TITLE: BUDGET VARIANCES IN INSURANCE COMPANY OPERATIONS

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ABSTRACT:

This paper attempts to provide the actuary with a methodology for monitoring the price and quantity of insurance for budgeting purposes. The paper discusses and defines cost accounting concepts and relates them to casualty actuarial work. The technique entitled "Analysis of Budget Variances" is applied to budgeted figures and actual results displayed on a net income statement prepared using the contribution method of allocating expenses. Although this process is shown to have applications for the assignment of responsibility for budget variances, its main contribution is to provide a separation of the variances of components of the net income statement into their price and quantity variances.

The need for explaining variances from budgeted results is a concern for casualty actuaries in insurance companies. Often, the method of presentation is the determination of an "indication," which shows the rate change necessary to balance the actual historical loss ratio with the expected, or budgeted, loss ratio.

The "indicated rate change" evaluates the price adequacy of the insurance product. However, the economic equation, "Price times Quantity equals Revenue," implies that only one half of the total revenue component of the net income statement is being examined by the indication. A technique is needed which evaluates the variances of the actual results from those expected for both the price of insurance (rates) and the quantity of insurance written (exposures).

This paper presents a methodology for monitoring these elements through the application of the cost accounting technique "Analysis of Budget Variances."

THE COST ACCOUNTANT AND THE ACTUARY

Cost accounting has been defined as "ways of accumulating historical costs and tracing them to units of output and to departments, primarily for purposes of providing the inventory valuations used in balance sheets and income statements."[1] In some ways, the role of the cost accountant is performed by the actuary. The reserving actuary accumulates losses (historical costs) and traces them to premiums (units of output) and to departments, providing reserve evaluations (inventory valuations) for the balance sheet and the income statement. Similarly, the pricing actuary accumulates incurred losses (historical costs) and traces them to premiums (units of output), providing the proper rate evaluation for the future balance sheet and net income statement.

The reserving and pricing actuaries may discover that cost accounting techniques, however, are not appropriate for their actuarial work. Due to the elements of risk and uncertainty inherent in insurance, historical loss patterns and loss costs are only considered the best estimates of loss reserves and pure premiums after appropriate actuarial analyses. Also, regulatory constraints in various jurisdictions, such as legislation or judicial decisions which prohibit recoupment, preclude a pure historical cost accounting analysis as a basis for ratemaking.

In an insurance company, actuaries often perform other duties besides those responsibilities of the pricing or reserving actuary. Before the beginning of a fiscal period, actuaries may participate in the corporate planning of budgeted goals for the forthcoming period. After the close of the period, a system of measurement is necessary to evaluate the performance of the respective departments in attaining their goals.

The "Analysis of Budget Variances" can be adapted to the planning activities of a casualty insurance company. Although other firms, such as manufacturing concerns, use this technique primarily to assign responsibility to various departments for variances from budgeted goals, its primary value for corporate management of an insurance company is the separation of the variances of expense components into price and quantity variances. This analysis provides the corporate planning actuary with a more detailed evaluation of a company's expense allocation system, which could be of value to the pricing actuary as well.

COST ACCOUNTING TERMINOLOGY

Before presenting examples of the budget analysis, some cost accounting terminology must be introduced.

Expense Allocation--The Contribution Method

The contribution method for the allocation of expenses is introduced in Roger Wade's paper "Expense in Ratemaking and Pricing."[2] This method of expense allocation separates and classifies the different expense components of the net income statement by product and line of business, as opposed to the traditional full absorption method of expense classification which details expenses by function.

A net income statement, prepared using both methods of expense allocation, is shown in Appendix A. Wade implies that the primary value of the contribution method is to evaluate alternate policies in a marginal situation through the maximization of the line of business contribution margin.[3] Another benefit of this expense allocation is an explicit separation of fixed and variable costs for expense analysis purposes. This cost component division is necessary to analyze budget variances.

The Budget

A budget is defined as a "detailed plan showing how resources will be acquired and used over some specific time interval,"[4] representing "a plan for the future expressed in formal quantitative terms."[5]

The pricing actuary recognizes the permissible or expected loss ratio as the budgeted expected losses as a percentage of one dollar of premium. The indicated rate change that the pricing actuary develops is a budget analysis of the adequacy of rates; the budgeted expenses (and profit)[6] are the complement of the expected loss ratio, while the actual incurred losses adjust the budget for the purposes of balancing the anticipated premium collected from the budgeted rates with the expected losses and budgeted expenses. Because losses are the most volatile portion of the premium dollar, the actuary maintains the other expenses as the budgeted fraction of the premium dollar, and shows how the historic adjusted losses compare with the budgeted losses.

