AN INVESTIGATION OF DISCRETIONARY ACCRUAL MODELS AND THE ACCRUAL ANOMALY

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CHAPTER 1

1. THE RESEARCH PROBLEM

1.1. INTRODUCTION

The general definition of an efficient market is a market where security prices fully reflect all publicly available information. Jensen (1978) elaborates further that a market is efficient with respect to a particular set of information if it is impossible to make economic profits, on average, by trading on the basis of that information set. Generally, the evidence is consistent with the semi-strong form of the efficient market hypothesis (EMH) and is generally accepted by researchers as descriptive (Watts and Zimmerman 1986). There is empirical evidence however that sometimes contradicts the EMH. These anomalies are typically illustrated by showing that an abnormal return can be earned by using publicly available information.

Two related anomalies regarding accruals (hereafter, collectively referred to as the accrual anomaly) have recently been documented by researchers. One stream of this research demonstrates that the market misprices the accrual component of earnings relative to its persistence [Sloan (1996), Xie (2001), Collins and Hribar (2000), Bradshaw, Richardson and Sloan (2001)].[1] A closely related stream of research documents the market's mispricing of discretionary versus nondiscretionary accruals [Subramanyam (1996), Guay, Kothari, and Watts (1996), Xie (1999)]. Regarding these two anomalies, researchers have shown that the market misprices the discretionary

[1] Sloan (1996) shows that the extent to which current earnings performance persists into the future is dependent on the relative magnitudes of the cash and accrual components of current earnings. Due to the nature of accrual accounting, at some future point the accruals must reverse, causing a subsequent decrease in earnings. Whereas, the portion of current earnings attributable to cash flows does not subsequently reverse. Thus, firms should be priced according to not only the level of current earnings, but also based on the relative accrual and cash flow components thereof.

accrual, nondiscretionary accrual, and cash flow components of earnings relative to their implications on future earnings. The accrual anomaly is evidence that investors ignore the components of earnings when making investment decisions. The accrual anomaly indicates that items of publicly available information (i.e., the relative components of earnings) are not correctly impounded into security prices. In other words, the market is inefficient. Sloan (1996) states that investors become "fixated" on the level of current earnings without considering the impact the cash flow and accrual components will have on future earnings. An important implication of the accrual anomaly is that firms can manage earnings through the use of discretionary accruals and "fool" investors.

A possible explanation for the accrual anomaly is that the model used to classify total accruals into the discretionary and nondiscretionary parts is misspecified. Discretionary accrual models are often used in investigations of earnings management. Generally, researchers hypothesize that earnings are managed in predictable ways by using discretionary accruals. Discretionary accrual models estimate the discretionary accruals used by firms to manage earnings (Thomas and Zhang 2000). Typically, models of discretionary accruals estimate discretionary accruals by comparing actual total accruals with estimated total accruals derived with an accrual prediction model. The forecast errors from the discretionary accrual model are assumed to represent discretionary accruals. Thus, forecast accruals are assumed to represent nondiscretionary accruals (i.e., the accruals that would be present absent any incentives to manage earnings).

The model used most frequently to accomplish this task is the Jones (1991) model. Although the Jones (1991) model is extensively used in the earnings management literature and it may be the best currently available alternative for separating total accruals into the discretionary and nondiscretionary components, it lacks power (Bernard and Skinner 1996). As Dechow, Sloan, and Sweeney (1995) point out, none of the currently available models of discretionary accruals work very well at identifying discretionary accruals.

This research study addresses two areas related to the accrual anomaly. First, this research set out to develop an improved discretionary accrual model. Second, the research attempts to better understand how the market prices the components of current earnings (i.e., discretionary accruals, nondiscretionary accruals and cash flows) in order to better understand the accrual anomaly and its implications for market efficiency and earnings management.

1.1.1 **Improved Model of Discretionary Accruals**

One possible explanation for the poor performance of the Jones (1991) model may be that nonstationarities in the data used to predict accruals are causing errors in the estimates of discretionary accruals. Regression analysis of time-series data is usually based on the assumption that the regression relationship is constant over time. In some instances, the validity of this assumption is open to question, and it is often desirable to examine it critically, particularly if the model is to be used for forecasting (Brown, Durbin, and Evans 1975). Statistical procedures are available that allow testing of the time-series of observations for periods of nonstationarity. These techniques, contained in the TIMVAR program developed by Brown, Durbin and Evans (1975), are effective in identifying periods where time-series data become unstable. By removing the periods where the structures of the regression relationships are unstable, the estimates of nondiscretionary and discretionary accruals will be more accurate. Further, the Jones (1991) model has a weakness in that it assumes that discretionary accruals are zero during the estimation period of the model (Thomas and Zhang 2000). If there is management discretion in the estimation period of the model, which there most surely is in many firms, the Jones (1991) model actually predicts unexpected accruals and its estimates of discretionary accruals contain some discretionary accruals and some nondiscretionary accruals.

The development an improved model was accomplished by applying the techniques of Brown, Durbin and Evans (1975) to a hypothetical data set. The hypothetical (or "made up") data was created allowing for the manipulation of various accounting choices. Model development proceeded by testing the impact on the accuracy of the model by introducing managerial discretion that resulted in nonstationary periods in the hypothetical data to determine whether the variables have the ability to predict discretionary accruals in a defined data set, where the amounts are known. The accuracy of the estimates of discretionary accruals of the stationary Jones model were compared to the accuracy of the estimates of discretionary accruals obtained from the original Jones (1991) model.

A better specified model of discretionary accruals is very useful to academic researchers. There is a large body of accounting research that relies on the measurement of accruals (Collins and Hribar 2000).

> "This literature includes studies on the relative informativeness or value relevance of cash flows versus accruals [Rayburn (1986), Wilson (1987), Dechow (1994)], tests of earnings management and income smoothing [e.g., Healy (1985), DeAngelo (1986, 1988), Jones (1991), Dechow, Sloan

and Sweeney (1995), Rees, Gill and Gore (1996), DeFond and Subramanyam (1998), Teoh, Welch, and Wong (1998), and Rangan (1998)], the pricing of discretionary versus nondiscretionary accruals [Subramanyam (1996), Guay, Kothari and Watts (1996), Xie (2001)], and the market's mispricing of accruals [Sloan (1996), Xie (2001), Collins and Hribar (2000)] (Collins and Hribar 2000 p. 2)."

No single model of discretionary accruals has gained acceptance among researchers as being sufficiently descriptive. A model that more accurately captures management's discretionary accruals will give researchers greater insight as to how companies adjust earnings to satisfy the market. Further, improved estimates of the discretionary and nondiscretionary components of total accruals will be useful in the above-cited streams of research.

1.1.2 The Accrual Anomaly

The second component of this research examines the pricing of discretionary accruals, nondiscretionary accruals, and the cash flow components of earnings in order to better understand the accrual anomaly and its implications for market efficiency. An evaluation of the market's pricing of the components of earnings was made using both the Jones (1991) model and the stationary Jones model to estimate discretionary accruals. When a properly specified model of discretionary accruals is used, it was determined that the market is, in fact, more sophisticated than previous studies have indicated in that discretionary accruals, nondiscretionary accruals and cash flows are indeed effectively evaluated for their implications for future earnings. Even if firms manipulate discretionary accruals to inflate current earnings, the market should price the stock of the firm accordingly since these discretionary accruals have been shown to be less persistent than the other components of earnings (Sloan 1996, Xie 2001). The pricing of the components of earnings is tested with the Mishkin (1983) test and by forming hedge portfolios based on relative discretionary accruals.

The accrual anomaly is of particular interest to accountants because it concerns how the market uses accounting information in valuing securities. The accrual anomaly represents a phenomenon where investors do not understand the financial reporting of firms. It also implies that it is possible for firms to manipulate earnings and fool investors. If research continues to indicate that the accrual anomaly exists, it may be indicative of a fundamental flaw in the current accounting model, requiring attention by standard setters. In order to mitigate these problems, it may be necessary for standard setters to reduce the subjectivity allowed to companies in making their discretionary accruals. If the research finds that the accrual anomaly disappears when an improved model of discretionary accruals is employed, then the current financial reporting model would appear to be valid, at least with respect to accrual accounting.

1.2. RESEARCH QUESTION

The specific research questions addressed are: Does the Jones (1991) model produce more accurate estimates of discretionary accruals if nonstationary periods that may or may not be the result of management discretion are removed from the estimation period of the model? Do investors correctly price discretionary accruals according to their persistence?

1.3. IMPORTANCE OF RESEARCH QUESTION

The question of why managers choose to manipulate reported earnings is important for at least two reasons. First, financial statement users are interested in how to interpret financial statements that have been produced using discretionary accruals – how do discretionary accruals affect the informativeness of financial statements? Second, standard setting bodies tend to reduce the discretion available to companies in reporting, based on the assumption that managers exercise their discretion opportunistically. If managers use their discretion to increase the informativeness of accounting earnings, then standard setters may wish to rethink their current approach (Bernard and Skinner 1996).

CHAPTER 2

2. LITERATURE REVIEW

2.1 DISCRETIONARY ACCRUAL MODELS

It is important for accounting researchers to understand the impact of public financial reporting on the users of that information. One avenue to understanding the effect on users is to study the reaction of the market to particular accounting numbers. One facet of accounting reporting is that there is flexibility allowed to management in the treatment of various accounting rules. This allows managers to have some flexibility through the use of discretionary accruals.

There are two possible reasons that managers may use discretionary accruals, one self-serving and the other as a means of signaling. The first reason is that accruals are good indicators of possible future cash flows for the firm. According to this reasoning, accruals are a more reliable and timely measure of firm performance (i.e., earnings) than cash flows. According to Subramanyam (1996), one possible reason management uses accruals is to improve the ability of earnings to reflect the value of the firm. Another possibility is that managers use accruals opportunistically to hide poor performance or to postpone a portion of unusually good performance into future years.

Tests of earnings management and market efficiency using discretionary accruals are widespread in accounting research (Kothari, Leone and Wasley 2001). However, it has been discovered that the current models being used to estimate discretionary accruals lack proper specification and power (Dechow, Sloan and Sweeney 1995). Unfortunately, there has been little success in improving the models used to estimate discretionary accruals. In spite of this, the discretionary accrual models identified as misspecified continue to be used (Kothari, et al. 2001).

2.1.1 Jones (1991) Model

The purpose of discretionary accrual models, such as the Jones (1991) model, is to allow researchers to separate the total accrual component of earnings into the discretionary and nondiscretionary components. The Jones (1991) model accomplishes this task by assuming that nondiscretionary accruals are relatively stable over time, and that discretionary accruals tend to vary. The Jones (1991) model does allow nondiscretionary accruals to vary with the economic circumstances of the firm. Therefore, nondiscretionary accruals become a function of firms' change in revenue and the level of property, plant, and equipment. Researchers then estimate the Jones (1991) model in time series, and use the forecasted values to estimate the nondiscretionary accruals. The estimated discretionary accruals then fall out as the prediction error.[2]

Jones began development of her model by extending the expectations model of DeAngelo (1986). DeAngelo was interested in conflicts of interest resulting from management buyouts of public stockholders. She hypothesized that mangers would use their managerial discretion over accruals to systematically understate net income when the firm was about to engage in a management buyout of the stockholders' interests. By decreasing earnings, managers would be able to obtain a purchase price for the outstanding shares below what would have otherwise been acceptable if earnings had been higher. She investigated the accounting decisions made by 64 firms publicly traded

[2] There are also variants of the Jones (1991) model. For instance, one variant estimates discretionary accruals cross sectionally based on two-digit SIC Code.

on the New York and American Stock Exchanges that proposed management buyouts during 1973-1982. DeAngelo found no empirical results that indicated that managers of firms proposing management buyouts were systematically understating earnings.

To test her hypotheses, DeAngelo tested whether average abnormal accruals were significantly negative for the periods immediately prior to the management buyout. In the DeAngelo (1986) model, total accruals from a prior period (t – k) are used as a measure of the "normal" total accrual. Abnormal total accrual is defined as the difference between current total accruals and the estimated normal total accruals, allowing total accruals to be separated into discretionary and nondiscretionary accruals:

$$\Delta TA_{it} = (TA_{it} - TA_{it-k}) = (DA_{it} - DA_{it-k}) + (NA_{it} - NA_{it-k}) \qquad (1)$$

where:

TA_{it} = total accruals in year *t* for firm *i*;

DA_{it} = discretionary accruals in year *t* for firm *i*;

NA_{it} = nondiscretionary accruals in year *t* for firm *i*;

TA_{it-k} = total accruals in year *t-k* for firm *i*;

DA_{it-k} = discretionary accruals in year *t-k* for firm *i*;

NA_{it-k} = nondiscretionary accruals in year *t-k* for firm *i*;

The DeAngelo (1986) model assumes that the average change in nondiscretionary accruals, $(NA_{it} - NA_{it-k})$, is approximately zero, so that a change in total accruals, $(TA_{it} - TA_{it-k})$, is due to a change in discretionary accruals, $(DA_{it} - DA_{it-k})$.

Jones (1991) was also interested in earnings management. She tests whether firms that would benefit from import relief (e.g., tariff increases and quota reductions) attempt to decrease earnings through earnings management during import relief investigations by the United States International Trade Commission (ITC). One factor looked by the ITC at when making decisions whether to provide import relief is the earnings of the firms that would benefit from the relief provisions. This provides incentives for managers to manage earnings down in order to increase the likelihood of obtaining import relief and/or increase the amount of relief granted (Jones 1991).

Jones finds support for her hypotheses indicating that firms make income-decreasing accruals during import relief investigation. However, Jones' greatest contribution to the literature was her improvements in the estimation of discretionary accruals from DeAngelo (1986). Use of the DeAngelo (1986) model assumes that the difference between current- and prior-year accruals is due solely to changes in discretionary accruals because nondiscretionary accruals are assumed to be constant from period to period. To relax this assumption, Jones includes variables in the model to allow for changes in the economic circumstances of the firm. Jones includes the change in revenues (ΔREV) and gross property, plant, and equipment (PPE) in order to control for changes in nondiscretionary accruals caused by changing economic conditions. Jones estimates the following weighted generalized least squares model:

$$TA_{it} / A_{it-1} = \alpha_i [1 / A_{it-1}] + \beta_{1i} [\Delta REV_{it} / A_{it-1}] + \beta_{2i} [PPE_{it} / A_{it-1}] + \varepsilon_{it} \quad (2)$$

where:

TA_{it} = total accruals in year t for firm i;

ΔREV_{it} = revenues in year t less revenues in year t-1 for firm i;

PPE_{it} = gross property, plant, and equipment in year t for firm i;

A_{it-1} = total assets in year t-1 for firm i;

ε_{it} = error term in year t for firm i;

i = 1, …, N firm index

t = 1, …,T year index for the years included in the estimation period for firm i.

The reasoning for including the change in revenues (ΔREV_{it}) is because total accruals (TA_{it}) includes changes in working capital accounts, such as accounts receivable, inventory, and accounts payable, that fluctuate to some extent on changes in revenues. According to Jones, revenues are used as a control for these changes because revenues are an unbiased endogenous measure of firms' performance that are not subject to managers' manipulations. The level of property, plant, and equipment is included to control for the portion of total accruals related to nondiscretionary depreciation expense. Gross PPE is used in the model, as opposed to the change in PPE, because it is total depreciation expense, as opposed to the change in depreciation, that is included in total accruals (Jones 1991). To reduce the problems associated with heteroscedasticity, a weighted or generalized least squares estimation procedure is used thus forcing all of the error terms to have the same variance. Lagged assets (A_{it-1}) are used to scale all of the variables in the expectations model. Lagged assets are assumed to be positively correlated with the variance of the error term (Jones 1991).

Jones uses generalized least squares (GLS) to obtain parameter estimates a_i, b_{1i}, and b_{2i} of α_i, β_{1i}, and β_{2i}, respectively. The Jones (1991) model assumes that the relationship between nondiscretionary accruals and the explanatory variables is stationary. Prediction error is defined as:

$$u_{ip} = TA_{ip} / A_{ip-1} - (a_i [1 / A_{ip-1}] + b_{1i} [\Delta REV_{ip} / A_{ip-1}] + b_{2i} [PPE_{ip} / A_{ip-1}]), \quad (3)$$

where p = year index for years included in the prediction period. The level of discretionary accruals is represented by the prediction error, u_{ip}.

Jones estimates the model using the longest time-series of observations available. Use of the Jones (1991) model to estimate nondiscretionary accruals in time series over long periods is problematic. Using long time-series of observations improves estimation efficiency, however it increases the likelihood that structural changes may occur during the estimation period. These nonstationarities can result in measurement error in both nondiscretionary accruals and discretionary accruals. This measurement error may lead to questionable results for any research utilizing this model to investigate the pricing of these two components of total accruals.

Another probable weakness of the Jones (1991) model is that it assumes there is no managerial discretion in the estimation period of the model. The variables in the Jones (1991) model are included to control for nondiscretionary changes in accruals due to exogenous factors. If there is discretionary manipulation of accruals during the estimation period of the model, the model cannot accurately predict total nondiscretionary accruals for the test/forecast period and the estimates of discretionary accruals will be wrong.

2.2 ACCRUAL ANOMALY

Sloan (1996) documents an anomaly to market efficiency. Sloan (1996) investigates the extent to which stock prices reflect information contained in the accrual and cash flow components of current earnings. Sloan first demonstrates that the extent to which current earnings performance persists into the future is dependent upon the relative magnitudes of the cash and accrual components of current earnings. Investors in an efficient market should recognize this relationship between accruals, cash flows and earnings, and price those firms with a relatively large portion of their earnings deriving from accruals accordingly. Those firms with earnings that are made up of relatively large amounts of accruals versus actual cash flows from operations may be using accrual accounting to manipulate their earnings.

Sloan finds that investors do not distinguish between the accrual and cash flow components of current earnings until that information impacts future earnings. He demonstrates that if one were to invest long (short) in firms in the bottom (top) decile of relative accruals, one would generate positive abnormal returns over the succeeding years. Sloan's interpretation is that the market becomes "fixated" on the level of current earnings without considering the accrual and cash flow components. The implication is that firms can manage earnings through the use of accruals, but that the market is so gripped by the level of total earnings that it is unable to distinguish between the cash component and the accrual component, even though the accrual component is less persistent. This is not the result one would expect in an efficient market. If all publicly available information is impounded into securities' prices, then the relative makeup of earnings should be impounded into the price. Those firms with earnings that consists of relatively large (small) amounts of accrual income should be priced lower (higher) than those firms whose earnings consist of relatively large (small) amounts of cash flows.

The accrual anomaly has been addressed more recently by Xie (2001). Xie studies the relationship between normal accruals, abnormal accruals[3], and cash flows from operations. Whereas Sloan assumes that relatively large amounts of total accruals is an indication that firms may be managing earnings, Xie posits that some accruals are necessary, and that the best indicator of earnings management is relatively large amounts of abnormal or discretionary accruals. For example, firms have a substantial degree of discretion in the amounts booked for bad debt expense, however they have very little discretion over accrued wages. The amount of accrued bad debt expense is very subjective while the amount of accrued wages expense is not. Consequently, since managers have the ability to manipulate earnings through discretionary accruals, the market should price these discretionary accruals differently than the nondiscretionary accrual and the cash flow components of current earnings.

Xie uses the Jones (1991) model of discretionary accruals to discriminate between discretionary accruals and nondiscretionary accruals. Xie finds that the market overestimates the persistence of discretionary accruals and consequently overprices those accruals. In other words, Xie finds that the market is inefficient with respect to discretionary accruals in that the market fails to differentiate between the components of current earnings and the implications that those components have on future earnings.

[3] There is disagreement among the terminology used by researchers in describing the results of the Jones (1991) model. Xie (2001) terms the estimates as "abnormal accruals" where other researchers have called the estimates "discretionary accruals". Accrual prediction models forecast total accruals. The forecast errors from the model are deemed to be discretionary accruals by some researchers and "unexpected accruals" by others.

Possible explanations for the anomalous findings discussed above are: 1) the market is inefficient with respect to the components of earnings and/or 2) the models and tests used to test the accrual anomaly are misspecified. Even though it is widely believed that firms manage earnings using discretionary accruals, if the market is efficient in the semi-strong form, those discretionary accruals should be priced differently than the nondiscretionary accrual component of earnings.

The accrual anomaly may be the result of using a discretionary accrual model that produces inaccurate estimates of the amount of discretionary accruals. A key issue in the tests of the accrual anomaly is how well the model classifies total accruals into discretionary and nondiscretionary components (Bernard and Skinner 1996). Healy (1996) points out that power and internal validity of tests of discretionary accruals depend critically on whether the discretionary accrual models used in studies are well specified. The model that is used most extensively to separate accruals into discretionary and nondiscretionary components is the Jones (1991) model. Dechow, Sloan, and Sweeney (1995) analyze five commonly-used models of discretionary accruals and conclude that the Jones (1991) model outperforms all others. Dechow, et al. and Guay, Kothari and Watts (1996) indicate that none of the models of discretionary accruals effectively detects earnings management since they lack sufficient power. A more robust discretionary accrual model is needed to study the accrual anomaly.

2.3 CONCLUSION

The study of accruals is important to the discipline of accounting. The profession has chosen to allow for flexibility in reporting with the intention of providing more useful information. In order for financial reporting to convey meaningful information, financial accounting standards must allow mangers to exercise judgment in their financial reporting (Healy and Wahlen 1999). This allows managers to use their knowledge about the business and its opportunities to use some discretion in the selection of reporting methods, estimates and disclosures that match the firm, which increases the value of accounting information to convey useful information. However, this judgment also provides opportunities for "earnings management," where managers use their discretion in self-serving ways, which does not accurately reflect the firms' underlying true value (Healy and Wahlen 1999).

