The Earnings Quality Status of Contemporary Big-4 Affiliated Auditors amidst ChuoAoyama Crisis

Ahamed Roshan Ajward

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1. Introduction

ChuoAoyama, one of the so-called Big-4 affiliated auditors in Japan was ordered to suspend operations in May 2006 by Japan’s Financial Services Agency (FSA) following its involvement in a massive corporate fraud in one of its major clients, Kanebo Ltd. (Skinner & Srinivasan, 2009). This event and in other related recent events, where auditors were involved in assisting corporate fraud and rendering poor quality auditing services has prompted a renewed call for assessing dimensions such as audit quality, earnings quality and related constructs of listed companies in the Japanese context. Conventionally, an auditor's size (as defined based on the US Big-n audit firm status) is operationalized as audit quality (see Becker et al., 1998). Being a Big-4 affiliated auditor, ChuoAoyama, however, may indicate evidence to the contrary that auditor's size may not signify audit quality in the current context. Hence, this study examines the status of Japanese Big-4 affiliated audit firms based on their clients’ (i.e. of listed companies) accrual based earnings quality. Earnings quality has been chosen as the basis of evaluation due to the strong positive relationship between auditor's size (as conventionally defined as being a Big-n audit firm or not) and earnings quality (accrual based) indicated by the extant empirical research (see Becker et al., 1998, Chen et al., 2005). Further, accrual based earnings quality of entities has been used to determine the status of
Big-4 affiliated auditors as earnings is one of the most often used element to defraud and manipulate financial statements and accruals (discretionary) is under the discretion of management.

Review of current research performed on this dimension in Japan indicates that contemporary studies are lacking and consequently leads to a research gap that needs to be addressed. In addition, another unique contribution of this study is the broad and sophisticated operationalization to capture the concept of earnings quality, while controlling for several alternative explanations in investigating the relationship between the auditor's size and earnings quality. The findings reveal that there is a positive and highly significant ($p<.01$) relationship between auditor's size and earnings quality based on cross-sectional analysis. In other words, the listed companies audited by the Japanese Big-4 affiliated audit firms have significantly higher earnings quality than listed companies audited by the Japanese non Big-4 affiliated audit firms. This concludes that the Japanese Big-4 affiliated auditors have a higher status on the basis of their clients' accrual based earnings quality, compared to Japanese non Big-4 affiliated auditors. In addition, the study finds that the smaller listed companies audited by non Big-4 affiliated audit firms have significantly ($p<.05$) lesser earnings quality than their counterparts audited by Big-4 affiliated audit firms, resulting in policy implications for the non Big-4 affiliated audit firms specifically, enhancing internal audit quality control procedures.

The remainder of this paper is structured as follows: Section 2 discusses the Japanese auditing context, related extant literature and develops the research hypothesis at the end; Section 3 indicates the survey design that is implemented in testing the developed hypothesis, while Section 4 elaborates the main findings of the study; Section 5 tests for the robustness of the measures utilized in the study and explains the findings of additional tests and finally Section 6 summarizes the findings and concludes the research study.

2. Literature Survey

This section briefly introduces the evolution of Big-4 affiliated auditors in Japan, the extant literature related to constructs of audit quality, auditor's size, earnings quality and their relationships. At the end, the research question addressed in this research study and the related hypothesis are introduced.
2.1 Big-4 auditors in the current Japanese auditing context

Takeda and Saito (2009) indicate that US audit firms had penetrated the Japanese market since 1949. They further explain that four of the then US Big-8 auditors had used different names in establishing themselves in the Japanese market without using their own US brand names (Pricewaterhouse as Aoyama in 1983, Arthur Anderson as Eiwa in 1984, Deloitte Haskins & Sells as Mita in 1985, and Peat Marwick Mitchell as Minato in 1985), while the other 4 had affiliated with Japanese audit firms in establishing themselves in Japan (Touche Ross affiliated with TohmatrixAoki in 1975, Ernst & Whinney with Ohta in 1983, Coopers & Lybrand with Chuo in 1984, and Arthur Young with AsahiShinwa in 1986). Takeda and Saito (2009) further elaborate that since then, due to re-organization and restructuring of these Big-n auditors in the US context, Japanese counterparts also had undergone drastic changes, and by 2006 (where Kanebo/ChuoAoyama scandal occurred) the affiliations were as PricewaterhouseCoopers (PwC) was affiliated with ChoAoyama, KPMG with Azsa, Ernst & Young with ShinNihon, and Deloitte Touche Tohmatsu with Tohmatsu.

