper addresses the incorporation of fixed expenses in the calculation of the actuarial indication. More specifically, the paper describes how the generally accepted method for including fixed expenses overstates or understates the actuarial indication. The materiality of the distortion depends on the magnitude of past rate changes, premium trend, and variations in average premiums for multistate companies. Finally, the paper suggests an alternative procedure that addresses the distortions.

1. INTRODUCTION

The role of a pricing actuary is to set rates that provide for the expected future amount of all costs associated with the transfer of risk [2]. Historically, actuarial literature has focused either on the larger costs of doing business (e.g., losses) or the more complex topics (e.g., profit provisions). Thus, there is relatively little literature dealing with the treatment of underwriting expenses.

Actuaries generally divide underwriting expenses into two groups: fixed and variable. Fixed expenses are those expenses

that are assumed to be the same for each exposure, regardless of the size of the premium (i.e., the expense is a constant dollar amount for each risk). Typically, overhead costs associated with the home office are considered a fixed expense.[1] Variable expenses are those expenses that vary directly with premium; in other words, the expense is a constant percentage of the premium. Premium taxes and commissions are two good examples of variable expenses.

This paper discusses the often-overlooked portion of the premium, the fixed expenses. Specifically, the paper addresses:

- The generally accepted method for calculating a fixed expense provision and including it within the overall statewide rate level indication;

- Potential distortions that may make the current methodology misstate the actuarial indication; and

- An alternative procedure for calculating and incorporating a fixed expense provision.

2. CURRENT METHOD

Calculation of Projected Fixed and Variable Expense Provision

A review of filings from several insurers of property/casualty personal lines confirms that most actuaries use a method similar to the one outlined by Schofield [4] to calculate a fixed expense provision and expense fee. Basically, the procedure assumes that historical expense ratios (i.e., historical expenses divided by historical premiums) are the best estimate of projected expenses.

The first step of Schofield's procedure is to determine the percentage of premium attributable to expenses for each of

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[1]It is likely that some of these expenses bear some relationship to risk and may vary at least slightly with premium. Activity-based cost studies may be able to verify the true relationship, and appropriate adjustments can be made.

the expense categories. To accomplish this, actuaries generally relate historical expenses to either written or earned premium for that same historical experience period. The choice of premium depends on whether the actuary believes the expenses are generally incurred at the onset of the policy or throughout the policy. Written premium is used in the former case and earned premium is used in the latter case. Once the appropriate ratios are determined for each type of expense, the ratios are then split into a fixed expense ratio and a variable expense ratio based on all available expense data, regulations, and judgment.

Exhibit 1 demonstrates this using homeowners data adjusted so that the three-year historical expense ratios (expenses divided by premiums) are approximately equal to the three-year industry historical expense ratios.

Exhibit 1-A displays three years of historical expense ratios. The underlying data can be obtained from the Insurance Expense Exhibit (IEE) and Statutory Page 14, although they may not have the finest level of detail desired. For example, the homeowners data include data on renters and mobile homes. Ideally, the actuary can access and use the source expense data to get the data corresponding to the product being priced. Of course, the actuary should always balance the additional cost of obtaining such data against the additional accuracy gained.

In this case, the company assumes that all expenses, except general expenses, are incurred at the onset of the policy and divides them by the written premium. General expenses are assumed to be incurred throughout the policy period and thus are divided by the earned premium.

Typically, the data used (countrywide or state) also vary by type of expense. Other acquisition and general expenses are usually assumed to be uniform across all locations and hence can be handled using countrywide figures that can be found in the IEE. Handling of commission and brokerage expenses varies from carrier to carrier, with some carriers using state-specific data and

others using countrywide figures. The treatment should be based on the variation of the company's commission plans by location. Taxes, licenses, and fees vary by state, therefore they are typically based on state data from the applicable Statutory Page 14. Ideally, the company can break the category into taxes, which are a variable expense, and licenses and fees, which are typically treated as fixed expenses.[2]

The following chart summarizes these expense characteristics:

Type of Expense	Data Used	Divided By
General Expense	Countrywide	Earned Premium
Other Acquisition	Countrywide	Written Premium
Commission and Brokerage	Countrywide/State	Written Premium
Taxes	State	Written Premium
Licenses and Fees	State	Written Premium

Once the historical ratios are calculated, the actuary chooses a selected provision for each expense type. Generally, the selection is based on either the latest year or a multiyear average; however, there are several things that may affect the selection:

- If the actuary is aware of a future change in the expenses, the new figure should be used. For example, if the commission structure is changing, the actuary should use the expected commission percentage, not the historical percentage.

- If there was a one-time shift in expense levels during the experience period, the expected future expense level should be used. For example, if productivity gains led to a significant reduction in necessary staffing levels during the historical experience period, then the selected ratios should be based on the ratios after the reduction rather than the all-year average.

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[2]Licenses and fees tend to be a smaller portion of the overall taxes, licenses, and fees category. Thus, if a company is unable to separate them, the inclusion of these with variable expenses will not have a material effect.

- If there were nonrecurring expense items during the historical period, the actuary should examine the materiality and nature of the expense to determine how to best incorporate the expense in the rates—if at all. If the aggregate dollars spent are consistent with dollars spent on similar non-recurring projects in other years, the expense ratios should be similar and no adjustment is warranted. If, however, the expense item represents an extraordinary expense, then the actuary must decide to what extent it should be included. Assume, for example, the extraordinary expense is from a major systems project to improve the policy issuance process. That project clearly benefits future policyholders and should be included in the rates. Assuming the new system will be used for a significant length of time, it may be appropriate to dampen the impact of the item and spread the expense over a period of several years. If the actuary consistently selects the three-year average, the expense will automatically be spread over three years, assuming rates are revised annually.[3] On the other hand, the actuary may determine that it is inappropriate to charge future policyholders for a given nonrecurring expense. If so, the actuary should exclude the expense from the ratemaking data altogether. In that case, the expense is basically funded by existing surplus.

