Monitoring Accounts Receivable Using Variance Analysis

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I. Introduction

In the past ten years, several articles have appeared in the literature discussing the monitoring of accounts receivable [1, 2, 6, 7, 14]. With few exceptions [4, 12, 15], however, the monitoring techniques proposed in these articles have not been incorporated into the standard textbook discussions. Therefore, it is not surprising that the traditional, and often misleading, techniques of days sales outstanding (DSO) and aging schedules still appear to be the primary vehicles used by analysts to evaluate a firm's accounts receivable balance.

Lewellen and Johnson [7], and then Stone [14], highlighted the deficiencies of these conventional calculations. They showed the conventional procedures to be misleading and capable of frequent errors. Their criticisms centered on the sensitivity of the calculations to the sales pattern and the sales averaging period selected.

As discussed by Stone, many analysts recognize that receivables can be influenced by sales effects, and they attribute this to seasonal or cyclical factors. They attempt to eliminate, or at least minimize, these effects by comparing calculated DSO ratios and aging schedules against those of historical periods or those of competitors. However, this approach may not be very satisfactory. History seldom repeats itself exactly, because of changes in the level of interest rates, customer mix, and many other factors that make it difficult to make meaningful comparisons. In the case of competitors, it is difficult to make comparisons because of differences in size, product mix, and geographic locations of companies.

One way to overcome these problems is to abandon DSO measures and aging schedules and rely on balance fractions [7] or payment patterns [14]. Another approach is to use an accounting-based dollar variance analysis model as discussed in this article. The variance analysis model compares actual against budgeted receivable performance. A real advantage of using a budget is that it can overcome the many problems inherent in historical data. Assuming that management has conscientiously calculated the budget amounts, then conditions expected to exist during the budget period are incorporated into the accounts receivable budget. This is obviously better than comparing actual

We gratefully acknowledge the contributions of two anonymous reviewers and are particularly indebted to Robert Taggart for his advice and support.

Exhibit 1. Sales and Receivables Information

	Receivables		Sales				Aging Schedule		Conventional DSO	
	Actual	Static Budget	Actual	%	Static Budget	%	Actual	Static Budget	Actual	Static Budget
Jan.	$ 15	$12	$ 30	17.6%	$ 60	33.3%	12.2%	12.5%		
Feb.	36	36	60	35.3	60	33.3	29.3	37.5		
Mar.	72	48	80	47.1	60	33.3	58.5	50.0		
Total	$123	$96	$170	100.0%	$180	100.0%	100.0%	100.0%	43.4	32.0
Column	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]

	Sales per Day		Monthly DSO		Business Days
	Actual	Budget	Actual	Budget	
Jan.	$1.50	$3.00	10	4	20
Feb.	3.00	3.00	12	12	20
Mar.	4.00	3.00	18	16	20
Total	$8.50	$9.00			

performance to some prior period that may not be representative of conditions prevailing during the budget period. Additional advantages of a variance methodology are as follows: First, errors in sales projections and collections forecasts are readily evident. This provides management with the opportunity to assess budget assumptions and improve the quality of forecasts. Second, the DSO calculation is independent of both the sales averaging period and any sales trend, thus overcoming criticisms of traditional measurement techniques. The independence of the DSO calculation allows identification of a collection experience variance and a sales effect variance. Third, the sales effect variance can be decomposed into components that allow the influence of sales on receivable balances to be better understood.

The discussion in Section II examines the variance analysis model. The total dollar variance between actual and budgeted performance is separated into a collection experience variance and a sales effect variance. This latter variance is subsequently split into pattern and quantity variances. Section III discusses the effect of changing credit policy on these variances. Section IV briefly discusses extensions to the model. A short summary is included in Section V.

