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PRICING OF AUDIT SERVICES: ADDITIONAL EVIDENCE

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I. INTRODUCTION

This paper deals with the economics of auditing. Previous empirical research in this area has examined competition in the audit industry, the impact of competition on audit prices, and the relation between audit and nonaudit services.[1] Empirical implications about the structure of the audit industry, competitiveness, and audit prices depend on the validity and reliability of the audit pricing models used.

A major contribution of previous work by Simunic [1980] has been the development of a positive model of the determinants of external audit fees. To the extent it is valid and reliable, this audit pricing model indicates factors that must be controlled before inferences about competition in the audit industry can be made from observed audit fee data. Further, the model provides evidence about factors of supply and/or demand for audit services. Finally, audit fee estimation models have practical use; both suppliers of audit services (e.g., Elliott and Korpi [1978]) and users of those services (e.g., Machinery and Allied Products Institute [1983]) use audit pricing models to estimate audit fees. Although the model has considerable potential use for research and practice, it has not been tested using other data sources, companies or time periods.[2]

The purpose of this paper is to test and modify Simunic's [1980] audit pricing model, (i) by testing Simunic's model for the year of his analysis (1977) using different data, (ii) by testing the model on two subsequent years (1978 and 1981), (iii) by examining and correcting for statistical problems with the model, and (iv) by modifying the model and developing a simpler model given the results of these analyses.

Although Simunic's tests of his audit pricing model indicate general support for his audit pricing model, there are a number of potential problems with the model and its tests that we address in this paper. First, Simunic's data were collected by questionnaire, which potentially introduces measurement error and moral hazard to the empirical analysis. We measure all independent variables by collecting data from public sources which will help the reader make inferences about the reliability of Simunic's questionnaire-based measures.

Second, we examine the stationarity of the model by testing the model for Simunic's test year, 1977, and for two subsequent years, 1978 and 1981. This covers a period in which there were significant developments in the auditing environment, including Congressional investigations of the accounting profession, the Foreign Corrupt Practices Act of 1977, and changes in the professional code of ethics that could increase competitive behavior among external auditors.[3] Any of these events could affect the factors of demand or supply of auditing and the stationarity of the model. For example, Simunic found a highly significant relation between the foreign-to-total-asset ratio and audit fees for 1977, which may have been exacerbated by publicity about events leading to the Foreign Corrupt Practices Act of 1977. Also, Maher and Cheh [1985] found a significant increase in the growth of external audit fees immediately after the Foreign Corrupt Practices Act in companies paying bribes to foreign government officials. There is no evidence that this observed relation between audit fees and foreign activities continued subsequent to the publicity about the bribery activity that led to the FCPA. By using the time period 1977 through 1981, we are able to test the stationarity of Simunic's model given changing events in the auditing environment. For example, with data for both 1977 and 1981 we can infer the extent to which the relation between audit fees and the percentage of foreign assets was a function of the particular regulatory attentions to audit responsibility for sensitive payments in foreign operations in 1977.

Third, we provide evidence about statistical problems (and their resolution) and about the functional form of the model. Simunic's tests include several ad hoc transformations of variables to fit the data. We test these and other potential transformations. Based on our tests of the Simunic model and its statistical properties, we propose a simpler audit pricing model with fewer independent variables. This model reduces the cost of data collection and analysis, yet essentially retains the explanatory power of Simunic's model.

In short, Simunic's audit pricing model is characterized by limited theory, but reasonable empirical results for most variables included in the model. Given the limited theoretical rationale for the variables in the model, additional tests are warranted to ascertain whether his results are peculiar to his sample and time period. Further, we shed additional light on statistical properties of the model, and we indicate areas where Simunic's particular transformations of variables do not hold for other samples.

This paper is organized as follows. Section II presents the basic audit pricing model proposed by Simunic [1980]. Sections III and IV discuss our research methods and tests of the Simunic model, respectively. Section V discusses properties of the data used to estimate the model, identifies statistical problems with the model estimate, and proposes modifications to deal with these problems. Based on the results from Section IV and the proposed modifications to the model from Section V, we present and test an estimate of a simpler version of the Simunic model. The objective of this modification is to enable researchers (and practioners) to use a simpler model in controlling for factors affecting audit fees without sacrificing the explanatory power of the model. Section VI presents conclusions, limitations, and implications of the work.

II. THE MODEL

This section discusses the Simunic [1980] audit pricing model which is summarized in Table 1. The theoretical model is comprised of three categories of theoretical variables to explain three sources of differences in audit fees: (i) loss exposure variables, which relate to the variations in liability loss exposure across audits; (ii) loss sharing variables, which relate to the auditor's potential share of losses; and (iii) production function variables.

Loss Exposure Variables

Based in part on information obtained from organizations providing professional liability insurance for accountants, Simunic hypothesized that the determinants of loss exposure would be (i) the size of the auditee, (ii) the complexity of the auditee's operations, and (iii) auditing problems associated with particularly "risky" balance sheet components, namely inventories and receivables.

Size of auditee. Simunic used assets as the measure of auditee size on the grounds that "the stock of assets seems more closely related to possible loss exposure than would an accounting flow measure such as revenue, because defective financial statements which result in a lawsuit frequently involve some deficiency in asset valuation.... In addition, external auditors have traditionally approached the audit process through the ending balance sheet. To the extent that increases in measured total assets of auditees reflect increases in the number of individual elements which comprise the accounting populations of which total assets are composed, then the sample size required to achieve a given level of control will increase at a decreasing rate" ([1980] p. 172). Simunic found (empirically) a nonlinear relationship between assets and audit fees, and used a square-root transformation of assets in his tests. (See variable (1) in Table 1.)

Complexity of operations. The complexity of auditee operations was measured by three variables. First, the number of subsidiaries included in the financial statements is a measure of complexity due to decentralization. Second, the number of Standard Industrial Classification System two-digit industries in which the auditee operates, minus one, is a measure of complexity due to diversification. Third, the ratio of the auditee's foreign-to-total assets is a measure of complexity as a function of foreign operations. (See variables (2), (3), and (4) in Table 1.)

Risky balance sheet components. Receivables and inventories are considered particularly "risky balance sheet components," in part because their valuation requires a forecast of future events. Hence, liability exposure is expected to be a function of the proportion of assets that are receivables and inventories. The ratios, receivables-to-total-assets and inventories-to-total assets, are the operational constructs for risky balance sheet components. (See variables (5) and (6) in Table 1.)

Loss-Sharing Ratio

Whereas loss exposure refers to the total exposure, loss-sharing refers to the expected fraction of losses borne by the auditor. This fraction is directly related to the auditee's financial distress. Evidence of auditee financial distress is measured by three variables: (i) ratio of net income to total assets, (ii) a categorical variable if the auditee has experienced a loss in the current year or any one of the two prior years, and (iii) another categorical variable if the auditee has received a "subject to" qualified audit opinion in the current year. (See variables (7), (8), and (9) in Table 1.)

Differences in Auditor Production Function

The production function effect in the model is a hypothesized learning effect. The relation between the length of auditor/auditee association and the quantity of auditor inputs is expected to be negative; hence, the number of years of the auditor/auditee association is used to control for the learning effect. (See variable (10) in Table 1.)

Modifications to the Model

Simunic modified the regression equation for two categories of variables not included in the theory. We include these variables to replicate Simunic's estimate.