For the underwriter, the budget is often expressed as total dollars of premium to be written at a future time. If the pricing actuary has accepted responsibility for the pricing budget, then the underwriter provides recommendations regarding the quantity of insurance to be written. This budgeted quantity, expressed as units of exposure, is obtained by dividing the total dollars of budgeted premium by the budgeted rate.

Standard Costs

A standard cost is defined as "the budgeted cost for one unit of product."[7] Different standard costs can have different measurement bases, with the appropriate base depending on the expense item being examined. For the total premium dollar, the standard cost base is the exposure unit, chosen as a medium which should vary with the hazard of loss, but is practical and preferably already in use.[8]

The exposure unit, however, may not be the medium that varies most directly with the level of expenses incurred. For example, a more appropriate standard cost measure to analyze the budget variances for salary might be number of hours worked rather than exposure units. Therefore, in the example shown in Appendix B, hours worked is the salary standard cost base applied due to accuracy considerations, although for practical purposes the exposure unit may be substituted.

Overhead Costs

Overhead costs, which are also known as indirect costs for an insurance company, are all costs not directly associated with the selling costs of an insurance product. Appendix A shows that overhead costs can be classified as variable overhead costs, such as product promotion, underwriting, marketing or actuarial, or fixed overhead costs, such as administration, marketing management, and building and maintenance.

THE ANALYSIS OF BUDGET VARIANCES

With the cost accounting terminology introduced, the "Analysis of Budget Variances" technique is presented.

Budget Variances--Variable Expenses

The total variance of actual results from expected results for variable expenses can be divided into price and quantity variances. Although cost accounting textbooks present this concept in terms of manufacturing companies,[9] this paper adapts the technique for a service industry such as insurance. The following

example introduces an analysis method for the variable expenses through the loss component, which is the most significant cost that varies directly with the earned premium of an insurance company.

Example

Insurance Company Management (ICM) has outlined a Master Budget for the year 1984. Based on discussions with the Underwriting Department, $1,400 of premium is planned to be written on January 1, 1984. The Actuarial Department, basing its recommendation on the rate indication, has budgeted a "standard price" for the rate at $1.00 per exposure. The actuaries have also agreed that the standard cost for losses, or expected loss ratio, for the 1,400 planned exposures ($1,400 ÷ $1.00 per exposure) is $.650, which will allow budgeted losses of $910.

After the close of the year, 1984 calendar year results show that 1,200 exposures were written at $.833 per exposure, for $1,000 of written and earned premium. The incurred losses have been posted at $700 for the year. The results follow:

Exhibit I
Total Variance Comparison

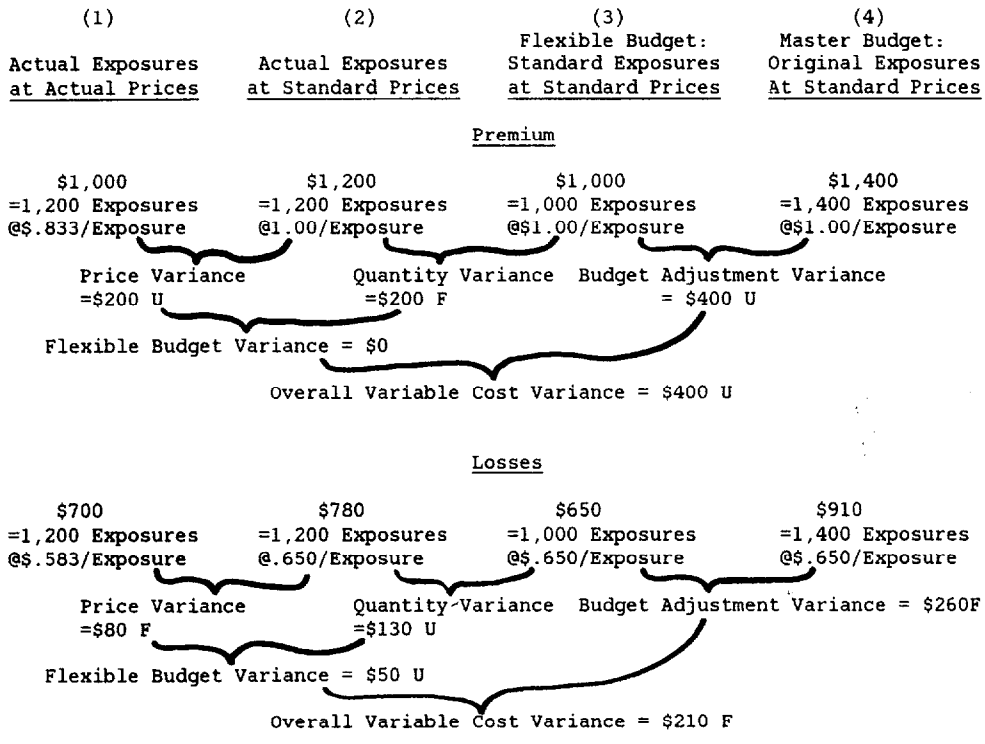
	(1) Master Budget	(2) Actual Results	(3) Variance*
Earned Premium	$1,400	$1,000	$400 U
Incurred Losses	910	700	210 F
Variable Gross Profit	$ 490	$ 300	$190 U

