

Determinants of Earnings Variability

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Abstract

Corporate earnings variability (EVAR) affects earnings predictability and firm value. Given the importance of EVAR to the business community, it is surprising that research identifying its determinants has not received more attention. In this study, firm and industry characteristics associated with cross-sectional differences in Value Line EVAR are investigated. Consistent with prior research, regression results indicate that firm size and product durability affect EVAR. The results, however, also indicate that corporate performance, capital structure, and industry membership affect EVAR. Adding these factors produces an improved EVAR model that explains approximately half of the cross-sectional variation in EVAR.

Introduction

Corporate earnings variability (EVAR) has been linked to a wide variety of business issues related to firm risk. In a recent study which appeared in this journal, Luttman and Silhan (1993) showed that EVAR performs well as an index of earnings predictability. Their results indicated that EVAR is consistently related to *Value Line* forecast accuracy and performs as well as a competing index based on past forecasting performance. In other studies, EVAR has been linked to equity values (Daley, 1984), bid-ask spreads (Bramble, 1990), earnings quality (Imhoff, 1992), earnings response coefficients (Trombley, 1990), management forecasts (Waymire, 1985), decision-making strategies (Malone, 1986), performance plan adoptions (Kumar, 1988), ownership structure (Demsetz and Lehn, 1985), and dividend policies (Chang and Rhee, 1990). These diverse studies underscore the importance of EVAR to investors and other groups. As noted by Lev (1983, p. 31), a major objective of business research is to gain an understanding of processes which generate corporate earnings because such an understanding is essential for the study of many positive and normative issues in accounting, finance, and economics.

Given the importance of EVAR to the business community, the purpose of this study is to investigate factors affecting cross-sectional differences in EVAR. Using a sample of *Value Line* firms, regression results indicate that firm size, product durability, corporate performance, capital structure, and industry membership affect EVAR. This improved model represents a substantial increase in explanatory power over prior research.

Prior Research

Given the central role that EVAR plays in applied business research, it is surprising that research designed to identify its determinants has not received more attention. In the only prior study to address this issue, Lev (1983) used regression analysis to empirically analyze several factors affecting cross-sectional differences in EVAR. His results indicated that EVAR was affected by firm size and product type (i.e., product durability). However, his regression results only accounted for about five percent of the cross-sectional variation in EVAR. Lev (1983, p. 46) therefore cautioned that "the possibility of 'missing variables' should, as always, be recognized." The current study is designed to address this issue.

By expanding the set of explanatory variables, the current model accounts for about half of the cross-sectional variation in EVAR. This expanded model, which indicates that firm size, product durability, corporate performance, capital structure, and industry membership affect EVAR, substantially increases the explanatory power of the Lev (1983) model.

Research Design

We use multiple regression analysis to test the null hypothesis that no other factors beyond firm size and product durability can be used to explain cross-sectional differences in EVAR. Lev (1983) found that firm size and product durability affect EVAR. Consequently, these two variables comprise the benchmark model. This model can be represented as follows:

$$\text{EVAR} = f(\text{firm size}, \text{product durability})$$

In selecting firm size as an explanatory variable, Lev noted that in numerous studies firm size had been found to be negatively related to EVAR (e.g., Whittington, 1971; Scherer, 1973). Firm size reflects a variety of factors. These include, for example, managerial discretion (Williamson, 1963), political costs (Watts and Zimmerman, 1978), and diversification (Lev, 1983). Such factors would tend to reduce EVAR.

Lev also noted that the demand for durable goods is generally viewed as much more volatile than the demand for nondurable goods. On a conceptual level, he related durable goods volatility to the "permanent income" hypothesis which postulates that the consumption of nondurables and services is a function of permanent income, while spending on durables is related to the more volatile transitory component. In addition, Zarnowitz (1972, p. 193) concluded that consumption aggregates (except for durable goods) are smoothly growing series. Given these factors, Lev hypothesized that the volatile demand for durable goods induces a large random element in the earnings of durable goods producers.

Performance and Leverage Effects

In the current study, corporate performance and capital structure were added to enhance the original model. Corporate performance was added as an explanatory factor because corporate performance, which reflects managerial ability, has been linked to various incentives (Lenz, 1981; Larcker, 1983; Murphy, 1985). With respect to EVAR, Marcus (1982), Lambert (1984), and others suggest that risk-averse managers would be motivated to take actions that dampen fluctuations in corporate earnings. Such actions might include, for example, project selection strategies and the use of slack resources (Shank and Burnell, 1974; Lambert, 1986; Rasmusen, 1992; Onsi, 1973).

