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Break-even analysis revisited: the need to adjust for profitability, the collection rate and autonomous income

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This paper modifies traditional break-even analysis and develops a model that reflects the influence of variation in payer mix, the collection rate, profitability and autonomous income on the desired volume alternative. The augmented model indicates that a failure to adjust for uncollectibles and the net surplus results in a systematic understatement of the desired volume alternative. Conversely, a failure to adjust for autonomous income derived from the operation of cafeterias, gift shops or an organization's investment in marketable securities produces an overstatement of the desired volume. In addition, this paper uses Microsoft® Excel to develop a spreadsheet that constructs a pro forma income statement, expressed in terms of the contribution margin. The spreadsheet also relies on the percentage of sales or revenue approach to prepare a balance sheet from which indicators of fiscal performance are calculated. Hence, the analysis enables the organization to perform a sensitivity analysis of potential changes in the desired volume, the operating margin, the current ratio, the debt: equity ratio and the amount of cash derived from operations that are associated with expected variation in payer mix, the collection rate, grouped by payer, the net surplus and autonomous income.

Introduction

Break-even analysis (BEA) is a cost accounting method commonly used to develop short-term plans and to assess the influence of volume on costs and revenue, a feature that enables an organization to identify the volume alternative that ensures total revenue is equal to total cost. Focusing on capitated arrangements, Finkler (1995) applied BEA to the problem of estimating the size of an insured population that enables the facility to earn revenues that exceed total costs by an amount equal to a desired net surplus. As commonly presented, however, the break-even volume is unadjusted for autonomous income or bad debts and other sources of uncompensated care. As demonstrated in this paper, a failure to adjust for the desired net surplus and uncompensated care results in

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an underestimation of the desired volume, whereas a failure to incorporate autonomous income results in an overestimate of the desired volume.

Closely related to BEA is the contribution margin, defined as the difference between total revenue and total variable cost. As commonly presented, the break-even volume is given by the ratio of fixed costs to the contribution margin per unit (i.e. price or revenue per unit less average variable cost). As described by Margriff (1989) and Horowitz (1993), the contribution margin enables management to reach fundamental decisions regarding operating activity and to assess the fiscal viability of plans to alter the service mix.

In addition, the contribution margin might be used to assess the decision to continue or discontinue operations that result in a net loss. In particular, if the provision of a given service or product line results in a net loss and the related contribution margin is positive, total variable costs and a portion of fixed costs are recovered by revenue-generating activity. Accordingly, it is financially prudent to continue operations, recognising that the potential losses during the planning period are equivalent to the portion of fixed costs that the organization does not expect to recover by operations. Conversely, if the contribution margin is negative, the organization expects to recover only a portion of total variable costs and none of the fixed costs, implying that, by discontinuing activity, the organization limits the net loss to the amount of fixed costs.

This paper has two purposes, focusing on BEA as a mechanism that might be used to develop short-term plans. The first objective is to modify the traditional model by incorporating the need to earn a desired net surplus, autonomous income, represented by non-operating and other operating income, bad debts and a weighted average price that depicts the payer mix of the organization. The second objective is to construct a spreadsheet that enables the organization to develop a pro forma income statement that is expressed in terms of the contribution margin. Using the percentage of sales or revenue approach, the spreadsheet also constructs a balance sheet from which indicators of fiscal performance are calculated. As described in this paper, the spreadsheet also enables the organization to perform sensitivity analysis and assess changes in fiscal performance resulting from changes in payer mix, the bad debt rate, autonomous income and variation in the volume of service.