According to the former Chairman of the Securities and Exchange Commission (SEC), Arthur Levitt, earnings management can have a serious effect on resource allocation. He noted that the credibility of financial reporting is being threatened by management accounting abuses such as "big bath" restructuring charges, premature revenue recognition, "cookie jar" reserves, and write-offs of purchased in-process research and development charges (1998). Healy and Wahlen define earnings management as the occurrence wherein management uses judgment in financial reporting and in structuring transactions to alter financial reports to either mislead some stakeholders about the true underlying economic conditions of the firm or to influence contractual outcomes that depend on reported accounting numbers (1999).

It is important to examine how users of accrual accounting information understand what is being reported. Insight can be gained as to whether users comprehend accrual accounting by determining whether they price accruals according to their persistence. The accrual anomaly implies that the market does not price accruals efficiently, and thus, the market does not understand accrual accounting. Possible explanations for the anomalous result should be investigated. If the accrual anomaly is possibly the result of a poorly specified discretionary accrual model, then researchers should investigate the model and the anomaly further.

CHAPTER 3

3. THEORETICAL FRAMEWORK AND STATEMENT OF HYPOTHESES

3.1 DISCRETIONARY ACCRUAL MODELS

3.1.1 Nonstationarity

The Jones (1991) model is an accrual prediction model. It estimates discretionary accruals by making a prediction of total accruals for a test/forecast period. The prediction of total accruals is compared to the actual accruals for the test period and any difference is deemed attributable to managerial discretion. To make predictions of total accruals, the Jones (1991) is estimated using a weighted least squares estimation procedure over the longest time series of observations available prior to the test period. Using a long time series of observations can improve estimation efficiency but it can also be problematic due to possible structural shifts in the data. These structural shifts can cause the estimates of total accruals provided by the model to be inaccurate and thus the estimates of discretionary accruals will also be inaccurate. Removing the structural shifts should improve the Jones (1991) model's ability to accurately estimate discretionary accruals. Brown, Durbin and Evans (1975) develop techniques contained in the TIMVAR program that are useful at identifying structural shifts in time-series data for the purpose of improving the forecast accuracy of models that use such data.

3.1.2 Unexpected Accruals Versus Discretionary Accruals

As Thomas and Zhang (2000) point out, the Jones (1991) model really makes a prediction of unexpected accruals, not discretionary accruals. Total accruals for firm *i* in year *t* consists of two elements, discretionary accruals and nondiscretionary accruals.

$$TA_{it} = DA_{it} + NA_{it} \quad (4)$$

Discretionary accrual models, such as the Jones (1991) model, predict total accruals (TA_{it}), which is the sum of the forecasted values of nondiscretionary accruals and discretionary accruals. The forecast error (FE_{it}) from the model is then viewed as the discretionary accruals. However, the forecast error is actually the sum of the forecast errors on the two components of total accruals.

$$FE_{it} = TA_{it} - T\hat{A}_{it} = (NA_{it} - N\hat{A}_{it}) + (DA_{it} - D\hat{A}_{it}) \quad (5)$$

However, the researcher only observes total accruals. Prior research has assumed that discretionary accruals are insignificant in the estimation period, and the model is in effect derived for only nondiscretionary accruals. Consequently, the forecast error is viewed as a reasonable estimate for discretionary accruals. If discretionary accruals exist in the estimation period, the model is actually predicting unexpected accruals because the predictable portion of both discretionary and nondiscretionary accruals is captured in the forecast (Thomas and Zhang 2000). Accordingly, an improved model of discretionary accruals that takes into account any possible managerial discretion during the estimation period of the model is needed to overcome the fact that prediction error from the Jones (1991) model actually represents unexpected accruals and not total discretionary accruals. Managerial discretion during the estimation period of the model results in a structural shift in the time-series data. These structural shifts are identified and removed from the estimation of the model, thereby eliminating managerial discretion during the estimation period. With managerial discretion removed from the estimation period of the model, the model then is providing more accurate estimates of discretionary accruals during the test period.

3.1.3 Discretionary Accrual Model Hypothesis Development

Nonstationarity is likely causing significant measurement error in the estimates of discretionary accruals provided by the Jones (1991) model.[4] These measurement errors cause results achieved from research using the Jones (1991) model to be suspect. By removing the nonstationary periods from the estimation period with the TIMVAR program of Brown, Durbin and Evans (1975) when using the Jones (1991) model, more accurate estimates of discretionary accruals should be achieved. Accordingly, the following hypothesis (stated in the null) is tested.

> **H_1:** The estimates of discretionary accruals generated by the stationary Jones model are more accurate than the estimates of discretionary accruals generated by the Jones (1991) model.

3.2 ACCRUAL ANOMALY HYPOTHESIS DEVELOPMENT

Formerly, tests of the accrual anomaly have been joint tests of the accrual anomaly and on the ability of the discretionary accrual model to bifurcate accruals into the discretionary and nondiscretionary parts. As Healy (1996) points out, tests of the accrual anomaly are difficult to interpret because they are joint tests of the market efficiency with respect to discretionary and nondiscretionary earnings and of the capacity

[4] The nonstationarity may or may not be the result of managerial discretion.

of the accrual model to separate the accrual component of earnings into discretionary and nondiscretionary accruals.

An improved model of discretionary accruals will allow more appropriate assessment of the market's pricing of discretionary accruals and understanding of the accrual anomaly. Current research attempting to test discretionary accruals are actually tests of (1) whether investors accurately parse total accruals into the discretionary and nondiscretionary components and (2) whether investors effectively evaluate cash flows, discretionary accruals and nondiscretionary accruals for their implications on future firm performance. With an improved model of discretionary accruals, this test becomes a test of the single hypothesis (stated in the null):

> **H_2:** Investors price discretionary accruals according to their persistence and thus correctly reflect their implications for future earnings.

3.3 SUMMARY

This research attempts to develop a better-specified discretionary accrual model that controls for instability in the time-series data and for any manipulation of net income through the use of discretionary accruals during the estimation period. The improved stationary model is evaluated by comparing its performance to the performance of the Jones (1991) model. The research then evaluates the accrual anomaly to gauge whether the anomaly truly exists or whether it may be the result of mismeasurement of discretionary accruals caused by an inadequate model.

CHAPTER 4

4. MODEL DEVELOPMENT

There is a large body of accounting research that relies on the measurement of accruals (Collins and Hribar 2000). No single model of discretionary accruals has gained acceptance among researchers as being sufficiently descriptive. A model that more accurately captures management's discretionary accruals will give researchers greater insight as to how companies adjust earnings to satisfy the market. Further, improved estimates of the discretionary and nondiscretionary components of total accruals will be useful in the above-cited streams of research.

The proposal for this research indicated that an attempt would be made to develop an "improved model of discretionary accruals." This goal is thought necessary because of the inadequacy of the Jones (1991) model or any completing models at accurately measuring the portion of accruals attributable to management discretion. The effects of nonstationarity are evaluated using the techniques of Brown, Durbin and Evans (1975). Model development began using a hypothetical (i.e., "made up") data set, thus allowing for the manipulation of the level of income through the use of various working capital accounts that would constitute discretionary accruals. It is believed that by using this procedure, the Jones (1991) model could be analyzed for its deficiencies and that a more accurate discretionary accrual model would emerge.

4.1 HYPOTHETICAL DATA

The development of the hypothetical data set begins with a number of assumptions. The model starts with 23 years of data, with 20 of the years used as the estimation period and the remaining two periods used as the test periods. One period is lost because the change in revenues variable required there to be a lag year to compute the change, and because lagged assets are used as a weighting variable. The data assumes a steady increase in sales (2.5%) and that 75 percent of the sales are for cash and the remaining sales are on credit.

There are three expenses included in the data. One is a purely cash expense, commissions, and the other two are accrual expenses that do not require an immediate cash outlay. One of the accruals is for bad debt expenses and the other is for depreciation. Commission expenses are assumed to be 40 percent of total sales. Bad debt expense is assumed to be 20 percent of credit sales and it is assumed that the actual bad debts written off are equal to the estimate and that the entire bad debts are realized in the year subsequent to the estimate. Depreciation expense is a function of the property, plant and equipment and it is assumed that the firm is depreciating the assets over 20 years. Finally, it is assumed that the owners made an initial contribution of $5,000 and that the money is invested in fixed assets, and further that all income is retained in the firm (i.e., no dividend payments).

The hypothetical data without any structural shifts in the time-series data is shown in Table 1. Total accruals are shown at the bottom of the table. Total accruals (ACCR) are calculated by subtracting cash flows from operations (CFO) from net income (NI). Starting in period one, total accruals are $(240.00), and they remain at this level with only slight increases every period throughout the model estimation period and the test period, eventually rising to $(233.20) at the end of the 23-year period. The reconciliation of the $(240.00) in period one is the result of removing $400 in cash received in Period 1 that is recorded as income in Period 0, adding \$513 in credit sales to be received in a future period, and subtracting out the noncash expenses, bad debt expense and depreciation, which are \$103 and \$250, respectively. That is, net income is \$240 less than it would have been if the hypothetical data are reported on a cash basis.

Calculation of Total Accruals in Year 1:

Net income			\$ 878.00
Less: CFO			
	Cash sales	\$ 1,538.00	
	Collections of AR	400.00	
	Commission Expense	(820.00)	(1,118.00)
Total accruals			\$ (240.00)

alternatively,

Collection of AR from period zero	\$ (400.00)
Credit Sales from current period	513.00
Non-cash expenses	(353.00)
Total accruals	\$ (240.00)

The change in revenues (ΔREV) is calculated by subtracting revenues in period t-1 from revenues in period t ($\Delta REV_t = REV_t - REV_{t-1}$). Property plant and equipment is started at \$5,000 and increased slightly each period to obtain sufficient variation to allow estimation of the coefficient on that variable.

4.1.1 Stationary Data

The stationary data is first estimated with the Jones model, making careful observations of the errors in the estimates to evaluate possible alterations to the model that would provide more accurate estimates. The ordinary least squares coefficient estimates for the Jones (1991) model using the hypothetical data are given in Table 2. The model parameters have the expected signs and are generally consistent with expectations. For example, the intercept parameter is \$(238.80), which is very close to the average total accrual amount of \$(237.23) over the estimation period. This is expected because there is little variation in the independent variables during the estimation period for this stationary data that would have affected the level of total accruals. The coefficient on the change in revenues variable is 0.2012, which indicates that total accruals increase by \$0.20 for every dollar change in revenues. The coefficient on the change in revenues variable is positive, as expected. Increases in the levels of sales should produce corresponding increases in the level of total accruals. The coefficient on the property, plant and equipment variable is -0.0025. The coefficient on the property, plant and equipment variable is expected to be negative. Increases in depreciable assets result in increased depreciation expense (a noncash expense), which produces decreases in the levels of total accruals.

The coefficient estimates are then used to make a prediction of total accruals during the test period to determine the accuracy of the model as shown in equation (3), which is as follows:

$$DA = -233.20/31{,}270.14 - [-238.81*(1/31{,}270.14) + 0.20*(83.98/31{,}270.14) - 0.00225*(5{,}022/31{,}270.14)$$

$$DA = -233.20 - (-233.30) = \$0.10 \text{ (see also Table 2)}$$

The Jones (1991) model is extremely accurate using data that did not contain any structural shifts. The estimate of total accruals for the test period (i.e., Period 22) is \$(233.30) and actual accruals for that period are \$(233.20) (see table 1). Therefore, the Jones (1991) model estimates discretionary accruals to be \$0.10. In reality, there is no manipulation of the hypothetical data during the test period, which would duplicate the outcome if management has not used its discretion during the test period.

4.1.2 Nondiscretionary Changes

Next, the hypothetical data set is manipulated to determine the accuracy of the Jones (1991) model when the data are not stationary. In this simple hypothetical data set there are two possible sources of structural shifts. Structural shifts may be the result of normal changes in the business circumstances of the firm (i.e., nondiscretionary) or the structural shifts may be the result of management manipulation of the accounting numbers (i.e., discretionary). The effects of nondiscretionary changes in the hypothetical data are evaluated first, and then discretionary changes are evaluated.

One possible source of a nondiscretionary change would arise if the firm changed its investment in property, plant and equipment. This type of change in the levels of accruals should have a more lasting effect than some other changes in accruals, which will be discussed later. The above data set is modified by assuming that the firm has added additional property, plant and equipment. Three scenarios are considered with additions assumed to be made in Periods five, ten and 15. Tables 3, 4 and 5 contain the data used for the asset additions. In the data containing the asset addition in Year 5, it is interesting to note the semi-permanent effect of the asset addition on total accruals. In the stationary data, the total accruals average $(237) over the estimation and test periods. In the year of the asset addition, a significant decrease in the level of total accruals is observed. In year four, before the asset addition, total accruals are close to the average for stationary data at $(239.23). However, the asset addition in Year 5 caused accruals to drop to \$(488.96). This drop is precipitated by the increased depreciation on the added assets. Depreciation increased by \$250, which caused a corresponding decrease in total accruals of about \$250. This is the result in the year of the asset addition for all three asset addition scenarios. In spite of this, the Jones (1991) model performs very well in predicting total accruals during the test period. This is because the Jones (1991) model contains a variable that is intended to control for increases in depreciation caused by changes in fixed assets, the level of property, plant and equipment.

The coefficient estimates for the three scenarios along with the estimates of discretionary accruals are included in Table 6. The coefficient estimates for all three scenarios are very similar. The intercept variable changes dramatically from the intercept for the data without any structural shifts. Where there are no structural shifts during the estimation period, the intercept is very close the level of total accruals. However, when some nondiscretionary changes are added, the coefficient seems to lose its significance in estimating total accruals, dropping to less than \$2 for all three scenarios. Although it is still statistically significant, the total dollar level decreases to a very low amount. The coefficient on the change in revenue variable does not change drastically from the stationary estimates, staying close to 0.23, which indicates that total accruals vary by 0.23 cents for every dollar change in revenues. The parameter on the property, plant and equipment variable also changes rather dramatically from the stationary estimate (as one would expect) because now the level of property, plant and equipment has a major impact on the level of accruals. The parameter estimate becomes significant and increases in value to –0.05 for all three scenarios, which indicates that total accruals should decrease by five cents for every dollar invested in PPE. One striking outcome of the three scenarios is how similar the parameter estimates are. They are very close, indicating that the model controls very well for changes in depreciation expense regardless of the period of change.

The best measure of the model's ability to control for a nondiscretionary change is to evaluate its performance with the hypothetical data. In these three scenarios there is no manipulation of accruals during the test period. Therefore, the successful discretionary accrual model would have errors of approximately zero during the test period, as the Jones (1991) model did here. The estimates of total accruals for the test period for the three scenarios are all very close to the actual level of total accruals during the test period. The model controls very well for changes in accruals caused by changes in one of the explanatory variables.

4.1.3 Discretionary Changes – Non reversing

Next, an evaluation of the model with the hypothetical data is made where the change in depreciation expense is attributable to managerial discretion. Accordingly, the change in depreciation expense is not accompanied by a corresponding change in the level of PPE.

Presumably, discretionary manipulation of the data would be to increase the level of reported net income. Accordingly, a change in the depreciable lives of the fixed assets is assumed to occur, causing corresponding decreases in depreciation expense. All assumptions regarding the data set are as they are with the stationary data, except that the depreciation expense is decreased by half for three different scenarios occurring at different time periods. As before, this type of change is not one that normally reverses quickly. The decrease in depreciation expense does not have any immediate negative consequences, as would a change in other type of expense accounts. The three different scenario changes decreased depreciation expense in Periods 5, 10 and 15. The data for the different scenarios is provided in Tables 7, 8 and 9.

The parameter estimates for the Jones (1991) model using the hypothetical data are shown in Table 10. Discretionary structural shifts in the data during the estimation period cause the Jones model to provide inaccurate estimates of discretionary accruals. Additionally, the results are considerably different depending on when the structural shift occurs. In the first scenario, the structural shift occurs early during the estimation period, at five years. The coefficient estimates bear little resemblance to the original coefficient estimates obtained with the stationary data nor even to the coefficient estimates obtained when there is a nondiscretionary structural shift in the time series. The coefficient estimates for the intercept term are in the tens and hundreds of thousands and are sometimes positive and sometimes negative. In spite of this, the intercept parameter is statistically significant for the five-year and the fifteen-year scenarios.

The parameter estimates for the change in revenues variable and the property, plant and equipment variable are also inconsistent, and have different signs depending on the period in which the discretionary change is assumed to occur. However, as above, both variables are statistically significant for the five and fifteen-year scenarios. The estimates of total accruals for the test period are equally disappointing. The model erred in estimating discretionary accruals in all three scenarios and in different directions (see Table 10). Overall, the results of the Jones (1991) model are very poor when there is a structural shift in the time series caused by managerial manipulation of net income. This is troubling because the Jones (1991) model is devised and is used widely to estimate discretionary accruals for testing market efficiency, as in this paper, and it is apparent even from this simplified data set that the model is susceptible to serious and random errors when there is managerial manipulation during the estimation period of the model.

4.1.4 Discretionary Accruals -- Reversing

As mentioned above, accrual manipulation can have differing effects on subsequent periods' income depending on what type of discretion is used. For example, the depreciation changes above do not have substantial immediate consequences on subsequent periods' net income. The only effect suffered by a company that increases the depreciable lives of its fixed assets is that the expense of the assets is spread over more periods. This increases income during the period of change and for the subsequent periods. It also increases the length of time the company must endure the expense, but this may be many periods into the future before this effect is realized. Other changes, however, are much more temporary, in that they reverse in subsequent periods. One example of this type of discretionary accrual would be if management underestimated the bad debt expense of the firm.

The hypothetical data being used in this example assumed that bad debts are equal to 20 percent of credit sales and that actual collections are in line with this estimate. One could envision a circumstance where management wished to increase net income, so they used their discretion to change the estimate of bad debts. If the bad debt collections continued to be the same then the accrual would subsequently reverse when the bad debts not accounted for earlier had to be written off in later periods.

The hypothetical data set will now be manipulated by using discretion in the estimates of bad debts. However, to make the example differ from the depreciation example above, the bad debt experience is assumed not to change. That is, management will change its estimate of bad debts to ten percent of credit sales but the actual bad debt experience will remain 20 percent of credit sales. In this way management can manipulate net income in the short run but there is a subsequent reversal that will cause later periods' net income to be lower because the manipulation reverses itself in the following periods.

All assumptions remain from the stationary example above, except now it is assumed that management desires to increase the income of the firm in a particular period by changing its estimate of bad debts to ten percent. However, subsequently, the bad debts continue to be 20 percent of credit sales. Tables 11, 12, 13 and 14 contain the hypothetical data set containing discretionary changes in bad debt expense occurring in Periods 5, 10, 13 and 15, respectively.

It is interesting to notice the effect on total accruals by making the discretionary change in the estimate of bad debt expense. The reversing effect is very noticeable. For instance, before the change made in Year 5 of the first scenario total accruals are about \$(240.00). The change caused an increase in total accruals in Year 5 to \$(182), then accruals drop to the lower amount of \$(293) and then in the second year after the change the total accrual amount has recovered back to about \$(240). The reversing discretionary change caused a shock to the system, but after two years the total accrual amount has recovered to its previous level. One important note here is that eventually management will have to revise its estimate of bad debts to the correct amount, and in that year there will be a dramatic drop in the level of total accruals because the bad debt expense will reflect the make up of the prior year lower amount and the current year will be for the correct amount.

The coefficient estimates for the Jones (1991) model for the four scenarios are shown in Table 15 along with the model's estimate of discretionary accruals. There appears to be a trend in the parameter estimates depending on the period of the change. All of the parameter estimates are insignificant, although the model R-squares remain high (as they have throughout). The estimates of the discretionary accruals appear to be influenced by the period of the shock. The Jones (1991) model predicts total accruals to be $(233.99) for the five-year scenario, which is relatively close to the actual total accruals of the hypothetical data set of $(233.15). The error in the prediction is not nearly as close for the other three scenarios however, missing by $4.06, $23.46 and $12.87 for the 10, 13 and 15-year scenarios, respectively.

4.1.5 Discretionary Changes – Multiple

Finally, the Jones (1991) model is evaluated using the hypothetical data with more than one change caused by managerial discretion. It has previously been demonstrated that the Jones (1991) model is susceptible to inaccuracy when there is managerial discretion during the estimation period. This example serves to illustrate that the results from the regression of the time-series data with the Jones (1991) model can be misleading. The hypothetical data set is provided in Table 16. The data is subject to two structural shifts caused by discretionary changes. The first shift occurs in Period 10 when bad debt expenses are again estimated to be ten percent. As above, the estimate goes to ten percent for the remaining periods but the actual bad debts continues to be 20 percent. This provides the reversing accrual and the permanent accrual is caused by a discretionary change in the depreciation expense of the fixed assets during Period 12. Both of these changes effect total accruals.

Table 17 provides the parameter estimates for the Jones (1991) model with the two discretionary changes. The coefficient estimates for the change in revenues and property, plant and equipment have the expected signs and appear to be reasonable in amount. The intercept parameter is 198,108, which indicates that total accruals would be positive 198,000 in the absence of any change in revenues or PPE. Also of interest is that all three parameters are statistically significant at the 10 percent level. Table 17 shows that the Jones (1991) model predicts total accruals to be \$(0.19), however, the total accrual amount for the test period is \$(108.20). The model is off by \$108, which is extremely poor. To summarize, the model appears to be well specified when one looks at the statistical information, but the model fails to accurately estimate discretionary accruals.

4.1.6 Hypothetical Data Conclusions

To evaluate the Jones (1991) model, a simple hypothetical data set is constructed and manipulated. This is done to analyze the strengths and weaknesses of the model and to gain insight into possible improvements for future model development. The results show that the Jones (1991) model is reasonably well specified for data that do not contain any structural shifts. The model works relatively well when there is no managerial discretion present during the estimation period. However, this seems likely to seldom be the case. After all the model is developed to estimate discretionary accruals, which surely exist.

When managerial discretion is introduced into the hypothetical data, the estimates of discretionary accruals provided by the Jones (1991) model are less reliable. Further, the errors appear to be more pronounced when the managerial discretion is non reversing. Additionally, an example is introduced where the statistical results from the regression appear to support the notion that the model is well specified. However, upon closer examination of the results and the prediction of the model, it is determined that the model is not performing well at all.

