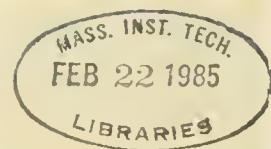Dewey

WORKING PAPER

ALFRED P. SLOAN SCHOOL OF MANAGEMENT

THE EFFECT OF BONUS SCHEMES
ON ACCOUNTING DECISIONS

by

Paul M. Healy

September 1984

MIT Sloan School of Management Working Paper #1589-84

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ABSTRACT

Studies examining managerial accounting decisions postulate that executives rewarded by earnings-based bonuses select accounting procedures that increase their compensation. The empirical results of these studies are conflicting. This paper analyzes the format of typical bonus contracts, providing a more complete characterization of their accounting incentive effects than earlier studies. The test results suggest that (1) accrual policies of managers are related to income-reporting incentives of their bonus contracts; and, (2) changes in accounting procedures by managers are associated with adoption or modification of their bonus plan.

1. INTRODUCTION

Earnings-based bonus schemes are a popular means of rewarding corporate executives. Fox (1980) reports that in 1980 ninety percent of the one thousand largest U.S. manufacturing corporations used a bonus plan based on accounting earnings to remunerate managers. This paper tests the association between managers' accrual and accounting procedure decisions and their income-reporting incentives under these plans. Earlier studies testing this relation postulate that executives rewarded by bonus schemes select income-increasing accounting procedures to maximize their bonus compensation.[1] Their empirical results are conflicting. These tests, however, have several problems. First, they ignore the earnings' definitions of the plans; earnings are often defined so that certain accounting decisions do not affect bonuses. For example, more than half of the sample plans collected for my study define bonus awards as a function of income before taxes. It is not surprising, therefore, that Hagerman and Zmijewski (1979) find no significant association between the existence of accounting-based compensation schemes and companies' methods of recording the investment tax credit.

Second, previous tests assume compensation schemes always induce managers to select income increasing accounting procedures. The schemes examined in my study also give managers an incentive to select income-decreasing procedures. For example, they typically permit funds to be set aside for compensation awards when earnings exceed a specified target. If earnings are so low that no matter which accounting procedures are selected target earnings will not be met, managers have incentives to

further reduce current earnings by deferring revenues or accelerating write-offs, a strategy known as "taking a bath." This strategy does not affect current bonus awards and increases the probability of meeting future earnings' targets.[2] Past studies do not control for such situations and, therefore, understate the association between compensation incentives and accounting procedure decisions.

This study examines typical bonus contracts, providing a more complete analysis of their accounting incentive effects than earlier studies. The theory is tested using actual parameters and definitions of bonus contracts for a sample of 94 companies. Two classes of tests are presented: accrual tests and tests of changes in accounting procedures. I define accruals as the difference between reported earnings and cash flows from operations. The accrual tests compare the actual sign of accruals for a particular company and year with the predicted sign given the managers' bonus incentives. The results are consistent with the theory. I also test whether accruals differ for companies with different bonus plan formats. The accrual differences provide further evidence of a relation between managers' accrual decisions and their income-reporting incentives under the bonus plan. Tests using changes in accounting procedures suggest that managers' decisions to change procedures are not associated with bonus plan incentives. However, additional tests find that changes in accounting procedures are related to the adoption or modification of a bonus plan.

Section 2 outlines the provisions of bonus agreements. The accounting incentive effects generated by bonus plans are discussed in Section 3.

Section 4 describes the sample design and data collection, and Section 5 reports the results of accrual tests. Tests of changes in accounting procedures are described in Section 6. The conclusions are presented in Section 7.

2. DESCRIPTION OF ACCOUNTING BONUS SCHEMES

Deferred salary payment, insurance plans, nonqualified stock options, restricted stock, stock appreciation rights, performance plans and bonus plans are popular forms of compensation.[3] Two of these explicitly depend on accounting earnings: bonus schemes and performance plans. Performance plans award managers the value of performance units or shares in cash or stock if certain long-term (three or five year) earnings' targets are attained. The earnings' targets are typically written in terms of earnings per share, return on total assets, or return on equity. Bonus contracts have a similar format to performance contracts except that they specify annual rather than long-term earnings goals.

A number of companies operate bonus and performance plans simultaneously. Differences in earnings definitions and target horizons of these two plans make it difficult to identify their combined effect on managers' accounting decisions. I therefore limit the study to firms whose only remuneration explicitly related to earnings is bonuses. Fox (1980) finds that in 1980 90 percent of the one thousand largest U.S. manufacturing corporations used a bonus plan to remunerate managers, whereas only 25 percent used a performance plan. Bonus awards also tend to constitute a higher proportion of top executives' compensation than performance payments. In 1978, for example, Fox reports that for his sample the median

ratio of accounting bonus to base salary was 52 percent. The median ratio for performance awards was 34 percent.

The formulae and variable definitions used in bonus schemes vary considerably between firms, and even within a single firm across time. Nonetheless, there are common features of these contracts. They typically define a variant of reported earnings (E_t) and an earnings target or lower bound (L_t) for use in bonus computations. If reported earnings exceed their target, the contract defines the maximum percentage (p_t) of the difference that can be allocated to a bonus pool. If earnings are less than their target, no funds are allocated to the pool. The formula for the maximum transfer to the bonus pool (B_t) is:

$$B_t = p_t \, \text{Max}\{(E_t - L_t), \, 0\}$$

Standard Oil Company of California, for example, defines its 1980 bonus formula as follows:

...the annual fund from which awards may be made is two percent of the amount by which the company's annual income for the award year exceeds six percent of its annual capital investment for such year.

Standard Oil defines "annual income" as audited net income before the bonus expense and interest, and "capital investment" as the average of opening and closing book values of long-term liabilities plus equity. Variations on these definitions are found in other companies' plans. Earnings are defined before or after a number of factors including interest, the bonus expense, taxes, extraordinary and nonrecurring items, and/or preferred dividends. Capital is a function of the book value of equity when incentive income is earnings after interest and a function of the sum of long-term debt and equity when incentive income is earnings

before interest. Bonus plans for 94 companies are examined in this study and only seven do not use these definitions of earnings and capital.