- Finally, a few states place restrictions on which expenses can be included for the purpose of determining rates. For example, Texas does not allow insurers to include charitable contributions or lobbying expenses. These expenses must be excluded from the calculation of the historical expense ratios when performing the analysis for that state. If such expenses are recurring, overall future income will be reduced by that state's proportion of the expenses.

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[3]This assumes all of the expense is booked in that year. Statutory accounting guidelines allow some expenses to be amortized over several years. If the extraordinary expense is amortized over three years, then the use of a three-year average will actually spread the expense over five years. The three-year average expense ratio will increase for the first three years and decrease for the last two years.

In the example in Exhibit 1-A, the data are fairly stable and there are no extraordinary expenses; therefore, a three-year straight average is selected.

Once the expense ratios are selected, they are divided into fixed and variable ratios. Ideally, the company has detailed expense data and can do this directly or has activity-based cost studies that help split the expenses appropriately. In the absence of any such data, the actuary should consult with other insurance professionals within the company to arrive at the best possible assumptions given the company's allocation of expenses. In this example, the company assumes that 75% of the general expenses and other acquisition costs and 100% of the licenses and fees are fixed. All other expenses are assumed to be variable. Some sensitivity testing was performed on these selections. For the example included, the difference in the indications between assuming that the aforementioned percentage of the general expenses, other acquisition costs, and licenses and fees were fixed and assuming that 100% of those expenses were fixed is not material. The exact impact will vary and depend on the magnitude of the expense ratios.

The fixed expense ratio represents the fixed expenses for the historical time period divided by the premium written or earned during that same time period. Often, companies trend this ratio to account for expected growth in fixed expenses. Some companies use internal expense data to select an appropriate trend. Given the volatility of internal data, many companies use government indices (e.g., Consumer Price Index, Employment Cost Index, etc.) and knowledge of anticipated changes in internal company practices to estimate an appropriate trend. Exhibit 1-B displays one such methodology. Basically, the indicated trend is a weighting of the Employment Cost Index and the Consumer Price Index. The weights are based on the percentage that salaries represent of the total expenditures for the two largest fixed expense categories, other acquisition and general expenses. These weights can be determined directly from data contained in the IEE. The selected fixed expense ratio will be trended from the

average date expenses were incurred in the historical expense period to the average date expenses will be incurred in the period the rates are assumed to be in effect (see Appendix A).[4] After making this adjustment, the ratio is often called the projected (or trended) fixed expense provision.

Variable expenses and profit are a constant percentage of the premium. This selected percentage will apply to the premiums from policies written during the time the rates will be in effect. Thus, there is no need to trend this ratio, called the variable expense provision.

Calculation of Statewide Indicated Rate Change

Exhibit 1-C shows the most commonly found method of incorporating the fixed expense provision within the calculation of the indicated statewide rate level change. The general formula for the statewide (SW) indicated rate change based on the loss ratio method is as follows:

SW Indicated Rate Change

$$= \frac{\text{Projected Loss Ratio} + \text{Projected Fixed Expense Provision}}{1.00 - \text{Variable Expense Provision} - \text{Profit \& Contingency Provision}}$$

$$- 1.00.$$

The projected fixed expense provision and the variable expense provision are calculated as discussed in the prior section. Much literature is dedicated to the determination of loss ratios

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[4]When multiyear historical ratios are used, there is often no trending to bring each year's ratio to the same expense and premium levels before making a selection. If the expenses and average premiums are changing at the same rate, then the two would offset each other and the ratios would remain constant. However, if the expense trend exceeds the change in average premium (or the change in average premium exceeds the expense trend), this would tend to result in increasing (decreasing) ratios over the historical period. The materiality of this distortion depends on the magnitude of the difference between the trends.

and profit and contingency provisions; thus, they will not be discussed further here.

3.   POTENTIAL DISTORTIONS

There are a few items that can cause the preceding methodology to create inaccurate and inequitable indicated rate changes.

First, rate changes[5] can impact the historical expense ratios and lead to an excessive or inadequate overall rate indication. The historical fixed expense ratios are based on written and earned premiums during the historical time period. To the extent that there are rate increases (or decreases) that impact only a portion of the premium in the historical time period or were implemented after the historical period entirely, the current procedure will tend to overstate (or understate) the expected fixed expenses. The materiality of the distortion depends on the magnitude of rate changes not fully reflected in the historical countrywide premiums. Also, utilizing three-year historical expense ratios increases the historical experience period, thereby increasing the chances of rate changes not being fully reflected in the historical premiums. One potential solution for the distortion caused by rate changes is to restate the historical written or earned premiums at current rates i.e., premiums level.

Second, a significant premium trend between the historical experience period and the projected period can lead to an excessive or inadequate overall rate indication.[6] Again, the historical

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[5]The term "rate changes" (or premium level changes) is intended to refer to changes resulting from an increase or decrease in the premiums. The term is not intended to be used interchangeably with "rate level changes," which can be caused by premium changes, coverage changes, or both. If a rate level change is caused solely by a change in coverage, it may or may not impact the appropriateness of the historical expense ratios. If the actuary adjusts the losses to account for coverage level changes, there will not be a distortion. If, however, the actuary adjusts premiums to account for such changes, the distortion will still exist.

[6]This assumes that the premium trend is due to changes that do not proportionately increase (or decrease) the fixed expenses. While this is the most common scenario, there may be situations that deviate from this assumption. For example, assume a company is

expenses are divided by the written and earned premium during the historical time period. To the extent that there have been distributional shifts that have increased the average premium (e.g., higher amounts of insurance) or decreased the average premium (e.g., higher deductibles), this methodology will tend to overstate or understate the estimated fixed expenses, respectively. The magnitude of overstatement or understatement depends on the magnitude of the premium trend. Utilizing three-year historical expense ratios increases the impact of a premium trend by increasing the amount of time between the historical and projected periods. A potential solution for this is to trend the historical premiums to prospective levels.