It is hypothesized that high corporate performance would be associated with low EVAR because the ability of managers to meet corporate objectives would be reflected in corporate performance. Given the linkage between managerial ability and corporate performance, it follows that managers of high performance companies might be more successful at reducing EVAR than managers of low performance companies. A negative association between EVAR and corporate profitability has been observed in prior research (Bowman, 1980; Murali and Welch, 1989).

Corporate performance could affect EVAR in a number of ways. Research indicates, for example, that high corporate performance tends to reduce risk taking by managers (Bowman, 1982; Singh, 1986). Consequently, the project portfolios of high performance

firms would tend to be less risky than the project portfolios of less successful firms. This tendency would lower EVAR. Furthermore, the managers of high performance firms might be in a better position to use accumulated slack resources to buffer their firms from environmental disturbances. This also would reduce EVAR (Onsi, 1973).

Lev (1983) attempted to measure the effects of leverage on EVAR by using capital expenditures and interest expense per dollar of sales. He did not find, however, an association between that measure and EVAR. In the current study, we reexamine this issue by using capital structure (i.e., financial leverage) as an explanatory variable. As noted by Dhaliwal (1988) and others, EVAR is expected to increase with increases in financial risk. Therefore, a positive association with EVAR is predicted for financial leverage.

Incorporating these additional factors, the revised model can be represented as follows:

$$\text{EVAR} = f(\text{firm size, product durability, performance, leverage})$$

Industry Effects

Product durability in the benchmark model represents an important industry-related characteristic. In the current study, we added industry membership to the model to represent other characteristics as well. This expanded model can be represented as follows:

$$\text{EVAR} = f(\text{firm size, product durability, performance, leverage, industry})$$

The presence of industry effects could reflect a variety of structural factors, such as capital intensity, cyclicity, entry barriers, and competitive behavior. Since these factors would affect each industry uniquely, there is no expected sign indicated for this categorical variable.

Regression Analysis

Regression analysis was used to assess the explanatory power of the benchmark model (M1) and two alternative models (M2-M3). The following models were compared:

$$\text{EVAR} = \alpha + \beta_1\text{SIZE} + \beta_2\text{DUR} + \epsilon \quad (\text{M1})$$

$$\text{EVAR} = \alpha + \beta_1\text{SIZE} + \beta_2\text{DUR} + \beta_3\text{NPM} + \beta_4\text{GROW} + \beta_5\text{LEVR} + \epsilon \quad (\text{M2})$$

$$\text{EVAR} = \alpha + \beta_1\text{SIZE} + \beta_2\text{DUR} + \beta_3\text{NPM} + \beta_4\text{GROW} + \beta_5\text{LEVR} + \sum \gamma_k \text{IND}_k + \epsilon \quad (\text{M3})$$

where

EVAR = earnings variability (EVAR1 = growth rate,

EVAR2 = return on assets),
 SIZE = natural log of annual sales,
 DUR = dummy variable indicating durable goods firm,
 NPM = net profit margin,
 GROW = sales growth rate,
 LEVR = financial leverage,
 IND_k = dummy variable indicating industry k.

Regression diagnostics (e.g., White, 1980; Belsley, Kuh, and Welsch, 1980) indicated that the distributional assumptions of regression analysis were satisfied.

Earnings Variability. Two measures (EVAR1 and EVAR2) were used to measure EVAR for the time period spanning 1978-1985. In effect, EVAR1 represents variability in the *earnings growth rate*, while EVAR2 represents variability in the *earnings return rate*.

For EVAR1, the *Value Line Earnings Predictability Index (VLPI)* was used because this EVAR measure has been used in numerous studies as a measure of ex ante uncertainty and earnings predictability (e.g., Pincus, 1983; Butler and Lang, 1991; Eddy and Seifert, 1992; Teets, 1992; Imhoff, 1992; Guo, 1993; Luttmann and Silhan, 1993). In effect, VLPI represents the relative stability of a firm's year-to-year changes in earnings per share. This index is derived from the interfirm ranking of each firm's standard deviation of percentage change in earnings. By construction, VLPI is scaled from 5 to 100, such that at one extreme 100 would represent a company with high earnings stability (i.e., low EVAR), while at the other extreme a 5 would represent a company with low earnings stability (i.e., high EVAR). For this study, each VLPI value was transformed into an EVAR1 value simply by subtracting 105 and changing the sign. Thus, a VLPI of 100, for example, would correspond to an EVAR1 of 5, and a VLPI of 5 would correspond to an EVAR1 of 100.