Industry classifications. Simunic's investigation of the data revealed systematically lower fees for banks and utilities than for other auditees, so he included a (0, 1) variable for each of these two industries. These variables are intended to help control for particular industry effects that are not explained by the theoretical model; hence, they have no hypothesized sign. (See variables (11) and (12) in Table 1.)

Auditor identity. Simunic modified the regression to control for the effects of Big Eight economies of scale or pricing behavior compared to non-Big Eight firms. Also, he found Price, Waterhouse & Co. fees were outliers on the high side. Hence, two additional variables are included to control for the particular effects of Price Waterhouse & Co. (Auditor-PW) and the other seven Big Eight firms (Auditor-7). (See variables (13) and (14) in Table 1.)

Transformation of variables. The estimated model also includes the following variable transformations. Siminic used a power transformation of assets to linearize the fee-to-assets relation. He found the best results and the most homogeneous residual variance using a square root transformation. Hence, auditee size was controlled by dividing audit fee by $\text{Assets}^{.5}$. He used the square root transformation of the variable SUBS and the natural log transformation of the variable TIME to help linearize the fitted function.

Similarity of estimates. The variables in our tests of the Simunic model are operationalized exactly the same as his for all variables except one. We assumed learning effects would be dissipated after five years, so our measure of LOG(TIME) stops after the first five years of an auditor/auditee engagement.

Other functional forms. It should be apparent from the preceeding discussion that, whereas a justification can be provided for each variable and its measures, alternative measures and variables could also be rationalized. One purpose of this paper is to examine alternative ways to measure these variables, as discussed in Sections IV and V.

III. THE SAMPLE

Audit fee data were collected directly from auditees in tandem with a study of internal auditing by Mautz, Tiessen, and Colson [1984]. Pilot studies were performed in six companies to ascertain difficulties in getting data and to ascertain whether audit fees could be separated from other CPA firm billings. Auditees in this sample were all able to report audit fees, alone. The measures of all the independent variables in the model are based on publicly available data. Table 2 presents the sources of data for those variables.

The sample for each year consists of the intersection of (1) auditees providing audit fee data in the Mautz, et al [1984] study and (2) auditee companies for which there was publicly available data on the independent variables. Demographic data about the sample are presented in the Appendix. The sample is comprised almost entirely of "Fortune 1300" companies, with nearly half in the Fortune 500 set.[4] Our sample is similar to Simunic's "large auditees" set (that is, auditees with sales greater than $125 MM), although the mean size of companies is larger in our sample.[5] In addition, nearly all of the sample are audited by Big Eight firms. Therefore, generalizations from our findings should be restricted to the population of relatively large, publicly held clients of Big Eight auditors.[6]

IV. FINDINGS

Determinants of External Audit Fees

The first regression is shown in equation (1):

$$\text{(1)} \quad \frac{\text{FEE}}{\text{ASSET}^{.5}} = b_0 + b_1\text{SUBS}^{.5} + b_2\text{DIVERS} + b_3\text{FORGN} + b_4\text{RECV}$$

$$+ b_5\text{INV} + b_6\text{PROFIT} + b_7\text{LOSS} + b_8\text{SUBJ}$$

$$+ b_9\text{LOG(TIME)} + b_{10}\text{BANK} + b_{11}\text{UTILITY}$$

$$+ b_{12}\text{AUDITOR-PW} + b_{13}\text{AUDITOR-7} + \tilde{e}.$$

The variables are defined in Table 1.

1977 Findings

Table 3 compares the results for 1977 with Simunic's results for the same year. The results for the coefficients are similar to Simunic's and the adjusted R^2 is higher. Like Simunic, we found coefficients of the loss exposure variables DIVERS, FORGN, RECV and INV to be significant in the predicted direction. The one exception is the coefficient of SUBS which is in the predicted direction in our sample, but not significant. We had mixed results for the loss-sharing variables (PROFIT, LOSS, and SUBJECT), as did Simunic. Coefficients for PROFIT and SUBJECT are not significant at $p = .05$ for either our sample or Simunic's large auditee subset. The variable LOSS, which is defined as a (0, 1) variable to indicate whether the auditee had a loss in the current or two previous fiscal years, is significant (at $p = .05$) in both our sample and Simunic's <u>all auditees</u> sample. The coefficient of the production function variable, LOG(TIME), is negative, as predicted, but not significant ($p = .05$) in either Simunic's or our results.

The coefficient for the dummy variable for banks is negative and significant in both studies; the coefficient for the dummy variable for utilities is negative and not significant, as in Simunic's large auditee sample. Considering the negative signs on both the AUDITOR-PW and AUDITOR-7 variables for our sample, these results are consistent with Simunic's results in which he failed to reject the null hypothesis that price competition prevails in the market for audits.

Overall, our results are similar to Simunic's. These findings support Simunic's choice of variables in his estimate of audit fee determination. The comparability of our findings to Simunic's provides a reliability check on Simunic's questionnaire data through our use of publicly available data to measure the independent variables.

1978 and 1981 Findings

Table 4 presents the results for 1978 and 1981, and compares them to the 1977 results. (The sample size increases due to data availability.) These results are similar from year to year, which suggests that the Simunic model is stable over time. The adjusted R^2 statistics are virtually identical and the coefficients are generally similar from year to year. The exceptions are as follows. SUBS$\cdot$[5] has the predicted sign for all three years, but the coefficient is significant only for the 1981 sample. AUDITOR-PW and AUDITOR-7 have negative but not significant coefficients in the 1977 sample; these coefficients are also negative, but significant, in the 1978 and 1981 samples. The coefficient for LOSS, which was significant in the predicted direction in the 1977 sample, is not significant in the 1978 and 1981 samples.

Discussion of the External Audit Pricing Model Results

These results indicate a degree of validity and reliability for the Simunic audit pricing model. Despite the changes in the audit environment during the period 1977-81, this audit pricing model appears to be a reliable and reasonable estimate of variables affecting audit prices. For example, we noted above that the significance of FORGN, defined as the ratio of foreign-to-total assets, in Simunic's 1977 findings could be a function of the regulatory emphasis on foreign operations at that time (e.g., the Foreign Corrupt Practices Act). Our results for 1981 indicate that the significance of FORGN was not peculiar to the 1977-78 time period; it has an effect on the economics of auditing beyond the regulatory and media attention given to foreign activities at that time.

These results and Simunic's suggest that measures of loss exposure are economically significant determinants of audit fees. The implications are not as clear for loss sharing variables, on the other hand. This may be a function of the size and risk characteristics of the auditees in Simunic's large auditee sample and our sample, however, and may not apply to smaller and perhaps more risky auditees. Note that Simunic finds two of these loss sharing variables significant when his sample includes smaller auditees, but they are not significant in the large auditee sample (see Table 3). These results imply that controlling for loss-sharing variables has little effect in samples of large auditees (e.g., Fortune 1300 companies), but they may be important variables in samples comprised of smaller auditees.

The coefficient of the variable LOG(TIME) is not significant, and the sign is opposite to the predicted direction for our 1981 sample. These results imply that learning effects, if they exist, may be offset by "low-balling."[7] Given the low auditor turnover in our sample, generalizations to high turnover samples are questionable. Nevertheless, considering our results and that of prior research in this area, the time length of the auditor/auditee relationship appears to have an insignificant net impact on audit pricing. These results should not be construed to imply that there are no "low-balling" or learning effects, but that additional analysis on a sample characterized by greater turnover would be necessary to separate low-balling from learning effects.