Third, this methodology can create inequitable rates for regional or nationwide carriers because it uses countrywide expense ratios[7] and applies them to state projected premiums to determine the expected fixed expenses. In other words, fixed expenses are allocated to each state based on premium. The average premium level in states can vary because of overall loss cost differences (e.g., coastal states tend to have higher overall homeowners loss costs) as well as distributional differences (e.g., some states have significantly higher average amounts of insurance than other states). If there exists significant variation in average rates across the states, a disproportionate share of projected fixed expenses will be allocated to the higher-than-average premium states. Thus, the estimated fixed expenses will be overstated in higher-than-average premium states and understated in lower-than-average premium states. If a company tracks fixed expenses by state and calculates fixed expense ratios for each state, then this distortion will not exist.

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pursuing an insurance-to-value (ITV) effort with an external inspection company. Presumably, the additional expenses incurred will lead to better ITV and higher average premiums. Thus, both average premiums and average expenses would be increasing. In a case like this, the actuary should determine the impact, decide if this is a one-time shift, and adjust the selections accordingly.

[7]State-specific data are usually used for taxes, licenses, and fees. However, these expenses are relatively small compared with the expenses that are generally evaluated on a countrywide level.

4. PROPOSED METHODOLOGY

By assumption, fixed expenses are assumed to be constant for each exposure and are not assumed to vary with the premium. The proposed methodology uses the concepts outlined by Childs and Currie [1]. In essence, historical fixed expenses are divided by historical exposures rather than by premium. Exhibit 2 displays this procedure.

Calculation of Projected Fixed and Variable Expense Provisions

Exhibit 2-A, Sheet 1 shows the development of the fixed and variable expenses for the general expense category. The total expenses for the category can be taken directly from the IEE. The total expenses are split into variable and fixed expenses. Ideally, the expenses are maintained at a level of detail that allows an accurate allocation between the variable and fixed expense categories. Typically, the total expenses are split using percentages based on internal company data and actuarial judgment. This example uses the same percentages assumed in the current procedure (75% of general expenses and other acquisition costs and 100% of licenses and fees are fixed, and all other expenses are variable).[8]

The total fixed expenses are then divided by the exposures[9] for the same time period. As general expenses are assumed to be incurred throughout the policy, the expense dollars are divided by earned exposures, rather than written, to determine an average expense per exposure for the historical period. The average expense figures are trended using the same approach discussed earlier in the paper (see Exhibit 1-B). All of the

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[8]If premiums and expenses are changing at different rates, then the ratio of fixed expenses to total expenses will change over time, but that does not result in a material distortion. See Appendix B for more discussion on this issue.

[9]House-years were used as the exposure unit for the example in the paper. Using amount-of-insurance years as an exposure base will lead to distortions similar to those caused by the current procedure if there are significant differences in amounts of insurance over time and among various locations.

average expense amounts are trended from the average date they were incurred in the historical period to the average date expenses will be incurred in the period the rates will be in effect.[10] Once the projected expenses per exposures are determined, the actuary then must select an appropriate figure.

As with the current procedure, the selection will generally be based on either the latest year or a multiyear average. Consistent values for the projected average expense per exposure imply that expenses are increasing or decreasing proportionately to exposures. This makes intuitive sense for many expense categories (e.g., full-time employee costs), but may not be accurate for all fixed expenses because of economies of scale. If the company is growing and the projected average expense per exposure is declining steadily each year, the selected expense trend may be too high or expenses may not be increasing as quickly as exposures because of economies of scale. If the decline is significant and the actuary believes it is because of economies of scale, then the selection should be adjusted to include the impact of economies of scale corresponding to expected growth in the book.[11] As mentioned earlier, nonrecurring expense items, one-time changes in expense levels, or anticipated changes in expenses should be considered in making the selection. In the example shown the figures are stable and the three-year average is selected to facilitate comparisons with the results of the current procedure.

Exhibit 2-A, Sheets 1–4 show the calculations for each of the major expense categories. The following chart summarizes the

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[10]In the example, the same trend period is used for all expense categories to maintain consistency with the current procedure. See Appendix A for more discussion on this issue.

[11]If the selected expense trend is based on historical internal expense data (e.g., historical changes in average expense per exposure) rather than external indices, then the trend would implicitly include the impact of economies of scale in the past. Assuming the impact of economies of scale will be the same as in the past, the projected average expense per exposure should be consistent and no further adjustment would be necessary.

characteristics of the data used:

| | | Divided By | |
Expense	Data Used	Fixed	Variable
General Expense	Countrywide	Earned Exposures	Earned Premium
Other Acquisition	Countrywide	Written Exposures	Written Premium
Commissions and Brokerage	Countrywide/State	—	Written Premium
Taxes	State	—	Written Premium
Licenses and Fees	State	Written Exposures	—

Exhibit 2-B summarizes the results of the analysis of the fixed and variable portions of each major expense group.

Calculation of Statewide Indicated Rate Change

The most straightforward way to calculate the indicated rate change is displayed on Exhibit 2-C. The statewide required projected average premium is calculated as follows:

$$\text{SW Projected Average Required Premium}$$
$$= \frac{\text{SW Projected Average Loss \& LAE Per Exposure} + \text{Projected Average Fixed Expense Per Exposure}}{1.00 - \text{Variable Expense Provision} - \text{Profit \& Contingency Provision}}$$

This figure is compared to the statewide projected average premium at present rates to determine the statewide indicated rate change:

$$\text{SW Indicated Rate Change}$$
$$= \frac{\text{SW Projected Average Required Premium}}{\text{SW Projected Average Premium at Present Rates}} - 1.00.$$

Alternatively, the projected average fixed expense per exposure can be converted to a projected fixed expense provision by

dividing the projected average fixed expense per exposure by the statewide projected average premium at present rates. This figure can then be used within the same formula to indicate loss ratio provided earlier:

SW Indicated Rate Change

$$= \frac{\text{Projected Loss Ratio} + \text{Projected Fixed Expense Provision}}{1.00 - \text{Variable Expense Provision} - \text{Profit \& Contingency Provision}}$$

$$- 1.00.$$

Calculation of Expense Fees

Some insurers may have expense fees or minimum premiums. If that is the case, this procedure directly lends itself to the determination of such values.