For EVAR2, the coefficient of variation of return on assets (ROA) was used. As noted by Antle and Smith (1986), ROA is frequently used in incentive plans. Expressed in percentage terms, EVAR2 was calculated for the same time span as EVAR1 (1978-1985). EVAR2 was calculated as follows:

$$\text{EVAR2} = [\sigma(\text{ROA}_i) / \mu(\text{ROA}_i)] \times 100$$

where

$\sigma(\text{ROA}_i)$ = standard deviation of return on assets for firm i,
 ROA = net income / beginning assets,
 $\mu(\text{ROA}_i)$ = mean return on assets (1978-1985) for firm i.

Firm Size and Product Durability. SIZE, the natural log of annual sales for 1985, was used to measure firm size.

Annual sales is used as a measure of size in the *Fortune 500* and has been used as a measure of size in numerous studies (e.g., Williamson, 1963; Lev, 1983). The expected sign between SIZE and EVAR is negative.

DUR was defined consistent with U.S. Department of Commerce classifications. In the current study, 68 firms were classified in the durable goods category.

Corporate Performance and Leverage. High performance firms maintain high levels of profitability and sustain high rates of growth. NPM was measured using average percentage of net income to net sales. As noted by Slade (1986), this measure is frequently used by economists to assess cross-sectional differences in corporate profitability. To reflect sustained profitability, NPM was based on ten years of data ending with 1985. The expected sign between NPM and EVAR is negative.

GROW was measured using percentage growth in annual sales. To reflect sustained growth, this measure, which is based on ten years of data ending with 1985, is provided by *Value Line*. The expected sign between GROW and EVAR is negative.

LEVR was used to investigate the effects of financial leverage on EVAR. LEVR was measured using the 1985 ratio of debt to fixed assets plus working capital obtained from *Value Line*. The expected sign between LEVR and EVAR is negative.

Industry Membership. IND_k was used to indicate industry membership. Using COMPUSTAT two-digit standard industrial classification (SIC) codes, each SIC with five or more companies was assigned an industry indicator variable. In all, there were 15 indicator variables used to estimate the effects of industry membership on EVAR. These variables are listed in Table 1.

Sample. There were 199 firms used in the analysis. Empirical measures were obtained from the *Value Line Investment Survey* (EVAR1, GROW, LEVR) and the *Standard and Poor's* COMPUSTAT file (EVAR2, NPM, SIZE, IND_k). Each firm in the sample (1) was listed in *Value Line* and COMPUSTAT, (2) was a December fiscal-year company throughout the sample period, (3) remained in its designated COMPUSTAT industry classification code throughout the sample period, (4) had complete COMPUSTAT sales, earnings, and assets data from 1978 to 1985, and (5) had VLPIs available from *Value Line*. Table 2 provides a summary of means, standard deviations, and correlations. Among the independent variables, the strongest correlation was between NPM and GROW (.352). The strongest correlation with the dependent variable was between NPM and EVAR1 (-.443).

Table 1
Sample Composition

Variable	Industry	No. of Firms
IND10	Metal mining (SIC 10)	5
IND20	Food and kindred products (SIC 20)	8
IND26	Paper and allied products (SIC 26)	12
IND27	Printing and publishing (SIC 27)	14
IND28	Chemical and allied products (SIC 28)	19
IND29	Petroleum refining (SIC 29)	5
IND30	Rubber and plastic products (SIC 30)	5
IND32	Stone, clay and glass products (SIC 32)	9
IND33	Primary metals (SIC 33)	8
IND34	Fabricated metal products (SIC 34)	5
IND35	Machinery, except electrical (SIC 35)	12
IND36	Electrical equipment and supplies (SIC 36)	12
IND37	Transportation equipment (SIC 37)	7
IND48	Communications (SIC 48)	5
IND49	Electric, gas, and sanitary services (SIC 49)	13
	All other (29 2-digit SIC codes)	60
	Total	199

Model Performance

Figure 1 summarizes the adjusted R-squares of the benchmark model (M1) and the two alternative models (M2-M3). As indicated from left to right, explanatory power was substantially increased by including additional explanatory variables. Table 3 provides details of these results. For EVAR1, the adjusted R-square increased from .0886 to .5139, while for EVAR2 it increased from .0664 to .4698. For both M2 and M3, the null hypothesis of no missing variables in M1, the benchmark model, was rejected by a substantial margin. It thus appears that Lev's intuition with respect to omitted variables is supported empirically.