Some schemes specify an upper limit (U'_t) on the excess of earnings over target earnings. When the difference between actual and target earnings is greater than the upper limit, the transfer to the bonus pool is limited, implying the formula for allocation to the bonus pool (B'_t) is:

$$B'_t = p_t\{Min \{U_t , Max \{(E_t - L_t), 0 \}\}\}$$

The upper limit is commonly related to cash dividend payments on common stock.[4] The 1980 bonus contract for Gulf Oil Corporation, for example, limits the transfer to the bonus reserve to six percent of the excess of earnings over six percent of capital "provided that the amount credited to the Incentive Compensation Account shall not exceed ten percent of the total amount of the dividends paid on the corporation's stock."

Administration of the bonus pool and awards to executives are made by a committee of directors who are ineligible to participate in the scheme. Awards are made in cash, stock, stock options or dividend equivalents.[5] The bonus contract usually permits unallocated funds to be available for future bonus awards. Plans also provide for award deferrals over as many as five years, either at the discretion of the compensation committee or the manager.

3. BONUS PLANS AND ACCOUNTING CHOICE DECISIONS

Watts (1977) and Watts and Zimmerman (1978) postulate that bonus schemes create an incentive for managers to select accounting procedures and accruals to increase the present value of their awards. This paper proposes a more complete theory of the accounting incentive effects of

bonus schemes.[6] The firm is assumed to comprise a single risk-averse manager and one or more owners. The manager is rewarded by the following bonus formula:

$$B_t' = p \{\min \{U', \text{Max} \{(E_t - L), 0 \}\}\}$$

where L is the lower bound on earnings (E_t), U' is the limit on the excess of earnings over the lower bound (E_t-L), and p is the payout percentage defined in the bonus contract. The manager receives $p(E_t - L)$ in bonus if earnings exceed the lower bound and are less than the bonus plan limit (the upper bound) on earnings, U, given by the sum (U' + L). The bonus is fixed at pU' when earnings exceed this upper bound.

Accounting earnings are decomposed into cash flows from operations (C_t), non-discretionary accruals (NA_t) and discretionary accruals (DA_t). Nondiscretionary accruals are accounting adjustments to the firm's cash flows mandated by accounting standard-setting bodies (e.g., the Securities Exchange Commission and the Financial Accounting Standards Board). These bodies require, for example, that companies depreciate long-lived assets in some systematic manner, value inventories using the lower of cost or market rule, and value obligations on financing leases at the present value of the lease payments. Discretionary accruals are adjustments to cash flows selected by the manager. The manager chooses discretionary accruals from an opportunity set of generally accepted procedures defined by accounting standard-setting bodies. For example, the manager can choose the method of depreciating long-lived assets; he can accelerate or delay delivery of inventory at the end of the fiscal year; and he can allocate fixed factory overheads between cost of goods sold and inventories.

Accruals modify the timing of reported earnings. Discretionary accruals therefore enable the manager to transfer earnings between periods. I assume that discretionary accruals sum to zero over the manager's employment horizon with the firm. The magnitude of discretionary accruals each year is limited by the available accounting technology to a maximum of K and a minimum of -K.

The manager observes cash flows from operations and nondiscretionary accruals at the end of each year and selects discretionary accounting procedures and accruals to maximize his expected utility from bonus awards.[7] The choice of discretionary accruals affects his bonus award and the cash flows of the firm. I assume that these cash effects are financed by stock issues or repurchases and, therefore, do not affect the firm's production/investment decisions.

Healy (1983) derives the manager's decision rule for choosing discretionary accruals when his employment horizon is two periods. The choice of discretionary accruals in period one fixes his decision in the second period because discretionary accruals are constrained to sum to zero over these two periods. Figure 1 depicts discretionary accruals in the first period as a function of earnings before discretionary accruals. These results are discussed in three cases.

INSERT FIGURE 1

Case 1

In Case 1, the manager has an incentive to choose income-decreasing discretionary accruals, that is to take a bath. This case has two regions. In the first, earnings before discretionary accruals are more than K below the lower bound (i.e., $C_1 + NA_1 < L - K$). The manager selects the minimum discretionary accrual ($DA_1 = -K$) because even if he chooses the maximum, reported income will not exceed the lower bound and no bonus will be awarded. By deferring earnings to period two, he maximizes his expected future award.

In the second region of Case 1 earnings before discretionary accruals in period one ($C_1 + NA_1$) are within $\pm$ K of the lower bound (L). The manager either selects the minimum ($DA_1 = -K$) or maximum ($DA_1 = K$) discretionary accrual. If he chooses the maximum accrual, he receives a bonus in period one but foregoes some expected bonus in period two because he is now constrained to report the minimum accrual in that period ($DA_2 = -K$). If he selects the minimum discretionary accrual in period one the manager maximizes his expected bonus in period two, but receives no bonus in the first period. He trades off present value and certainty advantages of receiving a bonus in period one against the foregone expected bonus in period two. Conditional on the bonus plan parameters, expected earnings before discretionary accruals in period two, the discount rate, and his risk aversion, the manager estimates a threshold (denoted by L' in Figure 1) where he is indifferent between reporting the minimum and maximum accrual in period one. In Figure 1, the threshold (L') exceeds the lower bound in the bonus plan (L). However, the threshold can also be less than the lower bound, depending on expected earnings in period two. The manager selects the minimum

discretionary accrual ($DA_1 = - K$) when earnings before discretionary accruals are less than the threshold, i.e., $C_1 + NA_1 < L'$.

Case 2

In Case 2, the manager has an incentive to choose income-increasing discretionary accruals. If first period earnings before discretionary accruals exceed the threshold L', the present value and certainty advantages of accelerating income and receiving a bonus in period one outweigh foregone expected awards in period two. The manager, therefore, selects positive discretionary accruals. When earnings before accounting choices are less than $(U - K)$, he chooses the maximum accrual ($DA_1 = K$). When earnings before accounting choices are within K of the upper bound, the manager selects less than the maximum discretionary accrual because income beyond the upper bound is lost for bonus calculations. He chooses $DA_1 = (U - C_1 - NA_1)$, thereby reporting earnings equal to the upper bound. If the bonus plan does not specify an upper bound, the manager selects the maximun discretionary accrual ($DA_1 = K$) when earnings before accounting choices exceed the threshold L'.

Case 3

In Case 3, the manager has an incentive to select income-decreasing discretionary accruals. When the bonus plan upper bound is binding, earnings before discretionary accruals exceeding that bound are lost for bonus purposes. By deferring income that exceeds the upper bound, the manager does not reduce his current bonus and increases his expected future award. When earnings before discretionary accruals are less than

$U + K$, he selects $DA_1 = (C_1 + NA_1 - U)$, reporting earnings equal to the upper bound. When earnings before discretionary accruals exceed $(U + K)$, he chooses the minimum accrual ($DA_1 = -K$).