* The following notation is used throughout the paper:

U designates an Unfavorable Variance
F designates a Favorable Variance

The "flexible budget" has been developed by cost accountants to provide more information than the information presented in Exhibit I. Exhibit II presents the flexible budget, shown as Column (3) of Exhibit II, and several variable cost variances for the earned premium and incurred losses of this example. The foundation for the flexible budget, the concept of "standard exposures," is presented below. Once this concept is understood, the remaining variances are formulas which can be plugged to measure the price and quantity variances. Appendix C contains a graph of the variances.

Exhibit II
Analysis of Variable Cost Variances



Standard Exposures - Exhibit II

Originally, 1,400 exposures have been budgeted through the master budget to be written at $1.00 per exposure. However, since $1,000 of premium is the final amount of premium written, the expected number of written exposures associated with the actual premium, at the original budgeted price of $1.00, is 1,000 exposures (not 1,400). Restated, one would expect that the number of exposures written would have been 1,000, if the original budgeted price of $1.00 had been actually charged for the $1,000 of premium actually written. Therefore, the concept of "standard exposures" gives the budget some flexibility, because the quantity of standard exposures adjusts to the level of premium actually written.

The formula for standard exposures shows the flexibility:

$$\text{Standard Exposures} = \text{Actual Premium} \div \text{Standard Price} \qquad (1)$$

In this example,

1,000 Standard Exposures = $1,000 of Actual Written Premium ÷ $1.00 per Exposure, the Budgeted Rate

The original, master budgeted quantity of 1,400 exposures can be considered an original, independent assessment of the quantity to be written, while 1,000 exposures is the flexible budget's standard quantity, dependent on the actual premium written.

Price Variance - Exhibit II

The general formula for the price variance is:

Price Variance = Actual Exposures x (Actual Price - Standard Price) (2)

The specific formulas for premium and losses are as follows:

Price Variance = Actual Exposures x (Actual Changed Rate - Budgeted Rate) (2a)
for Premiums

and

Price Variance = Actual Exposures x (Actual Loss Ratio - Expected Loss Ratio) (2b)
for Losses

The price variance, therefore, is the revenue variance due to the difference in actual and expected prices (or costs) while holding the quantity constant at the level of actual quantity written.

Quantity Variance - Exhibit II

The general formula for the quantity variance is:

Quantity Variance = Standard Price x (Actual Exposures - Standard Exposures) (3)

The specific formulas for premium and losses are as follows:

Quantity Variance = Budgeted Rate x (Actual Exposures - Standard Exposures) (3a)
for Premiums

Quantity Variance = Expected Loss Ratio x (Actual Exposures - Standard Exposures) (3b)
for Losses

The quantity variance, likewise, is the revenue variance due to the difference in actual and standard quantity while holding the price (or cost) constant at the price (or cost) level originally budgeted.

Budget Adjustment Variance - Exhibit II

The general formula for the budget adjustment variance is:

(4) Budget Adjustment Variance = Standard Price x (Standard Exposures - Original Exposures)

This variance is the revenue variance due to the difference in the standard quantity, flexibly adjusted for actual premium written, and the original budgeted quantity, while holding the price (or cost) constant at the price (or cost) level originally budgeted. It is also the difference between the flexible budget's revenue components and the master budget's revenue components.