4.2 NONSTATIONARITY AND MANAGERIAL DISCRETION

One of the main premises of this research is that structural shifts cause the estimates of discretionary accruals provided by the Jones (1991) model to be inaccurate as illustrated in the analysis of the hypothetical data set above. Many researchers address this problem by estimating the Jones (1991) model cross-sectionally by two-digit SIC code. This approach is flawed because it assumes that because firms are in the same industry that their total accruals behave in the same way. One possible way that the Jones (1991) model may be improved is to remove the structural shifts in the time-series data caused by managerial discretion during the estimation period.

Brown, Durbin and Evans (1975) develop the TIMVAR program that contains techniques that are able to identify structural shifts in time-series data. Removing the unstable periods in the data provides the ability to obtain more accurate estimates of discretionary accruals of the Jones (1991) model. The ability of the TIMVAR techniques is evaluated using the hypothetical data set.

4.2.1 Tests of Parameter Nonstationarity in Linear Regression Relationships Using Time-Series Data

The following basic regression model is considered:

$$y_t = x_t'\beta_t + u_t, \quad t = 1, \ldots, T, \qquad (6)$$

where y_t is the observation on the dependent variable at time t, x_t is the column vector of observations on k regressors, and β_t is the column vector of parameters. The first regressor, x_{1t}, takes the value of one if the model contains a constant. The use of subscript t in β_t is to indicate that the parameters may change over time. The error terms, u_t, are assumed to be independent and normally distributed with means zero and variances Φ_t^2, $t = 1, \ldots, T$. The null hypothesis of constancy over time can be expressed as:

$$H_0: \quad \beta_1 = \beta_2 = \ldots = \beta_T = \beta$$

The TIMVAR program uses the cusum test, cusum of squares test and the homegeneity test to investigate the validity of H_0. The cusum test is useful for identifying small and gradual changes in time-series data, whereas the homogeneity test is good at detecting distinct changes in data (Brown et al. 1975). If H_0 is rejected by any of these tests, then the Quandt's log-likelihood ratio statistic is used to pinpoint the time where structural changes in the data occur. Cusum of squares test is excluded in this study because Brown et al. (1975) observe that this test is sensitive to changes in the variances of the residuals.

4.2.2 Cusum Test

The cusum test statistically tests the constancy of parameters by examining the cumulative sums of recursive residuals. The recursive residuals are defined as:

$$w_r = \frac{y_r - \mathbf{x}_r' \mathbf{b}_{r-1}}{\sqrt{(1 + \mathbf{x}_r'(\mathbf{X}_{r-1}'\mathbf{X}_{r-1})^{-1}\mathbf{x}_r)}}, \qquad r = k+1, \ldots, T, \qquad (7)$$

where $X'_{r-1} = [\, x_1, \ldots, x_{r-1}]$, $b_{r-1} = (X'_{r-1}X_{r-1})^{-1}X'_{r-1}Y_{r-1}$, and $Y'_{r-1} = [y_1, \ldots, y_{r-1}]$. Assuming the above equation holds, it can be shown that $w_{k+1}, \ldots, w_T$ are independent, $N(0, \Phi^2)$.

If β_t stays constant up to a certain time point and differs from this constant value thereafter, then the w_r's will have zero means for r up to that point and non-zero means afterwards. Thus, the cusum test examines the cusum quantity

$$W_r = \frac{1}{\hat{\sigma}} \sum_{k+1}^{r} w_j , \qquad (8)$$

against r for $r = k+1, \ldots, T$, where $\hat{\sigma}$ denotes the estimated standard deviation determined by $\hat{\sigma}^2 = S_T/(T-k)$, and S_T denotes the residual sums of squares of the regression using all T observations.

Since the w_r's are $N(0, \Phi^2)$ under H_0, the W_r's are approximately normal variables such that:

$E(W_r) = 0,$

$Var(W_r) = r - k,$ and

$Cov(W_r, W_s) = \min(r, s) - k\,.$

Using these mean and covariance functions, a test is derived by approximating W_r through the Brownian motion process starting from zero at time $t = k$. This results in a pair of symmetrical straight lines, above and below the mean value line $E(W_r) = 0$. These two lines go through the points $\{k, \pm a\sqrt{(T\text{-}k)}\}$, $\{T, \pm 3a\sqrt{(T\text{-}k)}\}$, where the parameter a is determined based on known results of Brownian motion theory such that the probability of the sample path crossing one or both lines is α, the desired significance level. Critical values of a for $\alpha = .01$, .05, and .10 are, respectively, 1.143, .948, and .850. If for any r, W_r falls outside the region between the two lines, the null hypothesis is rejected.

4.2.3 Homogeneity Tests

A second method for testing the changes in β_t over time fits a regression on a short segment of n successive observations that is then moved along the time series. Based on this approach, a homogeneity test can be derived from the results of regressions based on non-overlapping time segments, using the analysis of variance. The non-overlapping time segments for a moving regression of length n, are $(1, n)$, $((n+1), 2n)$, ..., $((p\text{-}2)n+1, (p\text{-}1)n)$, $((p\text{-}1)n + 1, T)$, where p is the integral part of T/n. The homogeneity statistic is calculated as:

$$F = \left[\frac{(T-kp)}{k(p-1)}\right] \frac{S(1,T) - \{S(1,n)+S(n+1,2n)+\ldots+S(pn-2n+1,pn-n)+S(pn-n+1,T)\}}{\{S(1,n)+S(n+1,2n)+\ldots+S(pn-n+1,T)\}} \tag{9}$$

where $S(r, s)$ is the residual sums of squares from the regression using observations from $t = r$ to s inclusive. Under H_0 this statistic is distributed as $F(kp\text{-}k, T\text{-}kp)$. If $p = 2$, the above F test is equivalent to the Chow(1960) test.

4.2.4 Quandt's Log-likelihood Ratio Technique

The Quandt's log-likelihood ratio technique is used to detect the time-point, $t = r$, in which the parameters change from one constant value to another constant value. The development of this technique is described in Quandt (1958). For each r from $r = k+1$ to $r = T - k - 1$ the ratio

$$Q_r = \log_{10}\left(\frac{\text{max likelihood of the observations given } H_0}{\text{max likelihood of the observations given } H_A}\right),$$

is computed, where H_A is the hypothesis that the observations in the time segments $(1,\ldots,r)$ and $(r+1, \ldots, T)$ come from two different regressions. It can be shown that

$$Q_r = \frac{1}{2} r \log \hat{\sigma}_1^2 + \frac{1}{2}(T-r)\log\hat{\sigma}_2^2 - \frac{1}{2} T \log \hat{\sigma}^2 , \tag{10}$$

where $\hat{\sigma}_1^2$, $\hat{\sigma}_2^2$ and $\hat{\sigma}^2$ are the ratios of the residual sums of squares to number of observations when the regression is fitted to the first r observations, the remaining T-r observations, and the whole set of T observations, respectively. The estimate of the point at which the switch from one relationship to another has occurred is the value of r at which Q_r attains its minimum.

4.2.5 Algorithm for Identifying Stable Parameters

Given the parameters from the Jones (1991) model as follows:

$$TA_{it} / A_{it-1} = \alpha_i [1 / A_{it-1}] + \beta_{1i} [\Delta REV_{it} / A_{it-1}] + \beta_{2i} [PPE_{it} / A_{it-1}] + \varepsilon_{it} \quad (11)$$

from year r_1 to r_2, where $r_2 \geq r_1+k$, both the cusum test and the homogeneity test are used to examine the hypothesis of stationarity for the coefficients a_i, b_{1i}, and b_{2i}. A significance level of 0.10 is used for both tests. In the homogeneity test, the moving regressions are performed on length n, where n varies from k to the integral part of $(r_2 - r_1+1)/2$, incremented by one. If the homogeneity statistic of using any of these lengths is significant, then the time series fails the homogeneity test. Stable coefficients are defined for an interval when both tests fail to reject the null hypothesis.

The recursive procedure used to identify all periods where the parameters are stable works as follows:

Step 1. Initialize by letting $r_1 = 1$ and $r_2 = T$, i.e., the program starts by examining the full period of the time-series.

Step 2. If the time series from r_1 to r_2 passes both the cusum test and the homogeneity test, then the GLS parameter estimates on the time series from r_1 and r_2 are considered to be stationary.

Step 3. If the time series from r_1 to r_2 fails either the cusum test or the homogeneity test, then the Quandt's log-likelihood ratio technique is used to identify the point of time, r, $r_1 < r < r_2$, at which the non-stationarity has most likely occurred. This defines two new subperiods: (r_1, r) and $(r+1, r_2)$.

Step 4. Repeat the tests for the latter subperiod, i.e., return to Step 2, where r_1 and r_2 are defined as the lower and upper limits of the upper subperiod.

The algorithm ends when a subperiod with stable parameters has been identified prior to the test period. This period wherein the parameters are identified as stable is then used to predict the expected total accruals in the Jones (1991) model. Then as explained previously, the difference between actual total accruals and predicted accruals is the measured discretionary accruals that is used to initially test the accrual anomaly.

4.3 TIMVAR AND THE HYPOTHETICAL DATA SET

The TIMVAR program is then analyzed using the hypothetical data set. The program is first tested with the stationary data, shown in Table 1. The TIMVAR program indicates that the data are stationary and the estimated the parameters from the model are the same as when estimated using the SAS software. The TIMVAR program is then analyzed using the hypothetical data that contains structural shifts as above to determine the effect of removing those shifts on the ability of the Jones (1991) model to accurately estimate discretionary accruals. As before, the model is evaluated first using the data that simulated a nondiscretionary change with the addition of property, plant and equipment in years 5, 10 and 15. The data for the nondiscretionary asset additions are shown in Tables 3, 4 and 5. When the Jones (1991) model is tested with the nondiscretionary change in depreciation due to an asset addition, it still made accurate predictions, regardless of the period when the asset is added. This is due to the independent variable property, plant and equipment, which controlled for nondiscretionary changes in depreciation expense brought about by changes in depreciable assets. The three scenarios containing changes due to changes in the amount of depreciable assets is run through TIMVAR. The TIMVAR program does not identify any structural shifts in the data and the coefficient estimates are the same as those obtained in the first analysis.

The data containing the structural shifts due to managerial discretion is then tested. First, the data is tested to determine if the TIMVAR program could accurately identify nonstationary periods. Then the program is used to estimate the parameters of the Jones model to evaluate the errors in relation to the errors obtained using the Jones (1991) model over the entire estimation period (i.e., the 20 year estimation period as above). Finally, the ability of the model to estimate discretionary accruals in the test period is evaluated by comparing the total accruals predicted by the model to actual accruals in the hypothetical data for the test period.

The hypothetical data set is manipulated as before. The first test is on discretionary accruals that do not immediately reverse. For the hypothetical data set the nonreversing discretionary accrual manipulated is a change in the depreciation expense. It is assumed in three different scenarios that the depreciation expense is changed by management to increase reported net income. The hypothetical data for the three scenarios is shown in Tables 7, 8 and 9 for the change occurring in Periods 5, 10 and 15, respectively. As above, the discretionary change in the depreciation expense caused an increase in the amount of total accruals from about $(240) to around $(111) and accruals persisted at this level with slight increases each period to the end of the 22 years of hypothetical data.

The data are read into the TIMVAR program to determine if there are any statistically significant structural shifts in the time series. The performance of the TIMVAR program is evaluated because the timing of the structural shifts are known a priori. TIMVAR successfully identified the structural shifts in all three scenarios. The TIMVAR program identifies the structural shift, and then tests the period after the shift. If no shift is found in the latter sub-period, the program estimates the parameters from the Jones (1991) model for the remaining periods in the estimation period. The program then computes the estimated discretionary accrual for the test period by calculating the predicted total accrual of the model and subtracting that number from the actual accrual.

The parameter estimates and the estimates of discretionary accruals are shown in Table 18. Removing the nonstationary periods dramatically increases the ability of the model to accurately estimate the amount of discretionary accruals during the test period. Table 18 shows that the Jones (1991) model had large errors when estimated with the discretionary change in depreciation, with the model having errors of $69.67, $(86.75) and $(86.61) for the five, ten and 15 year scenarios, respectively. However, when the discretionary depreciation changes are removed from the estimation period of the model, the model does not err in predicting total accruals.

The TIMVAR program is then tested using the hypothetical data containing discretionary changes that reverse in a short period of time, the change in the estimates of bad debts. The hypothetical data has the same assumptions as before and is shown for the five, ten, 13 and 15-year scenarios in Tables 11, 12, 13 and 14, respectively. Again the TIMVAR program is extremely accurate at locating the structural shifts in the time-series data. The program successfully identified the point of nonstationarity for all three scenarios. The estimates of the parameters of the Jones (1991) model estimated over the stationary period prior to the test period are shown in Table 19, as well as the estimates of the model of discretionary accruals. Again, after the nonstationary periods are removed the Jones (1991) model is very accurate at predicting the total accruals during the test period and thus is very accurate at estimating the discretionary accruals.

Finally, the TIMVAR program is tested on the data containing multiple shifts. The data with multiple shifts is shown in Table 16. The data contains a discretionary change in the estimate of bad debt expense in Year 10 and a discretionary change in the depreciation expense in Year 12, as above. The coefficient estimates and estimates of discretionary accruals are shown in Table 20. The TIMVAR program correctly identifies the structural shift and the coefficient estimates have their expected signs. The estimate of discretionary accruals using the stationary data is again very accurate, indicating that the TIMVAR program is very successful at identifying structural shifts in the estimation period of the model that are due to managerial discretion.

4.4 OVERALL ANALYSIS

The purpose of this research is to evaluate the Jones (1991) model to determine if there is a way to obtain more accurate estimates of discretionary accruals. Once a better model emerges, then that model is used to test the accrual anomaly. Development of the improved model begins with a hypothetical data set that is used to evaluate the performance of the Jones (1991) model. A hypothetical data set is used to allow the researcher to manipulate nondiscretionary and discretionary accruals during the estimation period of the model.

The analysis of the hypothetical data shows that the Jones (1991) model performs reasonably well when the data used to estimate the model do not contain any structural shifts. Further, the model is equally impressive when the structural shift is the result of nondiscretionary changes in the amount of accruals. However, when the structural shifts are the result of management manipulation (i.e., discretionary accruals), the estimates of discretionary accruals obtained from the Jones (1991) model are inaccurate. This leads one to believe that the Jones model performs badly when there are discretionary accruals included in the estimation period.

Using the techniques of Brown, Durbin and Evans (1975), the hypothetical data is used again to estimate the Jones (1991) model. However these tests utilized the TIMVAR program to identify the structural shifts in the time series. The TIMVAR program is extremely accurate at identifying the structural shifts of the model. The structural shifts are identified by TIMVAR and the Jones (1991) model is then estimated with the remaining stationary periods prior to the test period. The Jones (1991) model performs very well when the discretionary structural shifts are removed from the estimation.

It appears that the Jones (1991) model is sufficient for its intended task so long as the researcher tests for any discretionary structural shifts during the estimation period. The TIMVAR program can be used to examine the time-series data. The data for the entire estimation period can be tested. If any nonstationary periods are discovered, the TIMVAR program then tests the data succeeding the point of nonstationarity until the longest time series of stable observations prior to the test period are located. This stable time series is then used to estimate the Jones (1991) model to make predictions of total accruals for the test period. Actual accruals for the test period are then compared to the predicted accruals of the model and this difference should be a more accurate estimate of discretionary accruals than would have otherwise been obtained if the Jones (1991) model had been estimated with the entire time series that contained the structural shift.

CHAPTER 5

5. RESEARCH DESIGN

The purpose of this chapter is to discuss the data collection procedures, the sample selection and the statistical tests to be used to test the hypotheses.

5.1 DATA COLLECTION

The financial accounting data for the sample firms is gathered from the COMPUSTAT/Research Insight database. The information collected is the information necessary for the estimation of the Jones (1991) model.

$$TA_{it} / A_{it-1} = \alpha_i [1 / A_{it-1}] + \beta_{1i} [\Delta REV_{it} / A_{it-1}] + \beta_{2i} [PPE_{it} / A_{it-1}] + \varepsilon_{it}, \quad (12)$$

where:

TA_{it} = total accruals in year *t* for firm *i* (See below for calculation);

ΔREV_{it} = revenues in year *t* less revenues in year *t*-1 for firm *i* (Research Insight item #12);

PPE_{it} = gross property, plant, and equipment in year *t* for firm *i* (Research Insight item #7);

A_{it-1} = total assets in year *t*-1 for firm *i* (Research Insight item # 6);

ε_{it} = error term in year *t* for firm *i*;

To estimate the Jones (1991) model, information necessary for the calculation of total accruals is also collected. Total accruals are calculated as the change in noncash working capital before income taxes payable less total depreciation expense. The change in noncash working capital before taxes is defined as the change in current assets other than cash and short-term investments less current liabilities other than current maturities of long-term debt and income taxes payable (Jones 1991). Thus, the composition of total accruals (TA_t) is as follows:

$$TA_{it} = [\Delta CA_{it} - \Delta Cash_{it}] - [\Delta CL_{it} - \Delta STD_{it} - \Delta TP_{it}] - Deprec_{it} \qquad (13)$$

where:

TA_{it} = total accruals;

ΔCA_{it} = change in current assets from period t-1 to period t (Research Insight item #4);

$\Delta Cash_{it}$ = change in cash from period t-1 to period t (Research Insight item #1);

ΔCL_{it} = change in current liabilities from period t-1 to period t (Research Insight item #5);

ΔSTD_{it} = change in current maturities of long-term debt from period t-1 to period t (Research Insight item #34);

ΔTP_{it} = change in income taxes payable from period t-1 to period t (Research Insight item #71); and

$Deprec_{it}$ = depreciation and amortization expense for period t (Research Insight item #14).

The accrual anomaly is tested using both the Mishkin (1983) test and a hedge portfolio test. Following Sloan (1996) and Xie (2001), both of these tests require the size-adjusted abnormal returns of the sample firms. The size-adjusted abnormal returns of the firms are calculated as difference between a firm's annual buy-and-hold returns and the buy-and-hold return for the same 12-month period on the market-capitalization-based portfolio decile (i.e., size decile) to which the firm belongs. The Center for Research in Security Prices (CRSP) database returns and size decile breakpoints are used to classify each firm into a size decile according to its market value of equity at the beginning of the calendar year in which the 12-month return period begins. The CRSP size deciles are based on the market capitalization deciles of NYSE, AMEX and NASDAQ firms.

The data used to test the discretionary accrual models are the levels of discretionary accruals as estimated by the Jones (1991) and the stationary Jones models. The Mishkin (1993) test and a hedge portfolio test are used to test the accrual anomaly. The data necessary for the hedge portfolio test is the level of discretionary accruals of the firms as estimated by the Jones (1991) model and the stationary Jones model and the size-adjusted abnormal returns. The Mishkin test requires the earnings of the firm, the components of earnings and the size-adjusted abnormal return. The earnings variable is obtained from Research Insight (Research Insight item #18), and the size-adjusted abnormal return is calculated from data obtained from CRSP. The components of earnings are calculated based on the level of earnings (Research Insight item #18), cash flows from operations and the discretionary accruals estimated by the Jones (1991) and stationary Jones models. Cash from operations is obtained by taking earnings and subtracting total accruals as defined above and nondiscretionary accruals are obtained by subtracting the estimates of discretionary accruals obtained from the Jones (1991) model and the stationary Jones model from total accruals as follows (see Xie (2001) and Sloan (1996)):

$CFO_t = Earn_t - TA_t$; and

$NDA_t = TA_t - DA_t$.

5.2 SAMPLE SELECTION

Originally, the Jones (1991) model is estimated using ordinary least squares with time-series data. The Jones (1991) model includes variables that are intended to control for changes in total accruals that are due to changes in the economic circumstances of the firm. That is, the Jones (1991) model has the change in revenue variable and the property, plant and equipment variables to account for changes in total accruals resulting from changes in sales and the changes in depreciation due to changes in depreciable assets. Despite this, the Jones (1991) model has been used extensively with cross-sectional data.

This research uses the Jones (1991) model with time-series data. Consequently, the sample of firms for this study must have useable variables from the COMPUSTAT/Research Insight and CRSP databases for the duration of both the estimation period and test periods of the model. The initial sample included all 21,371 firms contained in the COMPUSTAT/Research Insight database. All firms with missing financial data during the 20-year period are eliminated, leaving 1,439 firms. Then the return information is collected from the CRSP database. Firms with missing return information are also eliminated from the sample, leaving a final sample of 762 firms.

5.3 STATISTICAL TESTS

5.3.1 Tests of the Discretionary Accrual Models

The stationary Jones model and the improved model are evaluated using the techniques of Thomas and Zhang (2000). Thomas and Zhang use an adjusted or pseudo-

R^2 and firm-specific rankings of the predicted errors to evaluate the relative and absolute accuracy of six commonly used models of discretionary accruals.

To evaluate the relative performance of the models, the distribution of forecast errors across models for the same forecast firm year are compared (Thomas and Zhang 2000). This allows each firm year to serve as its own control, holding the level of true discretionary and non-discretionary accruals constant across the models for each firm year. Thomas and Zhang's work is limited because it assumed that discretionary accruals are rare in the estimation period. However, using the techniques of Brown, Durbin and Evans (1975) for identifying structural shifts in time-series data, the likelihood of discretionary accruals in the estimation period causing errors in the estimates of the models is reduced.

Twenty years of financial data for estimating the models is obtained from the 2001 editions of the annual COMPUSTAT/Research Insight files. The first 15 years (1982-1995) are designated the estimation period, and are used to estimate the model parameters. Since prior year data is required for the estimates of the Jones (1991) and the stationary Jones models to compute total accruals, only 14 years of data are available in the estimation period. The last five years of data (1996-2001) are designated as the prediction period, and are used to compare forecast errors across the models. Those firms with variables missing that are necessary for forecasting are eliminated from the sample. Further, the data for the 2001 year is incomplete at the time the models are estimated, therefore it is eliminated from the sample. A firm year is included in the sample, only if accrual forecasts are available for all models. Forecasts are available for 1,474 firms in the prediction period, providing 5,896 firm years in the prediction period. The model parameters are estimated over the prediction period, and are fixed throughout the entire prediction period.