The break-even model

Consistent with the simplest form of BEA, the total cost function is of the linear form:

$$\mathrm{TC} = b_0 + b_1 V, \tag{1.1}$$

where b_0 represents total fixed cost, b_1 corresponds to variable costs per unit and $b_1 V$ is the amount of total variable costs. As is well known, estimates of total fixed costs and the variable cost per unit might be obtained by the high-volume–high-cost, low-volume–low-cost method, the method of semi-averages or regression analysis. Similarly, the total revenue function is expressed by:

$$\mathrm{TR} = PV, \tag{1.2}$$

where P represents price and V is volume. Equations 1.1 and 1.2 can be combined to obtain the break-even volume, V^*, which is given by:

$$V^* = \frac{b_0}{(P - b_1)} \tag{2.1}$$

In this case, the denominator is the contribution margin per unit and indicates the amount that each unit contributes toward the payment of fixed costs. Adopting the approach suggested by Finkler (1995), the net surplus, represented by π, is regarded as a return that must be recovered by the organization, suggesting that the desired volume alternative is obtained by:

$$V_\pi = \frac{(b_0 + \pi)}{(P - b_1)} \tag{2.2}$$

Accordingly, holding price, total fixed costs and variable costs per unit constant, the inclusion of the desired net surplus in the analysis implies that V_π must exceed V^*.

Multiple payers rely on one of several payment systems, prices and units of payment to finance the care provided by the typical health organization. Suppose that payer mix of the organization is identified by the indices $1, \ldots, i, \ldots n$. Further, let P_i and $\mathrm{Prop}(R_i)$ correspond to the price and proportion of revenue derived from the ith payer, respectively. The average weighted price GAP, derived from the

payer mix of the organization may be expressed in the form:

$$\text{GAP} = \Sigma\ \text{Prop}(R_i)P_i \tag{3.1}$$

Equation 3.1 indicates that the slope of the revenue function and, hence, the break-even volume is related to variation in price and the payer mix of the health service organization. For example, suppose the distribution in Table 1 depicts the payer mix of the provider.

By contrast, if the organization derives 60% of operating revenues at a price of US$120 from insurer A and 40% of revenues at a price of US$100 from insurer B, the average weighted price is only US$112 per unit of service. Accordingly, relative to the first distribution, the slope of the revenue function derived for the second set of data rotates in clockwise direction, implying that the break-even volume must increase. Hence, after adjusting for payer mix, the break-even volume may be expressed in the form:

$$V = \frac{b_0}{\{[\Sigma\ \text{Prop}(R_i)P_i] - b_1\}} \tag{3.2}$$

In this case, the expression $[\Sigma\ \text{Prop}(R_i)\ P_i] - b_1$ represents the contribution margin per unit of service, after adjusting for payer mix.

As indicated by Clement *et al.* (1997), Duffee and Friedman (1993), McCue (1991), and Kane (1991), a reliable and accurate evaluation of fiscal performance requires an estimate of revenues, expressed in terms of net realisable cash value, and expenses expressed in terms of net cash disbursements. Accordingly, the revenue function should be adjusted for payer mix and the collection rate. In the following, let $P(B_i)$ correspond to the expected bad debt rate associated with one of the n payers such that $1 - P(B_i)$ represents the corresponding collection rate. Hence, the average weighted price, adjusted for variation in the collection rate, NAP, may be expressed in the form:

$$\text{NAP} = \Sigma[1 - P(B_i)]\,[\text{Prop}(R_i)]P_i \tag{3.3}$$

Table 1

Insurer	Prop(R_i)	P_i	Weighted Price
A	4	US$100	US$40
B	6	US$130	US$78
Weighted Average Price			US$118

Consequently, the revenue function, expressed in terms of net realisable cash value, is given by:

$$\text{TR} = \{\Sigma[1 - P(B_i)]\,[\text{Prop}(R_i)]P_i\}V \tag{3.4}$$

Other factors remaining constant, an increase in the value of B_i reduces the collection rate, the net realisable cash value of revenue generating activity and the slope of the revenue function, implying that the break-even volume must increase. Further, as the values B_i decrease, the value of $1 - P(B_i)$ approaches one, and consequently, the adjusted revenue function approaches its unmodified counterpart.