In summary, the sign and magnitude of discretionary accruals are a function of expected earnings before discretionary accruals, the parameters of the bonus plan, the limit on discretionary accruals, the manager's risk preferences and the discount rate. Three implications of this theory are tested:

(1) If earnings before discretionary accruals are less than the threshold represented by L', the manager has an incentive to select income-decreasing discretionary accruals.

(2) If earnings before discretionary accruals exceed the lower threshold, denoted by L' in Figure 1, but not the upper limit, the manager has an incentive to select discretionary accruals to increase income.

(3) If the bonus plan specifies an upper bound and earnings before discretionary accruals exceed that limit, the manager has an incentive to select discretionary accruals to decrease income.

Earlier studies on the smoothing hypothesis postulate that discretionary accruals are a function of earnings before accruals.[8] However, the predictions of the compensation theory outlined here differ from those of the smoothing hypothesis: when earnings before accrual decisions are less than the threshold L', the compensation theory predicts that the manager selects income-decreasing discretionary accruals; the smoothing hypothesis implies that he chooses income-increasing accruals.

4. SAMPLE DESIGN AND COLLECTION OF FINANCIAL DATA

4.1 Sample Design

The population selected for this study is companies listed on the 1980 Fortune Directory of the 250 largest U.S. industrial corporations.[9] It is common for stockholders of these companies to endorse the implementation of a bonus plan at the annual meeting. Subsequent plan renewals are ratified, usually every three, five or ten years and a summary of the plan is included in the proxy statement on each of these occasions. The first available copy of the bonus plan is collected for each company from proxy statements at one of three sources: Peat Marwick, the Citicorp Library and the Baker Library at Harvard Business School. Plan information is updated whenever changes in the plan are ratified.

One hundred and fifty-six companies are excluded from the final sample. The managers of 123 of these firms receive bonus awards but the details of the bonus contracts are not publicly available. Six companies do not appear to reward top management by bonus during any of the years proxy statements are available. A further twenty-seven companies have contracts which limit the transfer to the bonus pool to a percentage of the participating employees' salaries. Since this information is not publicly disclosed, no upper limit can be estimated for these companies.

Some of the sample companies operate earnings-based bonus and performance plans simultaneously. To control for the effect of performance plans on managers' accounting decisions, companies are deleted from the sample in years when both plans are used. This restriction reduces the number of company years by 239.

The useable sample comprises 94 companies. Thirty of these have bonus plans which specify both upper and lower bounds on earnings. The contract definitions of earnings, the net upper bound and the lower bound for the sample are summarized in Table 1. Earnings are defined as earnings before taxes for 52.7 percent of the company-years and earnings before interest for 33.5 percent of the observations. Bonus contracts typically define the lower bound as a function of net worth (42.0 percent of the observations) or as a function of net worth plus long-term liabilities (37.2 percent). Some contracts define the lower bound as a function of more than one variable. For example, the 1975 bonus contract of American Home Products Corporation defines the lower bound as "the greater of (a) an amount equal to 12 percent of Average Net Capital or (b) an amount equal to $1.00 multiplied by the average number of shares of the Corporation's common stock outstanding at the close of business on each day of the year." The upper bound is commonly written as a function of cash dividends.

INSERT TABLE 1

4.2 Collection of Financial Data

Earnings and upper and lower bounds for each company-year are estimated using actual bonus plan definitions. The definitions are updated whenever the plan is amended. The data to compute these variables is collected from COMPUSTAT for the years 1946-80 and from Moody's Industrial Manual for earlier years.

Two proxies for discretionary accruals and accounting procedures are used: total accruals and the effect of voluntary changes in accounting procedures on earnings. Total accruals (ACC_t) include both

discretionary and nondiscretionary components ($ACC_t = NA_t + DA_t$),

and are estimated by the difference between reported accounting earnings

and cash flows from operations. Cash flows are working capital from

operations (reported in the funds statement) less changes in inventory

and receivables, plus changes in payables and income taxes payable:

$$ACC_t = -DEP_t - XI_t \cdot D_1 + \Delta AR_t + \Delta INV_t - \Delta AP_t - \{\Delta TP_t + DEF_t\} \cdot D_2$$

where, DEP_t = depreciation in year t

XI_t = extraordinary items in year t

ΔAR_t = accounts receivable in year t less accounts receivable in year t-1

ΔINV_t = inventory in year t less inventory in year t-1

ΔAP_t = accounts payable in year t less accounts payable in year t-1

ΔTP_t = income taxes payable in year t less income taxes payable in year t-1

DEF_t = deferred income tax expense (credit) for year t

D_1 = $\begin{cases} 1 \text{ if bonus plan earnings are defined after extraordinary items} \\ 0 \text{ if bonus plan earnings are defined before extraordinary items} \end{cases}$

D_2 = $\begin{cases} 1 \text{ if bonus plan earnings are defined after income taxes} \\ 0 \text{ if bonus plan earnings are defined before income taxes} \end{cases}$

The only accrual omitted is the earnings effect of the equity method of

accounting for investments in associated companies.

The second proxy for discretionary accruals and accounting procedures

is the effect of voluntary changes in accounting procedures on reported

earnings. Accounting changes are collected for sample companies from

1968 to 1980 using two sources: the sample of depreciation changes used

by Holthausen (1981) and changes documented by Accounting Trends and

Techniques. The effect of each change on current and retained earnings

is collected from the companies' annual reports. This data is further
described in Section 6.

5. ACCRUAL TESTS AND RESULTS

5.1 Contingency Tests and Results

Contingency tables are constructed to test the implications of the
theory. Managers have an incentive to select income-decreasing
discretionary accruals when their bonus plan's upper and lower bounds are
binding. When these bounds are not binding the manager has an incentive
to choose income-increasing discretionary accruals. Total accruals proxy
for discretionary accruals.

Each company-year is assigned to one of three portfolios:
(1) Portfolio UPP, (2) Portfolio LOW, or (3) Portfolio MID. Portfolio
UPP comprises observations for which the bonus contract upper limit is
binding. Company-years are assigned to this portfolio when cash flows
from operations exceed the upper bound defined in the bonus plan. The
theory implies that observations should be assigned to portfolio UPP when
cash flows from operations plus nondiscretionary accruals exceed the
upper bound. Cash flows are a proxy for the sum of cash flows and
nondiscretionary accruals because nondiscretionary accruals are
unobservable. This method of identifying company-years when the upper
bound is binding leads to misclassifications which increase the
probability of incorrectly rejecting the null hypothesis. Discussion of
this problem and tests to control for the bias are presented later in
this section.