The techniques of Brown, Durbin and Evans (1975) are used to estimate the stationary Jones model using only stationary data during the estimation period. Further, any identified structural shifts in the time-series data in the prediction period are also eliminated.

Model accuracy is evaluated in four ways (Thomas and Zhang 2000). First, the distribution of raw forecast errors for each model is evaluated during the four-year prediction period, which included a comparison of the standard deviations for the models and interquartile ranges and spread between the 10^{th} and 90^{th} percentiles. Next, the models are compared based on firm-specific rankings of the forecast errors. For each firm, the models are ranked based on the sum of squared forecast error for all years with forecasts in the prediction period. This approach offers a different perspective than the first evaluation because it ignores the magnitudes of the differences. This evaluation favors discretionary accrual models that perform well in most firms, perhaps by a small margin, and not perform well occasionally, even if by large margins (Thomas and Zhang 2000).

The third measure of accuracy computes a pseudo-R^2 for each model during the prediction period. The pseudo-R^2 for both the Jones (1991) model and the stationary Jones model is equivalent to an R^2 obtained from regressing actual accruals on forecast accruals in the test period for each firm separately with two restrictions. The first restriction is that the slope in the regression be one and the second restriction is that the intercept in the regression be zero. For each sample firm and prediction model, data from the estimation period are used to estimate the parameters that are needed to make forecasts for the four-year prediction period. Actual accruals in those five years are then plotted against forecast accruals. Forecast accuracy is measured by the sum of squared forecast errors, $\sum(\text{Actual} - \text{Forecast})^2$. The R^2 value is computed as follows:

$$R^2 = 1 - \frac{ESS_{it}}{TSS_{it}} = 1 - \frac{\sum (Actual - Forecast)^2}{\sum (Actual - MeanAccrual)^2} \tag{14}$$

where,

ESS_{it} = Actual total accruals of firm *i* during period *t* of the test period less forecasted accruals for firm *i* during period *t* obtained from either the Jones (1991) or the stationary Jones model; and

TSS_{it} = Actual total accruals of firm *i* during period *t* of the test period less the mean accrual for firm *i* during the four years of the test period.

This allows the forecast errors from the Jones (1991) or the stationary Jones model to be represented by the residuals of the regression line, and the sum of squared forecast errors is equal to the conventional error sum of squares. This error sum of squares is normally compared to the total variation in actual accruals, or total sum of squares. Total sum of squares is measured by the sum of the squared deviations of the four actual accrual numbers from their mean. The conventional R^2 is then equal to the squared deviations of the four actual accrual numbers from their mean.

An R^2 value equal to zero implies that the forecast values perform as well as a naïve constant forecast equal to the mean accrual for all years. A positive value of R^2 is obtained if the sum of squared forecast errors is less than the sum of squared deviations from the mean actual accrual. A negative value of R^2 suggests that simply using the mean actual accrual as a forecast for all years for that firm outperforms the discretionary accruals from the prediction model (i.e., the Jones (1991) model and the stationary Jones model).

Since the mean accrual for all years is not known until the last period of the test period, a fourth measure of model accuracy is represented by a pseudo adjusted R^2 that compares the forecast against a naïve constant forecast equal to -5% of total assets for all firms for all years in the test period. In other words, this fourth measure of model accuracy, the pseudo adjusted R^2 compares the error sum of squares against an alternative total sum of squares that is computed by taking the sum of squared deviations of the four actual accrual numbers from -5% of total assets for the firm for each year as follows:

$$R_a^2 = 1 - \frac{ESS_{it}}{TSS_{it}} = 1 - \frac{\sum (Actual - Forecast)^2}{\sum (Actual - MeanAccrual)^2} \tag{15}$$

where,

ESS_{it} = Actual total accruals of firm *i* during period *t* of the test period less forecasted accruals for firm *i* during period *t* obtained from either the Jones (1991) or the stationary Jones model; and

TSS_{it} = Actual total accruals of firm *i* during period *t* of the test period less the -5% of total assets of firm *i* during year *t* of the test period.

The four measures of accuracy described above provide some insights regarding the accuracy of the Jones (1991) model and the stationary Jones model. These measures together allow for an evaluation of hypothesis one regarding the accuracy of the discretionary accrual models.

5.3.2 Tests of the Accrual Anomaly

The accrual anomaly is evaluated using the techniques of Xie (2001) and Sloan (1996). The accrual anomaly is evaluated using both the Jones (1991) model and the stationary Jones model. Both models are being used to evaluate the accrual anomaly to determine if there is a difference in the results that depends on the accuracy of the model and to assure that the anomaly documented in prior literature exists with the Jones (1991) model.

5.3.2.1 Mishkin (1983) Test

Mishkin (1983) developed an approach to test the rational expectations hypothesis in macroeconomics. The Mishkin test is used to investigate whether the market rationally prices discretionary accruals with respect to their one-year-ahead earnings implications. The following regression system is estimated:

$$EARN_{t+1} = \gamma_0 + \gamma_1 CFO_t + \gamma_2 NDA_t + \gamma_3 DA_t + \nu_{t+1} \quad (16)$$

$$SIZEAJR_{t+1} = \alpha + \beta(EARN_{t+1} - \gamma_0 - \gamma^*_1 CFO_t - \gamma^*_2 NDA_t - \gamma^*_3 DA_t) + \varepsilon_{t+1} \quad (17)$$

where:

$EARN_t$ = earnings in year *t* ;

CFO_t = cash flows from operations in year *t* ;

$SIZEAJR_t$ = size-adjusted abnormal returns = the difference between a firm's annual buy-and-hold returns and the buy-and-hold returns for the same 12-month period on the market-capitalization-based portfolio decile to which the firm belongs

NDA_t = nondiscretionary accruals in year *t* ;

DA_t = discretionary accruals in year t ;

ν_{t+1} and ε_{t+1} = error terms;

Equation (16) is a forecasting equation that estimates the forecasting coefficients (γs) of cash flows from operations, nondiscretionary accruals and discretionary accruals for predicting the subsequent year's earnings. Equation (17) is a valuation equation that estimates the valuation coefficients (γ^*s) that the market assigns to the components of earnings (i.e., CFO, NDA and DA) relative to the firms size-adjusted abnormal return. As in Mishkin (1983), both equations are estimated jointly using an iterative generalized nonlinear least squares estimation procedure, proceeding in two steps. First, both equations are estimated without imposing any constraints on the coefficients γs and γ^*s. To test whether the valuation coefficients are statistically different from the forecasting coefficients obtained in the first step, the second step jointly estimates both equations imposing the rational pricing constraint that $\gamma^*_q = \gamma_q$ (q = 1,2, and/or 3). Mishkin shows that under the null hypothesis that the market rationally prices one or more earnings components with respect to their impact on the subsequent year's earnings, and that the following likelihood ratio statistic:

$$2N\,Ln(SSR^c/SSR^u),$$

is asymptotically $\chi^2(q)$ distributed where:

q = the number of rational pricing constraints imposed;

N = the number of observations;

Ln = natural log;

SSR^c = sum of squared residuals from the constrained regressions in the second step;

SSR^u = sum of squared residuals from the unconstrained regressions in the first step.

If the likelihood ratio statistic above is sufficiently large, the null hypothesis of rational pricing of one or more earnings components (i.e., $\gamma^*_q = \gamma_q$, q = 1, 2, and/or 3) is rejected.

The iterative joint nonlinear estimation procedure of the two equations is performed using the SAS/NLIN nonlinear estimation procedure (SAS Institute 1999). The program estimates over the test periods the model consisting of the forecasting equation (16) and the valuation equation (17). The cross-equation restrictions are that the γ_q are identical in (16) and (17). The procedure is to stack the data so that the system of two linear equations, (16) and (17), can be written as one equation with the appropriate nonlinear constraints.

5.3.2.2 Hedge Portfolio Test

The accrual anomaly is also evaluated using the results of the hedge portfolio test following Sloan (1996) and Xie (2001). Theory suggests that if the market is efficient, then investors will price the components of earnings according to their persistence. However, prior research has shown that investors do not price the accrual components of earnings according to their persistence. If the accrual anomaly exists then the stock prices of firms with negative discretionary accruals would theoretically be lower than their intrinsic values. That is, they would be undervalued. On the other hand, the stock prices of firms with positive discretionary accruals will be higher than their intrinsic values. That is, these stocks will be overvalued. If a trading strategy that is long in the decile with the most negative discretionary accruals (i.e., the most undervalued firms) and short in the decile with the most positive discretionary accruals (i.e., the most overvalued firms) yields positive abnormal returns in subsequent years, then this would further support the notion that the market overprices the discretionary accrual component of earnings in the portfolio formation year.

Firms are grouped into portfolio deciles each year based on their ranking of discretionary accruals. A hedge portfolio is formed that is long in the most negative discretionary accrual decile and short in the most positive discretionary accrual decile. The size adjusted abnormal returns for each portfolio decile is computed and t-statistics are also computed based on the null hypothesis that the return to the portfolio is equal to zero.

The results of the Mishkin (1983) test and the hedge portfolio test allow an assessment of hypothesis two regarding the pricing of the components of earnings. If the market is efficient with respect to the discretionary accrual component of earnings and those amounts are measured more accurately using the stationary Jones model, then the results of the Mishkin (1983) test and the hedge portfolio test should reveal that the accrual anomaly exists when the discretionary accrual component of earnings is estimated using the Jones (1991) model and not with the stationary Jones model.

CHAPTER 6

6. RESULTS

The purpose of this research is to develop a new discretionary accrual model and to test the accrual anomaly with the new model. This chapter will proceed first with the evaluation of the discretionary accrual models and then the tests of the accrual anomaly. Once the models are tested, the accrual anomaly is tested with both the Jones (1991) model and the improved model (i.e., stationary Jones model). Testing with both models provides a benchmark for comparing the results of tests of the accrual anomaly.

6.1 DISCRETIONARY ACCRUAL MODELS

The descriptive statistics for the estimates of the coefficients for the Jones (1991) model and the stationary Jones model are reported in Table 21. Theoretically, the coefficient on the change in revenues (ΔREV) should be positive. Sales increases should cause proportionate increases in the working capital accounts (i.e., current assets and current liabilities). This coefficient is positive in both the stationary Jones model and the Jones (1991) model. The parameter estimate on gross property, plant and equipment (PPE) is expected to be negative. Depreciation, depletion and amortization should increase with increases in the level of PPE, which in turn decreases total accruals. The coefficient on PPE has the expected sign for both models.

Thomas and Zhang (2000) evaluate the relative performance of discretionary accrual models by comparing the distribution of forecast errors across models for the same forecast firm year. This effectively allows each firm year to serve as its own control, which holds the level of true discretionary and nondiscretionary accruals constant across the models for each firm year. The structure imposed on discretionary and nondiscretionary accruals forms a link between forecast errors and discretionary accruals in the estimation periods (Thomas and Zhang 2000). The forecast errors represent the error with which discretionary accruals are measured by a particular discretionary accrual model. Similar procedures are used to evaluate the stationary Jones model and the Jones (1991) model.

The stationary Jones model is evaluated in relation to the Jones (1991) model along four areas. The comparison is between the forecast errors for the test period with the test period being two years and then four years. The Jones (1991) model is estimated over, first 16 years and then 14 years. For the estimation of the stationary Jones model, the data is tested over those same time periods and the model is estimated over the longest stable time series of observations prior to the test period.

The first comparison is between the forecast errors of the two models for the test period. The forecast errors are computed by comparing the forecasts of the models with actual accruals during the two and four year periods. The dispersion of the forecast errors are compared among models as a measure of accuracy. The forecast errors are shown in Panel A of Table 22. The mean forecast error for the Jones (1991) model estimated over 16 and 14 years is –0.0089 and –0.0822, respectively. The mean forecast errors of the stationary Jones (1991) model are –0.0016 and –0.0442. These forecast errors are obtained by testing the estimation time series (i.e., 16 year and 14 year estimation periods) using the TIMVAR program to detect any periods of nonstationarity. When structural shifts are discovered by TIMVAR, the program tests the time series subsequent to the instability. This process is repeated until a stationary estimation period is determined prior to the test period. The stationary data prior to the test period are used to estimate the stationary Jones model and the forecast errors are computed for the test period. Some firms do not have a stationary period of sufficient length prior to the test period to allow estimation of the stationary Jones model. These firms are removed from the sample prior to estimation of both the Jones (1991) model and the stationary Jones model.

The forecast errors of the Jones (1991) model have a standard deviation of 12.6 percent and 17.4 percent of total assets for the two-year and four-year test periods, respectively. Whereas the forecast errors of the stationary Jones model have a standard deviation of 11.1 percent and 10.9 percent of total assets for the same forecast periods. Thus, the forecast errors of the stationary Jones model are smaller than the forecast errors of the Jones (1991) model that has not been corrected for any structural shifts. The stationary Jones model and the Jones (1991) model have similar spreads between the 10^{th} and 90^{th} percentiles and similar interquartile ranges. The spread between the 10^{th} and 90^{th} percentiles of the Jones (1991) model are from –13.3 percent to 10.5 percent (23.8 percent) and from –19.8 percent to 3.5 percent (23.23 percent). The spread between the 10^{th} and 90^{th} percentiles of the stationary Jones model are from –11.0 percent to 9.9 percent (20.8 percent) and from -6.9 percent to 15.6 percent (22.42 percent). The interquartile range of the Jones (1991) model is from –5.7 percent to 4.1 percent (9.8 percent) and –12.6 percent to –2.1 percent (10.5 percent). The interquartile range of the stationary Jones model is from –4.5 percent to 4.9 percent (9.4 percent) and from –1.4 percent to 10.4 percent (11.8 percent). Comparisons between the two models, based on measures of dispersion, indicate that the stationary Jones model is more accurate than the Jones (1991) model that has not been corrected for nonstationarity. The stationary Jones (1991) model has the lowest standard deviation of forecast errors. The interquartile range, and spread between the 10^{th} and 90^{th} percentiles appear to be very similar between the two models. Correcting for structural shifts in the time-series data appears to improve the ability of the stationary Jones model to estimate discretionary accruals.

The second evaluation of accuracy is based on firm-specific rankings. For each firm in a sample, the models are ranked based on the sum of squared forecast error for all years with forecasts in the test period. Since this approach uses within-firm ranks it offers a different perspective than the first test, above, because it ignores the magnitude of the differences. This test favors models that perform well for most firms, perhaps by a small margin, and not perform well occasionally (even if by a large margin) (Thomas and Zhang 2000).

As shown in Panel B of Table 22, the Jones (1991) model has smaller sum of squared forecast errors for 45.4 percent and 31.8 percent of the firms in the sample for the 16 and 14 year estimation periods, respectively, whereas the stationary Jones model has the smaller sum of squared forecast errors for the remaining 54.6 percent and 68.2 percent of the firms for the two year and four year test periods. The stationary Jones model resulted in smaller sum of squared forecast errors on the majority of firms over the Jones (1991) model, which indicates that the stationary Jones model is better specified than the Jones (1991) model that is not corrected for structural shifts in the time-series data.

A pseudo-R^2 is computed for the prediction period as a third measure of accuracy. The pseudo-R^2 is equivalent to an R^2 obtained from regressing actual accruals on forecast accruals in the prediction period, for each firm separately with two restrictions. The first restriction is that the slope is equal to one and the second is that the intercept be zero. A positive value of R^2 is obtained if the sum of squared forecast errors is less than the sum of squared deviations from the mean actual accrual. A negative value of R^2 suggests that simply using the mean actual accrual as a forecast for all years for that firm outperforms the accruals from that prediction model (Thomas and Zhang 2000). Note that in Panel C (and in Panel D) of Table 22, measures of distributional dispersion (i.e., standard deviations, interquartile ranges, etc.) are not used as indicators of forecast accuracy as in Panel A. A more important indicator of performance here is the fraction of firms that have a positive R^2.

Panel C of Table 22 shows that the stationary Jones model's performance exceeds the performance of the Jones (1991) model based on the pseudo R^2. Fifty-one percent and 57 percent of the firms have a positive pseudo R^2 for the two test periods as measured on the forecast errors of the Jones (1991) model, but 62 percent and 79 percent of those firms have a positive pseudo R^2 when the model is estimated with stationary data for the two test periods. Both of these compare favorably to the model evaluation performed by Thomas and Zhang (2000).

Thomas and Zhang (2000) point out that requiring a positive R^2 value in the prediction period may be a bit difficult for the models to achieve. A positive R^2 means the model in question outperforms a naïve model, which predicts that accruals are equal to the mean accrual for each firm over the prediction period. Given that the mean accrual for each firm is not known until the last year's accrual is reported, this benchmark may be unreasonably high. The fourth test, which is less demanding, is to compare the accuracy of the model in question against a naïve benchmark that forecasts total accruals equal to -5 percent of last period's assets for all firms for all years as in Thomas and Zhang (2000). The –5 percent value is based on the average total accruals for the sample during period. The mean actual accruals for the sample over the test period is -4 and -8 percent. These results are consistent with the model evaluation of Thomas and Zhang (2000). The results of this measure of accuracy are reported in Panel D of Table 22. Both models performed extremely well when compared to a naïve prediction model that estimates that total accruals are -5 percent of total assets. One-hundred percent of all firms had positive pseudo R^2 values, with a mean value near one for both models. This measure is also conducted assuming forecast accruals equal to 0.5, 1, 2, 2.5, 3 and 4 percent without any significant difference in the results. Both models perform very well based on the pseudo R^2 that compares the forecasts against a naïve model that predicts total accruals equal to -5 percent of total assets.

Overall, the stationary Jones model outperformed the Jones (1991) model. The dispersion measure favors the stationary Jones model, as the standard deviations of the forecast errors are smaller. Further, the sum of squared forecast errors are smaller for a larger percentage of the firms that are estimated using stationary data, and finally, based on the pseudo R^2, where the forecasts of the models are compared to the difference between the mean accrual amount, the stationary Jones model produced a larger number of firms that had positive R^2s. The correction for nonstationary periods improves model performance.

6.2 THE ACCRUAL ANOMALY

The accrual anomaly is evaluated using the techniques of Xie (2001) and Sloan (1996). Both Xie and Sloan evaluated the pricing of accruals using the Mishkin (1983) test and hedge portfolio tests. Both evaluation techniques (i.e., Mishkin test and hedge portfolios) are used with the discretionary accrual predictions of both the Jones (1991) model and the stationary Jones model. The purpose of using both models to evaluate the accrual anomaly is to determine if there is a difference in the results that depends on the accuracy of the model and to assure that the anomaly documented in prior literature exists with the Jones (1991) model.

6.2.1 Mishkin (1983) Test

Panel A of Table 23 reports the coefficient estimates for equations (16) and (17) obtained in the first stage using the estimates of discretionary accruals obtained from both the Jones (1991) model and the stationary Jones model. For cash from operations, the valuation coefficient is 0.82 (i.e., $\gamma^*_1 = 0.82$) and the forecasting coefficient is 0.94 ($\gamma_1 = 0.94$) for the Jones (1991) model. For the stationary Jones model, the valuation coefficient on cash flows of 0.39 is very close to the forecasting coefficient of 0.43. Smaller valuation coefficients ($\gamma^*_1 < \gamma_1$) indicate that the market underprices the cash flows from operations relative to its ability to forecast one-year-ahead earnings. To test whether the underpricing is statistically significant, equations (16) and (17) are jointly estimated again in the second stage for both the Jones (1991) model and the stationary Jones model, after imposing the rational pricing constraint that $\gamma^*_1 = \gamma_1$. The likelihood ratio statistic reported in Panel B of Table 23 is insignificant for the Jones (1991) model and the stationary Jones model. The ratio statistic for the Jones (1991) model is 0.63 (p=0.42) for the Jones (1991) model and for the stationary Jones model is 0.99 (p=0.32), which indicates that the underpricing of cash flows from operations ($\gamma^*_1 < \gamma_1$) is statistically insignificant. This result for both the Jones (1991) model and the stationary Jones model is consistent with the notion of rational pricing of the cash flows from operations component of earnings relative to its ability to predict one-year-ahead earnings.

Panel A of Table 23 shows that the valuation coefficients that the market assigns to nondiscretionary accruals (γ^*_2) and discretionary accruals (γ^*_3) are 0.46 and 0.68, respectively with estimates of discretionary accruals using the Jones (1991) model and 0.64 and 0.47 respectively with estimates of discretionary accruals using the stationary Jones model. With estimates of discretionary accruals from both models (i.e., Jones (1991) model and the stationary Jones model), the coefficients from the valuation equations are larger than there forecasting counterparts. The forecasting coefficients for nondiscretionary accruals (γ_2) and discretionary accruals (γ_3) with estimates of discretionary accruals from the Jones (1991) model are 0.22 and 0.38 respectively, and with estimates from the stationary Jones model the estimates from the forecasting equation for nondiscretionary accruals (γ_2) and discretionary accruals (γ_3) are 0.64 and 0.46. Larger coefficients on nondiscretionary accruals and discretionary accruals in the valuation equation indicates that the market overprices both relative to their ability to predict one-year-ahead earnings.