The specific formulas for premiums and losses are as follows:

$$\text{Budget Adjustment Variance for Premiums} = \text{Budgeted Rate} \times (\text{Standard Exposures} - \text{Original Exposures}) \quad (4a)$$

$$\text{Budget Adjustment Variance for Losses} = \text{Expected Loss Ratio} \times (\text{Standard Exposures} - \text{Original Exposures}) \quad (4b)$$

Flexible Budget Variance - Exhibit II

The flexible budget variance is the net effect of the price and quantity variances, obtained as follows:

$$\text{Flexible Budget Variance} = \text{Price Variance (2)} + \text{Quantity Variance (3)} \quad (5)$$

Overall Variable Cost Variance - Exhibit II

The overall variable cost variance is as follows:

$$\text{Overall Variable Cost Variance} = \text{Flexible Budget Variance (5)} + \text{Budget Adjustment Variance (4)} \quad (6)$$

Uses of the Flexible Budget

The flexible budget is a budget tailored to actual results, built to a level using standard costs. The flexible budget, column (3), is the primary benchmark for performance appraisal, while the budget adjustment variance, which reflects the master budget, can be considered a measure of the effectiveness of the operation. ICM's failure to reach the attainable level of $1,400 of premium written, targeted by the master budget, shows ineffective operation. The extent of the ineffectiveness of the operation is indicated through the $400 unfavorable budget adjustment variance for the premium. However, once the actual level of premium written is accepted, the efficiency of the operation may be considered favorable as indicated by the favorable quantity variance ($200) associated with the premium.

Exhibit II shows that the flexible budget concept for variable costs can be adapted for revenue, although cost accounting textbooks do not display revenue in this manner. Due to the nature of the flexible budget, price and quantity variances for premium will always net to zero. This fact does not render that exercise useless, as the variable gross profit variances, obtained by subtracting the loss variance from the premium variance, may be a valuable tool in explaining results to non-actuaries.

The separation of the flexible budget variance into price and quantity variances can offer additional insight into cash-flow underwriting practices. Cash-flow underwriting, through the Analysis of Budget Variances, is considered profitable when a favorable quantity variance, with its guaranteed positive variable gross profit, combines with an attractive investment environment to compel the profit seeker to overlook the unfavorable price variance which is likely to occur. Exhibit II shows that the $80 favorable price variance for losses could not overcome the $200

unfavorable price variance associated with the premium, which was necessary in order to attract the additional business.

The separation of the flexible budget variance into price and quantity components does not imply the absence of a price and volume relationship. Economic theory, through the ideas of supply, demand and elasticities, demonstrates that the price and quantity of a product are related. The flexible budget is a method to measure the sensitivity of the price and volume trade-offs, which Wade discusses in his paper.[10]

As explained above, the assignment of responsibilities for the price and quantity variances is the primary use of this system for manufacturing firms. Although the assignment of responsibility for some expenses may be realistic, the applicability of the responsibility assignment for the loss component of the price variance is questionable. First, an unfavorable variance may not necessarily be "bad"; reserve strengthening may produce an unfavorable variance but be warranted. Secondly, the multitude of forces that impact incurred losses, such as claims awarding, loss control, and reserving practices, obviate the assignability of a variance to one certain department or person. For the loss component of the price variance, its complex nature compels a more detailed investigation into its nature before the assignment of responsibility.

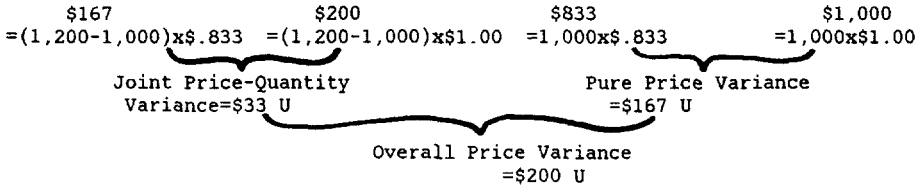
Pure Price Variance

Exhibit II shows the price variance as the difference between columns (1) and (2). The price variance, in addition, can be divided into two more variances. Exhibit III presents the price variances of Exhibit II, separated into additional variances. Appendix D contains a graph of these variances.

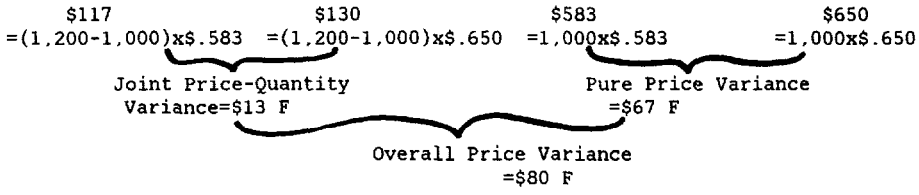
Exhibit III
Analysis of Price Variance

(1) (Actual Exposures minus Standard Exposures) at Actual Prices	(2) (Actual Exposures minus Standard Exposures) at Standard Prices	(3) Standard Exposures at Actual Prices	(4) Flexible Budget: Standard Exposures at Standard Prices