Portfolio LOW comprises observations for which the bonus plan lower bound is binding. Company-years are assigned to this portfolio if earnings are less than the lower bound specified in the bonus plan. The theory implies that observations should be assigned to portfolio LOW when cash flows from operations plus nondiscretionary accruals are less than the lower threshold L'. This threshold is a function of the bonus plan lower bound, the managers' risk preferences and their expectations of future earnings. Since the threshold is unobservable, the method of assigning company-years to portfolio UPP, using cash flows as a proxy for cash flows plus nondiscretionary accruals, cannot be used for portfolio LOW. Instead, company-years are assigned to portfolio LOW when earnings are less than the lower bound since no bonus is awarded in these years, and managers have an incentive to select income-decreasing discretionary accruals. This assignment method induces a selection bias which increases the probability of incorrectly rejecting the null hypothesis. Discussion of this problem is deferred to later in the section.

Portfolio MID contains observations where neither the upper nor lower bounds are binding. Company-years that are not assigned to portfolios UPP or LOW are included in portfolio MID, and are expected to have a higher proportion of positive accruals than the other two portfolios.

The incidence of positive and negative accruals for portfolios LOW, MID and UPP is presented in the form of a contingency table in Table 2. The row denotes the portfolio to which each company-year is assigned. The column denotes the sign of the accrual and each cell contains the proportion of observations fulfilling each condition. Mean accruals, deflated by the book value of total assets at the end of each company-year[10] are also displayed for each portfolio. If managers

select accruals to increase the value of their bonus compensation, there will be a higher incidence of negative accruals and lower mean accruals for portfolios LOW and UPP than for portfolio MID. Chi-Square and t statistics, testing these hypotheses, are reported in Table 2. The Chi-Square test is a two-tailed test which compares the number of observations in each contingency table cell with the number expected by chance.[11] The t tests are one-tailed tests of differences in mean deflated accruals for the three portfolios.[12]

INSERT TABLE 2

Sample A reports results for plans with a lower bound, but no upper bound. There is a lower proportion of negative accruals for portfolio LOW than for portfolio MID, inconsistent with the theory. However, the Chi-Square statistic is not statistically significant. The mean standardized accruals support the theory: the mean for portfolio LOW is less than the mean for portfolio MID and the t statistic, comparing the difference in means, is statistically significant at the .010 level. This result suggests that managers are more likely to take a bath, that is, select income-decreasing accruals, when the lower bound of their bonus plan is binding than when it is not.

Sample B comprises plans which specify both an upper and lower bound. The Chi-Square statistic is significant at the .005 level, indicating that there is a greater incidence of negative accruals when the bonus plan lower and upper limits are binding than otherwise. Tests of mean standardized accruals reinforce the Chi Square results: the means for portfolios LOW and UPP are less than the mean for the MID portfolio. The t tests, evaluating differences in means, are

statistically significant at the .005 level. These results are consistent with the hypothesis that managers are more likely to select income-decreasing accruals when the lower and upper bounds of their bonus plans are binding. Sample C aggregates Samples A and B and confirms the results.

There are several differences in the results for Samples A and B. First, the results for the MID portfolio are stronger for the sample of plans with upper bounds. One explanation is that bonus plan administrators enforce an informal upper bound when one is not specified in the contract. If this informal bound is binding, some of the companies included in the MID portfolio for Sample A are misclassified; they should be included in Sample B and assigned to portfolio UPP. A second difference between the samples is the stronger result for portfolio LOW for Sample B than Sample A. I have no explanation for this result.

Contingency tables are constructed for the following subcomponents of accruals: changes in inventory, changes in receivables, depreciation, changes in payables and, where relevant to the bonus award, changes in income taxes payable. The changes in inventory and receivable accrual subcomponents are most strongly associated with management compensation incentives. Contingency table results for the aggregate sample are presented for these two subcomponents in Table 3.[13] There are more negative inventory accruals when the upper and lower constraints are binding than for the MID portfolio. The results for receivable accruals confirm the theory for portfolios LOW and MID. However, there is no difference in the proportion of negative accruals for portfolios MID and UPP. The Chi-Square statistics for both inventory and receivable

accruals are significant at the .005 level. Differences in mean inventory and receivable accruals for portfolios LOW, MID and UPP are consistent with the theory: the means for portfolios UPP and LOW are significantly lower than the mean for portfolio MID at the .005 level.

INSERT TABLE 3

In summary, the evidence in Tables 2 and 3 is generally inconsistent with the null hypothesis that there is no association between discretionary accruals and managers' income-reporting incentives under the bonus plan. There is a greater incidence of negative accruals when the upper and lower bounds in the bonus contracts are binding. The contingency tables for decomposed accruals identify changes in inventory and accounts receivables as the accrual subcomponents most highly related to managers' bonus plan incentives.

There are several limitations of the contingency tests. First, the method of assigning observations to portfolio LOW induces a selection bias. Company-years are assigned to Portfolio LOW when reported earnings are less than the lower bound. A high incidence of negative accruals are observed for this portfolio, consistent with the theory. However, both reported earnings and total accruals include nondiscretionary accruals. Company-years with negative nondiscretionary accruals are therefore likely to be assigned to portfolio LOW and they will also tend to have negative total accruals. This selection bias increases the probability of incorrectly rejecting the null hypothesis.

A second limitation of the contingency tests arises from errors in measuring discretionary accruals. Total accruals are used as a proxy for discretionary accruals. Measurement errors for this proxy are correlated with the firm's cash flows from operations and earnings, the variables

used to assign company-years to portfolio UPP, MID and LOW. This relation could explain the contingency results. For example, inventory accruals reflect physical inventory levels.[14] If there is an unexpected increase in demand, physical inventory levels and nondiscretionary accruals will fall and cash flows from operations increase, consistent with the results reported for portfolio UPP in Table 3. However, an unexpected decrease in demand will increase physical inventory levels and nondiscretionary accruals and decrease cash flows from operations, opposite to the theory's predictions for portfolio LOW.

A third limitation of the contingency tests arises from errors in measuring earnings before discretionary accruals. Cash flows are a proxy for this variable and are used to assign company-years to portfolios MID and UPP. Errors in measuring earnings before discretionary accruals are perfectly negatively correlated with measurement errors in discretionary accruals since the sum of the actual variables (earnings before discretionary accruals and discretionary accruals) are constrained to equal the sum of the measured variables (cash flows and total accruals) by the accounting earnings identity. This implies that a disproportionate number of company-years with positive measurement error in earnings before discretionary accruals will be assigned to portfolio UPP. These observations have negative measurement errors in discretionary accruals, increasing the probability of incorrectly rejecting the null hypothesis.