Exhibit 2-D displays the necessary calculations for an expense fee. The projected average fixed expense per exposure has already been calculated. To calculate an expense fee, that figure needs to be increased to cover the variable items (variable expenses and profit) associated with the fixed portion of the premium. This is accomplished simply by dividing the fixed expense per exposure by the variable permissible loss ratio (i.e., 1.00 minus variable expense provision minus profit provision).

To determine a minimum premium, the expense fee should be combined with a minimum provision for losses.

5. CURRENT METHODOLOGY VERSUS PROPOSED METHODOLOGY

This section algebraically shows the difference in the projected fixed expense dollars calculated under the two different methodologies. The formula for calculating the total dollars of projected statewide fixed expenses using the current method-

ology is as follows:[12]

$$\text{Proj SW Fixed Expenses}_{\text{Curr}}$$

$$= \frac{\text{Historical CW Fixed Expenses}}{\text{Historical CW Premium}} * \text{Expense Trend Factor}$$

$$* \text{Proj SW Premium}.$$

The formula for calculating the projected statewide fixed expenses collected using the proposed methodology is as follows:

$$\text{Proj SW Fixed Expenses}_{\text{Prop}}$$

$$= \frac{\text{Historical CW Fixed Expenses}}{\text{Historical CW Exposures}} * \text{Expense Trend Factor}$$

$$* \text{Proj SW Exposures}.$$

Dividing the first formula by the second highlights the relative difference between the fixed expenses produced by the two procedures:

$$\frac{\text{Proj SW Fixed Expenses}_{\text{Curr}}}{\text{Proj SW Fixed Expenses}_{\text{Prop}}}$$

$$= \frac{\text{Historical CW Exposures}}{\text{Historical CW Premium}} * \frac{\text{Proj SW Premium}}{\text{Proj SW Exposures}}.$$

Equivalently,

$$\frac{\text{Proj SW Fixed Expenses}_{\text{Curr}}}{\text{Proj SW Fixed Expenses}_{\text{Prop}}} = \frac{\text{Proj SW Avg Premium}}{\text{Historical CW Avg Premium}}.$$

Multiplying by unity (i.e., Proj CW Avg Premium/Proj CW Avg Premium),

$$\frac{\text{Proj SW Fixed Expenses}_{\text{Curr}}}{\text{Proj SW Fixed Expenses}_{\text{Prop}}}$$

$$= \frac{\text{Proj SW Avg Premium}}{\text{Historical CW Avg Premium}} * \frac{\text{Proj CW Avg Premium}}{\text{Proj CW Avg Premium}}.$$

[12]The following section only deals with the categories of expenses that use the countrywide (CW) expenses. Taxes, licenses, and fees are not addressed. Those expenses represent a relatively small portion of the total expense dollars.

Rearranging the terms,

$$\frac{\text{Proj SW Fixed Expenses}_{\text{Curr}}}{\text{Proj SW Fixed Expenses}_{\text{Prop}}}$$

$$= \frac{\text{Proj CW Avg Premium}}{\text{Historical CW Avg Premium}} * \frac{\text{Proj SW Avg Premium}}{\text{Proj CW Avg Premium}}.$$

Since

$$\text{Proj CW Avg Premium}$$

$$= \text{Historical CW Avg Premium} * \text{Premium Trend Factor}$$

$$* \text{On-Level Factor},$$

we have

$$\frac{\text{Proj SW Fixed Expenses}_{\text{Curr}}}{\text{Proj SW Fixed Expenses}_{\text{Prop}}}$$

$$= \text{Premium Trend Factor} * \text{On-Level Factor} * \frac{\text{Proj SW Avg Premium}}{\text{Proj CW Avg Premium}}.$$

The difference between the fixed expenses produced by the two methodologies is driven by premium trend, on-level factors, and the relationship of the statewide average premium to the countrywide average premium. These are the three distortions in the current methodology mentioned earlier. Thus, the proposed methodology is not affected by these three distortions.

Exhibit 3 shows the impact on the overall indication by location for the two methodologies (Exhibit 3-A lists the information in table form and Exhibit 3-B displays the data graphically). This information is included to show two items: the total amount the current procedure overstates (understates) the overall indication relative to the proposed procedure and the variation of the overstatement (understatement) by location. The former tells us about the impact on the accuracy of the overall countrywide indication, while the latter is more indicative the potential for inequity between states.

An examination of the "countrywide" line on Exhibit 3-A shows the current procedure overstates the premium needed to

cover projected fixed expenses by +1.8 percentage points relative to the proposed procedure. During the historical period used, homeowners insurance rates were being increased and the overall premium trend was slightly positive. For these two reasons, the proposed procedure results in a fixed expense provision that is less than that produced by the current procedure.

A survey of the impact by location shows significant variation (from a high of +10.6 percentage points to a low of −8.3 percentage points). The location-specific differences are driven by the differences in average projected premiums at present rates (PPR). The average projected PPR can vary significantly from location to location due to the overall cost of doing business in the states as well as to differing distributions of insureds with high and low risk in the states. The relationship of each state's average projected PPR to the countrywide average projected PPR is included. In general, the higher the average projected PPR, the more the current procedure overstates the indication relative to the proposed procedure.

As mentioned earlier, the expense ratios in the example approximate the homeowners industry three-year expense ratios. The impacts will be larger (or smaller) for an individual company that has greater (or lesser) fixed expenses than the industry average. Additionally, the results depend on the rate changes, premium trends, and statewide rate relativities underlying the data.

6. OTHER CONSIDERATIONS AND FUTURE ENHANCEMENTS

While the procedure does correct for the three distortions mentioned, there are still some concerns that are not addressed.