Considering the dummy variables for industry classifications, both banks and utilities are negatively associated with audit prices. The coefficient for banks is significantly negative for all three years.

An overall assessment of these and Simunic's results implies that, for large auditees, loss exposure variables are significantly positively associated with $\frac{FEE}{ASSETS^{.5}}$. The findings for loss sharing variables only weakly support the theory. If a user's objective for using the audit pricing model is to predict audit fees, dropping the loss-sharing variables would probably not have much effect on the prediction. The LOG(TIME) variable could probably also be dropped from the model unless there is more evidence of auditor turnover in the sample than we found in our samples.

Determinants of Total Audit Costs

The next model, as shown in equation (2), tests the effects of the independent variables on total audit cost, including internal audit costs (i.e., salaries).

$$(2) \quad \frac{(FEE + ICOST)}{ASSETS^{.5}} = b_0 + b_1 SUBS^{.5} + b_2 DIVERS + b_3 FORGN$$

$$+ b_4 RECV + b_5 INV + b_6 PROFIT + b_7 LOSS$$
$$+ b_8 SUBJ + b_9 LOG(TIME) + b_{10} UTILITY$$
$$+ b_{11} AUDITOR\text{-}PW + b_{12} AUDITOR\text{-}7$$
$$+ \tilde{e}$$

The independent variables are defined above. To be comparable to Simunic's test of this model, we excluded banks from the sample, just as he did. Hence, the BANKS (0,1) variable is excluded from equation (2). Otherwise, the independent variables in equation (2) are the same as in equation (1).

Table 5 compares Simunic's results for 1977 with our tests for the years, 1977, 1978 and 1981. These results consistently show a lower adjusted R^2 when ICOST is added. Although the coefficients that were significant in the external audit $\frac{FEE}{ASSETS^{.5}}$ model are still significant in this model, the significance levels are generally not as high. These results imply that the model does not explain variations in total audit costs as well as it explains variations in external audit fees. Next we examine these results more closely to ascertain how well the model works for internal audit costs alone.

Internal Audit Costs

The Simunic model for internal audit costs is shown in equation (3):

$$(3) \quad \frac{ICOST}{ASSETS^{.5}} = b_0 + b_1 SUBS^{.5} + b_2 DIVERS + b_3 FORGN + b_4 RECV$$
$$+ b_5 INV + b_6 UTILITY + \tilde{e}$$

This model includes the loss exposure variables from the external audit fee model in equation (1), but it excludes the loss-sharing variables and LOG(TIME) which are variables peculiar to the external auditor/auditee relationship.

Simunic's tests of this model led him to conclude that "...the regression results are, on the whole, unsatisfactory. The low adjusted R^2 and the lack of significance and inconsistent signs of many of the control variables suggest that the determinants of ICOST are not correctly specified and/or that there is significant error in the measurement of this variable" (p. 184). Our results are consistent with the model specification problem (Table 6). After controlling for size, the only significant variables in our estimates of the model are INV, for 1978 only, and FORGN, for 1978 and 1981.

Given Simunic's findings, one of our objectives was to ascertain whether the poor results for the internal audit model were due to model specification or to measurement error. As noted above, the data for the independent variables were collected from publicly available sources. This, plus the consistently strong results for the external audit fee model, reduces our concern about measurement error in the independent variables. Like Simunic, we collected data to measure the dependent variable, internal audit salaries, directly from companies using questionnaires. We performed several data reliability checks to increase our confidence in the measures of internal audit costs, including pilot studies in six companies to identify measurement problems, internal checks in the questionnaire, and follow-up telephone calls to about 25% of all study participants. If the data do not contain measurement error, then the problem appears to be one of model specification. These results imply that the "internal audit cost" model is not a simple extension of the external pricing model. Specifying and estimating the internal audit cost model remains a topic for future research.

V. MODIFYING THE MODEL

The purpose of this section is to examine the properties of the data used to estimate the audit pricing model, and to identify statistical problems with the model estimate. This analysis helps us to assess further the relability of the audit pricing model, and to suggest modifications that could be useful for future research using this model.

We begin with the following estimate of the theoretical model before transforming any variables:

$$(4)\quad FEE = b_0 + b_1ASSETS + b_2SUBS + b_3DIVERS + b_4FORGN + b_5RECV + b_6INV + b_7PROFIT + b_8LOSS + b_9SUBJ + b_{10}TIME + \tilde{e}.$$

Transformations

The theoretical rationale for the particular form of the model estimated earlier in this paper is somewhat ad hoc, so we investigated the relation between the dependent variable FEE and each of the independent variables. Misspecified relationships may both bias the coefficients and bias the estimated variance of the coefficients.

A linear relation between FEE and independent variable X_k implies that the intercept of the model and the coefficient of X_k remain constant over all values of X_k. To test for linearity we begin by re-ordering the sample by ascending order of the values of X_k and segmenting it into four nonoverlapping subgroups.[8] Then, defining the following dummy variables, $Z_{ijk} = 1$ if the i^{th} observation for the k^{th} variable is in the j^{th} subgroup, 0 otherwise, we amend the basic model presented in (4) to the following:

$$(5)\quad FEE = b_0 + b_1ASSETS + b_2SUBS + \ldots + b_{10}TIME + a_2Z_{i2k} + a_3Z_{i3k} + a_4Z_{i4k} + c_2X_{ik}Z_{i2k} + c_3X_{ik}Z_{i3k} + c_4X_{ik}Z_{i4k} + e_i'.$$

In this model, a_j denotes the increment in the intercept for the j^{th} subgroups over the first subgroup. The coefficient c_j denotes the increment in the slope coefficient of X_k for the j^{th} subgroup relative to the first subgroup.

The null hypothesis that the relation between FEE and X_k is linear is tested as follows:

$$H_0: \ a_2 = a_3 = a_4 = c_2 = c_3 = c_4 = 0.$$

This hypothesis can be tested using the usual F-statistic for testing the joint influence of additional explanatory variables:

$\hat{F} = [(SSE_K - SSE_Q)/(Q-K)]/[SSE_Q/(n-Q)]$, distributed approximately $F_{Q-K,n-Q}$; where K = the number of coeffcients in the basic model in equation (4), Q = number of coefficients in equation (5), and SSE_K and SSE_Q refer to their respective residual sum of squares.

The expected value of $\hat{F}$ should be smaller under the null hypothesis than under the alternative hypothesis of nonlinearity. A large $\hat{F}$ provides evidence to reject the null hypothesis.

The purpose of this test is exploratory; it will help to identify the absence of linearity, but it will not identify the correct functional form nor will it ascertain whether inclusion of nonlinear functional forms will improve the fit of the multiple regression. Table 7 lists each of the variables tested with its F-statistic, which is significant for ASSETS ($p = .05$) as predicted by the theory. The F-statistic for the variables INV and DIVERS are also significant or nearly significant at $p = .10$.