The tests presented in Sections 5.2 and 6 are designed to control for the effects on the contingency results of measurement errors in discretionary accruals and in earnings before discretionary accruals.

5.2 Additional Tests and Results

Additional tests compare accruals for firms whose bonus plans include an upper bound with accruals for firms whose plans contain no upper limit. The theory predicts that managers whose bonus plans include an upper bound have an incentive to select income-decreasing discretionary accruals when that limit is triggered. Ceteris paribus, managers compensated by schemes with no ceilings on earnings are expected to select income-increasing discretionary accruals. This implies that, holding earnings before discretionary accruals constant, discretionary accruals are lower for company plans with a binding upper bound than for firms whose bonus plans exclude an upper bound. This relation reverses when the upper bound is not binding since I assume that discretionary accruals affect only the timing of reported earnings. Discretionary accruals are therefore higher for company plans with a nonbinding upper bound than for firms whose plans do not include an upper bound.

Tests of these implications of the theory control for measurement errors in discretionary accruals. They compare measured discretionary accruals (total accruals) for company-years with equivalent cash flows but different bonus plans - plans with and without an upper bound. If the measurement errors are independent of the existence of an upper bound in the bonus plan,[15] the tests isolate discretionary accrual differences between companies with these different types of bonus plans.

The tests also control for errors in measuring earnings before discretionary accruals by comparing accruals for company-years with equivalent measured earnings before discretionary accruals (cash flows) but with bonus plans that include and exclude an upper bound. If measurement errors are independent of the existence of an upper bound in

the bonus plan, the estimates of discretionary accrual differences between companies with these two types of bonus plans are unbiased.

The additional predictions of the theory are tested using all company-years for which earnings exceed the lower bound (i.e., portfolios MID and UPP). The observations are divided into two samples: company-years when the bonus plan specifies an upper bound, and company-years when no such limit is defined. The tests are constructed to compare accruals for these two samples holding cash flows constant. The following test design is implemented:

(1) Company-years with a bonus plan upper bound are assigned to one of two portfolios. The first comprises observations whose cash flows exceed the upper bound. The second contains company-years when the upper bound is not binding.

(2) Company-years with a binding upper bound are arrayed on the basis of cash flows (deflated by the book value of total assets) and deciles are constructed. Mean accruals and cash flows (both deflated by total assets) are estimated by decile.

(3) Company-years with no bonus plan upper bound are assigned to one of ten groups. The groups are constructed to have mean deflated cash flows approximately equal to the means of the deciles formed in Step 2. The high and low deflated cash flows for each decile are used as cutoffs to form the ten groups; a company-year with no upper bound is assigned to a group if deflated cash flows are within its cutoffs. Mean deflated accruals and cash flows are estimated for each group.

The mean deflated accruals and cash flows are reported in Table 4 by decile for company-years with a binding upper bound and by group for

company-years with no upper bound. The theory predicts that, holding cash flows constant, accruals are lower for companies with a binding bonus plan upper bound, than for companies with no upper bound. The results support the theory: mean accruals are less for company-years with a binding upper bound in nine of the ten pairwise comparisons reported in Table 4, Panel A. The Sign and Wilcoxon Signed-Ranks tests are used to evaluate whether this result is statistically significant.[16] The Sign test is significant at the .0107 level and the Wilcoxon Signed-Ranks test at the .0020 level.

INSERT TABLE 4

The test design is replicated to compare company-years whose upper bound is not binding with company-years whose bonus plan contains no upper bound. The theory predicts that, holding cash flows constant, accruals are higher for companies with a nonbinding bonus plan upper bound, than for companies whose plan contains no upper bound. Company-years for which the upper bound is not binding are arrayed on the basis of cash flows and deciles are formed. The high and low cash flows for these deciles are used to form ten groups for company-years with no plan upper bound. Mean deflated accruals and cash flows are reported in Table 4, Panel B by decile for company-years with a nonbinding upper bound, and by group for company-years with no upper bound. The results are consistent with the theory: mean accruals for company-years when the bonus plan upper bound is not binding are greater than mean accruals for company-years with no upper bound in nine of the ten pairwise comparisons. The Sign test is significant at the .0107 level and the Wilcoxon Signed-Ranks test at the .0068 level.

7.   CHANGES IN ACCOUNTING PROCEDURE TESTS AND RESULTS

The effect of voluntary changes in accounting procedures on earnings is also used to test the implications of the theory. The proxy used in Section 6, accruals, reflects both discretionary and nondiscretionary accruals and accounting procedures. Voluntary changes in accounting procedures reflect purely discretionary accounting procedure decisions.

Reported changes in accounting procedures are available from two sources: the sample of depreciation switches used by Holthausen (1981) and changes reported by Accounting Trends and Techniques. Accounting changes are collected from these sources for the sample companies from 1968 to 1980. Procedure changes are decomposed according to the type of change and a summary is presented in Table 5 for the full sample (342 changes) and for the changes whose effect on earnings is disclosed in the footnotes (242).

INSERT TABLE 5

The effect of each accounting procedure change on earnings and equity is collected from the financial statement footnotes. In 100 cases the effect of the change is described as immaterial or not disclosed. A further 49 changes report only the sign of the effect on earnings. These are coded to indicate whether the effect is positive or negative.

7.1 Contingency Tests

The contingency tests are replicated using the effect of changes in accounting procedures on earnings available for bonuses as a proxy for discretionary accounting decisions. Earnings available for bonuses are

reported earnings, defined in the bonus plan, less the lower bound. If the effect of the accounting change on this variable is positive (negative), the change is classified as income-increasing (income-decreasing). Company-years are assigned to portfolios LOW, MID and UPP using the method adopted in Section 6, and contingency tables are constructed to compare the incidence of income-increasing and income-decreasing accounting procedure changes for each portfolio. The results do not support the theory. However, there are several potential explanations of this finding:

(1) Casual evidence suggests that it is more costly for managers to transfer earnings between periods by changing accounting procedures than by changing accruals. Companies rarely change accounting procedures annually--for example, changes to straight line depreciation in one year are typically not followed by a change to other depreciation methods in succeeding years. Managers appear to have greater flexibility to change accruals. For example, they can accelerate or defer recognition of sales, and capitalize or expense repair expenditures.