M1 results for EVAR1 and EVAR2 indicate that DUR (product durability) was significant at the .01

level. The adjusted R-square was .0886 for EVAR1 and .0664 for EVAR2. The explanatory power of the M1 results is similar to the Lev (1983) results which indicated an R-square of approximately five percent.

M2 results reflect the inclusion of performance and leverage effects. These results indicate that adjusted R-square increased from .0886 to .3545 for EVAR1 and from .0664 to .2417 for EVAR2. *F*-statistics for the aggregate improvement in explanatory power were $F_{(3, 193)} = 27.921$ (.000 level) and $F_{(3, 193)} = 16.104$ (.000 level), respectively.

M3 results reflect the inclusion of industry membership as an additional categorical variable. These results indicate that industry effects beyond product durability increased the adjusted R-square of the model from .3545 to .5139 for EVAR1 and from .2417 to .4698

Table 2
Descriptive Statistics

Variable	Mean	Standard Deviation	Pearson Correlation Coefficient					
			EVAR2	SIZE	DUR	NPM	GROW	LEVR
EVAR1	51.66	28.42	.821	-.125	.290	-.443	-.334	.284
EVAR2	42.96	24.25	1	-.092	.262	-.294	-.224	.319
SIZE	6.97	1.34		1	-.031	.196	.039	.054
DUR	.34	.47			1	-.209	-.114	-.135
NPM	6.34	4.03				1	.352	-.103
GROW	8.67	6.38					1	-.151
LEVR	.32	.23						1

Note: EVAR1 = earnings variability index based on standard deviation of % change in earnings, EVAR2 = % coefficient of variation of return on assets, SIZE = natural log of annual sales (\$ millions), DUR = product durability dummy variable, NPM = % net profit margin, GROW = % growth rate in sales, and LEVR = financial leverage ratio.

for EVAR2. *F*-statistics for the aggregate improvement in explanatory power were $F_{(15,178)} = 8.540$ (.000 level) and $F_{(15, 178)} = 6.534$ (.000 level), respectively.

sectional variation in EVAR.

Summary and Implications

This study investigates the impact of firm and industry characteristics on cross-sectional differences in EVAR. It identifies several missing factors not included in Lev (1983). Consistent with Lev (1983), regression results indicate that firm size and product durability affect EVAR. The results, however, also indicate that corporate performance, capital structure, and industry membership affect EVAR. This improved model accounted for about half of the cross-