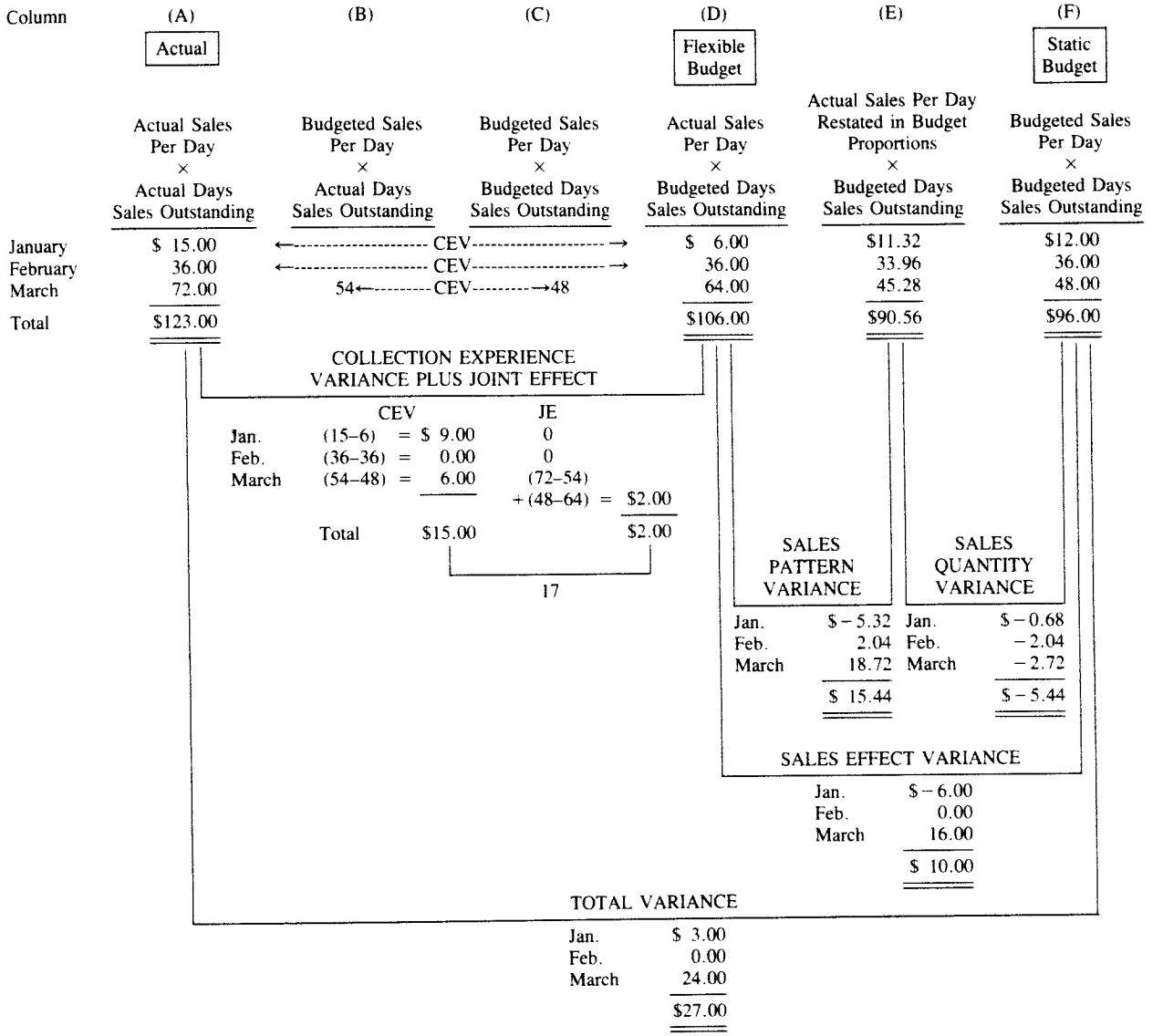
II. A Variance Analysis Model

The expression variance analysis is usually considered in a statistical context as the sum of squared deviations from the mean. Our usage of the expression is considerably different. We adopt the cost accountant's definition, wherein variance is defined as the dollar difference between actual and budgeted amounts.[1] This approach also requires explicit definition of the meaning of the word budget. In our problem, the accounts receivable budget is calculated by multiplying *single* estimates for expected sales by *single* estimates for expected days sales outstanding. The resulting figure is referred to as a *static* (*i.e.*, *ex ante*) budget. If actual sales differ from expected sales, a revised budget is determined to reflect the new sales level. This *ex post* budget is called a *flexible* budget. As will become evident shortly, the flexible budget is the pivotal budget for separating the total variance into components that explain the discrepancy between actual and budgeted performance.