To test whether the overpricing is statistically significant, the equations are estimated again forcing the valuation coefficients and the forecasting coefficients to be equal. Panel B of Table 23 reports that the likelihood ratio statistics reject the null hypotheses of rational pricing of nondiscretionary accruals ($\gamma^*_2 = \gamma_2$) using estimates of discretionary accruals obtained from the Jones (1991) model but not the stationary Jones model ($p < 0.08$ and $p=0.22$, respectively). Similarly, Panel B of Table 23 reports that the likelihood ratio statistics reject the null hypotheses of rational pricing discretionary accruals relative to their ability to predict one-year-ahead earnings with estimates of discretionary accruals obtained from the Jones (1991) model but not the stationary Jones model ($p = 0.001$ and $p = 0.15$, respectively). These results indicate that the market significantly overprices nondiscretionary accruals ($\gamma^*_2 > \gamma_2$) and discretionary accruals ($\gamma^*_3 > \gamma_3$) for the Jones (1991) model but not the stationary Jones model. The overpricing of accruals of the Jones (1991) model appears to be more severe for the estimates of discretionary accruals than for nondiscretionary accruals because the likelihood ratio statistic for the null hypothesis that $\gamma^*_2 = \gamma_2$ and $\gamma^*_3 = \gamma_3$ is 15.91 ($p = 0.0004$). However, the estimates of discretionary accruals obtained from the stationary Jones model still show no signs of inefficiency with a likelihood ration statistic of 2.13 ($p = 0.35$) for the null hypothesis that $\gamma^*_2 = \gamma_2$ and $\gamma^*_3 = \gamma_3$. Finally, the likelihood ratio statistic for the rational pricing of all components of earnings (i.e., cash flows from operations, nondiscretionary accruals and discretionary accruals) rejects the null of $\gamma^*_1 = \gamma_1$, $\gamma^*_2 = \gamma_2$ and $\gamma^*_3 = \gamma_3$ using estimates of discretionary accrual from the Jones (1991) model but not the stationary Jones model with likelihood ratio statistics of 16.40 and 2.13, respectively for the two models' estimates ($p = 0.0009$ and $p = 0.55$). All the results from the Mishkin (1983) indicate market inefficiency with respect to the discretionary accrual measurements obtained from the Jones (1991) model but not the stationary Jones model.

It is the contention of this research that the mispricing documented here using the Mishkin (1983) test on estimates of discretionary accruals is due to poor measurement of discretionary accruals obtained from the Jones (1991) model. When the discretionary accruals are measured with a better-specified model, the stationary Jones model, the accrual anomaly no longer exists.

It is shown in the evaluation of the discretionary accrual models that the estimates of discretionary accruals obtained from the stationary Jones model are more accurate that the estimates of discretionary accruals obtained from the Jones (1991) model. The results from the Mishkin (1983) test indicate that the accrual anomaly persists when the Jones (1991) model is used to measure discretionary accruals. However, when more accurate estimates of discretionary accruals are obtained from the stationary Jones model the accrual anomaly no longer exists. The evidence is consistent with Xie (2001) when the estimates of discretionary accruals are obtained from the Jones (1991) model, which suggests that presence of the accrual anomaly is the result of mismeasurement of discretionary accruals.

6.2.2 Hedge Portfolios

The results of the Mishkin (1983) test suggest that the accrual anomaly documented by Xie (2001) may be the result of a poorly specified model of discretionary accruals. The next test of the accrual anomaly using both models constructs a hedge portfolio based on the relative level of discretionary accruals, with discretionary accruals being predicted by both models. The economic significance of deviations from market efficiency can be assessed by examining the returns of a trading strategy based on the relative magnitude of the discretionary accrual component of earnings (Sloan 1996). If the accrual anomaly exists, the stock prices of firms with relatively lower levels of discretionary accruals should be lower than their intrinsic values (i.e., undervalued). Alternatively, the stock prices of firms with higher levels of discretionary accruals should be higher than their intrinsic values (i.e., overvalued). If hedge portfolios that are long in firms in the lowest decile of discretionary accruals and short in the highest decile of discretionary accruals earn positive abnormal returns in subsequent years, then this would further support the prior research that indicates that the market overprices discretionary accruals in the portfolio formation year (Xie 2001) (i.e., there is an accrual anomaly).

Firms in the sample are ranked according to the relative magnitude of the discretionary accrual component of earnings and assigned, in equal numbers, to ten portfolios each year. A separate abnormal return is then computed for each portfolio for each of the four years in the test period. The hedge portfolio test is also conducted with estimates of discretionary accruals obtained from both models estimated over 16 years, providing two years of discretionary accrual estimates. Table 24 reports the average of the two returns for each portfolio for the 16 year estimation procedure, along with the t-statistic computed from the two-year time-series. Abnormal returns are provided for each of the three subsequent years, where the return cumulation period begins four months after the fiscal year in which accruals are measured. The hedge portfolio is long in firms in the bottom decile of relative discretionary accruals and short in firms in the top decile of relative discretionary accruals. Abnormal returns to the hedge portfolio would be an indication of market inefficiency with respect to the discretionary accrual component of earnings.

The hedge portfolio results for the Jones (1991) model and the stationary Jones model are reported in Table 24 for the 16 year estimation procedure and Table 25 for the 14 year estimation procedure. The numbers in parentheses are two-tailed t-statistics based on the mean and standard deviations of the time-series, where a significant t-statistic indicates the return is significantly different from zero at the indicated p-value.

The hedge portfolios formed with the two year test period yield positive returns for all years subsequent to portfolio formation (i.e., t+1 and t+2) for the Jones (1991) model, and those returns are statistically significant in both years. However, the hedge portfolio returns for the estimates of discretionary accruals obtained from the stationary Jones model are insignificant in both years. The hedge portfolio returns for the hedge portfolios based on estimates of discretionary accruals obtained from the Jones (1991) model are 10.9 percent in t +1, 16.5 percent in t+2 with t-statistics of 1.88 and 2.52, respectively for the two years. These results imply that the market misprices the discretionary accrual component of earnings relative to its persistence when the estimates of discretionary accruals are obtained from the Jones (1991) model. The same conclusion cannot be reached, however, with the hedge portfolios formed based on the estimates of discretionary accruals obtained from the stationary Jones model. The returns for the hedge portfolios based on the stationary estimates of discretionary accruals for years t+1 and t+2 are 3.8 percent (t = 0.56), 7.8 percent (t = 1.17), respectively. Based on the results of the hedge portfolio tests, it appears that the accrual anomaly persists with estimates of discretionary accruals measured using the Jones (1991) model but not with estimates of discretionary accruals obtained using the stationary Jones model.

The hedge portfolio results for the models estimated over 14 years (i.e., four year test periods) are shown in Table 25. The portfolio data suggests the accrual anomaly exists with the estimates of discretionary accruals obtained from the Jones (1991) model. The returns in year t+1 are significantly positive for the two deciles at the bottom of relative discretionary accruals and they are significantly negative for the two deciles containing firms with the highest levels of discretionary accruals. Further, the return to the hedge portfolio for year t+1 based on discretionary accruals from the Jones (1991) is significantly positive at 16.9 percent (t=2.32). With the discretionary accruals obtained from the Jones (1991) model the accrual anomaly persists. However, there is more evidence that the accrual anomaly is a result of mismeasurement of the discretionary accruals. The are no signs of the accrual anomaly based on the deciles formed on the basis of discretionary accruals estimated by the stationary Jones model. There is no apparent trend in the returns of the deciles suggesting market inefficiency with respect to discretionary accruals and the return to the hedge portfolio is not significantly different from zero at 2.6 percent (t=0.19). Based on the measurement of discretionary accruals obtained from the stationary Jones model the accrual anomaly is nonexistent. Since the measurement of discretionary accruals from the stationary Jones model has been shown to be more accurate than those of the Jones (1991) model and since the accrual anomaly is nonexistent with the more accurate measurements, there is strong evidence that the previous findings of the anomaly are due to measurement error in the measurement of accruals. The market proves itself to be efficient in the pricing of discretionary accruals when those accruals are measure more accurately. Support is found for the second hypothesis that the market does correctly price the discretionary accrual component of earnings according to its persistence.

6.3 CONCLUSION

This research addresses two areas of the accrual anomaly. First, the most popular discretionary accrual model is evaluated for the effects of nonstationary periods and managerial discretion during the estimation period of the Jones (1991) model. From this analysis emerged a stationary Jones model that is estimated using the longest time series of stable data prior to the test period. Empirical testing provided support that the stationary Jones model produced more accurate estimates of discretionary accruals. The dispersion of the forecast errors favored the stationary Jones model. The sum of squared forecast errors are smaller for the stationary Jones model for a majority of the sample firms and a larger number of the firms had positive pseudo R^2s with the stationary Jones model than the Jones (1991) model. Based on the tests of the model, it is shown that removing the nonstationary periods and/or management discretion during the estimation period improves model accuracy. Thus, support is found for the first hypothesis that the estimates of discretionary accruals obtained from the stationary Jones model are more accurate than those obtained from the Jones (1991) model that has not been corrected for nonstationarity and managerial discretion during the estimation period.

Both models are then used to test the accrual anomaly. The accrual anomaly that has persisted in prior research is that the market does not price the discretionary accrual component of earnings based on its persistence. Discretionary accruals are thought to be the result of an attempt by management to inflate or manage earnings in order to fool the market. However, if the market is truly efficient it should not be fooled. Possible reasons for the anomaly are that the market is inefficient with respect to discretionary accruals or it may be that the anomaly exists because the methods of measuring discretionary accruals are misspecified. The accrual anomaly is tested with the Jones (1991) model and the stationary Jones model. Since the stationary Jones model has been shown to be more accurate than the Jones (1991) model that has not been corrected for structural shifts in the time-series data, if the anomaly persists with the Jones (1991) model but not the stationary Jones model it is an indication that the anomaly is the result of errors in the measurement of discretionary accruals. When the anomaly is tested with both models it persisted with the discretionary accruals estimated with the Jones (1991) model but not with the more accurate discretionary accruals obtained with the stationary Jones model. Thus, there is strong evidence that the anomalous results obtained from prior research is due to the mismeasurement of the discretionary accruals being tested. Thus, support is found for the second hypothesis that the market correctly prices the discretionary accrual component of earnings according to its persistence. It is impossible to earn abnormal returns based on the level of discretionary accruals and thus, the market does correctly price this component of earnings.

CHAPTER 7

7. CONCLUSIONS, LIMITATIONS AND FUTURE RESEARCH

7.1 CONCLUSIONS

This dissertation examines the Jones (1991) model of discretionary accruals and attempts to discover a more accurate method of estimating discretionary accruals. The Jones (1991) model uses time-series data to make predictions of total accruals for the test period. Any difference between actual accruals and the predicted accruals of the model is deemed to be due to management discretion. Howerver, the Jones (1991) model is subject to making erroneous estimates of discretioanry accruals because the time-series data may contain structural shifts that cause estimates of total accruals to be wrong, and thus the estimates of discretionary accruals would also be wrong. Another weakness of the Jones (1991) model is that it assumes that discretionary accruals do not exist in the estimation period of the model. If there are any discretionary accruals in the estimation period, the prediction of total accruals of the model will contain a prediction for expected nondiscretionary and discretionary accruals. Thus, the estimate of managerial discretion for the test period will be incorrect.

This dissertation hypothesizes that by controlling for nonstationarity in the estimation period of the model and controlling for the probable managerial discretion that exists in the estimation period that the Jones (1991) model will provide more accurate estimates of discretionary accruals. A hypothetical data set was created that allowed for the manipulation of the data to test the accuracy of the Jones (1991) model with various assumptions about nondiscretionary and discretionary structural shifts in the estimation period of the model. A stationary Jones model was developed that used the techniques of

Brown, Durbin and Evans (1975) to test for nonstationary periods in the estimation of the Jones (1991) model. The model was then estimated for the sample firms over the longest time-series prior to the test period that was stable. This hypothesis was tested by evaluating common statistical measures of dispersion. The measures of dispersion were compared between the Jones (1991) model and the stationary Jones model. The Jones (1991) model was used as a benchmark because of its prevalence in accounting research. Based on the measures of dispersion, there is an improvement in the estimates of discretionary accruals provided by the Jones model when the nonstationary periods are removed from the estimation period. The stationary Jones model outperformed the Jones model.

This dissertation is also concerned with the accrual anomaly. Prior research shows that the market does not price the discretionary accrual component of earnings according to its persistence. Since this information is publicly available, the accrual anomaly documents an instance of market inefficiency. The accrual anomaly implies that management can manage earnings by using discretionary accruals and that the market will be fooled. Possible causes of the anomaly are that the market it truly inefficient or that the methods and tests used to test the anomaly are inappropriate. This dissertation hypothesizes that a possible cause of the accrual anomaly is the mismeasurement of discretionary accruals.

The improved estimates of discretionary accruals obtained from the stationary Jones model are then used to test the anomaly along with the estimates of discretionary accruals obtained from the Jones (1991) model. The estimates of both models are used to test the accrual anomaly so the results can be compared between the two models. The accrual anomaly was tested using the same methods as those used by prior research that documents the anomaly. Xie (2001) and Sloan (1996) document the anomaly using the Mishkin (1983) test and a hedge portfolio test. The results of both tests document the anomaly with the discretionary accruals estimated by the Jones (1991) model but not the stationary Jones model. Thus, the tests indicate that the market does correctly price discretionary accruals when the estimates of discretionary accruals are obtained from the Jones model that controls for the effects of nonstationarity and for possible managerial discretion during the estimation period of the model. Support was found for hypothesis two that the market correctly prices discretionary accruals. However, this result was not found when the model used to estimate discretionary accruals was not correct for nonstationarity.

7.2 LIMITATIONS

This research uses a simplified hypothetical data set to test the accuracy of the Jones (1991) model when there are nondiscretionary and discretionary structural shifts in the time-series used to estimate the model. From this analysis it is believed that structural shifts in the time-series and managerial discretion cause the estimates of the model to be inaccurate. Based on this conclusion, a stationary Jones model was developed that tested the time-series data used to estimate the model for nonstationary periods. The stationary Jones model produced more accurate estimates of discretionary accruals. The hypothetical data set used for this analysis had many simplifying assumptions to allow for manipulation and testing. These simplifying assumptions limit the external validity of the results. However, the empirical testing using real data of the sample firms indicates that the stationary Jones model does outperform the Jones model estimated without correcting for instability in the data and managerial discretion during the estimation period.

Because the Jones (1991) model relies on time-series data, the sample used in this dissertation was made up of firms that were in existence for the entire time the models were estimated and tested. Consequently, external validity is limited because the firms in this study have remained in business for 20 plus years. The estimates of discretionary accruals of the stationary Jones model may not be as accurate when the model is used on firms that have shorter life spans. Further, internal validity is also limited because the sample firms are generally larger successful firms. The model performance may not be as good when the model is used on smaller firms that are less successful.

The accrual anomaly was tested using the Mishkin (1983) test. The results of the Mishkin test suggests that the market does correctly price discretionary accruals according to their persistence and that the anomaly is the result of the discretionary accrual model being used. Recently, the Mishkin test has come under criticism because of its use with panel data of the type contained in accounting research. Kraft, Leone and Wasley (2001) criticize use of the Mishkin test across multiple firms with cross-sectional data or pooled time-series data because that was not its intended use. They claim that the assumption that the errors of the two equations in the Mishkin test are the same is violated using cross-sectional or pooled time-series data. Further, they point out that if the Mishkin test is used across firms that the test then erroneously assigns the same forecasting coefficients to every firm being tested. They provide that the Mishkin test was intended to be used with a single time-series such as interest rates. While these criticisms may be valid, the results of the Mishkin test were confirmed by the results of the hedge portfolio tests. Based on the fact that alternate testing provided the exact same result, it would appear that some of the criticisms of the Mishkin test with cross sectional and pooled time-series data may be overstated.

7.3 FUTURE RESEARCH

The techniques of Brown, Durbin and Evans (1975) contained in the TIMVAR program proved to be very accurate at identifying structural shifts in the time-series data. The structural shifts may or may not be the result of managerial discretion during the estimation period of the model. These techniques may prove to be very useful in estimating managerial discretion in future research. Research that could test the market pricing of the structural shift may provide greater insight into the market's pricing of discretionary accruals. This could allow for the inclusion of a larger number of firms in the sample because it may lessen the length of time-series data necessary for estimation of the model.

The Brown, Durbin and Evans (1975) techniques may also be useful for testing the time-series of firms that have been subject to restatement in the past to see if the TIMVAR program can identify managerial discretion deemed to be abusive by regulating authorities. The accuracy of the program would be verified if there were some correlation between the incidence of the shift identified by the program and the trouble encountered by the firm causing the restatement.

The stationary Jones model has many possible uses in future research. The Jones (1991) model has been prevalent in accounting research testing the pricing of accruals and earnings management since it was developed. Using a better specified model to test in these areas may provide different results than those achieved using a flawed model.

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TABLE 1
HYPOTHETICAL DATA -- STATIONARY

	0	1	2	3	4	5	6	7	8	9	10	11
Cash Sales	1500	1538	1576	1615	1656	1697	1740	1783	1828	1873	1920	1968
Cr. Sales	500	513	525	538	552	566	580	594	609	624	640	656
Tot. Rev.	2000	2050	2101	2154	2208	2263	2319	2377	2437	2498	2560	2624
Comm Exp	800	820	841	862	883	905	928	951	975	999	1024	1050
B/D Expense	100	103	105	108	110	113	116	119	122	125	128	131
Deprec.	250	250	250	250	250	250	250	250	250	250	250	250
	1150	1173	1196	1219	1243	1268	1294	1320	1347	1374	1402	1431
NI	850	878	906	935	964	995	1026	1058	1090	1124	1158	1193
Cash	700	1818	2963	4137	5340	6574	7838	9134	10463	11824	13220	14650
A/R	400	410	420	431	442	453	464	475	487	500	512	525
PPE	5000	5001	5002	5003	5004	5005	5006	5007	5008	5009	5010	5011
A/D	(250)	(500)	(750)	(1000)	(1250)	(1500)	(1750)	(2000)	(2250)	(2500)	(2750)	(3000)
Assets	5850	6729	7635	8571	9536	10532	11558	12617	13708	14833	15992	17186
Contribution	5000	5001	5002	5003	5004	5005	5006	5007	5008	5009	5010	5011
R/E	0	850	1728	2633	3568	4532	5527	6552	7610	8700	9824	10982
Inc	850	878	906	935	964	995	1026	1058	1090	1124	1158	1193
L + OE	5850	6729	7635	8571	9536	10532	11558	12617	13708	14833	15992	17186
CFO		1118	1145	1174	1203	1234	1264	1296	1328	1362	1396	1430
Accruals	150.00	-240.00	-239.75	-239.49	-239.23	-238.96	-238.69	-238.40	-238.11	-237.82	-237.51	-237.20

TABLE 1 (CONTINUED)
HYPOTHETICAL DATA -- STATIONARY

	12	13	14	15	16	17	18	19	20	21	22
Cash Sales	2017	2068	2119	2172	2227	2282	2339	2398	2458	2519	2582
Cr. Sales	672	689	706	724	742	761	780	799	819	840	861
Tot. Rev.	2690	2757	2826	2897	2969	3043	3119	3197	3277	3359	3443
Comm Exp	1076	1103	1130	1159	1188	1217	1248	1279	1311	1344	1377
B/D Expense	134	138	141	145	148	152	156	160	164	168	172
Deprec.	250	250	250	250	250	250	250	250	250	250	250
	1460	1491	1522	1553	1586	1619	1654	1689	1725	1762	1799
NI	1229	1266	1304	1343	1383	1424	1466	1509	1552	1598	1644
Cash	16117	17619	19160	20739	22357	24016	25717	27460	29246	31077	32954
A/R	538	551	565	579	594	609	624	639	655	672	689
PPE	5012	5013	5014	5015	5016	5017	5018	5019	5020	5021	5022
A/D	(3250)	(3500)	(3750)	(4000)	(4250)	(4500)	(4750)	(5000)	(5250)	(5500)	(5750)
Assets	18416	19684	20989	22333	23717	25142	26609	28118	29672	31270	32915
Contribution	5012	5013	5014	5015	5016	5017	5018	5019	5020	5021	5022
R/E	12175	13404	14671	15975	17318	18701	20125	21591	23099	24652	26249
Inc	1229	1266	1304	1343	1383	1424	1466	1509	1552	1598	1644
L + OE	18416	19684	20989	22333	23717	25142	26609	28118	29672	31270	32915
CFO	1466	1503	1540	1579	1618	1659	1700	1743	1786	1831	1877
Accruals	-236.88	-236.55	-236.21	-235.87	-235.52	-235.15	-234.78	-234.40	-234.01	-233.61	-233.20

TABLE 2
COEFFICIENT ESTIMATES FOR THE JONES (1991) MODEL ESTIMATED USING THE STATIONARY HYPOTHETICAL DATA

$$ACCR_{it}/Assets_{it-1} = \alpha_i(1/\ Assets_{it-1}) + \beta_{1i}(\Delta REV_{it}/\ Assets_{it-1}) + \beta_{2i}(PPE_{it}/\ Assets_{it-1}) \quad (2)$$

Variable	Coefficient Estimates	Standard Deviation	t-statistic	p-value
α	-238.81	33.90	-7.04	$p < 0.0001$
β_1	0.2012	0.00462	43.58	$p < 0.0001$
β_2	-0.0025	0.00682	-0.33	0.7459
	Predicted TA	Actual TA	Est. of DA	Actual DA
	-233.30	-233.20	0.10	0.00

where:

$ACCR_{it}$ = Accruals as calculated in equation x in year *t* for firm *i*;

ΔREV_{it} = revenues in year *t* less revenues in year *t*-1 for firm *i*;

PPE_{it} = gross property, plant, and equipment in year *t* for firm *i*;

A_{it-1} = total assets in year *t*-1 for firm *i*;

ε_{it} = error term in year *t* for firm *i*;