Figure 1 illustrates the drastic changes that had taken place relating to ChuoAoyama. Skinner and Srinivasan (2009) in their study indicate that in spring 2006, the Japan's Financial Services Agency (FSA) suspended operations of ChuoAoyama due to its role in a major accounting fraud in one of its clients: Kanebo Ltd. Further, they point out that even before this

Figure 1: The Rise and Demise of ChuoAoyama

Chuo (established in Dec. 1968) → Coopers & Lybrand (affiliated since July 1984)

ChuoShinko

Shinko (merged in July 1988)


(Owned since 1949)

Aoyama (merged in July 1998)

ChuoAoyama

Arata (separated in June 2006) → PricewaterhouseCoopers

Misu (renamed between September 2006 and July 2007)

Source: Takeda & Saito, 2009
suspension, PricewaterhouseCoopers (PwC) had taken steps to address quality issues at ChuoAoyama, but had not succeeded due to resistance by the management of ChuoAoyama. Skinner and Srinivasan (2009) explain that therefore, PwC established PwCArata which is of a nature of high quality audit firm and assumed clients as Sony and Toyota. They further indicate that when the said suspension was lifted, ChuoAoyama resumed business as Misuzu but failed within a short period of time due to additional fraud cases coming in to light and finally PwC had to shutdown it completely.

The current research takes these changes into account in deciding the so-called Big-4 affiliated auditors in Japan. As explained in the next section, the construct audit quality is defined on the postulate of rendering quality audit services due being affiliated with a US Big-n audit firm (i.e. based on global brand share), and not necessarily on the local market share of a Japanese Big-4 affiliated audit firm. On this basis Azsa (affiliated with KPMG), ShinNihon (affiliated with Ernst & Young), Tohmatsu (affiliated with Deloitte Touche Tohmatsu) and PwC Arata (affiliated with PricewaterhouseCoopers) are considered affiliated with US Big-4 audit firms and will be referred as the Big-4 affiliated audit firms in Japan for the purpose of this research.

ChuoAoyama’s successor Mizuzu is excluded from the scope and analysis of this research as it is already being perceived of poor audit quality (see Skinner & Srinivasan, 2009) and non existence of that firm currently. The next section further justifies the basis of the above stated postulates by introducing the constructs audit quality and earning quality and their relationship.

2.2 US Big-n auditors and audit quality

The construct of audit quality has a long history in terms of definition and operationalization in extant empirical literature. In 1981, DeAngelo argued that being more independent (i.e. financial independence) large auditors provide higher quality service. Further, to date, it is noted that empirical research has used auditor size to operationalize the construct audit quality. Using a sample of Canadian firms, Davidson and Neu (1993) find that auditor size is an appropriate proxy variable for the measurement of audit quality.

As for the reasons for a big auditor to be characterized as of having higher audit quality, empirical research has cited several reasons; higher exposure to risk of litigation due to having larger wealth (deep pocket hypothesis: see Dye, 1993), reputation concerns (reputation
hypothesis: see DeAngelo, 1981) are two notable reasons (Lennox, 1999). Lennox (1999) concludes that the deep pocket hypothesis is more plausible than the reputation hypothesis for a big auditor to be perusing higher audit quality. More recent research indicates that an auditor being an industry specialist can also represent audit quality. Craswell, Francis and Taylor (1995) elaborate that significant amount of resources are allocated by audit firms for the development of industry expertise. Craswell et al. (1995); Ferguson and Stokes (2002) operationalize industry specialist measure on an industry audit fee basis. Chen, Lin and Zhou (2005); Zhou and Elder (2003) use an industry sales based measure in operationalizing the auditor's industry specialization.