Premium



Losses



The general formula for the price variance, as stated in formula (2), is:

Price Variance = Actual Exposures x (Actual Price - Standard Price) (2)

A pure price variance can be calculated as follows:

Pure Price Variance = Standard Exposures x (Actual Price - Standard Price) (7)

A joint price-quantity variance is defined as:

$$\text{Joint Price-Quantity Variance} = \{\text{Actual Exposures} - \text{Standard Exposures}\} \times \{\text{Actual Price} - \text{Standard Price}\} \quad (8)$$

The sum of formulas (7) and (8) equal the price variance, formula (2), which is apparent from the formulas.

The pure price variance, therefore, is the revenue variance due to the difference in actual and expected prices (or costs), while holding the quantity constant at the level of expected quantity written. This variance is more pure than the price variance, which holds the quantity at the level of actual quantity written.

This additional procedure may be unnecessary, as the overall price variance is a method of recognizing that the actual exposures written will impact the price of a product through supply and demand elasticities.

The remaining specific formulas for premium and losses, which produce Exhibit III, are as follows:

$$\text{Pure Price Variance for Premium} = \text{Standard Exposures} \times \{\text{Actual Charged Rate} - \text{Budgeted Rate}\} \quad (7a)$$

$$\text{Pure Price Variance For Losses} = \text{Standard Exposures} \times \{\text{Actual Loss Ratio} - \text{Expected Loss Ratio}\} \quad (7b)$$

$$\text{Joint Price-Quantity Variance for Premium} = \{\text{Actual Exposures} - \text{Standard Exposures}\} \times \{\text{Actual Charged Rate} - \text{Budgeted Rate}\} \quad (8a)$$

$$\text{Joint Price-Quantity Variance for Losses} = \{\text{Actual Exposures} - \text{Standard Exposures}\} \times \{\text{Actual Loss Ratio} - \text{Expected Loss Ratio}\} \quad (8b)$$

Budget Variances--Fixed Expenses

The fixed costs are budgeted and monitored through a different analysis of variance technique than the procedure described for the variable costs. The specific technique, called fixed-overhead application, requires the development of a fixed-overhead rate which will be used to monitor the fixed costs throughout the budget period. This rate is computed by dividing the budgeted dollar level of fixed costs by the best measure of capacity over the budget period. This measure is called the denominator level.[11]

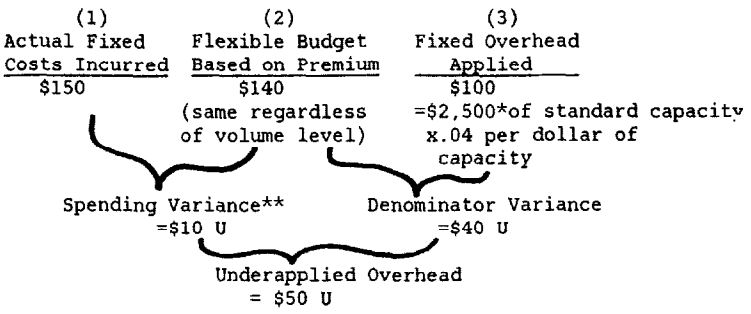
One insurance definition of capacity is "the total premium volume a single multiple-line insurer can write for all lines of insurance."[12] As long as a Kenney-type rule of the ratio of net written premium to policyholders' surplus is followed, the choice for an appropriate denominator level is facilitated.

Example

ICM's master budget for 1984 includes $140 of fixed costs. Corporate management has chosen to adhere to the Kenney rule, which states that capacity equals twice the level of policyholders' surplus.[13] At December 31, 1983, policyholders' surplus is $1,750, producing a denominator level of $3,500. The fixed overhead rate is set at .04($140 ÷ $3,500) per dollar of capacity.

On December 31, 1984, the net income statement shows $150 of fixed costs were incurred, and $1,000 of premium was written. Exhibit IV shows the Fixed Costs Analysis of Budget Variances.

Exhibit IV
Fixed Costs Analysis of Budget Variances



*Since $1,400 of premium was allowed in the master budget for $3,500 of capacity, then $1,000 of "good output" of premium actually written produces standard capacity of $2,500 (($1,000 ÷ $1,400) x $3,500 = $2,500).

**The spending variance is the budget variance.

Uses of Fixed-Overhead Analysis

The fixed costs variance analysis does not have an explicit quantity variance, as fixed costs are presumed to be constant over a range of volume levels. Column (2) is called a flexible budget because the $140 was selected as the best flexible measure of fixed costs over that range of volume levels.