Next we re-examined the basic model from equation (4) to ascertain whethe including nonlinear forms improved the fitted form for each of the following variables, one at a time: ASSETS, DIVERS, INV, SUBS and TIME. We consider the first three variables because of the nonlinearity tests reported in Table 7;

SUBS and TIME are considered for replication purposes because Simunic [1980] found a nonlinear form improved the fitted function in his sample. In each test, the transformed variable was substituted for its linear counterpart into the basic model in equation (4). The effect of each of these substitutions on the adjusted R^2 are shown in Table 8. There is virtually no improvement in fit for nonlinear transformation of all variables except ASSETS. These results imply that a nonlinear transformation of ASSET using exponents ranging from .25 to .5 have about the same effect on the fitted form in our sample. Simunic's results for a 1977 sample combined with our results using a 1981 sample provide evidence of a nonlinear relation between audit fees and auditee size, measured in assets. Further, a square-root transformation appears to be a reasonable operational fit.

Based on these results, we substituted $ASSETS^{.5}$ for ASSETS for the rest of our analysis. The modified model is as follows:

$$(6) \quad FEE = b_0 + b_1 ASSETS^{.5} + b_2 SUBS + b_3 DIVERS + b_4 FORGN + b_5 RECV + b_6 INV + b_7 PROFIT + b_8 LOSS + b_9 SUBJ + b_{10} TIME + \tilde{e}$$

Omitted Variables

Omitted variables may result in biased coefficients and biased estimated variance of coefficients. The variables considered are those for which a theoretical rationale for inclusion is not apparent; however, their omission may bias the estimates and affect hypothesis tests. In his omitted variable analysis, Simunic found banks and public utilities to have notably lower audit fees than the rest of his sample. He also found Price Waterhouse auditees to pay significantly higher audit fees. Our omitted variable test considers the effects of controlling for the effects on audit fees of each of the Big Eight firms and two industries: banks and utilities.

To perform the omitted variables test, we first added dummy variables for all ten omitted variables considered (eight auditors plus banks and utilities), and compared the explanatory power of this "all-inclusive" model with that in equation (6). The null hypothesis of no difference between this "all inclusive" model and the model in equation (6) was rejected (F = 3.3, critical value of $F_{.05,10,88} = 1.95$).[9] Next we investigate the impact of each of the ten variables omitted from the basic model (equation (6)) by testing the null hypothesis of no difference between the basic model in equation (6) and ten different models, each with one variable previously omitted from equation (6). We found only two models for which the null hypothesis could be rejected at p = .05: one model with BANK and one model with AUDITOR-PMM (Peat, Marwick, Mitchell & Co.). In both cases, the signs of the coefficients were negative. The F statistics for these were 10.1 for the model adding BANK and 19.0 for the model adding AUDITOR-PMM (critical $F_{.05,1,97} = 3.96$), indicating rejection of the hypotheses that BANK and AUDITOR-PMM are not explanatory variables. Not only was the individual effect of each of the other eight omitted variables not significant, but their joint effect was not significant (F = .88, critical $F_{.05,8,88} = 2.06$).

These tests for omitted variables are not exhaustive, of course, but they are suggestive of possible omitted variable problems. First, we find BANKS to be significant in both the model tested here (with FEE as a dependent variable and $ASSETS^{.5}$ as an independent variable) and the Simunic model (with $\frac{FEE}{ASSETS^{.5}}$ as the dependent variable). This implies that studies of audit fees should control for the effects of financial institutions. Second, differences in audit fees across audit firms is not as clear. We found firm effects, but the firm effects differed depending on the model. These findings are suggestive rather than conclusive; they suggest that the effects of each Big Eight firm on audit fees should be considered.

Based on these omitted variables tests, the model is now modified to include the independent variables BANK and AUDITOR-PMM:

$$(7)\quad FEE = b_0 + b_1 ASSETS^{.5} + b_2 SUBS + b_3 DIVERS + b_4 FORGN + b_5 RECV + b_6 INV + b_7 PROFIT + b_8 LOSS + b_9 SUBJ + b_{10} TIME + b_{11} BANK + b_{12} AUDITOR\text{-}PMM + \tilde{e}$$

The estimated coefficients for this model are shown in Table 9.

Outliers

In this section, we perform tests to detect the presence of outliers and influential cases. We computed the studentized residuals (r_i) and Cook's Distance statistic (D_i) for each of the 109 cases.[10] First, we tested each case to see whether it was an outlier. The distribution of r_i is a monotonic transformation of a Student's t-distribution and its corresponding t-statistic is appropriate for testing for outliers. Defining this statistic:

$$t_i = r_i((n-p'-1)/(n-p'-r_i^2))^{.5},$$

where r_i = studentized residual,

n = sample size,

p' = number of coefficients;

we then compared each t_i to the critical value of $t_{.05/n,n-p'-1}$. We detected two outliers in this manner. Neither of the outliers was an influential case in the estimation process according to their Cook's Distance statistics, however, so we did not delete them.[11] (One rule of thumb suggests that a D_i greater than one indicates an influential case.[12] Both of the outliers had $D_i = .20$, none of the 109 cases had $D_i > .35$).

Heteroscedasticity

This section reports our tests for heteroscedasticity. For data of this type, it is reasonable to suspect that the residual variance would increase with the asset size of the firms. Three plausible forms of the relation between residual variance and firm size (measured in assets) were specified and tested according to procedures described in Park [1966] and Glejser [1969].[13] The three forms are as follows (X_i = ASSETS of the ith auditee):

(8) $\mathrm{Var}(e_i) \equiv \sigma_i^2 = \sigma^2 X_i^\lambda$,

which is operationalized as

$$\ln(\hat{e}_i^2) = \ln\sigma^2 + \lambda \ln X_i + \mu_i;$$

(9) $|e_i| = a + bX_i + \eta_i;$

(10) $|e_i| = a + bX_i^{.5} + \varepsilon_i,$

where $\hat{e}$ replaces e in the testable counterparts of (9) and (10).

Estimation of all three testable forms of the relation yielded significant results, indicating the presence of firm size related heteroscedasticity. The results are shown in Table 10.[14]

The results from equation (9) were used in estimating the weighted least squares (WLS) model because it appeared to model the relation between error variance and firm size best among the three estimates in Table 10. Hence, each variable is divided by 233,930 + .000050 ASSETS_i for all i. The results for the estimated weighted least squares model are shown in Table 11.

We also examined two other adjustments for heteroscedasticity. First, Simunic made the following dependent variable transformation: $\frac{\mathrm{FEE}}{\mathrm{ASSETS}^{.5}}$. We examined residual plots and performed the Park-Glejser test on the residuals of Simunic's model with this dependent variable transformation and found no evidence of heteroscedasticity. Second, we used the IMSL Box-Cox transformation to find the best variance-stabilizing transformation of the dependent variable, FEE[15]. Over the transformations that we tested, which included LOG(FEE), FEE^2, and several roots of FEE, the square root of FEE was found to be the best transformation. These tests suggest that transformations to the dependent variable can be made to deal with heteroscedasticity. Regardless of adjustment method, our analysis indicates that heteroscedasticity is a problem to be addressed when estimating audit pricing models.