This research primarily uses auditor's size as defined on the basis of US Big-4 affiliated auditor status as the main focus of this research is to investigate the contemporary status of the Japanese Big-4 affiliated auditors taking accrual based earnings quality of their clients as the basis of evaluation. Having discussed the construct of audit quality, the next section briefly discusses of the construct: earnings quality.

2.3 Earnings quality

Financial Accounting Standards Board (FASB, 1980) indicates the quality of accounting information from the viewpoint of decision usefulness to the users and according to the FASB's conceptual framework, decision usefulness of financial information primarily depends on the relevance and reliability of the reported information. Hence, earnings being an important element of accounting information, quality of earnings can be defined based on the decision usefulness criteria (i.e. relevance and reliability). On the other hand, McNichols (2002) indicates that the accounting literature is rich in several characterizations (and measures) of earnings quality. He states that some researchers characterizes and measures earnings quality in terms of persistence of earnings (which can be seen as the predictive value ingredient under FASB's relevance characteristic). He further states that Dechow and Dichev's (2002) model (which will be hereafter referred as the D&D model) measures earnings quality in terms of the mapping between short-term accruals and cash-flows, and hence, could be seen as addressing again predictive value ingredient and feedback value ingredient under FASB's relevance characteristic. Next section introduces extant studies that deal with the relationship between auditor's size and earnings quality.
2.4 Auditor's size (Big-n status) and earnings quality

The extant empirical literature has indicated a strong and significant relationship between auditor's size and earnings quality in its long history and is yet evolving by introducing new and much representative proxy variables and sophisticated testing techniques. This section makes an attempt to introduce certain notable studies that represent major contributions. Francis, Maydew and Sparks (1999) tested a sample of NASDAQ companies using a cross sectional version of Jones model and found that US Big audit firms do have a lower amount of discretionary accruals (i.e. higher earnings quality). Balvers et al. (1998) on the other hand provides evidence by finding companies with higher accruals are having higher chances for opportunistic earnings management and motivated to hire a US Big-n auditor to convince that their earnings are credible. In their seminal study, Becker et al. (1998) performed a cross sectional study for the period of 1989-1992 utilizing again a cross-sectional version of Jones (1991) model and established that US Big-n audit firms' clients are having notably lesser discretionary accruals than clients of non Big-n audit firms in US. Becker et al. excluded companies (i.e. audit clients) that changed audit firms during the investigation period and selected a short-period of 3 years to control this aspect of change, which also has been followed in the current study. As a point of robustness and variation, however, compared to Becker et al., the current study uses an advanced accounting based conceptualization of earnings quality and sophisticated time-series technique in its derivation and arriving at the conclusions.

In more recent times, research under this theme has moved to more specific areas such as earnings quality and audit quality in the context of Initial Public Offering (see Chen et al., 2005). Chen et al. (2005), uses again a cross sectional version of the modified Jones model in estimating earnings quality. They also find that listed companies have lesser discretionary accruals in the case of being audited by Big-n auditors and industry specialized audit firms in Taiwan. Hence, the empirical evidence indicated in extant literature provides substantial support for a significant positive relationship between Big-n status and earnings quality. Based on this postulate the next section develops the research question addressed in this research study.

2.5 Research question and hypothesis

On the basis of the above discussion on the Japanese audit context and the related extant empirical literature, it is interesting to investigate whether in Japan the Big-4 affiliated status of
auditors still represents audit quality amidst the ChuoAoyama crisis. Due to the empirical evidence indicating highly significant positive relationship between auditor's size (i.e. operationalized as Big-n status) and earnings quality, using the basis of accrual based earnings quality to investigate the status of Japanese Big-4 affiliated firms, the research question can be stated as: is the earnings quality of listed companies in Japan audited by the Japanese Big-4 affiliated auditors is significantly higher than companies audited by Japanese non Big-4 affiliated auditors? Based on this research question, following hypothesis can be stated:

\[ H_0: \text{Earnings quality of Japanese listed companies audited by Big-4 affiliated audit firms are significantly higher than listed companies audited by non Big-4 affiliated audit firms.} \]

Section 3 on research design elaborates the research strategy used in operationalizing the aforementioned research question and the methodology used in testing the above hypothesis.