The denominator variance, which replaces the quantity variance for fixed costs analysis purposes, is an approximate measure of the efficiency of production. This firm has been inefficient in its production, as the amount of premium actually written is on the low end of the range of volume levels.

Wade warns that one of the potential misapplications of the contribution method of allocation of expenses is in the treatment of the fixed costs.[14] The contribution method is an appropriate technique to compare alternate policies in a marginal situation only when fixed costs truly remain "fixed" over the analysis period.

The spending variance, and the causes for its balance, should be examined to discover the true reason for any observed changes in fixed costs. Although Wade indicates that changes in the volume of business can affect the level of fixed costs, other factors such as inflation or poor cost estimation methods can produce unanticipated fixed cost differences.

Committed fixed costs, including depreciation, real estate taxes, and insurance,[15] are likely to be independent of short-term changes in volume. For example, an unanticipated increase in property tax assessments could produce an unfavorable spending variance, but would not likely be produced due to a change in volume. Discretionary costs, which are budgeted fixed costs due to short-term decisions, are more likely to be incurred due to growth reasons. Here, a recent surge in premium writings might encourage a company to undertake a management development program which it might not have afforded in the absence of the change in volume.

These above examples illustrate that the contribution method of allocation of expenses is not rendered an inappropriate comparison measure of alternatives, if the fixed-overhead budget analysis reveals that the variances occurred for reasons other than expanding capacity.

CONCLUSION

This paper has presented a technique which can evaluate the variances of the actual results from those expected for all the components of the net income statement. Price and quantity variances, which can be produced for the premium and variable cost components, may have some applications for the assignment of responsibilty. The fixed costs analysis provides a more detailed evaluation of a company's expense allocation system, which could be of value to the pricing actuary as well as the corporate planning actuary.

APPENDIX A
Net Income Statement Comparison[16]

Full Absorption Method

Earned Premiums		$200
Incurred Losses	$100	
Loss Adjustment Expenses Incurred	$ 30	
Commissions Incurred	$ 24	
Other Acquisition Expenses Incurred	$ 8	
General Expenses Incurred	$ 20	
Taxes, Licenses and Fees Incurred	$ 6	
Net Income		$ 12

Contribution Method

Earned Premiums		$200
Loss and Loss Adjustment Expenses Incurred (Variable Cost of Goods Sold)	$130	
Variable Gross Profit		$ 70
Commissions Incurred	$ 24	
Other Acquisition Expenses Incurred	$ 28	
Premium Taxes	$ 5	
Other Variable Costs Associated with Product (10% of General Expenses)	$ 2	
Variable Profit (Distribution Contribution Margin)		$ 31
Variable Overhead Expenses* (50% of General Expenses)	$ 10	
Line of Business Contribution Margin		$ 21
Fixed Overhead Expenses** (40% of General Expenses)	$ 8	
Other Taxes	$ 1	
Line of Business Profit/Net Income		$ 12

* Indirect Costs - Variable and Not Directly Associated with Product.
** Indirect Costs - Fixed and Not Directly Associated with Product.

APPENDIX B

This Appendix contains examples of standard cost bases other than exposure units to measure variable cost budget variances.

Examples--Hourly Wages and Number of Policies

A data processing department of an insurer has a clerical staff which is paid an hourly wage. In order to monitor the budget for clerical salaries, a standard cost system based on hourly wages is maintained.

This same insurer is also concerned with the General Expenses of the Other Underwriting Expenses shown on Part 1 of the Investment Income Exhibit. In particular, Items 3 through 17 are the itemized expenses to be monitored. All of these expenses have been deemed variable overhead by this insurer. The clerical salaries, to be examined in another standard cost base, are removed from these expenses. The standard cost for this group of expenses is number of policies written.

For 1984, the clerical salaries are budgeted for $100,000, composed of 20,000 hours at $5.00 per hour. The Other Underwriting Expenses are budgeted for $150,000, with 500 policies planned at a cost of $300 per policy. Budgeted earned premium for 1984 is $1,000,000.

Actual 1984 results show that 480 policies were written and $900,000 of earned premium was posted. Union negotiations have raised the clerical hourly wage to $5.20, and 17,000 hours have been worked by the clerical staff. The Other Underwriting Expenses actually incurred total $139,200.

Exhibits B-I and B-II show the Analysis of Budget Variances for clerical salaries and Other Underwriting Expenses, respectively.