As an aid for discussing the variance analysis model, Exhibits 1 and 2 include all relevant information for a numerical example. Background data on receivable balances, sales, and traditional monitoring measures are shown in Exhibit 1. The actual receivable balances of $15, $36, and $72 represent the amounts still outstanding from credit sales made in January ($30), February ($60) and March ($80), respectively. The receiv-

[1]Variance models are primarily used in cost accounting to analyze material, labor, and overhead variances. They are an important part of the budgetary planning and control cycle: they direct management's attention to problem areas in implementing the current budget and they provide information that is useful in improving the accuracy of future budgets. It is with these advantages in mind that we adapt the technique to receivables management. See Horngren [3], Magee [8], and Morse [11] for detailed explanation of variance analysis.

Exhibit 2. Variance Analysis of Accounts Receivable Balance



able budget is similarly defined. It is assumed that each month has 20 working days and that there has been no change in credit terms or standards. This latter assumption is relaxed later. It should be noticed that the conventional DSO measure and the aging schedule provide conflicting signals. The aging schedule shows receivables to be more current than budgeted, indicating superior collection performance, whereas the days sales outstanding measure indicates accounts to be outstanding longer than budgeted, indicating inferior performance.

Exhibit 2 shows that the total variance between actual outstanding accounts receivable and the static budget balance, as of the end of March, is $27 (column A minus column F). This variance is unfavorable since the actual receivable investment exceeds the budget level. It is the analyst's task to understand the factors contributing to this variance and to assign responsibility for it to the appropriate managers. This should result in better monitoring and control of accounts receivable investment and timely corrective action.

When actual monthly sales differ from budgeted monthly sales, one should expect the actual total receivable balance to differ from the budgeted amount. However, it is unreasonable to compare the actual receivable balance to the budget and attribute the difference to the influence of sales. It is just as unreasonable to attribute the total difference to collection efficiency.

A first level of analysis partitions total receivable variance into a collection experience variance, a sales effect variance, and, in some cases, a joint effect variance. Calculation of these variances is based on relationships between actual and budgeted days sales outstanding and actual and budgeted sales per day.

The joint effect variance has recently been discussed by Gentry and De La Garza [2]. They show that the collection experience and sales pattern variances can be significantly distorted if the joint variance is not isolated. Considerable debate exists in the accounting literature about the usefulness of the joint variance.[2] We include it in our discussion so as to give mathematically correct solutions and leave it to the reader to ascertain the relevance of the joint variance.

A. Collection Experience Variance

The collection experience variance isolates the efficiency of actual collections relative to revised (*i.e.*, flexible) budget collections. The importance of this revision is that the flexible budget accounts for the fact that sales have changed from original budget expectations. The flexible budget, however, does not change the days sales outstanding measure, since budget assumptions about credit terms and credit standards are still assumed to be valid. Section III will relax this assumption.

Calculation of the collection experience variance (CEV) requires recasting the static monthly receivable budgets of Exhibit 2 (column F) into flexible budgets based on actual sales performance, holding budgeted collection effort (*i.e.*, budgeted DSO) constant. The flexible budgets, shown in column D, indicate the expected levels of accounts still outstanding from each month, given that actual monthly sales differ from budgeted monthly sales. The differences between actual accounts receivable (column A) and the flexible budget for accounts receivable represent pure collection experience variances for January and February, and a combined pure collection experience and joint collection-sales pattern variance for March.[3]

The calculations are as follows. Actual receivables outstanding in each month j are rewritten as the product of two factors: actual sales per day ($ASPD_j$) and actual days sales outstanding ($ADSO_j$). $ASPD_j$ is calculated by dividing each month's sales by the number of business days (*i.e.*, 20). $ADSO_j$ is calculated using the traditional ratio: $receivables_j \times days_j/sales_j$. A similar calculation is performed for budgeted days sales outstanding ($BDSO_j$). Collection experience variance plus joint effect (JE) is measured as actual sales per day $\times$ (actual days sales outstanding $-$ budgeted days sales outstanding)$_j$:

$$CEV_j + JE_j = ASPD_j[ADSO_j - BDSO_j]. \quad (1)$$

According to the Gentry-De La Garza [2] algorithm, the joint effect is zero in Exhibit 2 for January and February, but positive for March.