Model Simplification

A disadvantage of the Simunic audit pricing model is its user cost. Because of the large number of independent variables, data collection is costly. If data are collected by questionnaire, as Simunic did, then the greater the number of data points, the higher the cost of data collection to both the researcher and subject. Further, the higher the cost to the subject and the greater the number of measures provided by the subject, the lower the response rate of questionnaires and the greater the frequency of measurement error. If data to measure the independent variables are collected from public sources, as in this study, the number of independent variables affects the cost to the researcher. As shown in Table 2, much of the data were not readily available on Compustat, in Moody's, or in Standard and Poor's. (We found data on foreign assets, subject-to opinions, and the length of time of the auditor/auditee relationship to be particularly costly to collect.)

In addition to data collection costs, a large number of independent variables reduces degrees of freedom which may be a particular problem for specific auditor or industry analyses. Finally, as shown in Table 12 in this study, and in Simunic's Table 9 [1980, p. 182], several of the independent variables in the model are correlated with each other, which can make interpretation of coefficients problematic. The purpose of this section is to simplify the model by eliminating variables that appear to be making no explanatory contribution, and to rerun the simpler model on all three years' data. The three variables dropped from the full model were TIME, PROFIT, and SUBJ. TIME and PROFIT were not significant in any of our tests or in Simunic's analysis. SUBJ was not significant in our test or in Simunic's test on large auditees. This implies that SUBJ should still be considered as a variable for small auditees but not for large auditees.

Table 13 shows the results when these three variables are dropped. The adjusted R-square is the same for both the OLS full model and the simpler model--.68. For the estimates using WLS and $FEE^{.5}$ as the transformed dependent variable, the adjusted R^2 is slightly higher for the parsimonious model than for the full model. The simpler model appears to retain the explanatory power of the full model, while reducing research costs when compared to the full model.

VI. CONCLUSIONS, SUMMARY AND LIMITATIONS

The objective of this study was to test Simunic's positive model of the determinants of audit fees. Simunic's tests showed reasonable empirical results, particularly given the limited theory to justify the variables in the model; however, it is not clear to what extent his results are peculiar to his time period (i.e., 1977), his sample, and his data collection methods (i.e., using questionnaires). Hence, we performed additional tests on different samples, using different sources of data, and different years. These tests produced several findings, including (1) evidence about the reliability of the model and its stationarity over time, (2) additional evidence on the variables affecting external audit fees, (3) additional evidence about statistical problems with the estimates, and 4) the results for a simpler audit pricing model.

Summary of the results. The results support Simunic's model for the two major classes of variables that are hypothesized to affect audit prices: loss exposure variables and loss sharing variables. The findings are consistent with the notion that the greater the loss exposure, the higher the audit fees, all other things equal. We find significant coefficients for all five loss exposure variables, in addition to auditee size, in the 1981 sample, and for four of the five in the 1977 and 1978 samples. We found little support for the notion that audit prices reflect measures of potential loss sharing, however, which is consistent with Simunic's large auditee subsample results. (Auditee size in our sample is comparable to Simunic's large auditee subsample.) Comparing our findings with Simunic's suggests that loss sharing variables may have a greater effect on audit prices for smaller auditees than for larger auditees.

Like Simunic, we find no evidence that the length of the auditor-auditee relationship affects audit prices; however, our sample is characterized by low auditor turnover. These findings imply that research on learning effects and strategic pricing behavior (i.e., "low-balling") may require higher auditor turnover samples than the samples used in these studies. We find significant industry effects for financial institutions, but not for utilities, which is consistent with Simunic's results for his large auditee subsample.

Additional tests and modifications to the model. Audit fees are nonlinearly related to auditee size, measured as total assets. The square root transformation of assets used by Simunic provided a good fit for our sample. Unlike Simunic, we did not find a nonlinear relation between FEE and SUBS, nor between FEE and TIME. Although we found two outliers, neither was an 'influential" case. Finally, we found evidence of heteroscedasticity and showed results using two methods of correction: weighted least squares and a square root transformation of the dependent variable. We also found that scaling audit fees by the square root of assets, as used by Simunic, corrected for heteroscedasticity. We also created and tested a more parsimonious audit pricing model that retained the explanatory power of the full model, but with fewer variables.

Because of the lack of publicly available data for small auditees, our samples are comprised mostly of "Fortune 1300" companies. Generalizations to smaller auditees are questionable; in particular, the lack of significance for loss sharing variables should not be generalized to smaller auditees. Different samples could also provide more insight into the effect of "low-balling" and learning on fees, auditor effects, and the effects of industry specialization (e.g., see Danos and Eichenseher [1982] and Palmrose [1983]).

Despite the limitations of the tests, the results were supportive of the Simunic audit pricing model. Alternative formulations of the model by transforming variables did not have much effect on the results. Further, the model does not appear to be sensitive to the changes in the audit environment that occurred in the late 1970's.

TABLE 1

VARIABLES IN THE MODEL

Theoretical Variable	Operational Variable	Hypothesized Impact of Variable on: Audit Fee	Internal Audit Cost
Loss Exposure Variables			
Size of Auditee	(1) Total year-end assets ($ASSETS^{.5}$)	+	+
Complexity of operations: Auditee decentralization and diversification	(2) Number of consolidated subsidiaries (SUBS)	+	+
	(3) Number of two-digit SIC codes less one (DIVERS)	+	+
	(4) Ratio of foreign to total assets (FORGN)	+	+
Risky balance sheet components	(5) Ratio of receivables to total assets (RECV)	+	+
	(6) Ratio of inventories to total assets (INV)	+	+
Loss-sharing Variables			
Degree of auditee financial distress	(7) Ratio of net income to total assets (PROFIT)	–	N/A

Theorectical Variable		Operational Variable	Hypothesized Impact of Variable on: Audit Fee	Internal Audit Cost
	(8)	(0,1) variable, where (1) if auditee had a net loss in at least one of the current or prior two years (LOSS)	+	N/A
	(9)	(0,1) variable, where (1) if auditee received a "subject to" opinion in the current year (SUBJ)	+	N/A
<u>Differences in Auditor Production Function</u>				
Learning curve effect	(10)	Log of the number of years of the auditor/auditee relationship LOG(TIME)	-	N/A
<u>Industry Classification</u>				
Impact of particular industry characteristics on audit fee	(11)	(0,1) variable where (1) if client is a bank (BANK)	none	N/A
	(12)	(0,1) variable where (1) if client is a utility (UTILITY)	none	N/A

Theorectical Variable	Operational Variable	Hypothesized Impact of Variable on: Audit Fee	Hypothesized Impact of Variable on: Internal Audit Cost
Auditor Identity			
Impact of economies of scale or pricing strategy because auditor is a Big-Eight firm	(13) (0,1) variable where (1) if the auditor is Price Waterhouse & Co. (AUDITOR-PW)	none	none
	(14) (0,1) variable where (1) if the auditor is one of the Big-Eight firms other than Price Waterhouse & Co. (AUDITOR-7)	none	none
Cost of Audit Services to Auditee	Amount of current year's external audit fee. (FEE)		
	Salaries paid to internal auditors in current year. (ICOST)		

TABLE 2

Sources of Data

VARIABLE	SOURCE(S)[a]
1. Audit Fee Internal Audit Cost	Questionnaire to auditees
2. Auditor Name Time	- Moody's Industrial, Public Utility, and Bank and Finance Manuals - Who Audits America[b] - Disclosure Journal: Profiles[c]
3. Foreign Assets	- Annual Reports
4. Total Assets Receivables Inventory Net Sales Net Income Loss (0,1)	- Compustat Tapes - Annual Reports - Moody's Manuals
5. Subject to (0,1)	- Annual Reports - Disclosure Journal
6. Subsidiaries	- Moody's Manuals
7. SIC Bank (0,1) Utility (0,1)	- Standard and Poor's Register of Corporations, Directors & Executives - Principal International Business[d]

[a]Principal Source is listed first for each variable or group of variables.