TABLE 3
HYPOTHETICAL DATA -- NONDISCRETIONARY CHANGE DUE TO ASSET ADDITION IN YEAR 5

	0	1	2	3	4	5	6	7	8	9	10	11
Cash Sales	1500	1538	1576	1615	1656	1697	1740	1783	1828	1873	1920	1968
Cr. Sales	500	513	525	538	552	566	580	594	609	624	640	656
Tot. Rev.	2000	2050	2101	2154	2208	2263	2319	2377	2437	2498	2560	2624
Comm Exp	800	820	841	862	883	905	928	951	975	999	1024	1050
B/D Expense	100	103	105	108	110	113	116	119	122	125	128	131
Deprec.	250	250	250	250	250	500	500	500	500	500	500	500
	1150	1173	1196	1219	1243	1518	1544	1570	1597	1624	1652	1681
NI	850	878	906	935	964	745	776	808	840	874	908	943
Cash	700	1818	2963	4137	5340	1574	2838	4134	5463	6824	8220	9650
A/R	400	410	420	431	442	453	464	475	487	500	512	525
PPE	5000	5001	5002	5003	5004	10005	10006	10007	10008	10009	10010	10011
A/D	(250)	(500)	(750)	(1000)	(1250)	(1750)	(2250)	(2750)	(3250)	(3750)	(4250)	(4750)
Assets	5850	6729	7635	8571	9536	10282	11058	11867	12708	13583	14492	15436
Contribution	5000	5001	5002	5003	5004	5005	5006	5007	5008	5009	5010	5011
R/E	0	850	1728	2633	3568	4532	5277	6052	6860	7700	8574	9482
Inc	850	878	906	935	964	745	776	808	840	874	908	943
L + OE	5850	6729	7635	8571	9536	10282	11058	11867	12708	13583	14492	15436
CFO		1118	1145	1174	1203	1234	1264	1296	1328	1362	1396	1430
Accruals	150.00	-240.00	-239.75	-239.49	-239.23	-488.96	-488.69	-488.40	-488.11	-487.82	-487.51	-487.20

TABLE 3 (CONTINUED)
HYPOTHETICAL DATA -- NONDISCRETIONARY CHANGE DUE TO ASSET ADDITION IN YEAR 5

	12	13	14	15	16	17	18	19	20	21	22
Cash Sales	2017	2068	2119	2172	2227	2282	2339	2398	2458	2519	2582
Cr. Sales	672	689	706	724	742	761	780	799	819	840	861
Tot. Rev.	2690	2757	2826	2897	2969	3043	3119	3197	3277	3359	3443
Comm Exp	1076	1103	1130	1159	1188	1217	1248	1279	1311	1344	1377
B/D Expense	134	138	141	145	148	152	156	160	164	168	172
Deprec.	500	500	500	500	500	500	500	500	500	500	500
	1710	1741	1772	1803	1836	1869	1904	1939	1975	2012	2049
NI	979	1016	1054	1093	1133	1174	1216	1259	1302	1348	1394
Cash	11117	12619	14160	15739	17357	19016	20717	22460	24246	26077	27954
A/R	538	551	565	579	594	609	624	639	655	672	689
PPE	10012	10013	10014	10015	10016	10017	10018	10019	10020	10021	10022
A/D	(5250)	(5750)	(6250)	(6750)	(7250)	(7750)	(8250)	(8750)	(9250)	(9750)	(10250)
Assets	16416	17434	18489	19583	20717	21892	23109	24368	25672	27020	28415
Contribution	5012	5013	5014	5015	5016	5017	5018	5019	5020	5021	5022
R/E	10425	11404	12421	13475	14568	15701	16875	18091	19349	20652	21999
Inc	979	1016	1054	1093	1133	1174	1216	1259	1302	1348	1394
L + OE	16416	17434	18489	19583	20717	21892	23109	24368	25672	27020	28415
CFO	1466	1503	1540	1579	1618	1659	1700	1743	1786	1831	1877
Accruals	-486.88	-486.55	-486.21	-485.87	-485.52	-485.15	-484.78	-484.40	-484.01	-483.61	-483.20

TABLE 4
HYPOTHETICAL DATA -- NONDISCRETIONARY CHANGE DUE TO ASSET ADDITION IN YEAR 10

	0	1	2	3	4	5	6	7	8	9	10	11
Cash Sales	1500	1538	1576	1615	1656	1697	1740	1783	1828	1873	1920	1968
Cr. Sales	500	513	525	538	552	566	580	594	609	624	640	656
Tot. Rev.	2000	2050	2101	2154	2208	2263	2319	2377	2437	2498	2560	2624
Comm Exp	800	820	841	862	883	905	928	951	975	999	1024	1050
B/D Expense	100	103	105	108	110	113	116	119	122	125	128	131
Deprec.	250	250	250	250	250	250	250	250	250	250	500	500
	1150	1173	1196	1219	1243	1268	1294	1320	1347	1374	1652	1681
NI	850	878	906	935	964	995	1026	1058	1090	1124	908	943
Cash	700	1818	2963	4137	5340	6574	7838	9134	10463	11824	8220	9650
A/R	400	410	420	431	442	453	464	475	487	500	512	525
PPE	5000	5001	5002	5003	5004	5005	5006	5007	5008	5009	10010	10011
A/D	(250)	(500)	(750)	(1000)	(1250)	(1500)	(1750)	(2000)	(2250)	(2500)	(3000)	(3500)
Assets	5850	6729	7635	8571	9536	10532	11558	12617	13708	14833	15742	16686
Contribution	5000	5001	5002	5003	5004	5005	5006	5007	5008	5009	5010	5011
R/E	0	850	1728	2633	3568	4532	5527	6552	7610	8700	9824	10732
Inc	850	878	906	935	964	995	1026	1058	1090	1124	908	943
L + OE	5850	6729	7635	8571	9536	10532	11558	12617	13708	14833	15742	16686
CFO		1118	1145	1174	1203	1234	1264	1296	1328	1362	1396	1430
Accruals	150.00	-240.00	-239.75	-239.49	-239.23	-238.96	-238.69	-238.40	-238.11	-237.82	-487.51	-487.20

TABLE 4 (CONTINUED)
HYPOTHETICAL DATA -- NONDISCRETIONARY CHANGE DUE TO ASSET ADDITION
ASSET ADDITION IN YEAR 10

	12	13	14	15	16	17	18	19	20	21	22
Cash Sales	2017	2068	2119	2172	2227	2282	2339	2398	2458	2519	2582
Cr. Sales	672	689	706	724	742	761	780	799	819	840	861
Tot. Rev.	2690	2757	2826	2897	2969	3043	3119	3197	3277	3359	3443
Comm Exp	1076	1103	1130	1159	1188	1217	1248	1279	1311	1344	1377
B/D Expense	134	138	141	145	148	152	156	160	164	168	172
Deprec.	500	500	500	500	500	500	500	500	500	500	500
	1710	1741	1772	1803	1836	1869	1904	1939	1975	2012	2049
NI	979	1016	1054	1093	1133	1174	1216	1259	1302	1348	1394
Cash	11117	12619	14160	15739	17357	19016	20717	22460	24246	26077	27954
A/R	538	551	565	579	594	609	624	639	655	672	689
PPE	10012	10013	10014	10015	10016	10017	10018	10019	10020	10021	10022
A/D	(4000)	(4500)	(5000)	(5500)	(6000)	(6500)	(7000)	(7500)	(8000)	(8500)	(9000)
Assets	17666	18684	19739	20833	21967	23142	24359	25618	26922	28270	29665
Contribution	5012	5013	5014	5015	5016	5017	5018	5019	5020	5021	5022
R/E	11675	12654	13671	14725	15818	16951	18125	19341	20599	21902	23249
Inc	979	1016	1054	1093	1133	1174	1216	1259	1302	1348	1394
L + OE	17666	18684	19739	20833	21967	23142	24359	25618	26922	28270	29665
CFO	1466	1503	1540	1579	1618	1659	1700	1743	1786	1831	1877
Accruals	-486.88	-486.55	-486.21	-485.87	-485.52	-485.15	-484.78	-484.40	-484.01	-483.61	-483.20

TABLE 5
HYPOTHETICAL DATA -- NONDISCRETIONARY CHANGE DUE TO ASSET ADDITION
ASSET ADDITION IN YEAR 15

	0	1	2	3	4	5	6	7	8	9	10	11
Cash Sales	1500	1538	1576	1615	1656	1697	1740	1783	1828	1873	1920	1968
Cr. Sales	500	513	525	538	552	566	580	594	609	624	640	656
Tot. Rev.	2000	2050	2101	2154	2208	2263	2319	2377	2437	2498	2560	2624
Comm Exp	800	820	841	862	883	905	928	951	975	999	1024	1050
B/D Expense	100	103	105	108	110	113	116	119	122	125	128	131
Deprec.	250	250	250	250	250	250	250	250	250	250	250	250
	1150	1173	1196	1219	1243	1268	1294	1320	1347	1374	1402	1431
NI	850	878	906	935	964	995	1026	1058	1090	1124	1158	1193
Cash	700	1818	2963	4137	5340	6574	7838	9134	10463	11824	13220	14650
A/R	400	410	420	431	442	453	464	475	487	500	512	525
PPE	5000	5001	5002	5003	5004	5005	5006	5007	5008	5009	5010	5011
A/D	(250)	(500)	(750)	(1000)	(1250)	(1500)	(1750)	(2000)	(2250)	(2500)	(2750)	(3000)
Assets	5850	6729	7635	8571	9536	10532	11558	12617	13708	14833	15992	17186
Contribution	5000	5001	5002	5003	5004	5005	5006	5007	5008	5009	5010	5011
R/E	0	850	1728	2633	3568	4532	5527	6552	7610	8700	9824	10982
Inc	850	878	906	935	964	995	1026	1058	1090	1124	1158	1193
L + OE	5850	6729	7635	8571	9536	10532	11558	12617	13708	14833	15992	17186
CFO		1118	1145	1174	1203	1234	1264	1296	1328	1362	1396	1430
Accruals	150.00	-240.00	-239.75	-239.49	-239.23	-238.96	-238.69	-238.40	-238.11	-237.82	-237.51	-237.20

TABLE 5 (CONTINUED)
HYPOTHETICAL DATA -- NONDISCRETIONARY CHANGE DUE TO ASSET ADDITION
ASSET ADDITION IN YEAR 15

	12	13	14	15	16	17	18	19	20	21	22
Cash Sales	2017	2068	2119	2172	2227	2282	2339	2398	2458	2519	2582
Cr. Sales	672	689	706	724	742	761	780	799	819	840	861
Tot. Rev.	2690	2757	2826	2897	2969	3043	3119	3197	3277	3359	3443
Comm Exp	1076	1103	1130	1159	1188	1217	1248	1279	1311	1344	1377
B/D Expense	134	138	141	145	148	152	156	160	164	168	172
Deprec.	250	250	250	500	500	500	500	500	500	500	500
	1460	1491	1522	1803	1836	1869	1904	1939	1975	2012	2049
NI	1229	1266	1304	1093	1133	1174	1216	1259	1302	1348	1394
Cash	16117	17619	19160	15739	17357	19016	20717	22460	24246	26077	27954
A/R	538	551	565	579	594	609	624	639	655	672	689
PPE	5012	5013	5014	10015	10016	10017	10018	10019	10020	10021	10022
A/D	(3250)	(3500)	(3750)	(4250)	(4750)	(5250)	(5750)	(6250)	(6750)	(7250)	(7750)
Assets	18416	19684	20989	22083	23217	24392	25609	26868	28172	29520	30915
Contribution	5012	5013	5014	5015	5016	5017	5018	5019	5020	5021	5022
R/E	12175	13404	14671	15975	17068	18201	19375	20591	21849	23152	24499
Inc	1229	1266	1304	1093	1133	1174	1216	1259	1302	1348	1394
L + OE	18416	19684	20989	22083	23217	24392	25609	26868	28172	29520	30915
CFO	1466	1503	1540	1579	1618	1659	1700	1743	1786	1831	1877
Accruals	-236.88	-236.55	-236.21	-485.87	-485.52	-485.15	-484.78	-484.40	-484.01	-483.61	-483.20

TABLE 6
Coefficient Estimates and Error Analysis
Effects of Nondiscretionary Changes in the Hypothetical Data Set
Nondiscretionary Change Due to Asset Addition
Asset Additions in Years 5, 10 and 15

	Coefficient	Standard		
Variable	Estimates	Deviation	t-statistic	p-value
Asset Addition in Period 5				
α	-1.51	0.02	-66.46	< 0.0001
β_1	0.23	0.0005	440.19	< 0.0001
β_2	-0.05	0.000002	-28,910	< 0.0001
Asset Addition in Period 10				
α	-1.61	0.04	-39.51	< 0.0001
β_1	0.2336	0.0010	229.38	< 0.0001
β_2	-0.05	0.000004	-13,667	< 0.0001
Asset Addition in Period 15				
α	-1.63	0.02	-76.32	< 0.0001
β_1	0.2350	0.0005	450.88	< 0.0001
β_2	-0.05	0.000003	-18,004	< 0.0001
Estimates of DA				
Addition Year:	Predicted TA	Actual TA	Est. of DA	Actual DA
Five	-483.14	-483.20	-0.06	0.00
Ten	-483.09	-483.20	-0.11	0.00
Fifteen	-483.09	-483.20	-0.11	0.00

TABLE 7
HYPOTHETICAL DATA -- DISCRETIONARY CHANGE IN DEPRECIATION EXPENSE
CHANGE IN YEAR 5

	0	1	2	3	4	5	6	7	8	9	10	11
Cash Sales	1500	1538	1576	1615	1656	1697	1740	1783	1828	1873	1920	1968
Cr. Sales	500	513	525	538	552	566	580	594	609	624	640	656
Tot. Rev.	2000	2050	2101	2154	2208	2263	2319	2377	2437	2498	2560	2624
Comm Exp	800	820	841	862	883	905	928	951	975	999	1024	1050
B/D Expense	100	103	105	108	110	113	116	119	122	125	128	131
Deprec.	250	250	250	250	250	125	125	125	125	125	125	125
	1150	1173	1196	1219	1243	1143	1169	1195	1222	1249	1277	1306
NI	850	878	906	935	964	1120	1151	1183	1215	1249	1283	1318
Cash	700	1818	2963	4137	5340	6574	7838	9134	10463	11824	13220	14650
A/R	400	410	420	431	442	453	464	475	487	500	512	525
PPE	5000	5001	5002	5003	5004	5005	5006	5007	5008	5009	5010	5011
A/D	(250)	(500)	(750)	(1000)	(1250)	(1375)	(1500)	(1625)	(1750)	(1875)	(2000)	(2125)
Assets	5850	6729	7635	8571	9536	10657	11808	12992	14208	15458	16742	18061
Contribution	5000	5001	5002	5003	5004	5005	5006	5007	5008	5009	5010	5011
R/E	0	850	1728	2633	3568	4532	5652	6802	7985	9200	10449	11732
Inc	850	878	906	935	964	1120	1151	1183	1215	1249	1283	1318
L + OE	5850	6729	7635	8571	9536	10657	11808	12992	14208	15458	16742	18061
CFO		1118	1145	1174	1203	1234	1264	1296	1328	1362	1396	1430
Accruals	150.00	-240.00	-239.75	-239.49	-239.23	-113.96	-113.69	-113.40	-113.11	-112.82	-112.51	-112.20

TABLE 7 (CONTINUED)
HYPOTHETICAL DATA -- DISCRETIONARY CHANGE IN DEPRECIATION EXPENSE
CHANGE IN YEAR 5

	12	13	14	15	16	17	18	19	20	21	22
Cash Sales	2017	2068	2119	2172	2227	2282	2339	2398	2458	2519	2582
Cr. Sales	672	689	706	724	742	761	780	799	819	840	861
Tot. Rev.	2690	2757	2826	2897	2969	3043	3119	3197	3277	3359	3443
Comm Exp	1076	1103	1130	1159	1188	1217	1248	1279	1311	1344	1377
B/D Expense	134	138	141	145	148	152	156	160	164	168	172
Deprec.	125	125	125	125	125	125	125	125	125	125	125
	1335	1366	1397	1428	1461	1494	1529	1564	1600	1637	1674
NI	1354	1391	1429	1468	1508	1549	1591	1634	1677	1723	1769
Cash	16117	17619	19160	20739	22357	24016	25717	27460	29246	31077	32954
A/R	538	551	565	579	594	609	624	639	655	672	689
PPE	5012	5013	5014	5015	5016	5017	5018	5019	5020	5021	5022
A/D	(2250)	(2375)	(2500)	(2625)	(2750)	(2875)	(3000)	(3125)	(3250)	(3375)	(3500)
Assets	19416	20809	22239	23708	25217	26767	28359	29993	31672	33395	35165
Contribution	5012	5013	5014	5015	5016	5017	5018	5019	5020	5021	5022
R/E	13050	14404	15796	17225	18693	20201	21750	23341	24974	26652	28374
Inc	1354	1391	1429	1468	1508	1549	1591	1634	1677	1723	1769
L + OE	19416	20809	22239	23708	25217	26767	28359	29993	31672	33395	35165
CFO	1466	1503	1540	1579	1618	1659	1700	1743	1786	1831	1877
Accruals	-111.88	-111.55	-111.21	-110.87	-110.52	-110.15	-109.78	-109.40	-109.01	-108.61	-108.20

TABLE 8
HYPOTHETICAL DATA -- DISCRETIONARY CHANGE IN DEPRECIATION EXPENSE
CHANGE IN YEAR 10

	0	1	2	3	4	5	6	7	8	9	10	11
Cash Sales	1500	1538	1576	1615	1656	1697	1740	1783	1828	1873	1920	1968
Cr. Sales	500	513	525	538	552	566	580	594	609	624	640	656
Tot. Rev.	2000	2050	2101	2154	2208	2263	2319	2377	2437	2498	2560	2624
Comm Exp	800	820	841	862	883	905	928	951	975	999	1024	1050
B/D Expense	100	103	105	108	110	113	116	119	122	125	128	131
Deprec.	250	250	250	250	250	250	250	250	250	250	125	125
	1150	1173	1196	1219	1243	1268	1294	1320	1347	1374	1277	1306
NI	850	878	906	935	964	995	1026	1058	1090	1124	1283	1318
Cash	700	1818	2963	4137	5340	6574	7838	9134	10463	11824	13220	14650
A/R	400	410	420	431	442	453	464	475	487	500	512	525
PPE	5000	5001	5002	5003	5004	5005	5006	5007	5008	5009	5010	5011
A/D	(250)	(500)	(750)	(1000)	(1250)	(1500)	(1750)	(2000)	(2250)	(2500)	(2625)	(2750)
Assets	5850	6729	7635	8571	9536	10532	11558	12617	13708	14833	16117	17436
Contribution	5000	5001	5002	5003	5004	5005	5006	5007	5008	5009	5010	5011
R/E	0	850	1728	2633	3568	4532	5527	6552	7610	8700	9824	11107
Inc	850	878	906	935	964	995	1026	1058	1090	1124	1283	1318
L + OE	5850	6729	7635	8571	9536	10532	11558	12617	13708	14833	16117	17436
CFO		1118	1145	1174	1203	1234	1264	1296	1328	1362	1396	1430
Accruals	150.00	-240.00	-239.75	-239.49	-239.23	-238.96	-238.69	-238.40	-238.11	-237.82	-112.51	-112.20

TABLE 8 (CONTINUED)
HYPOTHETICAL DATA -- DISCRETIONARY CHANGE IN DEPRECIATION EXPENSE
CHANGE IN YEAR 10

	12	13	14	15	16	17	18	19	20	21	22
Cash Sales	2017	2068	2119	2172	2227	2282	2339	2398	2458	2519	2582
Cr. Sales	672	689	706	724	742	761	780	799	819	840	861
Tot. Rev.	2690	2757	2826	2897	2969	3043	3119	3197	3277	3359	3443
Comm Exp	1076	1103	1130	1159	1188	1217	1248	1279	1311	1344	1377
B/D Expense	134	138	141	145	148	152	156	160	164	168	172
Deprec.	125	125	125	125	125	125	125	125	125	125	125
	1335	1366	1397	1428	1461	1494	1529	1564	1600	1637	1674
NI	1354	1391	1429	1468	1508	1549	1591	1634	1677	1723	1769
Cash	16117	17619	19160	20739	22357	24016	25717	27460	29246	31077	32954
A/R	538	551	565	579	594	609	624	639	655	672	689
PPE	5012	5013	5014	5015	5016	5017	5018	5019	5020	5021	5022
A/D	(2875)	(3000)	(3125)	(3250)	(3375)	(3500)	(3625)	(3750)	(3875)	(4000)	(4125)
Assets	18791	20184	21614	23083	24592	26142	27734	29368	31047	32770	34540
Contribution	5012	5013	5014	5015	5016	5017	5018	5019	5020	5021	5022
R/E	12425	13779	15171	16600	18068	19576	21125	22716	24349	26027	27749
Inc	1354	1391	1429	1468	1508	1549	1591	1634	1677	1723	1769
L + OE	18791	20184	21614	23083	24592	26142	27734	29368	31047	32770	34540
CFO	1466	1503	1540	1579	1618	1659	1700	1743	1786	1831	1877
Accruals	-111.88	-111.55	-111.21	-110.87	-110.52	-110.15	-109.78	-109.40	-109.01	-108.61	-108.20

TABLE 9
HYPOTHETICAL DATA -- DISCRETIONARY CHANGE IN DEPRECIATION EXPENSE CHANGE IN YEAR 15

	0	1	2	3	4	5	6	7	8	9	10	11
Cash Sales	1500	1538	1576	1615	1656	1697	1740	1783	1828	1873	1920	1968
Cr. Sales	500	513	525	538	552	566	580	594	609	624	640	656
Tot. Rev.	2000	2050	2101	2154	2208	2263	2319	2377	2437	2498	2560	2624
Comm Exp	800	820	841	862	883	905	928	951	975	999	1024	1050
B/D Expense	100	103	105	108	110	113	116	119	122	125	128	131
Deprec.	250	250	250	250	250	250	250	250	250	250	250	250
	1150	1173	1196	1219	1243	1268	1294	1320	1347	1374	1402	1431
NI	850	878	906	935	964	995	1026	1058	1090	1124	1158	1193
Cash	700	1818	2963	4137	5340	6574	7838	9134	10463	11824	13220	14650
A/R	400	410	420	431	442	453	464	475	487	500	512	525
PPE	5000	5001	5002	5003	5004	5005	5006	5007	5008	5009	5010	5011
A/D	(250)	(500)	(750)	(1000)	(1250)	(1500)	(1750)	(2000)	(2250)	(2500)	(2750)	(3000)
Assets	5850	6729	7635	8571	9536	10532	11558	12617	13708	14833	15992	17186
Contribution	5000	5001	5002	5003	5004	5005	5006	5007	5008	5009	5010	5011
R/E	0	850	1728	2633	3568	4532	5527	6552	7610	8700	9824	10982
Inc	850	878	906	935	964	995	1026	1058	1090	1124	1158	1193
L + OE	5850	6729	7635	8571	9536	10532	11558	12617	13708	14833	15992	17186
CFO		1118	1145	1174	1203	1234	1264	1296	1328	1362	1396	1430
Accruals	150.00	-240.00	-239.75	-239.49	-239.23	-238.96	-238.69	-238.40	-238.11	-237.82	-237.51	-237.20