The example in Exhibit 2 indicates that collection efficiency is worse than flexibly budgeted. Analysis of individual months reveals the source of the problem. Although February's receivables are exactly as budgeted, the positive collection variances of $9 and $8 for January and March, respectively, indicate inferior collection effort, since actual DSO for these months exceed their flexible budget counterparts. The March variance, however, includes a $2 joint collection experience-sales pattern effect that may not be the responsibility of the credit manager. The analyst needs to look for those factors that explain the unfavorable collection performance of January and March's sales.

B. Sales Effect Variance

By restating the static budget to a flexible budget in order to eliminate the influence of changing sales, the collection experience variance was isolated. This flexible budget is now used to eliminate the influence of collection experience on total variances so that the effect of sales on accounts receivable balances can be measured. The sales effect variance (SEV) is measured as the difference between the flexible budget and the static budget; or in terms of Exhibit 2, it is column D minus column F.

Mathematically, the SEV for month j is calculated as

$$SEV_j = BDSO_j[ASPD_j - BSPD_j], \quad (2)$$

where $BSPD_j$ is the budgeted sales per day for month j and the other variables are as previously defined.

Referring to Exhibit 2, January's negative sales ef-

[2]The economic importance of the joint effect variance has been debated in the accounting literature by McIntyre [9, 10] and Piper [13] and has been given minimal discussion in all leading cost accounting textbooks (*e.g.*, [3, 8, 11]). The basic conclusion of managerial accountants is that it is difficult both to interpret and to assign responsibility for the joint variance.

[3]In terms of Gentry and De La Garza's [2] nomenclature, January's accounts receivable position is indicated by Condition 6, February's position is indicated by Condition 1, and March's position is indicated by Condition 4.

ect variance of $6 indicates the influence that poorer han expected sales performance *should have had* on eceivable balances had the firm's collection experi- nce been as expected; in other words, the budget- djusted receivable balance for accounts still outstand- ng from January's sales (*i.e.*, the flexible budget) hould be $6 less than the January component of the tatic budget to compensate for the lower than expect- d sales. In March the greater than budgeted sales erformance indicates that the revised receivable bud- et for accounts still outstanding from March should be $16 higher than that indicated by March's associated static budget. February shows no deviation from budget.

One might argue that credit managers cannot be held accountable for the sales effect variance. Although this is generally true, circumstances exist that can negate this claim. For example, one of the credit manager's tasks is to determine if credit should be extended to customers. An overly lenient credit-granting policy, resulting from inadequate analysis of credit applicants, leads to higher sales, but also to higher receivable balances that are outstanding longer. If this is the case, the credit manager is responsible for at least a portion of the sales effect variance.

Regardless of who is held responsible for the sales effect variance, an understanding of this variance is important in analyzing resource allocation. However, the sales effect variance can be difficult to interpret. For example, Exhibit 1 indicates that total actual sales are less than total budgeted sales, and the proportion that each month's sales is of the total differs between budget and actual. By separating the sales effect variance into its pattern and quantity components, the significance of sales on receivables is then discovered.

C. Sales Pattern Variance

A sales pattern variance is known to be present since differences exist between actual and budgeted monthly sales proportions (as shown in Exhibit 1). The calculation of the pattern variance is not as straightforward as either the collection experience variance or the sales effect variance. Whereas these variances can be calculated for each month, independent of all other months, the pattern variance must use all months to date that have receivable balances outstanding (either actual, budget, or both).

The pattern variance compares the composition of the flexible budget (which eliminates the collection experience influence) against what accounts receivable should be when actual sales per day for month j are restated in their budgeted proportions. The sales pattern variance (SPV) of $15.44, shown in Exhibit 2 as the difference between columns D and E, is calculated from the data in Exhibit 1 by the equation:

$$SPV_j = BDSO_j[ASPD_j - RASPD_j]. \quad (3)$$

Exhibit 1 shows the values for $BDSO_j$ and $ASPD_j$. Actual sales per day restated in budgeted proportions ($RASPD_j$) are calculated by allocating the sum of the monthly sales per day amounts of $8.50 (see Exhibit 1) to each month based on the budgeted proportions for monthly sales per day (see column 6 in Exhibit 1 for the proportions):

		RASPD
January	$8.50 × 0.3333 =	$2.83
February	$8.50 × 0.3333 =	$2.83
March	$8.50 × 0.3333 =	$2.83

Each month's SPV is calculated as follows:

January	4 [$1.50 − $2.83] =	$−5.32
February	12 [$3.00 − $2.83] =	2.04
March	16 [$4.00 − $2.83] =	18.72
Total		$15.44

The calculations indicate the influence that the changed sales pattern, relative to budget, has on accounts receivable. January's negative sales pattern variance indicates that actual accounts receivable *should be* lower by $5.32 since January's sales, as a proportion of total actual sales, are less than January's static budgeted proportion. The favorable pattern variances for February and March, of $2.04 and $18.72, respectively, indicate that actual receivables outstanding from these months *should be* higher than their budgeted counterparts because their actual proportions of total sales exceed their respective static budget proportions. Overall, the shift in sales from a budgeted constant pattern to an actually increasing pattern should have resulted in a $15.44 greater investment in receivables than budgeted.

D. Sales Quantity Variance

The remaining component of the sales effect variance is the sales quantity variance. It represents the *true* sales volume effect on outstanding accounts receivable. This variance is calculated as the difference between columns E and F in Exhibit 2, or as the difference between the sales effect variance and the sales

pattern variance.[4] The negative sales quantity variance indicates that accounts receivable should be $5.44 lower than budgeted because total actual sales volume is less than total budgeted sales volume.

E. Overall Analysis

The significance of the aforementioned variance analysis model is revealed by comparing it to the traditional models of days sales outstanding (DSO) and aging schedules shown in Exhibit 1. Conventional DSO calculations indicate that accounts are outstanding 11.4 days longer than budgeted without any explanation as to the reason. The aging schedule indicates that accounts are more current than budgeted as revealed by the higher proportion of accounts outstanding in March versus the budgeted proportion. A lower proportion of accounts has been outstanding 60 days than was budgeted, while a marginally smaller proportion than budgeted has been outstanding 90 days. Unfortunately, neither the day sales outstanding nor the aging schedule techniques can indicate the relative importance of collection efficiency versus sale influences.

The variance model, however, untangles the various underlying effects. Exhibit 2 indicates that, at the end of March, about 57% of the total unfavorable receivable balance variance of $27 is caused by the imbalance in the actual monthly sales proportions as compared to the budgeted proportions (*i.e.*, the sales pattern). The inferior (pure) collection effort accounts for 56% of the overall unfavorable performance. These two unfavorable effects are partially offset by the sum of the sales quantity and joint effects, which together represent −13% of the total variance.

It is interesting to note that the collection experience variance (pure or otherwise) is diametrically opposite the interpretation of the aging schedule. The aging schedule is simply not able to disaggregate the various influences.

Analysis of the variances also directs management's attention to both explicit and implicit assumptions in the static budget. For example, the monthly sales pattern variances indicate that management did not have a very clear understanding of how sales would actually occur. A reconciliation of sales assumptions with actual performance should improve future resource allocation decisions.

III. The Effect of a Changing Credit Policy

The previous analysis assumes that credit policy is constant. If credit policy changes, it is necessary to incorporate any changes into the analysis so as to correctly state the variances. For example, assume that management decides to tighten credit as of the start of March. This should result in both lower actual sales and investment in receivables for March, *relative to the "pre-credit policy change" static budget*. It also means that a *new static budget* for March, reflecting these lower expectations, must be determined. We assume that the new budgets for March's sales and receivables are $50 and $30, respectively (versus $60 and $48, respectively, in the old budget) and that actual sales and receivables in March decline to $40 and $25, respectively (from their previous levels of $80 and $72, respectively).

The effects of the credit policy change are captured in Exhibit 3.[5] Actual receivables outstanding are $2 less than the (revised) static budget. Although it appears that the tightening of credit has had the desired downward effect on sales and outstanding receivables, a comparison of actual and static budget totals is deceiving. Collection effort by the credit department is inefficient relative to the flexible budget for January and March. This is shown by the positive collection experience variances for these months. The sales effect variance indicates that receivables should be $12 lower than the static budget because of sales influences.

A decomposition of the sales effect variance into its two components is revealing. The quantity variance indicates that the lower sales volume for the quarter *should have* reduced total receivable investment by $18.32. However, the sales pattern for the quarter caused accounts receivable to increase by $6.32, thereby partially offsetting the sales quantity variance.