After adjusting for the projected value of uncompensated care, the desired volume might be expressed in the form:

$$V_{\text{bd}} = \frac{b_0}{\{\Sigma[(1 - P[B_i])(\text{Prop}[R_i])P_i] - b_1\}} \tag{3.5}$$

Recognising that the fiscal viability of the organization is contingent on earning the desired net surplus, it can be shown that Equation 2.2 may be modified to obtain:

$$V_{\pi,\text{bd}} = \frac{(b_0 + \pi)}{\{\Sigma[1 - P[B_i])(\text{Prop}[R_i])P_i] - b_1\}} \tag{3.6}$$

As indicated, Equation 3.6 enables the organization to derive the desired volume after adjusting for the desired net surplus, π, the set of bad debts, represented by $1 - P(B_i)$ the distribution of payers, measured by Prop(R_i) and variation in rates of compensation, P_i.

The final adjustment in BEA that is explored in this paper reflects the influence of autonomous income on total revenue and fiscal performance. For purposes of presentation, autonomous income, represented by a_0, is defined as revenues that are derived from activities other than the provision of patient care. For example, the health service organization may derive non-operating income from an investment in marketable securities, and other operating revenues from the operation of a gift shop or the sale of laboratory or dietary services to another health organization. After adjusting for autonomous income, the revenue function might be expressed in the form:

$$\text{TR} = a_0 + \{\Sigma[1 - P(B_i)]\,[\text{Prop}(R_i)]P_i\}V \tag{3.7}$$

The inclusion of autonomous income raises the intercept of the revenue function, an outcome that, holding other factors constant, must reduce the desired volume. As can be easily

verified, the target volume derived from Equation 3.7 is given by:

$$V_a = \frac{[(b_0 + \pi) - a_0]}{\{\Sigma(1 - P[B_i])(\text{Prop}[R_i])P_i] - b_1\}} \qquad (3.8)$$

Therefore, Equation 3.8, identifies the volume alternative that, after adjusting for payer mix, the collection rate and autonomous income, enables the organization to earn the desired net surplus.

The contribution margin and financial statements

As indicated, the contribution margin is defined as the difference between total revenue and total variable costs. After adjusting for autonomous income, the desired net surplus and the collection rate, the contribution margin that defines the break-even volume satisfies:

$$a_0 + \{\Sigma(1 - P[B_i])(\text{Prop}[R_i])P_i\}V - b_1V = b_0 + \pi \qquad (4.1)$$

Similarly, the expression:

$$[a_0 + \{\Sigma(1 - P[B_i])(\text{Prop}[R_i])P_i\}V - [b_1V + b_0] > 0 \qquad (4.2)$$

represents a forecast of the net surplus, while:

$$a_0 + \{\Sigma(1 - P[B_i])(\text{Prop}[R_i])P_i\}V - [b_1V + b_0] < 0 \qquad (4.3)$$

provides a projection of a potential loss. Equations 4.2 and 4.3 indicate that forecasts might be summarized by an income statement expressed in a format similar to that set out below:

	Gross patient revenue
Less	*Uncollectibles*
	Net patient revenue
Less	*Total variable costs*
	Contribution margin
Less	*Total fixed costs*
	Net gain or loss
	Autonomous income
	Net surplus or loss

If the desired net profit is eliminated from the calculations, the model permits management to perform a sensitivity analysis of the influence that is expected to result from potential variation in volume on the net surplus or loss.

When combined with the projected income statement, the percentage of sales or revenue method enables the organization to develop projections of items that appear in the balance sheet. The percentage of sales method might be expressed in the general form:

$$B_j = (\text{Pct}_j)[\Sigma(1 - P[B_i]\text{Prop}[R_i])P_i]V \qquad (5)$$

In equation 5, B_j corresponds to one of several items that is estimated from projected revenues and appears in the balance sheet. Excluding discretionary financing, such as notes payable and long-term debt, the approach is commonly applied to the problem of estimating assets and liabilities that vary directly with the level or rate of generating income. On the basis of historic data or the judgement of management, the coefficient Pct_j expresses the balance sheet item as a percentage or proportion of patient revenue. The final term represents the forecast of revenue, after adjusting for payer mix and uncollectibles.