TABLE 9 (CONTINUED)
HYPOTHETICAL DATA -- DISCRETIONARY CHANGE IN DEPRECIATION EXPENSE
CHANGE IN YEAR 15

	12	13	14	15	16	17	18	19	20	21	22
Cash Sales	2017	2068	2119	2172	2227	2282	2339	2398	2458	2519	2582
Cr. Sales	672	689	706	724	742	761	780	799	819	840	861
Tot. Rev.	2690	2757	2826	2897	2969	3043	3119	3197	3277	3359	3443
Comm Exp	1076	1103	1130	1159	1188	1217	1248	1279	1311	1344	1377
B/D Expense	134	138	141	145	148	152	156	160	164	168	172
Deprec.	250	250	250	125	125	125	125	125	125	125	125
	1460	1491	1522	1428	1461	1494	1529	1564	1600	1637	1674
NI	1229	1266	1304	1468	1508	1549	1591	1634	1677	1723	1769
Cash	16117	17619	19160	20739	22357	24016	25717	27460	29246	31077	32954
A/R	538	551	565	579	594	609	624	639	655	672	689
PPE	5012	5013	5014	5015	5016	5017	5018	5019	5020	5021	5022
A/D	(3250)	(3500)	(3750)	(3875)	(4000)	(4125)	(4250)	(4375)	(4500)	(4625)	(4750)
Assets	18416	19684	20989	22458	23967	25517	27109	28743	30422	32145	33915
Contribution	5012	5013	5014	5015	5016	5017	5018	5019	5020	5021	5022
R/E	12175	13404	14671	15975	17443	18951	20500	22091	23724	25402	27124
Inc	1229	1266	1304	1468	1508	1549	1591	1634	1677	1723	1769
L + OE	18416	19684	20989	22458	23967	25517	27109	28743	30422	32145	33915
CFO	1466	1503	1540	1579	1618	1659	1700	1743	1786	1831	1877
Accruals	-236.88	-236.55	-236.21	-110.87	-110.52	-110.15	-109.78	-109.40	-109.01	-108.61	-108.20

TABLE 10
Coefficient Estimates and Error Analysis
Effects of Discretionary Depreciation Changes in the Hypothetical Data Set
Discretionary Depreciation Change in Years 5, 10 and 15

Variable	Coefficient Estimates	Standard Deviation	t-statistic	p-value
Deprec. Change in Period 5				
α	-465,998	103,447	-4.50	0.0003
β_1	-55.6546	13.94	-3.99	0.0009
β_2	93.68658	20.82	4.50	0.0003
Deprec. Change in Period 10				
α	58,787	95,940	0.61	0.55
β_1	14.13279	12.93	1.09	0.29
β_2	-11.9465	19.31	-0.62	0.54
Deprec. Change in Period 15				
α	267,700	56,945	4.70	0.0002
β_1	39.64468	7.69	5.15	<0.0001
β_2	-53.9727	11.46	-4.71	0.0002
Estimates of DA				
Change Year:	Predicted TA	Actual TA	Est. of DA	Actual DA
Five	-177.87	-108.20	69.67	0.00
Ten	-21.65	-108.20	-86.75	0.00
Fifteen	-21.59	-108.20	-86.61	0.00

TABLE 11
HYPOTHETICAL DATA -- DISCRETIONARY CHANGE IN BAD DEBT EXPENSE
CHANGE IN YEAR 5

	0	1	2	3	4	5	6	7	8	9	10	11
Cash Sales	1500	1538	1576	1615	1656	1697	1740	1783	1828	1873	1920	1968
Cr. Sales	500	513	525	538	552	566	580	594	609	624	640	656
Tot. Rev.	2000	2050	2101	2154	2208	2263	2319	2377	2437	2498	2560	2624
Comm Exp	800	820	841	862	883	905	928	951	975	999	1024	1050
B/D Expense	100	103	105	108	110	57	115	117	120	123	126	130
Deprec.	250	250	250	250	250	250	250	250	250	250	250	250
	1150	1173	1196	1219	1243	1212	1292	1318	1345	1372	1401	1429
NI	850	878	906	935	964	1051	1027	1059	1092	1125	1160	1195
Cash	700	1818	2963	4137	5340	6574	7895	9192	10522	11885	13282	14714
A/R	400	410	420	431	442	509	465	477	489	501	514	526
PPE	5000	5001	5002	5003	5004	5005	5006	5007	5008	5009	5010	5011
A/D	(250)	(500)	(750)	(1000)	(1250)	(1500)	(1750)	(2000)	(2250)	(2500)	(2750)	(3000)
Assets	5850	6729	7635	8571	9536	10588	11616	12676	13769	14895	16056	17252
Contribution	5000	5001	5002	5003	5004	5005	5006	5007	5008	5009	5010	5011
R/E	0	850	1728	2633	3568	4532	5583	6610	7669	8761	9886	11046
Inc	850	878	906	935	964	1051	1027	1059	1092	1125	1160	1195
L + OE	5850	6729	7635	8571	9536	10588	11616	12676	13769	14895	16056	17252
CFO		1118	1145	1174	1203	1234	1321	1297	1330	1363	1397	1432
Accruals	150.00	-240.00	-239.75	-239.49	-239.23	-182.39	-293.84	-238.37	-238.08	-237.78	-237.47	-237.16

TABLE 11 (CONTINUED)
HYPOTHETICAL DATA -- DISCRETIONARY CHANGE IN BAD DEBT EXPENSE
CHANGE IN YEAR 5

	12	13	14	15	16	17	18	19	20	21	22
Cash Sales	2017	2068	2119	2172	2227	2282	2339	2398	2458	2519	2582
Cr. Sales	672	689	706	724	742	761	780	799	819	840	861
Tot. Rev.	2690	2757	2826	2897	2969	3043	3119	3197	3277	3359	3443
Comm Exp	1076	1103	1130	1159	1188	1217	1248	1279	1311	1344	1377
B/D Expense	133	136	140	143	147	150	154	158	162	166	170
Deprec.	250	250	250	250	250	250	250	250	250	250	250
	1459	1489	1520	1552	1584	1618	1652	1687	1723	1760	1797
NI	1231	1268	1306	1345	1385	1426	1468	1510	1554	1600	1646
Cash	16182	17687	19229	20810	22430	24091	25793	27538	29326	31159	33038
A/R	540	553	567	581	596	611	626	641	657	674	691
PPE	5012	5013	5014	5015	5016	5017	5018	5019	5020	5021	5022
A/D	(3250)	(3500)	(3750)	(4000)	(4250)	(4500)	(4750)	(5000)	(5250)	(5500)	(5750)
Assets	18484	19753	21060	22406	23791	25218	26687	28198	29754	31354	33001
Contribution	5012	5013	5014	5015	5016	5017	5018	5019	5020	5021	5022
R/E	12241	13472	14740	16046	17391	18775	20201	21669	23179	24734	26333
Inc	1231	1268	1306	1345	1385	1426	1468	1510	1554	1600	1646
L + OE	18484	19753	21060	22406	23791	25218	26687	28198	29754	31354	33001
CFO	1468	1505	1542	1581	1620	1661	1702	1745	1788	1833	1879
Accruals	-236.84	-236.51	-236.17	-235.83	-235.47	-235.11	-234.74	-234.36	-233.96	-233.56	-233.15

TABLE 12
HYPOTHETICAL DATA -- DISCRETIONARY CHANGE IN BAD DEBT EXPENSE
CHANGE IN YEAR 10

	0	1	2	3	4	5	6	7	8	9	10	11
Cash Sales	1500	1538	1576	1615	1656	1697	1740	1783	1828	1873	1920	1968
Cr. Sales	500	513	525	538	552	566	580	594	609	624	640	656
Tot. Rev.	2000	2050	2101	2154	2208	2263	2319	2377	2437	2498	2560	2624
Comm Exp	800	820	841	862	883	905	928	951	975	999	1024	1050
B/D Expense	100	103	105	108	110	113	116	119	122	125	64	130
Deprec.	250	250	250	250	250	250	250	250	250	250	250	250
	1150	1173	1196	1219	1243	1268	1294	1320	1347	1374	1338	1429
NI	850	878	906	935	964	995	1026	1058	1090	1124	1222	1195
Cash	700	1818	2963	4137	5340	6574	7838	9134	10463	11824	13220	14714
A/R	400	410	420	431	442	453	464	475	487	500	576	526
PPE	5000	5001	5002	5003	5004	5005	5006	5007	5008	5009	5010	5011
A/D	(250)	(500)	(750)	(1000)	(1250)	(1500)	(1750)	(2000)	(2250)	(2500)	(2750)	(3000)
Assets	5850	6729	7635	8571	9536	10532	11558	12617	13708	14833	16056	17252
Contribution	5000	5001	5002	5003	5004	5005	5006	5007	5008	5009	5010	5011
R/E	0	850	1728	2633	3568	4532	5527	6552	7610	8700	9824	11046
Inc	850	878	906	935	964	995	1026	1058	1090	1124	1222	1195
L + OE	5850	6729	7635	8571	9536	10532	11558	12617	13708	14833	16056	17252
CFO		1118	1145	1174	1203	1234	1264	1296	1328	1362	1396	1494
Accruals	150.00	-240.00	-239.75	-239.49	-239.23	-238.96	-238.69	-238.40	-238.11	-237.82	-173.51	-299.60

TABLE 12 (CONTINUED)
HYPOTHETICAL DATA -- DISCRETIONARY CHANGE IN BAD DEBT EXPENSE
CHANGE IN YEAR 10

	12	13	14	15	16	17	18	19	20	21	22
Cash Sales	2017	2068	2119	2172	2227	2282	2339	2398	2458	2519	2582
Cr. Sales	672	689	706	724	742	761	780	799	819	840	861
Tot. Rev.	2690	2757	2826	2897	2969	3043	3119	3197	3277	3359	3443
Comm Exp	1076	1103	1130	1159	1188	1217	1248	1279	1311	1344	1377
B/D Expense	133	136	140	143	147	150	154	158	162	166	170
Deprec.	250	250	250	250	250	250	250	250	250	250	250
	1459	1489	1520	1552	1584	1618	1652	1687	1723	1760	1797
NI	1231	1268	1306	1345	1385	1426	1468	1510	1554	1600	1646
Cash	16182	17687	19229	20810	22430	24091	25793	27538	29326	31159	33038
A/R	540	553	567	581	596	611	626	641	657	674	691
PPE	5012	5013	5014	5015	5016	5017	5018	5019	5020	5021	5022
A/D	(3250)	(3500)	(3750)	(4000)	(4250)	(4500)	(4750)	(5000)	(5250)	(5500)	(5750)
Assets	18484	19753	21060	22406	23791	25218	26687	28198	29754	31354	33001
Contribution	5012	5013	5014	5015	5016	5017	5018	5019	5020	5021	5022
R/E	12241	13472	14740	16046	17391	18775	20201	21669	23179	24734	26333
Inc	1231	1268	1306	1345	1385	1426	1468	1510	1554	1600	1646
L + OE	18484	19753	21060	22406	23791	25218	26687	28198	29754	31354	33001
CFO	1468	1505	1542	1581	1620	1661	1702	1745	1788	1833	1879
Accruals	-236.84	-236.51	-236.17	-235.83	-235.47	-235.11	-234.74	-234.36	-233.96	-233.56	-233.15

TABLE 13
HYPOTHETICAL DATA -- DISCRETIONARY CHANGE IN BAD DEBT EXPENSE
CHANGE IN YEAR 13

	0	1	2	3	4	5	6	7	8	9	10	11
Cash Sales	1500	1538	1576	1615	1656	1697	1740	1783	1828	1873	1920	1968
Cr. Sales	500	513	525	538	552	566	580	594	609	624	640	656
Tot. Rev.	2000	2050	2101	2154	2208	2263	2319	2377	2437	2498	2560	2624
Comm Exp	800	820	841	862	883	905	928	951	975	999	1024	1050
B/D Expense	100	103	105	108	110	113	116	119	122	125	128	131
Deprec.	250	250	250	250	250	250	250	250	250	250	250	250
	1150	1173	1196	1219	1243	1268	1294	1320	1347	1374	1402	1431
NI	850	878	906	935	964	995	1026	1058	1090	1124	1158	1193
Cash	700	1818	2963	4137	5340	6574	7838	9134	10463	11824	13220	14650
A/R	400	410	420	431	442	453	464	475	487	500	512	525
PPE	5000	5001	5002	5003	5004	5005	5006	5007	5008	5009	5010	5011
A/D	(250)	(500)	(750)	(1000)	(1250)	(1500)	(1750)	(2000)	(2250)	(2500)	(2750)	(3000)
Assets	5850	6729	7635	8571	9536	10532	11558	12617	13708	14833	15992	17186
Contribution	5000	5001	5002	5003	5004	5005	5006	5007	5008	5009	5010	5011
R/E	0	850	1728	2633	3568	4532	5527	6552	7610	8700	9824	10982
Inc	850	878	906	935	964	995	1026	1058	1090	1124	1158	1193
L + OE	5850	6729	7635	8571	9536	10532	11558	12617	13708	14833	15992	17186
CFO		1118	1145	1174	1203	1234	1264	1296	1328	1362	1396	1430
Accruals	150.00	-240.00	-239.75	-239.49	-239.23	-238.96	-238.69	-238.40	-238.11	-237.82	-237.51	-237.20

TABLE 13 (CONTINUED)
HYPOTHETICAL DATA -- DISCRETIONARY CHANGE IN BAD DEBT EXPENSE
CHANGE IN YEAR 13

	12	13	14	15	16	17	18	19	20	21	22
Cash Sales	2017	2068	2119	2172	2227	2282	2339	2398	2458	2519	2582
Cr. Sales	672	689	706	724	742	761	780	799	819	840	861
Tot. Rev.	2690	2757	2826	2897	2969	3043	3119	3197	3277	3359	3443
Comm Exp	1076	1103	1130	1159	1188	1217	1248	1279	1311	1344	1377
B/D Expense	134	69	140	143	147	150	154	158	162	166	170
Deprec.	250	250	250	250	250	250	250	250	250	250	250
	1460	1422	1520	1552	1584	1618	1652	1687	1723	1760	1797
NI	1229	1335	1306	1345	1385	1426	1468	1510	1554	1600	1646
Cash	16117	17619	19229	20810	22430	24091	25793	27538	29326	31159	33038
A/R	538	620	567	581	596	611	626	641	657	674	691
PPE	5012	5013	5014	5015	5016	5017	5018	5019	5020	5021	5022
A/D	(3250)	(3500)	(3750)	(4000)	(4250)	(4500)	(4750)	(5000)	(5250)	(5500)	(5750)
Assets	18416	19753	21060	22406	23791	25218	26687	28198	29754	31354	33001
Contribution	5012	5013	5014	5015	5016	5017	5018	5019	5020	5021	5022
R/E	12175	13404	14740	16046	17391	18775	20201	21669	23179	24734	26333
Inc	1229	1335	1306	1345	1385	1426	1468	1510	1554	1600	1646
L + OE	18416	19753	21060	22406	23791	25218	26687	28198	29754	31354	33001
CFO	1466	1503	1609	1581	1620	1661	1702	1745	1788	1833	1879
Accruals	-236.88	-167.63	-303.42	-235.83	-235.47	-235.11	-234.74	-234.36	-233.96	-233.56	-233.15

TABLE 14
HYPOTHETICAL DATA -- DISCRETIONARY CHANGE IN BAD DEBT EXPENSE
CHANGE IN YEAR 15

	0	1	2	3	4	5	6	7	8	9	10	11
Cash Sales	1500	1538	1576	1615	1656	1697	1740	1783	1828	1873	1920	1968
Cr. Sales	500	513	525	538	552	566	580	594	609	624	640	656
Tot. Rev.	2000	2050	2101	2154	2208	2263	2319	2377	2437	2498	2560	2624
Comm Exp	800	820	841	862	883	905	928	951	975	999	1024	1050
B/D Expense	100	103	105	108	110	113	116	119	122	125	128	131
Deprec.	250	250	250	250	250	250	250	250	250	250	250	250
	1150	1173	1196	1219	1243	1268	1294	1320	1347	1374	1402	1431
NI	850	878	906	935	964	995	1026	1058	1090	1124	1158	1193
Cash	700	1818	2963	4137	5340	6574	7838	9134	10463	11824	13220	14650
A/R	400	410	420	431	442	453	464	475	487	500	512	525
PPE	5000	5001	5002	5003	5004	5005	5006	5007	5008	5009	5010	5011
A/D	(250)	(500)	(750)	(1000)	(1250)	(1500)	(1750)	(2000)	(2250)	(2500)	(2750)	(3000)
Assets	5850	6729	7635	8571	9536	10532	11558	12617	13708	14833	15992	17186
Contribution	5000	5001	5002	5003	5004	5005	5006	5007	5008	5009	5010	5011
R/E	0	850	1728	2633	3568	4532	5527	6552	7610	8700	9824	10982
Inc	850	878	906	935	964	995	1026	1058	1090	1124	1158	1193
L + OE	5850	6729	7635	8571	9536	10532	11558	12617	13708	14833	15992	17186
CFO		1118	1145	1174	1203	1234	1264	1296	1328	1362	1396	1430
Accruals	150.00	-240.00	-239.75	-239.49	-239.23	-238.96	-238.69	-238.40	-238.11	-237.82	-237.51	-237.20

TABLE 14 (CONTINUED)
HYPOTHETICAL DATA -- DISCRETIONARY CHANGE IN BAD DEBT EXPENSE
CHANGE IN YEAR 15

	12	13	14	15	16	17	18	19	20	21	22
Cash Sales	2017	2068	2119	2172	2227	2282	2339	2398	2458	2519	2582
Cr. Sales	672	689	706	724	742	761	780	799	819	840	861
Tot. Rev.	2690	2757	2826	2897	2969	3043	3119	3197	3277	3359	3443
Comm Exp	1076	1103	1130	1159	1188	1217	1248	1279	1311	1344	1377
B/D Expense	134	138	141	72	147	150	154	158	162	166	170
Deprec.	250	250	250	250	250	250	250	250	250	250	250
	1460	1491	1522	1481	1584	1618	1652	1687	1723	1760	1797
NI	1229	1266	1304	1416	1385	1426	1468	1510	1554	1600	1646
Cash	16117	17619	19160	20739	22430	24091	25793	27538	29326	31159	33038
A/R	538	551	565	652	596	611	626	641	657	674	691
PPE	5012	5013	5014	5015	5016	5017	5018	5019	5020	5021	5022
A/D	(3250)	(3500)	(3750)	(4000)	(4250)	(4500)	(4750)	(5000)	(5250)	(5500)	(5750)
Assets	18416	19684	20989	22406	23791	25218	26687	28198	29754	31354	33001
Contribution	5012	5013	5014	5015	5016	5017	5018	5019	5020	5021	5022
R/E	12175	13404	14671	15975	17391	18775	20201	21669	23179	24734	26333
Inc	1229	1266	1304	1416	1385	1426	1468	1510	1554	1600	1646
L + OE	18416	19684	20989	22406	23791	25218	26687	28198	29754	31354	33001
CFO	1466	1503	1540	1579	1691	1661	1702	1745	1788	1833	1879
Accruals	-236.88	-236.55	-236.21	-163.46	-306.12	-235.11	-234.74	-234.36	-233.96	-233.56	-233.15

TABLE 15
Coefficient Estimates and Error Analysis
Effects of Discretionary Changes in the Bad Debt Expense in the Hypothetical Data
Discretionary Change in the Estimates of Bad Debts in Years 5, 10, 13 and 15

	Coefficient	Standard		
Variable	Estimates	Deviation	t-statistic	p-value
Bad Debt Chg. in Period 5				
α	3,112.53918	107,335	0.03	0.98
β_1	0.54337	14.55	0.04	0.97
β_2	-0.67546	21.61	-0.03	0.98
Bad Debt Chg. in Period 10				
α	-10,353	59,115	-0.18	0.86
β_1	-1.16876	7.97	-0.15	0.89
β_2	2.03384	11.90	0.17	0.87
Bad Debt Chg. in Period 13				
α	-49,080	70,657	-0.69	0.50
β_1	-6.50618	9.74	-0.67	0.51
β_2	9.83070	14.23	0.69	0.50
Bad Debt Chg. in Period 15				
α	-28,804	54,345	-0.53	0.60
β_1	-3.67736	7.42	-0.50	0.63
β_2	5.74807	10.94	0.53	0.61
Estimates of DA				
B/D Chg. Year:	Predicted TA	Actual TA	Est. of DA	Actual DA
Five	-233.99	-233.15	0.84	0.00
Ten	-237.21	-233.15	4.06	0.00
Thirteen	-256.61	-233.15	23.46	0.00
Fifteen	-246.02	-233.15	12.87	0.00

TABLE 16
HYPOTHETICAL DATA
DISCRETIONARY CHANGE IN BAD DEBT EXPENSE AND DEPRECIATION EXPENSE
DISCRETIONARY BAD DEBT CHANGE IN YEAR 10 AND DISCRETIONARY DEPRECIATION CHANGE IN YEAR 12