[b]Published by: Data Financial Press
P.O. Box 801
Menlo Park, CA 94025

[c]Published by: Disclosure, Inc.
5161 River Road
Bethesda, MD 20816

Disclosure, Inc. ceased publication of Disclosure Journal in 1978. However, annual report and other data can be obtained through Disclosure, Inc.'s data service at the above address.

[d]Published by: Dun & Bradstreet
3 Century Drive
Parsippany, NJ 07054

TABLE 3

Comparison of Results for 1977

Variable	Hypothesized Sign of Coefficient	Our Results for 1977	Simunic's Results: Large Auditees (Excluding Banks)	Simunic's Results: All Auditees
Loss exposure variables				
SUBS.[5]	+	.22 (.46)	.93* (.18)	.96* (.14)
DIVERS	+	.87* (.32)	.72* (.31)	1.03* (.26)
FORGN	+	25.13* (7.60)	14.61* (2.88)	14.88* (2.45)
RECV	+	22.10* (7.04)	18.93* (4.46)	9.06* (2.29)
INV	+	18.50* (6.60)	9.09* (2.98)	7.26* (1.86)
Loss sharing variables				
PROFIT	-	7.84 (23.59)	1.53 (12.20)	2.52 (5.52)
LOSS	+	9.86* (5.76)	.93 (1.73)	1.83* (.92)
SUBJ	+	-2.16 (2.99)	.81 (1.73)	2.71* (1.19)
Time variable				
LOG(TIME)**	-	-.57 (3.42)	-1.58 (1.28)	-.43 (.86)
Industry variables				
BANK	none	-10.85* (3.86)	-	-9.79* (1.63)
UTILITY	none	-2.26 (3.37)	-1.62 (1.87)	-2.97* (1.59)
Auditor variables				
AUDITOR-PW	none	-7.55 (6.55)	1.20 (1.61)	.76 (1.14)
AUDITOR-7	none	-8.05 (6.02)	-1.15 (1.21)	-1.66* (.77)
Adjusted R^2		.61	.51	.46
Sample Size		89	202	397

Note: Standard errors are in parentheses.

*Regression coefficient significant at p = .05 (one-tail test where appropriate).

**Coefficient is not comparable to Simunic's because the measures of the variable are different. (We assumed learning effects were dissipated after five years.)

TABLE 4

Results for 1977, 1978, and 1981: Regression of FEE/ASSETS$^{.5}$ on Independent Variables

Variable	Hypothesized Sign of Coefficient	1981 Results	1978 Results	1977 Results
Loss exposure variables				
SUBS$^{.5}$	+	1.37* (.42)	.58 (.46)	.22 (.46)
DIVERS	+	1.04* (.35)	1.35* (.43)	.87* (.32)
FORGN	+	23.26* (6.21)	26.23* (7.09)	25.13* (7.60)
RECV	+	16.83* (6.10)	16.73* (6.88)	22.10* (7.04)
INV	+	12.42* (7.13)	19.59* (6.67)	18.50* (6.60)
Loss sharing variables				
PROFIT	-	-9.46 (22.55)	4.97 (29.07)	7.84 (23.59)
LOSS	+	3.92 (3.74)	-3.49 (4.43)	9.86* (5.76)
SUBJ	+	3.24 (3.39)	3.60 (3.79)	-2.16 (2.99)
Time variable				
LOG(TIME)	-	3.40 (6.31)	-2.33 (7.59)	-.57 (3.42)
Industry variables				
BANK	none	-13.93* (3.44)	-10.50* (3.98)	-10.85* (3.86)
UTILITY	none	-3.30 (3.15)	-2.48 (3.28)	-2.26 (3.37)
Auditor variables				
AUDITOR-PW	none	-12.56* (4.92)	-11.48* (5.13)	-7.55 (6.55)
AUDITOR-7	none	-13.83* (4.44)	-11.06* (4.60)	-8.05 (6.02)
Adjusted R^2		.60	.61	.61
Sample Size		109	97	89

Note: Standard errors are in parentheses.

*Regression coefficient is significant at p = .05 (one-tail test where appropriate).

TABLE 5

Results for 1977, 1978, and 1981:

Regression of [(FEE + ICOST)/ASSETS$^{.5}$] on Independent Variables
(Banks excluded from samples.)

Variable	Hypothesized Sign of Coefficient	1981 Results	1978 Results	1977 Results	Simunic's 1977 Results
Loss exposure variables					
SUBS$^{.5}$	+	1.58*	-.08	-.23	1.58*
		(.79)	(.86)	(.80)	(.21)
DIVERS	+	1.28*	1.95*	1.10*	1.70*
		(.66)	(.88)	(.61)	(.41)
FORGN	+	42.65*	47.10*	38.89*	12.88*
		(12.34)	(13.13)	(13.22)	(3.41)
RECV	+	24.97*	18.40	29.02*	9.74*
		(13.90)	(13.95)	(13.71)	(3.22)
INV	+	15.85	35.72*	27.68*	8.73*
		(13.10)	(11.71)	(11.22)	(2.52)
Loss sharing variables					
PROFIT	-	-55.57	1.16	18.85	.57
		(41.72)	(52.0)	(43.14)	(7.26)
LOSS	+	7.82	-7.65	8.68	.56
		(7.08)	(8.31)	(12.05)	(1.22)
SUBJ	+	11.60*	13.46*	7.89	2.88*
		(6.45)	(6.73)	(5.07)	(1.63)
Time variable					
LOG(TIME)**	-	-7.16	-3.07	-5.71	1.41
		(11.59)	(13.38)	(5.69)	(1.23)
Industry variable					
UTILITY	none	-3.90	-2.92	-6.23	-2.75
		(5.89)	(5.77)	(5.69)	(2.17)
Auditor variables					
AUDITOR-PW	none	-18.14	-12.62	.64	5.71*
		(10.05)	(10.20)	(14.15)	(1.57)
AUDITOR-7	none	-19.75*	-13.40	.96	-.82
		(9.35)	(9.36)	(13.58)	(1.04)
Adjusted R^2		.44	.45	.45	.44
Sample Size		98	85	77	314

align

Note: Standard errors are in parentheses.

*Regression coefficient is significant at .05 level; one-tail test where appropriate.

**Coefficient not comparable to Simunic's results because of difference in measurement.

TABLE 6

Results for 1977, 1978, and 1981 Samples:
Regression of ($ICOST/ASSETS^{.5}$) on Independent Variables
(Banks excluded from samples.)