Exhibit B-I

Salaries: Analysis of Budget Variances

(1)	(2)	(3)	(4)
Actual Exposures at Actual Prices	Actual Exposures at Standard Prices	Flexible Budget: Standard Exposures at Standard Prices	Master Budget: Original Exposures at Standard Prices
$88,400 =17,000 hours @$5.20 per hour	$85,000 =17,000 hours @$5.00 per hour	$90,000 =18,000* hours at @$5.00 per hour	$100,000 =$20,000 hours at @$5.00 per hour
	Price Variance =$3,400 U	Efficiency Variance =$5,000 F	
	Flexible Budget Variance = 2,600 F		Budget Adjustment Variance = $10,000 F

*18,000 hours = $1 of clerical salaries allowed for $10 of earned premium ("good output"), so $900,000 of earned premium allows $90,000 of clerical salaries, and $90,000 ÷ $5.00 per hour = 18,000 hours.

Exhibit B-II

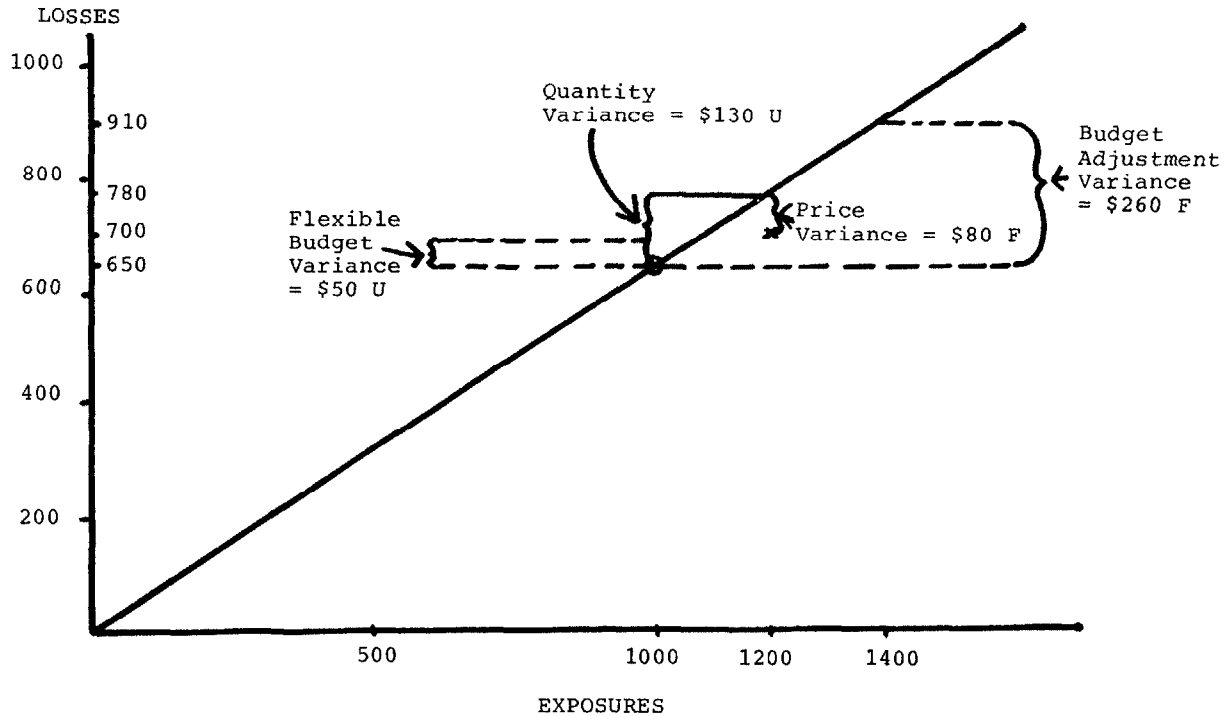
Other Underwriting Expenses: Analysis of Budget Variances

(1)	(2)	(3)	(4)
Actual Exposures at Actual Prices	Actual Exposures at Standard Prices	Flexible Budget: Standard Exposures at Standard Prices	Master Budget: Original Exposures at Standard Prices
$139,200 =480 policies at $290 per policy	$144,000 =480 policies at $300 per policy	$135,000 =450* policies at $300 per policy	$150,000 =500 policies at $300 per policy
	Price Variance =$4,800 U	Efficiency Variance =$9,000 F	
	Flexible Budget Variance = 4,200 U		Budget Adjustment Variance = $15,000 F

*450 policies = $15 of Other Underwriting Expenses allowed for $100 of earned premium ("good output"), so $900,000 earned premium allows $135,000 of Other Underwriting Expenses as a standard cost, and $135,000 ÷ $300 per policy = 450 policies.