(2) Changes in accounting procedures affect earnings and the bonus plan lower bound in the current and future years. Managers consider the effect of alternative accounting methods on the present value of their bonus awards. However, the effect of a procedure change on the accounting numbers is only publicly disclosed for the year of the change. This proxy therefore fails to control for the effect of accounting procedures on bonus awards in future years.

The tests presented in Section 7.2 control for these problems.

7.2 Tests of the Association between Bonus Plan Changes and Changes in Accounting Procedures

Watts and Zimmerman (1983) postulate that changes in the contracting or political processes are associated with changes in accounting methods. For example, companies are more likely to voluntarily change accounting procedures during years following the adoption or modification of a bonus plan, than when there is no such contracting change. To test this hypothesis, useable sample companies[17] are partitioned into two portfolios for each of the years 1968 to 1980. One portfolio comprises companies that adopt or modify their bonus plan; the other contains companies that have no such contracting change.

Bonus plans are adopted or modified at the annual meeting, which typically occurs three or four months after the fiscal year end. The mean number of voluntary accounting changes per firm reported at the end of the following fiscal year is estimated for companies that modify and adopt bonus plans and for companies with no bonus plan change for each of the years 1968 to 1980. A greater number of voluntary changes are expected for the sample of firms adopting or modifying bonus plans, than for firms with no such change. The Sign and Wilcoxon Ranked-Sign tests are used to evaluate whether the mean number of changes per firm differ for firms with and without a bonus plan change.

The test mitigates one of the limitations of the contingency tests. The proxy for the managers' accounting decisions in those tests, the effect of an accounting procedure change on bonus earnings in the year of the change, ignores the effect on future years' bonus earnings. Tests of the association between bonus plan modifications/adoptions and the incidence of changes in accounting procedures avoid estimating this effect.

INSERT TABLE 6

Test results are reported in Table 6. The mean number of voluntary changes in accounting procedures is greater for firms with bonus plan changes than for firms with no such change in nine of the twelve years. No means are reported for 1979 because no sample companies introduced or modified bonus plans in that year. The Sign and Wilcoxon Signed-Rank tests are statistically significant at the .0730 and .0212 levels respectively, consistent with the hypothesis that changes in bonus schemes are associated with changes in accounting procedures.

8. CONCLUSIONS

Bonus schemes create incentives for managers to select accounting procedures and accruals to maximize the value of their bonus awards. These schemes appear to be an effective means of influencing managerial accrual and accounting procedure decisions. There is a strong association between accruals and managers' income-reporting incentives under their bonus contracts. Managers are more likely to choose income-decreasing accruals when their bonus plan upper or lower bounds are binding, and income-increasing accruals when these bounds are not binding. Results of tests comparing accruals for firms whose bonus plans include and exclude an upper bound further support the theory: holding cash flows constant, accruals are lower for company-years with binding bonus plan upper bounds than for company-years with no upper bound. This difference in the timing of reported earnings is offset when bonus plan upper limits are not binding.

Tests of the theory also use voluntary changes in accounting procedures as a proxy for discretionary accounting decisions. The results suggest that there is a high incidence of voluntary changes in accounting procedures during years following the adoption or modification of a bonus plan. However, managers do not change accounting procedures to decrease earnings when the bonus plan upper or lower bounds are binding.

The paper raises several questions for future investigation. First, why do bonus contracts reward managers on the basis of earnings, rather than stock price? Second, what are the other incentive effects of bonus contracts? Finally, what are the joint incentive effects of bonus schemes and other forms of compensation, such as performance plans?

FOOTNOTES

1. These studies include Watts and Zimmerman (1978), Hagerman and
    Zmijewski (1979), Holthausen (1981), Zmijewski and Hagerman (1981),
    Collins, Rozeff and Dhaliwal (1981) and Bowen, Noreen and Lacey
    (1981).

2. See Holthausen (1981) and Watts and Zimmerman (1983).

3. For a discussion of these types of compensation see Smith and Watts
    (1982).

4. Contracts taking this form create an incentive for the manager to
    increase dividend payments when the upper limit is binding, thereby
    counteracting the over-retention problem noted in Smith and Watts
    (1983).

5. Dividend equivalents are claims which vary with the dividend payments
    on common stock.

6. The theory does not explain the form of bonus contracts or why
    executives are awarded earnings-based bonuses. For a discussion of
    these issues see Jensen and Meckling (1976), Holmstrom (1979), Miller
    and Scholes (1980), Fama (1980), Hite and Long (1980), Holmstrom
    (1982), Smith and Watts (1983), Larcker (1983) and Demski, Patell and
    Wolfson (1984).

7. The manager's accrual decision is motivated by factors other than
    compensation. Watts and Zimmerman (1978) suggest that the manager
    also considers the effect of accounting choices on taxes, political
    costs, and the probability and associated costs of violating lending
    agreements.

8. See Ronen and Sadan (1981) for an extensive review of the smoothing
    literature.

9. Fox (1980) provides evidence that the probability of a corporation
    employing a bonus plan is not independent of size or industry. The
    inferences drawn from this study are, therefore, strictly limited to
    the sample population. Nonetheless, that population is a non-trivial
    one - the largest 250 industrials account for more than 40 percent of
    sales of all U.S. industrial corporations.

10. Accruals are also deflated by sales and the book value of assets at
    the beginning of the year. The test results are insensitive to
    alternative size deflators.

11. The Chi-Square test assumes that the sample is a random one from the
    population, and the sample size is large. The statistic is drawn
    from a Chi-Square distribution with $(R - 1)(C - 1)$ degrees of
    freedom, where R is the number of rows and C the number of columns in
    the contingency table.

12. This statistical test assumes that the populations are normal with equal variances. Each t value is then drawn from a t distribution with (N + M - 2) degrees of freedom, where N is the number of observations in one sample and M the number in the other. Both the t and Chi-Square tests assume that accruals are independent. This assumption is violated if accruals are autocorrelated or sensitive to market-wide and industry factors. Accruals exhibit significant positive first order autocorrelation. The test statistics reported in Table 2 are therefore overstated.

13. Results for other subcomponents, and for different plan forms - those with and without an upper bound - are reported in Healy (1983). The upper bound results for depreciation, changes in accounts payable and changes in taxes payable are consistent with the theory, but the lower bound results are inconsistent.

14. Managers therefore have an incentive to manage inventory levels, as well as to select accounting procedures, to maximize the value of their bonus compensation (see Biddle, 1980).