Variable	Hypothesized Sign of Coefficient	1981 Results	1978 Results	1977 Results	Simunic's 1977 Results (Auditees with sales greater than $125 M)
Loss exposure variables					
$SUBS^{.5}$	+	.28 (.58)	-.63 (.57)	-.44 (.54)	.04* (.01)
DIVERS	+	.19 (.48)	.42 (.56)	.43 (.35)	.95* (.31)
FORGN	+	14.90* (8.64)	20.96* (8.16)	9.20* (8.54)	-.11 (2.37)
RECV	+	-1.24 (9.94)	-4.94 (9.09)	-.72 (8.84)	3.97 (3.93)
INV	+	9.57 (8.73)	14.58* (7.59)	8.19 (7.28)	0.07 (2.59)
Industry variable					
UTILITY	none	-.97 (4.24)	-1.70 (3.72)	-4.01 (3.62)	-.88 (1.47)
Auditor variables					
AUDITOR-PW	none	-3.38 (7.37)	1.92 (6.47)	11.53 (9.27)	6.03* (1.37)
AUDITOR-7	none	-.83 (6.82	2.64 (5.88)	12.08 (8.94)	1.57 (1.04)
Adjusted R^2		.02	.10	.06	.25
Sample Size		98	85	77	154

Note: Standard errors are in parentheses.

*Regression coefficient is significant at .05 level (one-tail test where appropriate).

TABLE 7

F-Tests of Nonlinearity in the Relationships Between FEE and the Independent Variables

Variable tested by the model in Equation (5)[a]	F-statistic for testing H_o^b
DIVERS	1.83
SUBS	.37
FORGN	.40
RECV	.95
INV	1.84
PROFIT	1.26
ASSETS	2.14

[a] Testing linearity for the variable time was not appropriate using this method because of the small sample of auditees (i.e., 4) that had used their current auditor for less than five years.

[b] H_0: $a_2 = a_3 = a_4 = c_2 = c_3 = c_4 = 0$.
Critical value for $F_{.05,6,92} = 2.21$

TABLE 8

Tests of Transformed Variables, ASSETS, DIVERS, INV, SUBS, and TIME

Variable Transformation	Adjusted R^2 of Model with Transformed Variable
Basic model with no transformed variables	.50
ASSET transformations:	
LOG(ASSET)	.53
$ASSET^{.75}$	.56
$ASSET^{.50}$	.59
$ASSET^{.40}$	.59
$ASSET^{.33}$	.59
$ASSET^{.25}$	.58
DIVERS transformations:	
LOG(DIVERS)	.49
$DIVERS^{.75}$	.50
$DIVERS^{.50}$	.50
$DIVERS^{.25}$	.50
INV transformations:[a]	
$INV^{.75}$	.50
$INV^{.50}$	.51
$INV^{.25}$	.51
The following two transformations used by Simunic [1980] are also tested:	
$SUBS^{.5}$	.50
LOG(TIME)	.50

[a]LOG(INV) was not considered because it is not defined in auditees having no inventory.

TABLE 9

Basic Model Modified for Variable
Transformations and Omitted Variable Tests
1981 Sample

Variable	Hypothesized Sign	Coefficients
Loss exposure variables		
$ASSETS^{.5}$	+	19.9* (2.3)
SUBS	+	5,585* (3,107)
DIVERS	+	45,514* (27,110)
FORGN	+	1,728,700* (566,410)
RECV	+	1,276,400* (468,970)
INV	+	176,450 (520,220)
Loss sharing variables		
PROFIT	-	-419,390 (1,767,900)
LOSS	+	480,550* (291,460)
SUBJ	+	18,362 (264,520)
Time variable		
TIME	-	-59,547 (142,920)
Industry variable		
BANK	none	-1,024,300* (269,360)
Auditor variable		
AUDITOR - PMM	none	-551,770* (224,840)
Adjusted R^2		.68

Note: Standard errors are in parentheses.

*Significant at p = .05.

TABLE 10

Park-Glejser Test of Heteroscedasticity

Variable	Equation 8 $\ln(\hat{e}_i^2)$	Equation 9 $(\lvert\hat{e}_i\rvert)$	Equation 10 $(\lvert\hat{e}_i\rvert)$
Intercept	9.52*	233,930*	-30,867
LOG(ASSETS)	.73*		
ASSETS	-	.000050*	
$ASSETS^{.5}$	-		9.39*
R^2	.23	.63	.55

*Significant at p = .05.

TABLE 11

Adjustments for Heteroscedasticity
1981 Sample

Variable	Hypothesized Sign	WLS Coefficients[a]	Coefficient FEE.5	OLS Coefficients
Loss exposure variables				
ASSETS.5	+	16.9* (2.3)	.0080* (.0008)	19.9* (2.3)
SUBS	+	5,940* (2,196)	3.1* (1.1)	5,585* (3,107)
DIVERS	+	47,179* (14,679)	34* (10)	45,514* (27,110)
FORGN	+	1,323,700* (338,480)	699* (210)	1,728,700* (566,410)
RECV	+	596,130* (265,960)	555* (173)	1,276,400* (468,970)
INV	+	361,970* (279,140)	314* (193)	176,450 (520,220)
Loss sharing variables				
PROFIT	-	-749,880 (1,048,200)	-153 (655)	-419,390 (1,767,900)
LOSS	+	123,000 (155,860)	106 (108)	480,550* (291,460)
SUBJ	+	100,820 (139,330)	46 (98)	18,362 (264,520)
Time variable				
TIME	-	44,925 (77,651)	41 (53)	-59,547 (142,920)
Industry variable				
BANK	none	-555,880* (187,100)	-424* (100)	-1,024,300* (269,360)
Auditor variable				
AUDITOR-PMM	none	-248,980** (137,380)	-208* (83)	-551,770* (224,840)
Adjusted R^2		.56	.73	.68

Note: Standard errors are in parentheses.

[a]All variables, including FEE, are divided by (233,930 + .000050 ASSETS) in the WLS estimation. Intercept is suppressed in WLS. OLS results are reproduced here for convenient comparison.

*Significant at p = .05.

**Significant at p = .10.

TABLE 12

Correlation Matrix:
OLS Model

FEE	1.00												
TIME	-.06	1.00											
DIVERS	.22*	-.21*	1.00										
SUBS	.45*	-.14	.29*	1.00									
FORGN	.64*	.03	.21*	.49*	1.00								
RECV	.04	-.07	.12	.06	.03	1.00							
INV	.13	-.31*	.33*	.17	.16	.09	1.00						
PROFIT	.04	-.02	.14	.13	.18	-.05	.06	1.00					
LOSS	.15	.06	-.02	.02	.18	.05	.20*	-.37*	1.00				
SUBJ	-.09	.06	-.11	-.14	-.10	-.10	-.11	-.25*	.39*	1.00			
$ASSETS^{.5}$	.64*	.05	-.05	.21*	.46*	-.12	-.21*	-.09	-.01	-.11	1.00		
BANK	-.18	.06	-.17	-.14	-.11	.21*	-.34*	-.30*	.02	.02	.24*	1.00	
PM	.02	.07	.08	.02	.20*	.21*	-.09	-.04	.11	.00	.23*	.29*	1.00
	FEE	TIME	DIVERS	SUBS	FORGN	RECV	INV	PROFIT	LOSS	SUBJ	$ASS^{.5}$	BANK	PM

*Significant at p = .05.