APPENDIX C

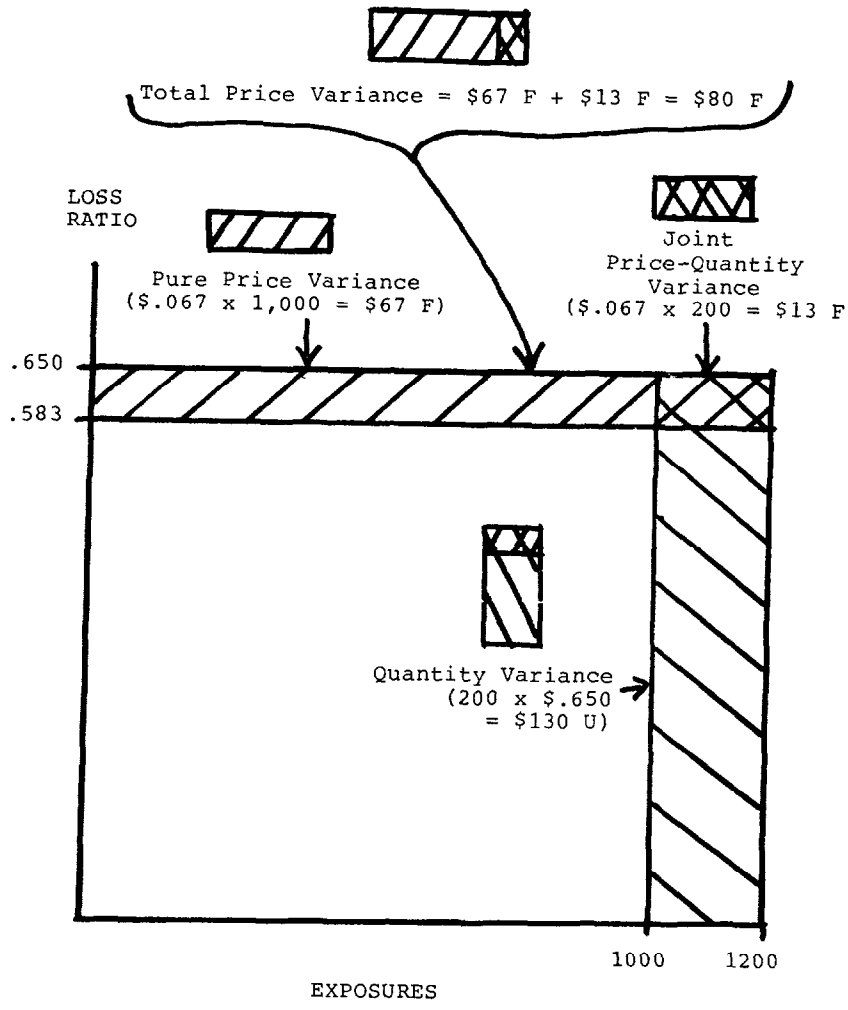
Graph of Variable Cost Variances



x = Actual Losses Point of $700
o = Standard Losses Point of $650

APPENDIX D

Graph Illustrating Pure Price Variance



FOOTNOTES

1. Charles T. Horngren, Cost Accounting: A Managerial Emphasis, 4th ed. (Englewood Cliffs, NJ: Prentice-Hall, Inc., 1977), p.4.
Much of the general techniques for this paper are found in chapters 7 through 10 of this reference.

2. Roger C. Wade, "Expense Analysis in Ratemaking and Pricing," PCAS Vol. LX, 1973.

3. Ibid., p.1.

4. Ray H. Garrison, Managerial Accounting, 3rd ed. (Plano, Texas: Business Publications, Inc., 1982), p. 288.
Additional material for this paper, very similar to Horngren's, was gathered in chapters 8-10.

5. Ibid.

6. Explicit considerations for investment income and underwriting profit can embellish this method, but are ignored for the purposes of this paper.

7. Garrison, p.347.

8. Paul Dorweiler, "Notes on Exposures and Premium Bases," PCAS Vol. LVIII, 1971, p.60.

9. See Footnotes [1] and [4].

10. Wade, p.6.

11. Horngren, p.265

12. Robert I. Mehr, "Insurance Capacity: Issues and Perspectives," Issues in Insurance, Volume 1 (Malvern, PA: American Institute for Property and Liability Underwriters, 1981), p.318.

13. Ibid., p.321.

14. Wade, p.9.

15. Garrison, p.154.

16. This example was based on Wade's of p.5.