Figure 1
Model Performance

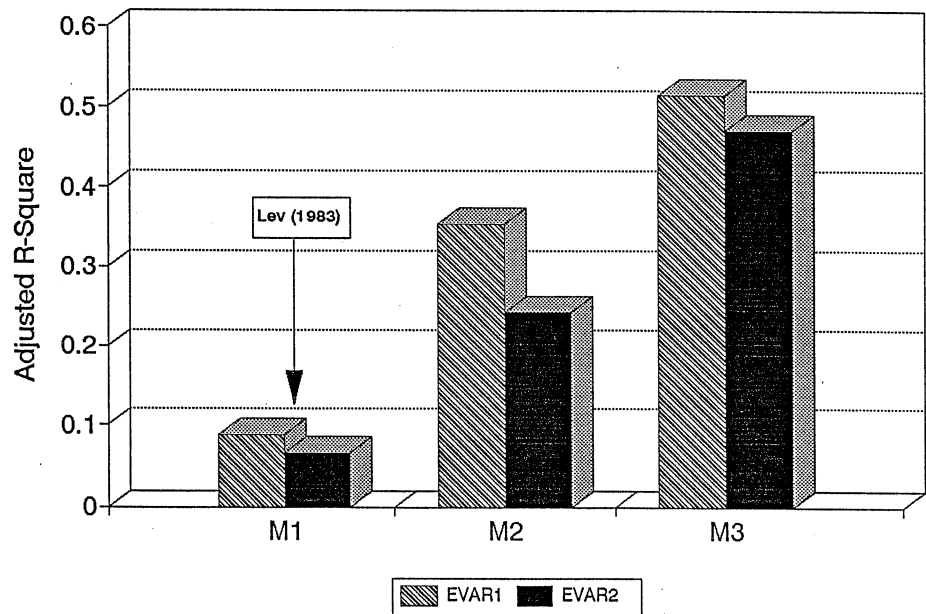


Table 3
Regression Results

Variable	EVAR1			EVAR2		
	M1	M2	M3	M1	M2	M3
Intercept	62.90 ^a	86.56 ^a	91.85 ^a	49.01 ^a	55.51 ^a	58.17 ^a
SIZE [-]	-2.45 ^b	-4.17 ^a	-5.19 ^a	-1.52	-2.55 ^b	-3.31 ^a
DUR [+]	17.14 ^a	13.76 ^a	7.64	13.24 ^a	12.76 ^a	18.36 ^a
NPM [-]		-2.53 ^a	-1.79 ^a		-1.28 ^a	-.59 ^c
GROW [-]		-.59 ^b	-.46 ^b		-.25	-.20
LEVR [+]		33.53 ^a	33.82 ^a		35.02 ^a	40.04 ^a
IND10			29.88 ^a			45.28 ^a
IND20			-22.38 ^a			-14.12 ^b
IND26			5.89			1.91
IND27			-19.54 ^a			-15.42 ^a
IND28			-4.86			-6.93
IND29			20.21 ^b			15.93 ^c
IND30			-.91			-5.91
IND32			2.52			-15.69 ^b
IND33			29.21 ^a			6.17
IND34			-21.48 ^b			-30.71 ^a
IND35			3.16			-12.98 ^c
IND36			- 8.73			-17.24 ^b
IND37			17.02 ^c			5.32
IND48			-25.09 ^a			-24.51 ^a
IND49			-19.19 ^a			-22.05 ^a
Adj R ²	.0886	.3545	.5139	.0664	.2417	.4698

[] Indicates expected sign (one-tailed test)

a Significant at .01 level

b Significant at .05 level

c Significant at .10 level

Extending Lev (1983), the current model indicates more precisely the types of firms that would be expected to have similar EVARs. Interestingly, after controlling for other factors, firm performance tends to reduce EVAR. This multivariate finding is consistent with the

univariate risk-return paradox first noted by Bowman (1980).

Several practical implications are suggested by these results. For investors, the results indicate that *Value Line* EVAR is systematically affected by a number of factors not specified in the Lev (1983) model. From a practical perspective, these explanatory variables are readily available and do not require burdensome computational effort. Thus, the current model can be used without requiring a great deal of data-gathering effort. Since EVAR affects firm risk and market values, these observable determinants are important to consider when formulating expectations and making investment decisions.

It should be noted that the focus of the current model is on explanation, not computation or prediction. Therefore, since investors already have access to historical EVAR information (e.g., VLPI), there is no need to compute EVAR on a firm-by-firm basis. However, given this availability, there remains a need to explain cross-sectional differences in EVAR. In this vein, the current model identifies factors

affecting EVAR. Based on the results presented here, *Value Line* investors might use this model to improve their intuition on company profiles. For example, a firm with a very high or very low EVAR would imply a number of expected characteristics. In this vein, investors might use VLPI as more than an index of earnings predictability. Perhaps they may be able to adopt it as an expectational index of other existing characteristics, such as firm size, performance, and capital structure. Extreme profile divergences from profile expectations would serve to trigger further analysis.

Suggestions for Future Research

For researchers in business, an effective EVAR model, such as the one developed here, could be used for several purposes. When evaluating published research, an effective EVAR model would be helpful for developing a better understanding of potential EVAR effects. One might expect, for example, that a sample comprised of relatively large, profitable, growing firms with low financial leverage, would be comprised mainly of low EVAR firms. Thus, when evaluating an income forecasting study, for example, we would not expect empirical results based on such firms to generalize to high EVAR firms. Researchers in forecasting and other applied areas also should be aware of potential EVAR differences when designing studies and evaluating samples. In effect, then, the current study provides an improved model for anticipating such differences.

In addition, future applied research could explore using an improved EVAR model for auditing and analytical purposes. An explanatory EVAR model, such as the one presented here, might be useful to auditors as an analytical review technique. For example, using a database of existing clients, an auditor might use an EVAR model to estimate, ex ante, approximately what the EVAR of a prospective client should be, given its data history. In this way, an EVAR profile could be used to plan audit procedures. In a similar vein, financial analysts might use a multivariate EVAR model to gauge inter-firm differences in risk. In effect, an analyst would first calculate residuals from the fitted values of the dependent variable (i.e., expected EVAR) provided by the regression model. Next, the analyst would identify firms with unusual EVAR based on regression diagnostics. Then, further financial analysis on these firms would be used to determine why corporate earnings were more or less variable than expected. ●

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