The spreadsheet

Table 2 shows hypothetical data depicting daily revenue and payer mix. The average weighted price, GAP, is represented by gross daily revenue in Table 2 and was obtained by applying Equation 3.1 to the hypothetical data. These calculations indicate that, in the absence of an adjustment for uncompensated care, the organization expects to receive a weighted average of approximately US$178.75 for each day of care rendered during the planning period. Listed in Table 2 is a set of data that depict the bad debt rate for each source of payment. On the basis of these data, it can be easily verified that the expected collection rate for sources A, B, C and D is 0.95, 0.92, 0.99 and 0.96, respectively. As indicated in the spreadsheet, expected net daily revenue per day of approximately US$167.51 is given by Equation 3.3, represented in the spread sheet by the sum of products among the values appearing in the last two columns of Table 2.

Table 3 summarizes the net and gross daily revenue, the autonomous income the organization expects to derive from its portfolio or other operating activities, and the desired net surplus. In terms of the illustration, it is assumed that the organization expects to earn autonomous income, a_0, amounting to US$10 000 and desires a net surplus of US$90 000. The data also indicate that the organization expects fixed costs, b_0, of US$1 900 000 and variable costs amounting to US$130 per day.

Table 2 *Basic data*

Revenue data source	Daily revenue	Payer mix	Gross daily revenue	Bad debt rate	Net daily revenue
A	US$180.00	0.10	US$18.00	0.05	US$17.10
B	US$175.00	0.60	US$105.00	0.08	US$96.60
C	US$190.00	0.05	US$9.5	0.01	US$9.41
D	US$185.00	0.25	US$46.25	0.04	US$44.40
Total			US$178.75		US$167.51

On the basis of the data presented in Table 2, the break-even or desired volume and the contribution margin for each of four scenarios are calculated in Table 4. In this case, the illustration focuses on values calculated for the traditional model (i.e. unadjusted for profit, bad debt and autonomous income). After adjusting for payer mix, the break-even volume derived for the traditional model was calculated in accordance with Equation 3.2, while the volume alternative that reflects the adjustment for bad debts was derived by applying Equation 3.5 to the hypothetical data. Similarly, Equation 3.6 was used to identify the desired volume that reflects the adjustment for bad debts and the desired net surplus, while the desired volume, adjusted for bad debts, the desired surplus and autonomous income, was calculated by applying Equation 3.8 to the data. The results indicate that, relative to the basic model, a failure to adjust for uncollectibles results in an understatement of the desired rate of activity amounting to 30% (i.e. [50 660/38 974] × 100), whereas a failure to adjust for bad debts and the desired net surplus results in an understatement of the target volume amounting to 37% (i.e. [53 060/38 974] × 100). The data also indicate that, when autonomous income is incorporated in the analysis, the traditional model understates the desired volume by 35% (i.e. [52 793/38 974] × 100). Further, the spreadsheet indicates that the unmodified BEA and related understatement of the desired volume results in a lower contribution margin than is forecast by the adjusted approaches.