15. Weak evidence to support this assumption is presented in Healy (1983). He finds that companies whose bonus plans include and exclude an upper limit do not have different means and variances of leverage, firm value, the ratio of gross fixed assets to firm value, and systematic risk. Leverage is defined as the ratio of long-term debt to firm value, and firm value is the sum of the book values of debt and preferred stock and the market value of common stock.

16. The Sign test and Wilcoxon Signed-Ranks test assume that assignments to test and control groups are random. For a detailed description of the tests see Siegel (1956) pp. 67-83.

17. The sample includes the 94 companies used in earlier tests and the 27 companies formerly excluded because their bonus plan upper limit was a function of participating employees' salaries.

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Discretionary
Accruals
(DA_1)

Case 1   Case 2   Case 3

K

0

L + K   L'   L   L+K   U-K   U   U + K

Earnings before
discretionary
accruals
$(C_1 + NA_1)$

-K
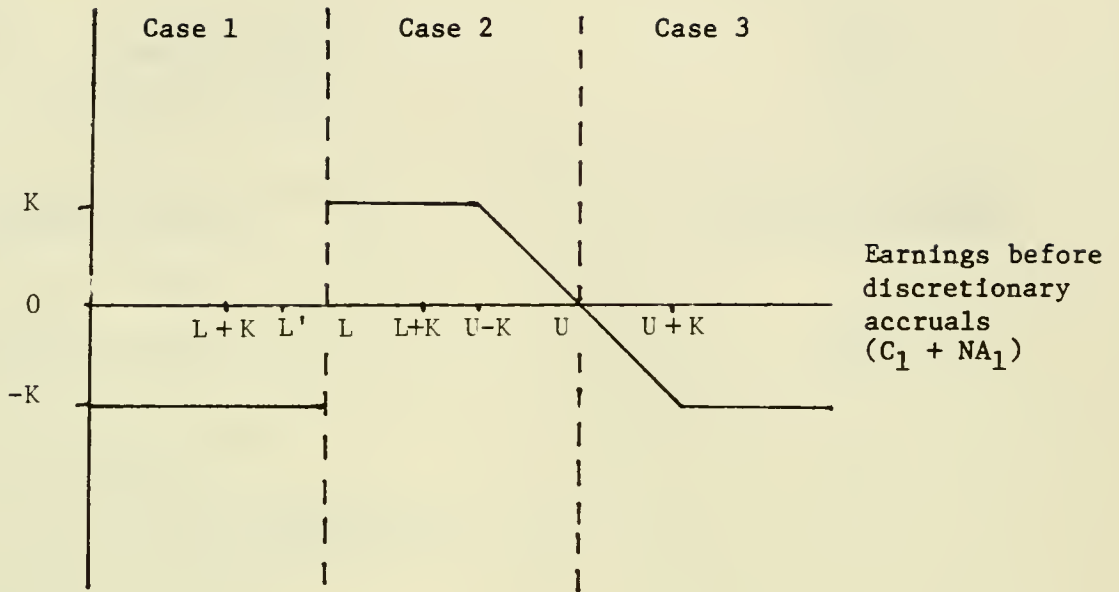
Figure 1.

<u>Managerial Discretionary Accrual Decisions
as a Function of Earnings before Discretionary
Accruals and Bonus Plan Parameters in the
First Period of a Two-Period Model</u>

L = the lower bound defined in the bonus plan
U = the upper bound on earnings
L' = a cutoff point which is a function of the lower bound, the
     manager's risk preference, expected earnings in period two
     and the discount rate
K = the limit on discretionary accruals
C = cash flows from operations
NA = nondiscretionary accruals

Table 1

Summary of Useable Bonus Plan Definitions for a Sample
from the Fortune 250 over the Period 1930-1980

Total number of sample companies	94
Total number of company-years	1527
Number of company-years subject to an upper bound constraint	447

Adjustments to Earnings Specified in the Bonus Contract	Percentage of Company Year Observations
Additions to net income	
Income Tax	52.7%
Extraordinary items	27.5
Interest	33.5
Deductions from net income	
Preferred dividends	12.1
Variables Used to Define Lower Bounds in the Bonus Contract	
Net worth	42.0
Net worth plus long-term liabilities	37.2
Earnings per share	8.3
Other	17.8
Variables Used to Define Upper Bounds in the Bonus Contract	
Cash dividends	22.4
Net worth or net worth plus long-term liabilities	2.5
Other	4.5

Table 2

Summary of the Association between
Accruals and Bonus Plan Parameters

Sample A: Plans with a Lower Bound but No Upper Bound

Portfolio[a]	Proportion of accruals with given sign		Number of Company Years	Mean Accruals[b]	t Test for Difference in Means
	Positive	Negative			
Portfolio LOW	0.38	0.62	74	−0.0367	
					2.5652[d]
Portfolio MID	0.36	0.64	1006	−0.0155	
X^2 (d.f. = 1)	0.1618				

Sample B: Plans with Both a Lower Bound and Upper Bound

Portfolio	Proportion of accruals with given sign		Number of Company Years	Mean Accruals	t Test for Difference in Means
	Positive	Negative			
Portfolio LOW	0.09	0.91	22	−0.0671	
					4.2926[c]
Portfolio MID	0.46	0.54	281	0.0021	
					8.3434[c]
Portfolio UPP	0.10	0.90	144	−0.0536	
X^2 (d.f. = 2)	61.3930[c]				

Sample C: Aggregate of Samples A and B

Portfolio	Proportion of accruals with given sign		Number of Company Years	Mean Accruals	t Test for Difference in Means
	Positive	Negative			
Portfolio LOW	0.31	0.69	96	−0.0437	
					4.3247[c]
Portfolio MID	0.38	0.62	1287	−0.0117	
					7.4593[c]
Portfolio UPP	0.10	0.90	144	−0.0536	
X^2 (d.f. = 2)	43.7818[c]				

[a] Portfolio LOW comprises company years when the bonus plan lower bound is binding. Portfolio MID contains observations for which the lower and upper bounds are not binding. Portfolio UPP contains company years when the upper bound is binding.

[b] Accruals are deflated by the book value of total assets.

[c] Significant at the .005 level.

[d] Significant at the .010 level.