First, the proposed procedure, like the current procedure, requires the actuary to separate the expenses into fixed and variable categories. Today, this is generally done judgmentally. Perhaps future activity-based cost studies will more accurately segregate expenses. As mentioned earlier, sensitivity testing revealed that

the overall indication is not materially impacted by moderate swings in the categorization of expenses.

Second, the proposed procedure essentially allocates country-wide fixed expenses to each state based on the by-state exposure distribution (as it assumes fixed expenses do not vary by exposure). In reality, average fixed expense levels may vary by location (e.g., advertising costs may be higher in some locations than others). If a regional or national carrier feels the variation is material, the company should collect data at a finer level and make the appropriate adjustments. Once again, the cost of the data collection should be balanced against the additional accuracy gained.

Third, some expenses considered fixed probably vary slightly with premium. For example, policies for coastal homes may be more costly to service than other homes. Further studies may uncover a more accurate quantification of this relationship. However, assuming the expenses are "nearly" fixed, the resulting inequity is not material.

Fourth, some expenses considered fixed vary by other characteristics. For example, fixed expenses may vary between new and renewal business. This only affects the overall statewide indication if the distribution of risks for a given characteristic is changing dramatically or varies significantly by state. Even if there is no impact on the overall indication, any material fixed expense cost difference not reflected in the rates will have an impact on the equity of the two groups. To make rates equitable for the example of new versus renewal business, material differences in new and renewal provisions should be reflected with consideration given to varying persistency levels as described by Feldblum [3].

Finally, the existence of economies of scale in a changing book will lead to increasing or decreasing figures for projected average expense per exposure. Further studies may reveal techniques for better approximating the relationship between

changes in exposures and expenses and capturing the impact of economies of scale. Until then, internal expense trend data and actuarial judgment should suffice for incorporating the impact of economies of scale.

7. CONCLUSION

The prevailing methodology for incorporating fixed expenses in the statewide indication has some methodological flaws. These flaws can lead to overstated or understated actuarial indications. While this paper describes a simple alternative that corrects the three weaknesses discussed, there are still improvements that can be made.

REFERENCES

[1] Childs, Dianna, and Ross Currie, "Expense Allocation in Insurance Ratemaking," Casualty Actuarial Society *Discussion Paper Program*, May 1980, pp. 32–60.

[2] Committee on Ratemaking Principles, Statement of Principles Regarding Property and Casualty Insurance Ratemaking, Casualty Actuarial Society, May 1988.

[3] Feldblum, Sholom, "Asset Share Pricing for Property and Casualty Insurance," Casualty Actuarial Society *Forum*, Special Edition, 1993, pp. 241–312.

[4] Schofield, David, "Going from a Pure Premium to a Rate," Casualty Actuarial Society Study Note, 1998.

APPENDIX A

TRENDING PERIODS

Expenses should be trended from the average date they were incurred in the historical period to the average date they will be incurred in the projected period. Actuaries generally make the simplifying assumption that expenses are either incurred at the inception of the policy or are incurred evenly throughout the policy period. When using calendar year historical expense data, the trend periods should be different for the two different types of expenses.

First, expenses that are incurred at the inception of the policy should be trended from the average written date in the historical period to the average written date in the projection period. The following figure shows the resulting trend period assuming annual policies, a steady book of business, and that the projected rates will be in effect for one year:
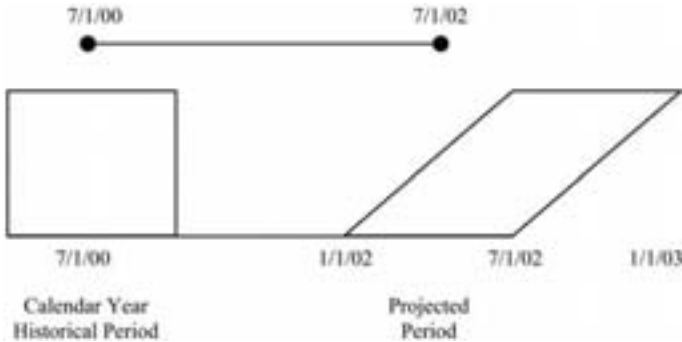
Second, expenses that are incurred evenly throughout the policy period should be trended from the average earned date in the historical period to the average earned date in the projection period. The following figure shows the resulting trend period assuming annual policies, a steady book of business, and that the

projected rates will be in effect for one year:
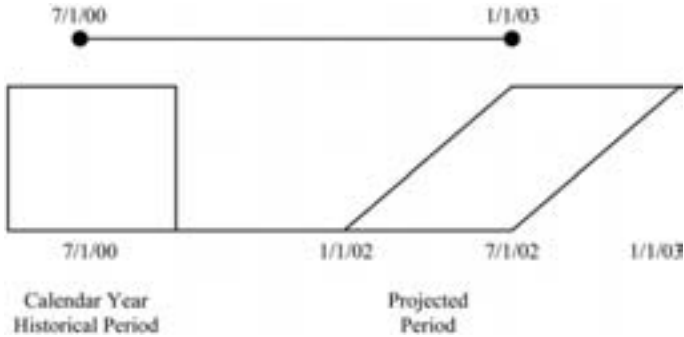
As can be seen by the figures, under our assumptions, expenses incurred throughout the policy are trended 6 months longer than expenses incurred at inception. Indications do not generally include different trend periods for the different expenses. Presumably, a common trend period is used for simplicity, as this distinction does not have a material impact. The exhibits in the paper use a common trend period.

APPENDIX B

Does the Percentage That Fixed Expenses Represent of Total Expenses Vary Over Time?

In both the current and proposed procedures, the actuary must separate the expenses into fixed and variable expenses. Since detailed expense data may not be available, the actuary may have to use a judgmentally selected percentage to split the expenses into these two categories.