Table 3 *Daily revenues, autonomous income, net surplus and costs*

Net revenue per day	US$167.51
Gross revenue per day	US$178.75
Autonomous income	US$10 000.00
Desired net surplus	US$90 000.00
Cost data	
Fixed costs	US$1 900 000.00
Variable cost per day	US$130.00
Depreciation expense	US$100 000.00
Current balance: equity	US$1 700 000.00

Consistent with Equations 4.1, 4.2 and 4.3, the pro forma income statements derived from the traditional and adjusted models are presented in Table 5. On the basis of the calculations derived from the unmodified model, the results indicate that anticipated gross revenues of US$6 966 666.67 less expected variable costs that amount to US$5 066 666.67 yields a contribution margin of US$1 900 000.00; and, in the absence of an adjustment for bad debts, the organization might expect to break even. However, Table 5 also indicates that, after adjusting for anticipated uncompensated care, the projected net income amounts to only US$6 528 400.00 (i.e. the product of the net payment per day of US$167.51 and the volume alternative of 38 974 days) and that an application of the traditional model, without an adjustment for uncompensated care, results in a volume alternative that produces a contribution margin of only US$1 461 733.33 and — given fixed costs of US$1 900 000 — a net loss of US$438 266.67, an amount equivalent to the provision for uncompensated care.

By contrast, Table 5 suggests that after adjusting for uncompensated care, net patient revenues amounting to US$8 485 788.56 are expected. When compared to variable costs of $6 585 788.56, the income statement indicates that the contribution margin is equal to expected fixed costs, implying that, if 5066 days of care are provided, the organization will break-even during the operating period. As expected, an application of the model that is adjusted for the desired net surplus and the provision for uncompensated care results in a contribution margin of $1 990 000 and, given fixed costs of US$1 900 000, an excess of revenues relative to costs that amounts to

Table 4 *Break-even volume and the contribution margin*

	Unadjusted break-even	Adjusted for bad debt	Adjusted for bad debt and the net surplus	Adjusted for autonomous income, net surplus and bad debt
Desired volume in days	38 974.00	50 660.00	53 060.00	52 793.00
Percentage of traditional model		1.30%	1.36%	1.35%
Contribution margin	US$1 461 733.33	US$1 980 000.00	US$1 980 000.00	US$1 980 000.00
Percentage of traditional model		1.30%	1.36%	1.35%

US$90 000. Finally, after adjusting for autonomous income, uncompensated care and the desired net surplus, the model indicates that, if 52 793 days of care are provided, the organization expects a contribution margin of US$1 980 000, a gain on operations amounting to $80 000 which, when combined with autonomous income of US$10 000, results in an anticipated net surplus of US$90 000.

Equation 5 was applied to the projected amount of net patient revenue listed in the income statement to derive the balance sheet that appears in Table 6. The illustration assumes that the organization expects a balance in the note payable account of US$120 000 and long-term liabilities amounting to US$1 250 000. The discretionary funding listed in the balance sheet is an amount that ensures the equality of projected assets and sources of expected financing. As indicated, the unmodified model results in projections of assets, liabilities and the balance of the unrestricted equity account that are less than those derived by the modified approaches. The results also indicate that the traditional approach understates the amount of additional funding that the organization requires by approximately 50% or more.

Finally, Table 7 lists common indicators of fiscal performance for each of the models. The operating margin is defined as the ratio of the gain or loss on operations relative to net patient revenue while the current ratio measures the relation of current assets to current liabilities. The long-term debt: equity ratio is used to measure capital structure where, as described in the discussion of Table 6, the anticipated balance of the unrestricted equity account is obtained by the sum of the current balance and the net surplus that is anticipated during the planning period. The illustration also assumes that depreciation expense is the only non-cash item appearing in the income statement. Consequently, the net cash flow derived from operations is given by the sum of the net

Table 5 *The income statement*

	Unadjusted break-even	Adjusted for bad debt	Adjusted for bad debt and the net surplus	Adjusted for autonomous income, net surplus and bad debt
Gross patient revenue	US$6 966 666.67			
Less uncollectibles	US$438 266.67			
Net patient revenue	US$6 528 400.00	US$8 485 788.56	US$8 887 746.97	US$8 843 084.92
Total variable cost	US$5 066 666.67	US$6 585 788.56	US$6 897 746.97	US$6 863 084.92
Contribution margin	US$1 461 733.33	US$1 900 000.00	US$1 990 000.00	US$1 980 000.00
Less fixed costs	US$1 900 000.00	US$1 900 000.00	US$1 900 000.00	US$1 900 000.00
Gain on operations	−US$438 266.67	0	US$90 000.00	US$80 000.00
Autonomous income	0	0	0	US$10 000.00
Net surplus (loss)	−US$438 266.67	0	US$90 000.00	US$90 000.00