IV. Other Extensions

The variance model can be used to accommodate various other forms of receivables analysis, such as

[4]The sales quantity variance can also be calculated as follows:

$$\frac{\text{total actual sales} - \text{total budgeted sales}}{\text{total days in the period}} \times \text{total DSO}.$$

For example, using data in Exhibit 1, the sales quantity variance is

$$\frac{[\$170 - \$180]}{60} \times 35 = \$5.33.$$

A small rounding error exists.

[5]The change in assumptions for sales and receivables eliminates the joint effect. March's revised assumptions are represented by Gentry and De La Garza's [2] Condition 6.

Exhibit 3. Variance Analysis of Accounts Receivable Balance: Change in Credit Policy, Effective Mar. 1st

Column	(A) Actual	(B) Flexible Budget	(C)	(D) Static Budget
	Actual Sales Per Day × Actual Days Sales Outstanding	Actual Sales Per Day × Budgeted Days Sales Outstanding	Actual Sales Per Day Restated in Budget Proportions × Budgeted Days Sales Outstanding	Budgeted Sales Per Day × Budgeted Days Sales Outstanding
January	$15.00	$ 6.00	$ 9.16	$12.00
February	36.00	36.00	27.48	36.00
March	25.00	24.00	23.04	30.00
Total	$76.00	$66.00	$59.68	$78.00

COLLECTION EXPERIENCE VARIANCE

January	$ 9.00
February	0
March	1.00
	$10.00

SALES PATTERN VARIANCE

January	$ −3.16
February	8.52
March	0.96
	$ 6.32

SALES QUANTITY VARIANCE

January	$ −2.84
February	−8.52
March	−6.96
	$ −18.32

SALES EFFECT VARIANCE

January	$ −6.00
February	0
March	−6.00
	$ −12.00

TOTAL VARIANCE

January	$ 3.00
February	0
March	−5.00
	$ −2.00

analysis by customers, product lines, geographical areas, or combinations of these or other dimensions. All that is needed are budget figures for accounts receivable for each dimension analyzed. The proliferation of the use of microcomputers and database software by businesses makes this a relatively easy computational task, assuming that managers are willing to seriously consider what the various budget figures should be. For example, management could analyze receivables (i) by sales district, (ii) by customers within districts, and (iii) by product lines purchased by customers within districts. Or they could just as easily use some other hierarchical ordering.

Although the respective totals for actual and budgeted receivables are constant from one hierarchical alternative to another, the variances computed will differ. This may cause consternation with managers if they are presented with two different analyses on the same data that allocate variances differently. Unfortunately, this problem cannot be avoided. Management has to be educated as to the reason that it occurs.

The reason is that calculated days sales outstanding and sales per day differ from one ordering scheme to another. For example, instead of doing the analysis by months, as was done earlier, assume that the credit manager analyzes accounts by sales districts. Obviously, actual and budgeted sales per day and days sales outstanding for this analysis differ from the analysis by months. Aggregation is over sales districts, as opposed to months. The values used to calculate district i's

flexible budget, and the budget to restate actual sales in budgeted proportions, differ from the values used to calculate similar budgets for month j. In the monthly analysis, the dimension of time is the important factor, whereas location is secondary. Time is secondary in the districts analysis.

Another extension that could be incorporated is to isolate the effects of cash and volume discounts from the collection experience and sales effect variances. However, for this extension to provide meaningful information, management must have a reasonably good understanding of the price elasticities of the demand functions for its products, and the demand functions must remain stationary during the period in question. Otherwise, the additional complexity is of dubious value.

V. Conclusions

Traditional measures of days sales outstanding and aging schedules are unable to isolate a number of factors that influence accounts receivable balances. We propose an accounting-based dollar variance model that compares actual performance to budget and identifies collection experience, sales pattern, and sales quantity influences on receivable balances. Thus, it overcomes the deficiencies of the traditional models. An understanding of these variances provides the credit analyst with information to better understand how well receivables have been managed. These variances prompt questions, such as the following: Is collection efficiency changing? Is the budgeted receivables pattern representative of what to expect in the future? Were budget assumptions for sales, receivables, and collection efforts faulty? Are assumptions for the changing credit terms realistic? Is the credit screening model effective? How is the firm's liquidity affected? Answers to these questions provide the analyst with better information for evaluating receivables.

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