Generally, that same percentage is applied to the expenses for each of the years in the historical period. If the change in the average premium does not equal the fixed expense trend, then fixed and variable expenses will grow at different rates. Thus, the percentages that fixed expenses and variable expenses represent of total expenses will change over time.

A sensitivity analysis was performed to determine the impact on the indications of a change in the distribution of fixed and variable expenses. For the sensitivity analysis, the same example as given in the text of the paper was used with the assumption the percentage was accurately determined in year 1. Even with the very unlikely assumption that average premiums subsequently changed at a rate in excess of +10 percentage points differently than expenses, the indicated rate change increased by only about +0.2 percentage points. In reality, premiums and expenses would likely be changing at a more equivalent rate. Thus, it is reasonable to assume that fixed expenses will remain a constant percentage of total expenses throughout a three-year period.

EXHIBIT 1-A

COMPANY

STATE XX HOMEOWNERS

PROJECTED FIXED AND VARIABLE EXPENSE PROVISIONS: CURRENT METHOD

	Year 1	Year 2	Year 3	3-Year Average	Selected
(1) General Expenses					
a. Countrywide Expenses	$26,531,974	$28,702,771	$31,195,169		
b. Countrywide Earned Premium	$450,000,000	$490,950,000	$545,250,000		
c. Ratio $[(a)/(b)]$	5.9%	5.8%	5.7%	5.8%	5.8%
d. % Assumed Fixed					75.0%
e. Fixed Expense % $[(c) \times (d)]$					4.4%
f. Variable Expense % $[(c) \times (1.0 - (d))]$					1.5%
(2) Other Acquisition Expenses					
a. Countrywide Expenses	$41,758,296	$45,612,462	$49,582,543		
b. Countrywide Written Premium	$468,850,000	$515,550,000	$577,900,000		
c. Ratio $[(a)/(b)]$	8.9%	8.8%	8.6%	8.8%	8.8%
d. % Assumed Fixed					75.0%
e. Fixed Expense % $[(c) \times (d)]$					6.6%
f. Variable Expense % $[(c) \times (1.0 - (d))]$					2.2%
(3) Licenses and Fees					
a. State Expenses*	$1,157,006	$1,210,200	$1,321,419		
b. State Written Premium*	$468,850,000	$515,550,000	$577,900,000		
c. Ratio $[(a)/(b)]$	0.2%	0.2%	0.2%	0.2%	0.2%
d. % Assumed Fixed					100.0%
e. Fixed Expense % $[(c) \times (d)]$					0.2%
f. Variable Expense % $[(c) \times (1.0 - (d))]$					0.0%

EXHIBIT 1-A
Continued

	Year 1	Year 2	Year 3	3-Year Average	Selected
(4) Commission and Brokerage Expenses					
a. Countrywide Expenses	$63,507,320	$69,832,993	$78,278,512		
b. Countrywide Written Premium	$468,850,000	$515,550,000	$577,900,000		
c. Ratio [(a)/(b)]	13.5%	13.5%	13.5%	13.5%	13.5%
d. % Assumed Fixed					0.0%
e. Fixed Expense % [(c) × (d)]					0.0%
f. Variable Expense % [(c) × (1.0 − (d))]					13.5%
(5) Taxes					
a. State Expenses*	$10,607,226	$9,917,093	$11,580,187		
b. State Written Premium*	$468,850,000	$515,550,000	$577,900,000		
c. Ratio [(a)/(b)]	2.3%	1.9%	2.0%	2.1%	2.1%
d. % Assumed Fixed					0.0%
e. Fixed Expense % [(c) × (d)]					0.0%
f. Variable Expense % [(c) × (1.0 − (d))]					2.1%
(6) Subtotal Fixed Expenses	[(1e) + (2e) + (3e) + (4e) + (5e)]				11.2%
(7) Fixed Expense Trend	[Exhibit 1-B]				3.4%
(8) Trend Period					3.00
(9) Fixed Expense Trend Factor	$[(1.00 + (7))^{(8)}]$				1.1055
(10) Projected Fixed Expense Provision	[(6) × (9)]				12.4%
(11) Variable Expense Provision	[(1f) + (2f) + (3f) + (4f) + (5f)]				19.3%

*Countrywide data were used for the example.

EXHIBIT 1-B

COMPANY
COUNTRYWIDE HOMEOWNERS
CALCULATION OF ANNUAL EXPENSE TREND

(1) Employment Cost Index—Finance, Insurance, and Real Estate, excluding Sales Occupations— (annual change over latest 2 years) U.S. Department of Labor	4.8%
(2) % of Other Acquisition and General Expenses used for Salaries and Employee Relations and Welfare— Insurance Expense Exhibit, Year 3	50.0%
(3) Consumer Price Index, All Items— (annual change over latest 2 years)	1.9%
(4) Annual Expense Trend— $\{(1)*(2)\} + \{(3)*[100\% - (2)]\}$	3.4%
Selected Annual Expense Trend	3.4%

EXHIBIT 1-C

COMPANY
STATE XX HOMEOWNERS
CALCULATION OF INDICATED RATE CHANGE:
CURRENT METHOD

(1) Projected Loss and LAE Ratio	64.7%
(2) Projected Fixed Expense Provision	12.4%
(3) Variable Expense Provision	19.3%
(4) Profit and Contingencies Provision	5.0%
(5) Variable Permissible Loss Ratio $[100\% - (3) - (4)]$	75.7%
(6) Indicated Rate Change $\{[(1) + (2)]/(5) - 100\%\}$	1.8%

EXHIBIT 2-A
SHEET 1

COMPANY
STATE XX HOMEOWNERS
GENERAL EXPENSES:
PROPOSED METHOD

	Year 1	Year 2	Year 3	3-Year Straight Average	Selected
(1) Total Countrywide General Expenses (IEE)	$26,531,974	$28,702,771	$31,195,169		
FIXED					
(2) Fixed General Expense as % of Total General Expense	75.0%	75.0%	75.0%		
(3) Fixed General Expense $	$19,898,981	$21,527,078	$23,396,377		
(4) Total Countrywide Earned Exposures	625,500	666,500	696,000		
(5) Average Fixed General Expense Per Exposure	$31.81	$32.30	$33.62		
(6) Expense Trend	3.4%	3.4%	3.4%		
(7) Trend Period	4.00	3.00	2.00		
(8) Expense Trend Factor	1.1431	1.1055	1.0692		
(9) Projected Average Fixed General Expense Per Exposure	$36.36	$35.71	$35.95	$36.01	$36.01