Table 6 *The balance sheet*

	Percentage of net patient revenue	Unadjusted break-even	Adjusted for bad debt	Adjusted for bad debt and the net surplus	Adjusted for autonomous income, net surplus and bad debt
Assets					
Current assets	0.45%	US$2 937 780.00	US$3 818 604.853	US$3 999 486.14	US$3 979 388.21
Net Fixed assets	0.30%	US$1 958 520.00	US$2 545 736.57	US$2 666 324.09	US$2 652 925.48
Total assets		US$4 896 300.00	US$6 364 341.42	US$6 665 810.23	US$6 632 313.69
Liabilities					
Accounts payable	0.15%	US$979 260.00	US$1 272 868.28	US$1 333 162.05	US$1 326 462.74
Accrued expenses	0.12%	US$783 408.00	US$1 018 294.63	US$1 066 529.64	US$1 061170.19
Notes payable		US$120 000.00	US$120 000.00	US$120 000.00	US$120 000.00
Total current liabilities		US$1 882 668.00	US$2 411 162.91	US$2 519 691.68	US$2 507 632.93
Total long-term liabilities		US$1 250 000.00	US$1 250 000.00	US$1 250000.00	US$1 250 000.00
Discretionary funding needs		US$501 898.67	US$1 003 178.51	US$1 106118.54	US$1 084680.76
Total liabilities		US$3 634 566.67	US$4 664 341.42	US$4 875 810.23	US$4 842 313.69
Unrestricted equity		US$1 261 733.33	US$1 700 000.00	US$1 790 000.00	US$1 790 000.00
Liabilities and equity		US$4 896 300.00	US$6 364 341.42	US$6 665 810.23	US$6 632 313.69

surplus or loss and depreciation expense that amounts to US$100 000.

Relative to the modified model, the results presented in Table 7 indicate that a BEA that is not adjusted for profitability, uncompensated care and autonomous income understates the profitability and liquidity the organization might expect during the planning period. Conversely, the unmodified analysis suggests that the relative dependence of the organization on external sources of credit is higher than the projections derived from the modified models. Finally, the results indicate that the unmodified model understates the cash flows derived from operations. In particular, based on the traditional analysis, the unmodified model indicates that the organization should expect a net cash disbursement of about US$338 000. Conversely, the net cash receipt derived from operations that is projected after adjusting for uncompensated care amounts to US$100 000; and the net cash receipts derived from operations that are forecast by the model adjusted for uncompensated care and profitability and by the model adjusted for profitability, uncompensated care and autonomous income amount to US$190 000. These data indicate that projections of fiscal performance are systematically biased when BEA is unadjusted for factors that may influence profitability, debt structure and liquidity.

Limitations

The analysis presented in this paper is limited by several considerations. First, the analysis assumes that a portion of the organization's total cost comprises fixed expenses or costs that remain invariant with respect to changes in volume. In most situations, however, an increase in volume might require the organization to expand capacity or to use the portion of existing capacity that remains idle. Accordingly, rather than remaining constant, it is possible that related expenses increase in a step-like fashion when it is necessary to increase capacity or to activate idle capacity. Second, BEA assumes that the organization provides a service that is homogenous and

Table 7 *Fiscal performance*

Operating margin	−0.0671	0.0000	0.0101	0.0090
Current ratio	1.5604344	1.58371914	1.587291876	1.586910177
Debt: equity ratio	0.9907006	0.735294118	0.698324022	0.698324022
Net cash flow from operations	−US$338 266.67	US$100 000.00	US$190 000.00	US$190 000.00

measured by days or visits. However, most health organizations provide a heterogeneous bundle of services, implying that the analysis is appropriate if the mix of care remains relatively stable. Similarly, the specification of the revenue function, as modified herein, is contingent on relative stability in the organization's payer mix and distribution of collection rates.