	0	1	2	3	4	5	6	7	8	9	10	11
Cash Sales	1500	1538	1576	1615	1656	1697	1740	1783	1828	1873	1920	1968
Cr. Sales	500	513	525	538	552	566	580	594	609	624	640	656
Tot. Rev.	2000	2050	2101	2154	2208	2263	2319	2377	2437	2498	2560	2624
Comm Exp	800	820	841	862	883	905	928	951	975	999	1024	1050
B/D Expense	100	103	105	108	110	113	116	119	122	125	64	131
Deprec.	250	250	250	250	250	250	250	250	250	250	250	250
	1150	1173	1196	1219	1243	1268	1294	1320	1347	1374	1338	1431
NI	850	878	906	935	964	995	1026	1058	1090	1124	1222	1193
Cash	700	1818	2963	4137	5340	6574	7838	9134	10463	11824	13220	14714
A/R	400	410	420	431	442	453	464	475	487	500	576	525
PPE	5000	5001	5002	5003	5004	5005	5006	5007	5008	5009	5010	5011
A/D	(250)	(500)	(750)	(1000)	(1250)	(1500)	(1750)	(2000)	(2250)	(2500)	(2750)	(3000)
Assets	5850	6729	7635	8571	9536	10532	11558	12617	13708	14833	16056	17250
Contribution	5000	5001	5002	5003	5004	5005	5006	5007	5008	5009	5010	5011
R/E	0	850	1728	2633	3568	4532	5527	6552	7610	8700	9824	11046
Inc	850	878	906	935	964	995	1026	1058	1090	1124	1222	1193
L + OE	5850	6729	7635	8571	9536	10532	11558	12617	13708	14833	16056	17250
CFO		1118	1145	1174	1203	1234	1264	1296	1328	1362	1396	1494
Accruals	150.00	-240.00	-239.75	-239.49	-239.23	-238.96	-238.69	-238.40	-238.11	-237.82	-173.51	-301.20

TABLE 16 (CONTINUED)
HYPOTHETICAL DATA
DISCRETIONARY CHANGE IN BAD DEBT EXPENSE AND DEPRECIATION EXPENSE
DISCRETIONARY BAD DEBT CHANGE IN YEAR 10 AND DISCRETIONARY DEPRECIATION CHANGE IN YEAR 12

	12	13	14	15	16	17	18	19	20	21	22
Cash Sales	2017	2068	2119	2172	2227	2282	2339	2398	2458	2519	2582
Cr. Sales	672	689	706	724	742	761	780	799	819	840	861
Tot. Rev.	2690	2757	2826	2897	2969	3043	3119	3197	3277	3359	3443
Comm Exp	1076	1103	1130	1159	1188	1217	1248	1279	1311	1344	1377
B/D Expense	134	138	141	145	148	152	156	160	164	168	172
Deprec.	125	125	125	125	125	125	125	125	125	125	125
	1335	1366	1397	1428	1461	1494	1529	1564	1600	1637	1674
NI	1354	1391	1429	1468	1508	1549	1591	1634	1677	1723	1769
Cash	16181	17683	19224	20803	22421	24080	25781	27524	29310	31141	33018
A/R	538	551	565	579	594	609	624	639	655	672	689
PPE	5012	5013	5014	5015	5016	5017	5018	5019	5020	5021	5022
A/D	(3125)	(3250)	(3375)	(3500)	(3625)	(3750)	(3875)	(4000)	(4125)	(4250)	(4375)
Assets	18605	19998	21428	22897	24406	25956	27548	29182	30861	32584	34354
Contribution	5012	5013	5014	5015	5016	5017	5018	5019	5020	5021	5022
R/E	12239	13593	14985	16414	17882	19390	20939	22530	24163	25841	27563
Inc	1354	1391	1429	1468	1508	1549	1591	1634	1677	1723	1769
L + OE	18605	19998	21428	22897	24406	25956	27548	29182	30861	32584	34354
CFO	1466	1503	1540	1579	1618	1659	1700	1743	1786	1831	1877
Accruals	-111.88	-111.55	-111.21	-110.87	-110.52	-110.15	-109.78	-109.40	-109.01	-108.61	-108.20

TABLE 17
Coefficient Estimates and Error Analysis
Effect of Discretionary Accrual Changes in the Hypothetical Data
Discretionary Change in Bad Debt Expense in Year 10 and
Discretionary Change in Depreciation Expense in Year 12

Variable	Coefficient Estimates	Standard Deviation	t-statistic	p-value
α	198,108	102,195	1.94	0.07
β_1	31.83113	13.81	2.31	0.03
β_2	-39.98036	20.57	-1.94	0.07
	Predicted TA	Actual TA	Est. of DA	Actual DA
	-0.19	-108.20	-108.01	0.00

TABLE 18
Coefficient Estimates and Error Analysis
Effects of Discretionary Depreciation Changes in the Hypothetical Data Set With Nonstationary Periods Removed by TIMVAR
Discretionary Depreciation Changes in Years 5, 10 and 15

Variable	Coefficient Estimates	Standard Deviation	t-statistic	p-value
Deprec. Change in Period 5				
α	-54.12128	17.67644	-3.06	0.0099
β_1	0.20882	0.00217	96.03	< 0.0001
β_2	-0.01426	0.00356	-4.01	0.0017
Deprec. Change in Period 10				
α	-14.1545	10.51	-1.35	0.22
β_1	0.21267	0.00125	170.50	< 0.0001
β_2	-0.02228	0.002	-10.55	< 0.0001
Deprec. Change in Period 15				
α	12.55	4.57	2.75	0.1109
β_1	0.2143	0.0005	465.04	< 0.0001
β_2	-0.02763	0.0009	-30.11	0.0011
Estimates of DA				
Change Year:	Predicted TA	Actual TA	Est. of DA	Actual DA
Five	-108.20	-108.20	0.00	0.00
Ten	-108.18	-108.20	-0.02	0.00
Fifteen	-108.20	-108.20	0.00	0.00

TABLE 19
Coefficient Estimates and Error Analysis
Effects of Discretionary Changes in the Bad Debt Expense in the Hypothetical Data
Nonstationary Periods Removed By TIMVAR
Discretionary Changes in the Estimates of Bad Debts in Years 5, 10, 13 and 15

Variable	Coefficient Estimates	Standard Deviation	t-statistic	p-value
Bad Debt Chg. in Period 5				
α	-88.4775	48.61	-1.82	0.096
β_1	0.2198	0.0062	35.46	< 0.0001
β_2	-0.0325	0.0098	-3.32	0.0068
Bad Debt Chg. in Period 10				
α	23,307	63,301	0.37	0.72
β_1	3.3678	8.58	0.39	0.70
β_2	-4.7418	12.74	-0.37	0.71
Bad Debt Chg. in Period 13				
α	-12.68	33.72	-0.38	0.72
β_1	0.2258	0.0036	62.72	< 0.0001
β_2	-0.0477	0.0068	-7.04	0.0009
Bad Debt Chg. in Period 15				
α	-198,414	166,658	-1.19	0.35
β_1	-16.3059	21.07	-0.77	0.35
β_2	39.73513	33.53	1.19	0.35
Estimates of DA				
B/D Chg. Year:	Predicted TA	Actual TA	Est. of DA	Actual DA
Five	-233.13	-233.15	-0.02	0.00
Ten	-233.14	-233.15	-0.01	0.00
Thirteen	-248.89	-233.15	15.74	0.00
Fifteen	-233.54	-233.15	0.39	0.00

TABLE 20
Coefficient Estimates and Error Analysis
Effect of Discretionary Accrual Changes in the Hypothetical Data
Nonstationary Periods Removed by TIMVAR
Discretionary Change in Bad Debt Expense in Year 10 and
Discretionary Change in Depreciation in Year 12

Variable	Coefficient Estimates	Standard Deviation	t-statistic	p-value
α	-8.4622	10.11	-0.84	0.43
β_1	0.2131	0.0012	174.29	<0.0001
β_2	-0.02342	0.0020	-11.52	<0.0001
	Predicted TA	Actual TA	Est. of DA	Actual DA
	-108.19	-108.20	-0.01	0.00

Table 21
Parameter Estimates for the Jones Model and the Stationary Jones Model
Models with 2 and 4 year test periods using 762 firms

$$ACCR_{it}/Assets_{it-1} = \alpha_i(1/ Assets_{it-1}) + \beta_{1i}(\Delta REV_{it}/ Assets_{it-1}) + \beta_{2i}(PPE_{it}/ Assets_{it-1}) \quad (2)$$

Panel A: Jones and Stationary Jones Models Estimated With 2-Year Test Period

Coefficient Estimates	Mean	Standard Deviation
Jones Model		
a	**11.4690**	**369.8463**
b_1	**0.0875**	**0.2268**
b_2	**-0.1456**	**0.3957**
Stationary Jones Model		
a	**-65.0520**	**432.5069**
b_1	**0.0667**	**0.3139**
b_2	**-0.1099**	**0.9438**

TABLE 21 (continued)
Parameter Estimates for the Jones Model and the Stationary Jones Model
Models with 2 and 4 year test periods using 762 firms

Panel B: Jones and Stationary Jones Models Estimated With 4-Year Test Period

Coefficient Estimates	Mean	Standard Deviation
Jones Model		
a	**21.8486**	**308.5313**
b_1	**0.0892**	**0.2132**
b_2	**-0.1500**	**0.4123**
Stationary Jones Model		
a	**-57.4121**	**474.6473**
b_1	**0.1128**	**0.5489**
b_2	**-0.1546**	**0.9931**

TABLE 22
Forecast Accuracy of the Jones (1991) Model and the Stationary Jones Model
Models estimated over 16 and 14 years using 762 firms

Panel A: Distributional Statistics for Forecast Errors

Model Estimated Over 16 Years

Model	Mean	Std. Dev.	Percentiles 10th	25th	Median	75th	90th
Jones Model	-0.0089	0.1259	-0.1329	-0.0573	-0.0083	0.0413	0.1046
Stationary Jones	-0.0016	0.1110	-0.1095	-0.0451	0.0015	0.0493	0.0989

Model Estimated Over 14 Years

Model	Mean	Std. Dev.	Percentiles 10th	25th	Median	75th	90th
Jones Model	-0.0822	0.1738	-0.1979	-0.1257	-0.0749	-0.0210	0.0347
Stationary Jones	-0.0442	0.1091	-0.0685	-0.0139	0.0478	0.1042	0.1557

Panel B: Percent of Times Each Model Has Lowest Sum of Squared Forecast Errors (SSFE)

Model Estimated Over 16 Years

Model	Lowest SSFE	Highest SSFE
Jones Model	45.44%	54.56%
Stationary Jones	54.56%	45.44%

Model Estimated Over 14 Years

Model	Lowest SSFE	Highest SSFE
Jones Model	31.80 %	68.20 %
Stationary Jones	68.20 %	31.80 %

Table 22 (continued)
Forecast Accuracy of the Jones (1991) Model and the Stationary Jones Model
Models estimated over 16 and 14 years using 762 firms

Panel C: Distribution of Firm-Specific Explained Variation

$R^2 = 1 - ESS/TSS$

where:

$ESS = \sum(\text{actual} - \text{forecast})^2$
$TSS = \sum(\text{actual} - \text{mean})^2$

Model Estimated Over 16 Years

		Std.	Percentiles				
Model	Mean	Dev.	10^{th}	25th	Median	75^{th}	90^{th}
Jones Model	-9.9837	72.2333	-15.5113	-2.7354	0.0382	0.7818	0.9528
Stationary Jones	-4.0895	34.8688	-5.0239	-1.7540	0.2322	0.8108	0.9788

Percent With Positive R^2

Jones Model	51.00%
Stationary Jones	62.00%

Model Estimated Over 14 Years

		Std.	Percentiles				
Model	Mean	Dev.	10th	25th	Median	75^{th}	90^{th}
Jones Model	-1.2592	5.5898	-4.2221	-1.1088	0.2691	0.7617	0.9070
Stationary Jones	0.5103	0.4889	-0.1592	0.1143	0.6856	0.9536	0.9948

Percent With Positive R^2

Jones Model	57.00%
Stationary Jones	79.00%

Table 22 (continued)
Forecast Accuracy of the Jones (1991) Model and the Stationary Jones Model
Models estimated over 16 and 14 years using 762 firms

Panel D: Distribution of Firm-Specific Explained Variation, Relative to Naïve Model of Forecast Accrual of -5% of Assets

$$R^2 = 1 - ESS/TSS$$

where:

$$ESS = \sum(\text{actual} - \text{forecast})^2$$
$$TSS = \sum(\text{actual} - (-5\%*\text{Assets}))^2$$

Model Estimated Over 16 Years

Model	Mean	Std. Dev.	Percentiles 10th	25th	Median	75th	90th
Jones Model	0.9815	0.3852	0.9986	0.9999	1.0000	1.0000	1.0000
Stationary Jones	0.9888	0.0967	0.9967	0.9999	1.0000	1.0000	1.0000

Percent With Positive R^2

Jones Model	100.00%
Stationary Jones	100.00%

Model Estimated Over 14 Years

Model	Mean	Std. Dev.	Percentiles 10th	25th	Median	75th	90th
Jones Model	0.9954	0.0308	0.9981	0.9999	1.0000	1.0000	1.0000
Stationary Jones	0.9966	0.0414	0.9995	1.0000	1.0000	1.0000	1.0000

Percent With Positive R^2

Jones Model	100.00%
Stationary Jones	100.00%

TABLE 23

Nonlinear Generalized Least Squares Estimation (the Mishkin (1983) Test) of the Market Pricing of Cash from Operations, Nondiscretionary Accruals and Discretionary Accruals with Respect to Their Implications for One-Year-Ahead Earnings

Panel A: Market Pricing of Earnings Components with Respect to Their Implications for One-Year-Ahead Earnings

$$EARN_{t+1} = \gamma_0 + \gamma_1 CFO_t + \gamma_2 NDA_t + \gamma_3 DA_t + v_{t+1} \quad (16)$$

$$SIZEAJR_{t+1} = \alpha + \beta(EARN_{t+1} - \gamma_0 - \gamma^*_1 CFO_t - \gamma^*_2 NDA_t - \gamma^*_3 DA_t) + \varepsilon_{t+1}{}^{a} \quad (17)$$

Jones Model

Forecasting Coefficients			Valuation Coefficients		
Parameter	Estimate	Std. Error	Parameter	Estimate	Std. Error
γ_1 (CFO)	.94	.108	γ^*_1 (CFO)	.82	.350
γ_2 (NDA)	.22	.052	γ^*_2 (NDA)	.46	.201
γ_3 (DA)	.38	.086	γ^*_3 (DA)	.68	.238

Stationary Jones Model

Forecasting Coefficients			Valuation Coefficients		
Parameter	Estimate	Std. Error	Parameter	Estimate	Std. Error
γ_1 (CFO)	.43	.234	γ^*1 (CFO)	.39	.157
γ_2 (NDA)	.64	.309	γ^*_2 (NDA)	.64	.254
γ_3 (DA)	.46	.301	γ^*_3 (DA)	.47	.272

TABLE 23 (continued)
Nonlinear Generalized Least Squares Estimation (the Mishkin (1983) Test) of the Market Pricing of Cash from Operations, Nondiscretionary Accruals and Discretionary Accruals with Respect to Their Implications for One-Year-Ahead Earnings

Panel B: Tests of Rational Pricing of Earnings Components

Jones Model

Null Hypothesis	Likelihood Ratio Statistic	Significance Level
CFO: $\gamma^*_1 = \gamma_1$	0.63[b]	p=0.42
NDA: $\gamma^*_2 = \gamma_2$	3.11	p=0.08
DA: $\gamma^*_3 = \gamma_3$	10.58	p=0.001
NDA, DA: $\gamma^*_2 = \gamma_2$ & $\gamma^*_3 = \gamma_3$	15.91	p=0.0004
CFO, NDA, DA: $\gamma^*_1 = \gamma_1$ & $\gamma^*_2 = \gamma_2$ & $\gamma^*_3 = \gamma_3$	16.40	p=0.0009

Stationary Jones Model

Null Hypothesis	Likelihood Ratio Statistic	Significance Level
CFO: $\gamma^*_1 = \gamma_1$	0.99	p=0.32
NDA: $\gamma^*_2 = \gamma_2$	1.51	p=0.22
DA: $\gamma^*_3 = \gamma_3$	2.10	p=0.15
NDA, DA: $\gamma^*_2 = \gamma_2$ & $\gamma^*_3 = \gamma_3$	2.13	p=0.35
CFO, NDA, DA: $\gamma^*_1 = \gamma_1$ & $\gamma^*_2 = \gamma_2$ & $\gamma^*_3 = \gamma_3$	2.13	p=0.55

[a] Equations (xa) and (xb) are jointly estimated using an iterative generalized nonlinear least squares estimation procedure based on 1,776 observations during 1998-2001.
[b] $2NLn(SSR^c/SSR^u) = 2 * 1{,}776 * Ln(1{,}691.4/1{,}691.1) = 0.63$.
The variables are defined in Table 1.

TABLE 24
Hedge Portfolio Results For Stationary Jones Model versus Jones (1991) Model Models Estimated Over 16 Years With Longest Stationary Period Prior To Test Period Used for Stationary Jones Model

Portfolio Rank[a]	Jones Model t + 1		t + 2		Stationary Jones Model t + 1		t + 2	
Low	0.103		0.112		0.113		0.035	
	(1.78)	**	(1.70)	*	(1.59)	*	(0.59)	
2	0.340		-0.117		0.093		0.042	
	(4.03)	**	(-2.72)	**	(1.65)	**	(0.69)	
3	0.206		0.108		0.295		-0.043	
	(3.37)	**	(1.78)	**	(3.71)	**	(-0.90)	
4	0.211		-0.008		0.179		0.121	
	(3.22)	**	(-0.15)		(4.20)	**	(1.83)	**
5	0.160		0.030		0.112		0.255	
	(2.87)	**	(0.63)		(1.62)	*	(3.79)	**
6	0.104		0.080		0.122		-0.062	
	(2.27)	**	(1.29)	*	(2.82)	**	(-1.26)	
7	0.041		0.096		0.086		0.093	
	(0.90)		(1.36)	*	(1.80)	**	(2.02)	**
8	0.132		0.084		0.168		0.090	
	(1.97)	**	(1.97)	**	(2.45)	**	(1.48)	*
9	0.062		0.091		0.100		-0.055	
	(1.41)	*	(1.47)	*	(2.13)	**	(-1.26)	
High	-0.001		-0.053		0.076		-0.043	
	(-0.11)		(-1.10)		(1.21)		(-0.81)	
Hedge	0.105		0.165		0.038		0.078	
	(1.77)	*	(2.02)	**	(0.46)		(0.97)	
N	1,132		566		1,132		566	

* and ** denote significance at the 0.10 and 0.05 level, respectively, based on a one-tailed t-test for the test period (2 years) of annual portfolio abnormal returns.
[a] Portfolio deciles are formed annually based on the ranking of discretionary accruals. The hedge portfolio is formed by taking a long position in the lowest decile portfolio and a short position in the highest decile portfolio based on discretionary accruals.

TABLE 25

Hedge Portfolio Results For Stationary Jones Model versus Jones (1991) Model Models Estimated Over 14 Years With Longest Stationary Period Prior To Test Period Used for Stationary Jones Model

Portfolio Rank[a]	Jones Model t + 1		t + 2	t + 3		Stationary Jones Model t + 1	t + 2	t + 3	
Low	0.054		0.022	0.093		0.000	0.027	0.097	
	(1.80)	**	(0.22)	(0.92)		(0.00)	(0.24)	(1.37)	*
2	0.176		-0.075	0.162		-0.094	0.048	0.224	
	(2.34)	**	(-0.85)	(2.00)	**	(-1.25)	(0.48)	(2.23)	**
3	0.093		0.020	0.172		-0.012	0.035	0.139	
	(1.21)		(0.21)	(2.33)	**	(-0.16)	(0.44)	(1.46)	*
4	-0.019		0.066	0.041		-0.009	-0.012	0.175	
	(-0.28)		(0.84)	(0.71)		(-0.14)	(-0.18)	(2.44)	**
5	0.062		-0.012	0.211		0.012	0.017	0.167	
	(0.85)		(-0.17)	(2.72)	**	(0.16)	(0.22)	(2.27)	**
6	-0.093		-0.022	0.181		0.027	0.068	0.160	
	(-0.82)		(-0.34)	(3.57)	**	(0.24)	(0.59)	(2.08)	**
7	-0.035		0.107	0.121		-0.007	0.021	0.113	
	(-0.44)		(1.10)	(1.54)	*	(-0.09)	(0.27)	(1.63)	*
8	-0.077		0.066	0.154		-0.003	-0.014	0.139	
	(-1.21)		(0.59)	(2.04)	**	(-0.05)	(-0.21)	(2.18)	**
9	-0.149		-0.032	0.194		-0.002	-0.038	0.107	
	(-2.25)	**	(-0.49)	(2.18)	**	(-0.02)	(-0.50)	(1.68)	**
High	-0.115		0.023	0.140		-0.025	0.017	0.131	
	(-1.71)	*	(0.21)	(1.50)	*	(-0.31)	(0.15)	(1.39)	*
Hedge	0.169		-0.001	-0.048		0.026	0.010	-0.033	
	(2.32)	**	(-0.01)	(-0.35)		(0.19)	(0.06)	(-0.28)	
N	2,372		1,779	1,186		2,372	1,779	1,186	

* and ** denote significance at the 0.10 and 0.05 level, respectively, based on a one-tailed t-test for the test period (2 years) of annual portfolio abnormal returns.

[a] Portfolio deciles are formed annually based on the ranking of discretionary accruals. The hedge portfolio is formed by taking a long position in the lowest decile portfolio and a short position in the highest decile portfolio based on discretionary accruals.

VITA

J Riley Shaw 2

Candidate for the Degree of

Doctor of Philosophy

Thesis: AN INVESTIGATION OF DISCRETIONARY ACCRUAL MODELS AND THE ACCRUAL ANOMALY

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Minor Field: Accounting

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