VARIABLE

(10) Variable General Expense as % of Total General Expense	25.0%	25.0%	25.0%	
(11) Variable General Expense $	$6,632,994	$7,175,693	$7,798,792	
(12) Countrywide Earned Premium	$450,000,000	$490,950,000	$545,250,000	
(13) Variable General Expense %	1.5%	1.5%	1.4%	1.5% 1.5%

Notes:

(3) = (1) × (2).
(5) = (3)/(4).
(6) Exhibit 1-B.
(7) 6/30/XX to midpoint of anticipated coverage period.
(8) = [1.00 + (6)]$^{(7)}$.
(9) = (5) × (8).
(10) = 100% − (2).
(11) = (1) × (10).
(13) = (11)/(12).

EXHIBIT 2-A
SHEET 2

COMPANY
STATE XX HOMEOWNERS
OTHER ACQUISITION (ACQ.) EXPENSES:
PROPOSED METHOD

	Year 1	Year 2	Year 3	3-Year Straight Average	Selected
(1) Total Countrywide Other Acq. Expenses (IEE)	$41,758,296	$45,612,462	$49,582,543		
FIXED					
(2) Fixed Other Acq. Expense as % of Total Other Acq. Expense	75.0%	75.0%	75.0%		
(3) Fixed Other Acq. Expense $	$31,318,722	$34,209,347	$37,186,907		
(4) Total Countrywide Written Exposures	646,500	687,000	717,500		
(5) Average Fixed Other Acq. Expense Per Exposure	$48.44	$49.80	$51.83		
(6) Expense Trend	3.4%	3.4%	3.4%		
(7) Trend Period	4.00	3.00	2.00		
(8) Expense Trend Factor	1.1431	1.1055	1.0692		
(9) Projected Average Fixed Other Acq. Expense Per Exposure	$55.37	$55.05	$55.42	$55.28	$55.28

VARIABLE

(10) Variable Other Acq. Expense as % of Total Other Acq. Expense	25.0%	25.0%	25.0%		
(11) Variable Other Acq. Expense $	$10,439,574	$11,403,116	$12,395,636		
(12) Countrywide Written Premium	$468,850,000	$515,550,000	$577,900,000		
(13) Variable Other Acq. Expense %	2.2%	2.2%	2.1%	2.2%	2.2%

Notes:
(3) = (1) × (2).
(5) = (3)/(4).
(6) Exhibit I-B.
(7) 6/30/XX to midpoint of anticipated coverage period.
(8) = [1.00 + (6)][(7)].
(9) = (5) × (8).
(10) = 100% − (2).
(11) = (1) × (10).
(13) = (11)/(12).

EXHIBIT 2-A
SHEET 3

COMPANY
STATE XX HOMEOWNERS
TAXES, LICENSES AND FEES:
PROPOSED METHOD

	Year 1	Year 2	Year 3	3-Year Straight Average	Selected
(1) Total State Taxes, Licenses and Fees (AS, Page 15)*	$11,764,232	$11,127,293	$12,901,606		
FIXED					
(2) Fixed Licenses & Fees Expense $	$1,157,006	$1,210,200	$1,321,419		
(3) Total State Written Exposures*	646,750	687,000	717,650		
(4) Average Fixed Licenses and Fees Expense Per Exposure	$1.79	$1.76	$1.84		
(5) Expense Trend	3.4%	3.4%	3.4%		
(6) Trend Period	4.00	3.00	2.00		
(7) Expense Trend Factor	1.1431	1.1055	1.0692		
(8) Projected Average Fixed Licenses & Fees Expense Per Exposure	$2.05	$1.95	$1.97	$1.99	$1.99

VARIABLE

(9) Variable Premium Tax Expense $	$10,607,226	$9,917,093	$11,580,187		
(10) State Written Premium*	$468,850,000	$515,550,000	$577,900,000		
(11) Variable Premium Tax Expense %	2.3%	1.9%	2.0%	2.1%	2.1%

Notes:
(4) = (2)/(3).
(5) Exhibit 1-B.
(6) 6/30/XX to midpoint of anticipated coverage period.
(7) = [1.00 + (5)]^{(6)}.
(8) = (4) × (7).
(11) = (9)/(10).

*Countrywide data were used for the example.

EXHIBIT 2-A
SHEET 4

COMPANY
STATE XX HOMEOWNERS
COMMISSION AND BROKERAGE EXPENSES:
PROPOSED METHOD

	Year 1	Year 2	Year 3	3-Year Straight Average	Selected
(1) Total Countrywide Commission and Brokerage Expenses (IEE)	$63,507,320	$69,832,993	$78,278,512		
FIXED					
(2) Fixed Commission & Brokerage Expense as % of Total Commission and Brokerage Expense	0.0%	0.0%	0.0%		
(3) Fixed Commission and Brokerage Expense $	$—	$—	$—		
(4) Total Countrywide Written Exposures	646,500	687,000	717,500		
(5) Average Fixed Commission and Brokerage Expense Per Exposure	$—	$—	$—		
(6) Expense Trend	3.4%	3.4%	3.4%		
(7) Trend Period	4.00	3.00	2.00		
(8) Expense Trend Factor	1.1431	1.1055	1.0692		
(9) Projected Average Fixed Commission and Brokerage Expense Per Exposure	$—	$—	$—	$—	$—

VARIABLE

(10) Variable Commission and Brokerage Expense as % of Total Commission and Brokerage Expense	100.0%	100.0%	100.0%
(11) Variable Commission and Brokerage Expense $	$63,507,320	$69,832,993	$78,278,512
(12) Countrywide Written Premium	$468,850,000	$515,550,000	$577,900,000
(13) Variable Commission and Brokerage Expense %	13.5%	13.5%	13.5%

Notes:
(3) = (1) × (2).
(5) = (3)/(4).
(6) Exhibit 1-B.
(7) 6/30/XX to midpoint of anticipated coverage period.
(8) = [1.00 + (6)][7].
(9) = (5) × (8).
(10) = 100% − (2).
(11) = (1) × (10).
(13) = (11)/(12).