As is well known, BEA and the estimation of the coefficients that define the cost function are based on an historical relationships between expenses and volume. When changes in technology or extreme rates of activity are considered, historical relationships between costs and volume could be non-existent. In addition, as presented here, the purpose of BEA is to evaluate future, rather than historic, relationships between volume, costs and revenue. Consequently, estimates are subject to uncertainties and risks that are not considered in traditional BEA.

The use of the percentage of sales or revenue method of deriving the balance sheet from which indicators of fiscal performance are derived also is dependent on several limiting assumptions. The first and most obvious assumption is that the relationship of net patient revenue to the item that appears in the balance sheet is stable. Moreover, the percentage of sales method also assumes that the relationship between income generating activity and the related item appearing in the balance sheet is continuous and emanates from the origin. As indicated above, however, fixed assets are not infinitely divisible and, as a result, the relation between net patient revenue and the related asset is perhaps a step-wise, rather than continuous, function. Similarly, the relationship between income and several current assets, such as inventory, is not likely to emanate from the origin. For example, it is likely that a health service organization maintains a fixed investment in inventory irrespective of the volume of care provided and the amount of patient revenue.

Implications

Although limited by several assumptions, the analysis presented in this paper suggests modifications to traditional BEA that promise to improve financial forecasts, plans and performance during the operating period. In particular, relative to the traditional model, the analysis indicates that a failure to adjust for uncompensated care and the desired net surplus results in a projection that understates the desired volume alternative. An unmodified application of the break-even model also is accompanied by the potential for a net loss, an increased dependency on external sources of credit and a decline in liquidity. Moreover, the traditional analysis is also likely to result in an underestimate of the contribution margin and the need for discretionary funding that will be required during the planning period. It should also be emphasized that the explicit recognition of autonomous income as a component of the analysis vitiates the effects on the desired volume created by the inclusion of uncompensated care and the desired net surplus as factors in the model.

In addition to improving measures of planned operating and fiscal performance, the augmented analysis also enables the health service organization to examine, *a priori*, variation in the desired volume that might be expected to result from changes in one or more parameters of the model. As indicated, potential variation in the payer mix, represented by Prop(R_i) and the bad debt rate $P(B_i)$ influence the net weighted average price and, consequently, the desired volume. Similarly, the model enables the organization to establish the desired volume alternative that is contingent on the values assigned to the amount of expected autonomous income, a_0, and the desired net surplus, π, required to satisfy the financial objectives of the provider. The spreadsheet also enables the organization to assess the influence of variation in the forecasts of the contribution margin, the long-term debt: equity ratio and the liquidity of the organization resulting from changes in payer mix or the collection rate.

Finally, when combined with the percentage of sales or revenue method, Equations 4.1, 4.2 and 4.3 could be applied to the general problem of deriving a pro forma income statement, balance sheet and indicators of fiscal performance for alternatives other than the desired volume of care. For example, suppose that the organization adopts one of several approaches, such as a confidence or prediction interval, to develop a forecast of volume. In this case, the predicted value might serve as the expected rate of activity, whereas the lower limit of the interval represents a surrogate for the low estimate of volume. Further, the upper limit might serve as the high-volume alternative. The values obtained by substituting the three volume alternatives into the cost and revenue functions form the basis for the development of a flexible set of financial statements that portray the financial position and changes in financial position with a known

degree of confidence. Hence, the model presented in this paper promises to assist the healthcare organization to improve fiscal and operational plans that are contingent on different volumes of care, a feature that may increase the likelihood of the organization's long-term survival.

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