Table 3

Summary of the Association between Accrual
Subcomponents and Bonus Plan Parameters

Change in Inventory

Portfolio[a]	Proportion of inventory accruals with given sign		Mean Accruals[b]	t Test for Difference in Means
	Positive	Negative		
Portfolio LOW	0.59	0.41	0.0096	
Portfolio MID	0.80	0.20	0.0246	2.6880[c]
Portfolio UPP	0.69	0.31	0.0078	4.0515[c]
x^2 (d.f. = 2)	26.3171[c]			

Change in Accounts Receivable

Portfolio	Proportion of receivable accruals with given sign		Mean Accrual	t Test for Difference in Means
	Positive	Negative		
Portfolio LOW	0.59	0.41	0.0092	
Portfolio MID	0.83	0.17	0.0218	3.1152[c]
Portfolio UPP	0.84	0.16	0.0135	2.8119[c]
x^2 (d.f. = 2)	35.4581[c]			

[a] Portfolio LOW comprises company years when the bonus plan lower bound is binding. Portfolio MID contains observations for which the lower and upper bounds are not binding. Portfolio UPP contains company years when the upper bound is binding.

[b] Accruals are deflated by the book value of total assets.

[c] Significant at the .005 level.

Table 4

Results of Tests Comparing Accruals for Companies Whose Bonus
Plans Include and Exclude An Upper Bound Holding Cash Flows Constant

A. Accruals for company-years when the bonus plan's upper bound is
   binding compared with accruals for company-years with no upper limit
   defined in their bonus plan.

Decile[a]	Average Cash Flows[b] by Decile for Company-Years Whose Bonus Plan		Average Accruals[b] by Decile for Company-Years Whose Bonus Plan		
	Includes an Upper Bound	Excludes an Upper Bound	Includes an Upper Bound	Excludes an Upper Bound	Difference in Average Accruals[c]
1	.0681	.0658	-.0044	.0099	- .0143
2	.0912	.0927	-.0048	-.0091	.0043
3	.1066	.1066	-.0341	-.0191	-.0150
4	.1158	.1163	-.0585	-.0280	-.0305
5	.1271	.1277	-.0611	-.0320	-.0291
6	.1368	.1382	-.0611	-.0349	-.0262
7	.1481	.1485	-.0660	-.0399	-.0330
8	.1580	.1574	-.0729	-.0399	-.0330
9	.1784	.1775	-.0908	-.0456	-.0452
10	.2445	.2183	-.0870	-.0694	-.0176
	Sign Test				.0107
	Wilcoxon Signed-Rank Test				.0020

[a] Company-years for which the bonus plan upper limit is binding are arrayed on
     the basis of cash flows (deflated by total assets) and deciles are formed.
     The high and low cash flow values for these deciles are used to form ten
     groups for company-years with no upper bound. Mean cash flows and accruals
     (both deflated by total assets) are estimated for each group/decile.

[b] Cash flows and accruals are deflated by the book value of total assets.

[c] The compensation theory predicts that the difference is negative.

Table 4 (cont.)

B. Accruals for company years when the bonus plan's upper bound is not binding compared with accruals for company-years with no upper limit defined in their bonus plan.

Decile[a]	Average Cash Flows[b] by Decile for Company-Years Whose Bonus Plan		Average Accruals[b] by Decile for Company-Years Whose Bonus Plan		
	Includes an Upper Bound	Excludes an Upper Bound	Includes an Upper Bound	Excludes an Upper Bound	Difference in Average Accruals[c]
1	−.0754	−.0444	.1235	.1011	.0224
2	.0355	.0342	.0277	.0348	−.0121
3	.0612	.0628	.0150	.0099	.0051
4	.0857	.0840	−.0040	−.0042	.0002
5	.1039	.1045	.0055	−.0161	.0216
6	.1257	.1263	−.0174	−.0323	.0321
7	.1482	.1465	−.0261	−.0354	.0093
8	.1687	.1675	−.0314	−.0449	.0135
9	.1953	.1962	−.0430	−.0587	.0157
10	.2547	.2499	−.0474	−.0836	.0362
		Sign Test			.0107
		Wilcoxon Signed-Rank Test			.0068

[a] Company-years for which the bonus plan upper bound is not binding are arrayed on the basis of cash flows (deflated by total assets) and deciles formed. The high and low cash flow values for these deciles are used to form ten groups for company-years with no upper bound. Mean cash flows and accruals (both deflated by total assets) are estimated for each group/decile.

[b] Cash flows and accruals are deflated by the book value of total assets.

[c] The compensation theory predicts that the difference is positive.

Table 5

Summary and Decomposition of Changes in Accounting Procedures for a
Sample from the Fortune 250 over the Period 1968-1980

Type of Change	Full Sample (342 changes)	Subsample with Earnings Effect Disclosed (242 changes)
Miscellaneous	19	12
Inventory		
Miscellaneous	16	9
To LIFO	64	63
To FIFO	3	3
Depreciation		
Miscellaneou	11	6
To accelerated	3	1
To straight-line	27	25
To replacement cost	2	1
Other expenses		
Miscellaneous	20	12
To accrual	12	8
To cash	5	4
Actuarial assumptions for pensions	68	54
Revenue recognition	3	1
Entity accounting		
Miscellaneous	21	8
To inclusion in consolidation	21	1
To equity from unconsolidated	47	34
	342	242

Disclosure of effect on net income

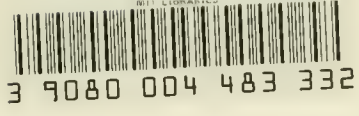|		
Effect on earnings disclosed		242
Estimate given in dollars	193	
Directional effect reported	49	
Effect undisclosed or described as immaterial		100
		342

Table 6

Association between Voluntary Changes in Accounting
Procedures and the Adoption or Modification of a Bonus Plan

| Year[a] | Mean Number of Voluntary Accounting Changes per Firm | | |
	Sample changing bonus plan	Sample not changing bonus plan	Difference in means
1968	0.6364	0.1161	0.5203
1969	1.0000	0.0932	0.9068
1970	1.3333	0.2250	1.1080
1971	0.2000	0.1780	0.0220
1972	0.2000	0.1102	0.0898
1973	0.2500	0.1739	0.0761
1974	0.5000	0.4132	0.0868
1975	0.4000	0.2458	0.1542
1976	0.5000	0.1818	0.3182
1977	0.0000	0.0250	-0.0250
1978	0.0000	0.0417	-0.0417
1980	0.0000	0.1983	-0.1983
	Sign test		0.0730
	Wilcoxon Signed-Rank Test		0.0212

[a] No results are reported for 1979 since none of the sample companies adopted or modified their bonus plan in that year.

Date Due