EXHIBIT 2-B

COMPANY
STATE XX HOMEOWNERS
PROJECTED FIXED AND VARIABLE EXPENSE PROVISIONS:
PROPOSED METHOD

	Fixed	Variable
(1) General Expenses	$36.01	1.5%
(2) Other Acquisition Expenses	$55.28	2.2%
(3) Taxes, Licenses and Fees	$1.99	2.1%
(4) Commission and Brokerage Expenses	$—	13.5%
(5) Total	$93.28	19.3%

EXHIBIT 2-C

COMPANY
STATE XX HOMEOWNERS
CALCULATION OF INDICATED RATE CHANGE:
PROPOSED METHOD

(1) Statewide Projected Average Premium at Present Rates*	$850.59
(2) Statewide Projected Loss and LAE Ratio	64.7%
(3) Statewide Projected Average Loss and LAE [(1) × (2)]	$550.33
(4) Projected Average Fixed Expense Per Exposure	$93.28
(5) Variable Expense Provision	19.3%
(6) Profit and Contingencies Provision	5.0%
(7) Variable Permissible Loss Ratio [100% − (5) − (6)]	75.7%
(8) Statewide Projected Average Required Premium [(3) + (4)]/(7)	$850.21
(9) Indicated Rate Change (8)/(1) − 100%	0.0%

*Countrywide data were used in the example.

EXHIBIT 2-D

COMPANY
STATE XX HOMEOWNERS
CALCULATION OF PROPOSED EXPENSE FEE:
PROPOSED METHOD

(1) Total Projected Average Fixed Expense Per Exposure	$93.28
(2) Variable Expense Provision	19.3%
(3) Profit and Contingencies Provision	5.0%
(4) Proposed Expense Fee [(1)]/[100% − (2) − (3)]	$123.22

EXHIBIT 3-A

COMPARISON OF RESULTS

Location	(1) Average Projected Premium at Present Rates Relativity	(2) Indication* Current Methodology	(3) Proposed Methodology	(4) Current Indication Proposed (2)–(3)
1	2.53	1.7%	−8.9%	10.6%
2	1.44	1.3%	−4.9%	6.2%
3	1.44	1.7%	−4.5%	6.2%
4	1.31	1.8%	−3.4%	5.2%
5	1.31	1.3%	−3.8%	5.1%
6	1.27	1.7%	−3.2%	4.9%
7	1.23	1.7%	−2.8%	4.5%
8	1.22	1.2%	−3.2%	4.4%
9	1.13	1.8%	−1.7%	3.5%
10	1.12	1.3%	−2.0%	3.3%
11	1.11	1.5%	−1.7%	3.2%
12	1.06	1.7%	−0.9%	2.6%
13	1.05	1.6%	−0.9%	2.5%
14	1.03	1.7%	−0.7%	2.4%
15	1.01	1.7%	−0.3%	2.0%
16	0.95	0.5%	−0.5%	1.0%
17	0.91	1.2%	0.8%	0.4%
18	0.91	1.2%	0.8%	0.4%
19	0.87	0.7%	1.1%	−0.4%
20	0.86	1.7%	2.2%	−0.5%
21	0.85	1.7%	2.4%	−0.7%
22	0.85	1.7%	2.4%	−0.7%
23	0.85	1.3%	2.1%	−0.8%
24	0.82	2.1%	3.3%	−1.2%
25	0.82	1.7%	2.9%	−1.2%
26	0.81	1.5%	2.9%	−1.4%
27	0.80	0.5%	2.4%	−1.9%
28	0.80	1.1%	2.9%	−1.8%
29	0.80	1.7%	3.6%	−1.9%
30	0.75	1.5%	4.4%	−2.9%

EXHIBIT 3-A

Comparison of Results

Location	(1) Average Projected Premium at Present Rates Relativity	(2) Indication* Current Methodology	(3) Indication* Proposed Methodology	(4) Current Indication Proposed (2)–(3)
31	0.75	1.7%	4.8%	−3.1%
32	0.75	1.5%	4.5%	−3.0%
33	0.75	1.6%	4.6%	−3.0%
34	0.74	1.7%	4.8%	−3.1%
35	0.73	1.7%	5.2%	−3.5%
36	0.71	1.3%	5.3%	−4.0%
37	0.71	1.8%	5.9%	−4.1%
38	0.70	1.6%	5.8%	−4.2%
39	0.70	0.8%	5.3%	−4.5%
40	0.69	1.7%	6.2%	−4.5%
41	0.68	1.6%	6.5%	−4.9%
42	0.67	1.2%	6.2%	−5.0%
43	0.67	1.7%	6.9%	−5.2%
44	0.65	1.7%	7.5%	−5.8%
45	0.63	1.7%	8.2%	−6.5%
46	0.63	1.8%	8.2%	−6.4%
47	0.61	1.6%	9.0%	−7.4%
48	0.60	1.2%	9.0%	−7.8%
49	0.59	2.0%	10.0%	−8.0%
50	0.59	1.7%	9.9%	−8.2%
51	0.58	1.6%	9.9%	−8.3%
Countrywide	1.00	1.8%	0.0%	1.8%

*Loss ratio set at 64.7% to make countrywide indication equal 0% for proposed methodology.

EXHIBIT 3-B

COMPARISON OF CURRENT AND PROPOSED METHODS