TABLE 13

Parsimonious Model Results
1981 Sample

Variable	Hypothesized Sign	WLS[a]	FEE$^{.5}$	OLS
Loss exposure variables				
ASSETS$^{.5}$	+	17.0* (2.3)	.0080* (.0008)	20.0* (2.19)
SUBS	+	6,052* (2,176)	2.9* (1.1)	5,739* (3,038)
DIVERS	+	44,729 (14,350)	33.5* (9.9)	46,523* (26,574)
FORGN	+	1,256,900* (317,490)	701* (198)	1,658,400* (532,330)
RECV	+	543,670* (258,250)	542* (171)	1,283,900* (458,520)
INV	+	296,230* (256,630)	257** (179)	233,380 (481,870)
Loss sharing variable				
LOSS	+	220,530* (129,170)	143** (89)	507,060* (239,280)
Industry variable				
BANK	none	-536,930* (182,140)	-424* (96)	-1,005,500* (258,760)
Auditor variable				
AUDITOR - PMM	none	-251,620** (135,930)	-206* (82)	-559,290* (221,020)
Adjusted R^2		.57	.74	.68

[a]Weights for this model were based on regressing the (absolute value) residuals from the ordinary least squares parsimonious model on ASSETS. All variables, including FEE, were divided by (233,300 + .000050 ASSETS).

*Significant at p = .05.

**Significant at p = .10.

APPENDIX

TABLE A-1
Demographic Data for Firms in 1977 and 1978 Samples

CASES	VARIABLE	PERCENTILE (000,s omitted) 10%	25%	50%	75%	90%
All 1977	Total Assets	139,320	427,790	1,276,100	2,307,100	4,610,700
All 1977	Net Sales*	158,110	354,790	847,920	2,112,800	4,594,500
1977 Non-banks	Total Assets	139,320	382,360	1,031,800	2,179,300	4,350,100
1977 Non-banks	Net Sales	168,880	389,970	1,014,800	2,318,300	4,594,500
1977 Banks	Total Assets	1,691,400	1,705,500	1,929,100	3,517,000	8,702,100
1977 Banks	Net Sales	126,230	129,810	277,560	615,470	823,050
All 1981	Total Assets	214,200	509,610	1,541,300	3,120,600	6,607,800
All 1981	Net Sales	265,220	526,150	1,336,200	3,328,000	7,384,900
1981 Non-banks	Total Assets	170,970	436,370	1,354,900	2,776,900	6,607,800
1981 Non-banks	Net Sales	265,220	585,210	1,570,100	3,385,100	7,384,900
1981 Banks	Total Assets	2,110,600	2,500,200	3,027,900	4,914,500	5,257,200
1981 Banks	Net Sales	256,070	279,730	423,340	820,210	887,280

*For the 1977 sample as a whole only four firms had net sales less than $125 million. For 1981, one had net sales less than $125 million.

OTHER DEMOGRAPHIC STATISTICS

DEMOGRAPHIC	% 1981 Sample	% 1977 Sample
1. Fortune 50 Companies	9.1%	7.8%
2. Fortune 500 Companies	48.0%	50.5%
3. Companies Audited by Big-8 Auditor	96.3%	97.8%
4. Companies using current Auditor for:		
5 or more years	96.4%	95.6%
4 years	0 %	0 %
3 years	1.8%	1.1%
2 years	1.8%	0 %
1 year	0 %	3.3%
5. Banks	9.2%	7.9%
6. Utilities	12.8%	14.6%

TABLE A-2

Descriptive Statistics for Variables

	(1) 1981 Data (n=109)	(2) 1977 (n=89)	(3) Simunic's Sample Auditees with Sales Greater Than $125 MM	(4) Simunic's Total Sample 1977 Data
FEE	$ 926.9M (1,150.3M)	$ 701.5M (886.1M)	$ 322.0M (355.0M)	$ 206.6M (277.1M)
ASSETS	$3,576.6MM (7,249.1MM)	$2,239.5MM (3,498.4MM)	$ 891.9MM (1,147.7)	$ 555.1MM (1,194.5MM)
SUBS	20.9 (24.5)	22.5 (25.8)	25.6 (37.8)	16.9 (30.5)
DIVERS	2.2 (2.7)	2.2 (3.3)	1.3 (1.6)	.9 (1.4)
FORGN	.13 (.16)	.13 (.15)	.11 (.23)	.07 (.15)
RECV	.20 (.15)	.18 (.14)	.18 (.11)	.23 (.17)
INV	.16 (.15)	.16 (.16)	.23 (.17)	.23 (.19)
PROFIT	.05 (.04)	.05 (.05)	.06 (.04)	.06 (.04)
LOSS	8.3%	4.5%	8.1%	16.3%
SUBJ	8.3%	11.2%	12.9%	10.5%
TIME	Not Comparable[1]			

Note: Numbers presented are means, except numbers in parentheses, which are standard deviations.

[1]We collected data for the first five years of an auditor-auditee relationship and found the average length of the relationship was 4.91 years in 1981, and 4.84 years in 1977. Like Simunic's study, we found very little auditor turnover in our sample.

FOOTNOTES

[1]See Simunic [1980, 1984], Dopuch and Simunic [1980], Palmrose [1983, 1984], and Francis [1984], for example.

[2]Francis [1984] and Palmrose [1982] also test audit pricing models; however, their models are substantially different from Simunic's model and our tests.

[3]See American Institute of Certified Public Accountants [1981]. This change, effective March 31, 1979, repealed an ethical rule that prohibited an auditor from encroaching on the client practices of another auditor, and modified previous prohibitions of advertising and other client solicitation.

[4]The "Fortune 1300" set of companies is comprised of the "Fortune 1000" industrials plus the fifty largest companies in each of the following six special groups: banks, diversified financials, retail, utilities, transportation, and insurance.

[5]There is an overlap of 12 auditees in Simunic's study and our 1977 sample. Although we expect the findings for 1977 to be the same as Simunic for these 12 companies, differences could occur because of the different sources of data to measure the independent variables.

[6]Simunic [1980] compared small to large companies in his sample and did not reject the null hypothesis that the overall regression relationship was the same for the small and large company subsets.

[7]See Francis [1984] and DeAngelo [1981] for a discussion of the economics of "low-balling," and see AICPA [1978] for anecdotal evidence about the existence of "low-balling."

[8]For a discussion of this test, see Kmenta [1971], pp. 468-70.

[9]F-statistics computed as follows:

$$F = \frac{(SSE_K - SSE_Q)/(Q-K)}{SSE_Q/(n-Q)} \sim F_{(Q-K),(n-Q)}$$

where SSE_K = residual sum of squares of basic model regression,

SSE_Q = residual sum of squares of augmented model regression,

K and Q = 1 + number of explanatory variables in basic and augmented models, respectively,

n = sample size.

[10]See Weisberg [1980], pp. 108-117, for a discussion of studentized residuals and Cook's distance.

[11]Deleting outliers to make the data fit the model would be a questionable practice. Our interest was in seeing whether the characteristics of the outliers provided information about audit fee determination that was not in the model.

[12]Weisberg [1980], p. 108.

[13]The Goldfeld-Quandt [1972] test, which is a common test for heteroscedasticity, could not be used here. The test requires breaking the sample into two equal-size subsamples of large and small auditees. There were no banks in the small auditee subsample; hence, with BANK as an independent variable, the variance-covariance matrix is singular for that subsample.

[14]Equations 8, 9, 10 were also estimated on samples that excluded apparent outliers to see the effects of removing outliers on heteroscedasticity. The results were about the same as those reported in Table 10--removal of the outliers did not reduce heteroscedasticity.

[15]Weisberg [1980], pp. 137-41 provides a discussion of this technique.

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