### 3. Research Design

This section indicates the details related to the research strategy, sample selection basis and models utilized in operationalizing the research question and testing the hypotheses that were introduced in the preceding section.

#### 3.1 Research strategy and sample selection

In order to test the proposed hypotheses under section 2.5, as per the extant literature, an empirical approach is being utilized and secondary data sources are used. Primarily, consolidated financial data for fiscal years 2000 to 2009 (the fiscal year end was considered as any period within this fiscal year range) was obtained from NEEDS FinancialQuest database for all industrial companies in Japan resulting in a sample of 26,425 firm years (See Exhibit 1). In estimating the time-series based earnings quality measure (see section 3.2.2), for proper comparison, companies that did not have 12 months in their fiscal periods and companies that did not fall within the fiscal year range 2000 to 2009 were excluded. Furthermore, companies that did not have 10 periods of data panels (within the period 2000 to 2009) were excluded as it is required for the time series estimations of earnings quality and for proper comparison. This resulted in a sample of 1,973 companies that have 19,730 firm years. Finally, the sample is
reduced to 5,919 firm years representing the period 2006 to 2008.

**Exhibit 1: Screening of the Listed Companies**

<table>
<thead>
<tr>
<th>Description</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total firm years for fiscal periods 2000 to 2009</td>
<td>26,425</td>
</tr>
<tr>
<td>Firm years that do not have 12 months in its fiscal period</td>
<td>(166)</td>
</tr>
<tr>
<td>Firm years that do not fall within the period 2000 - 2009</td>
<td>(224)</td>
</tr>
<tr>
<td>Firm years that do not have 10 periods within 2000 to 2009</td>
<td>(6,305)</td>
</tr>
<tr>
<td>Firm years that have 10 periods from 2000 - 2009 (1973 firms x 10 periods)</td>
<td>19,730*</td>
</tr>
<tr>
<td>Firm years that do not fall within 2006 to 2008 (1973 firms x 7 periods)</td>
<td>(13,811)</td>
</tr>
<tr>
<td>Firm years for the final analysis (1973 firms x 3 periods)</td>
<td>5,919**</td>
</tr>
</tbody>
</table>

*These firm year sample has been utilized to estimate earnings quality indicator: $\text{RMSE}_{MA, \beta}$ (see section 3.2.2).

**For the purpose of testing the hypotheses (see section 2.5) these firm years have been utilized.

Auditor information is obtained from the corporate information database (会社四季報) published by Toyo KEIZAI INC. For the purposes of final cross-sectional regression analysis (see section 3.3), the fourth quarter (which represents the mid-year and does not correspond to general financial quarterly periods of companies) external auditor for 2006, 2007 and 2008 were used, as the database is released on a quarterly basis. Next section elaborates the models, measures and related variables that utilize the above data for the analysis purposes.

### 3.2 Models and related measures utilized

#### 3.2.1. Japanese Big-4 affiliated auditors and Audit quality:
As explained in section 2.2, *audit quality* is operationalized using: *size* of audit firm as defined based on the Big-4 affiliation status. As explained in Section 2.1, there are 4 Japanese Big-4 affiliated audit firms in the Japanese context (i.e. ShinNihon, Azsa, Tohmatsu and PwC Arata). The clients of Misuzu (formerly known as ChuoAoyama) are excluded from the analysis as already being perceived for poor quality (see Skinner & Srinivasan, 2009). Furthermore, as Becker et al. (1998) had suggested, companies which had changed their auditor (from Big-4 affiliated to non Big-4 affiliated audit firm and vice versa) within the period 2006 to 2008 and changes observed within quarterly periods of the *corporate information database* (会社四季報) are also excluded from the analysis. Furthermore, listed companies audited jointly by two or more audit firms were also excluded to facilitate proper comparison.
3.2.2. Earnings quality:

In section 2.3, it was explained that there are several characterizations and measures of earnings quality. Although conventionally, different variants of the Jones (1991) model has been used to measure earnings quality, it has been subjected to considerable level of criticisms (see Dechow, Sloan & Sweeney 1995; Bernard & Skinner 1996; Larcker & Richardson 2004). On the other hand the variants of the D&D model is gaining prominence in recent research as a more valid measure (see Francis et al. 2004; Aboody, Hughes & Liu 2005; Francis, Olsson & Schipper 2005; Dhaliwal, Naiker & Navissi 2006). Hence, due to being closer to the decision usefulness criterion based definition of earnings quality (see discussion in section 2.3) and for the purposes of variation/robustness, in this research a robust and sophisticated time-series version of the D&D model is being suggested. This operationalization of the construct of earnings quality is expected to result in a higher robustness of findings and therefore is quite distinct and unique compared with prior studies. The specific operationalization aspect of this time-series version of the D&D model is elaborated below.

The Moving Average D&D model: Dechow and Dichev (2002) define (short-term) accruals as the magnitude of the estimation errors. They introduced the following model in operationalizing and ascertaining the said estimation errors on a firm-specific basis:

\[ SACC_{jt} = \alpha + \beta_1 CF_{jt} + \beta_2 CF_{jt+1} + \beta_3 CF_{jt+2} + \epsilon_{jt} \]  

(Eq. 1)

Where \( SACC_{jt} \) denotes total current accruals at time \( t \) for firm \( j \), and is estimated as \( SACC_{jt} = \Delta \text{current assets} - \Delta \text{cash \\& deposits} - \Delta \text{short-term investment securities} - \Delta \text{short-term loans receivable} - (\Delta \text{current liabilities} - \Delta \text{short-term loans payable} - \Delta \text{commercial papers} - \Delta \text{current portion of the long-term loans payable} - \Delta \text{current portion of the bonds and convertible bonds}) \), \( \Delta \) is the change in a given accounting amount from year \( t-1 \) to year \( t \), \( CF \) denotes operating cash flow of firm \( j \) at time \( t \).

The sample period 2000 to 2009 allows actual operating cash flows to be used instead of using estimated operating cash flows where the latter depends on a balance sheet approach which is only an estimate (see McNichols, 2002). Hence, actual cash-flows are utilized under this study.
According to Dechow and Dichev (2002), the residual term obtained by regressing equation (Eq. 1) is, by definition, the difference between the amount accrued and the amount realized. Hence, they suggest the standard deviation of the residual term as the measure of accruals quality and the earnings quality. As a point of variation and enhancing the robustness this study utilizes a time series version of the above D&D model (referred hereafter as MA D&D model), this standard deviation of the residual is calculated using a 5 year moving average basis that utilizes financial data for 2000 to 2009 and the standard deviation of residual is estimated for the years: 2006, 2007 and 2008. The resulting standard deviation of residual term is utilized as the dependent variable (denoted as $RMSE_{MA_{j,t}}$) for the cross-sectional regression specification proposed under succeeding section: 3.3.

### 3.3 Cross-sectional regression model and hypotheses testing

This section elaborates the cross-sectional OLS (Ordinary Least Squares) regression model that is utilized to test the relationship between auditor’s size and earnings quality constructs. The independent variables, other control variables and the expected predictions are introduced under this section.

#### 3.3.1. Multivariate cross-sectional regression model specifications:

Regression equation: Eq 2 denotes the model specification that is used for the cross-sectional OLS regression analysis in testing the hypothesis indicated under section 2.5. The main independent variable is the auditor size as defined based on Big-4 affiliation (denoted as $AUDS_{j,t}$). In the depicted regression model (Eq 2), control variables such as size, earnings, leverage etc. of the listed companies are included based on related extant empirical literature (see Chen et al., 2005; Becker et al., 1998) that indicates as significant factors, and also depending on the relevancy to the context.

$$
RMSE_{MA_{j,t}} = \alpha + \beta_1 AUDS_{j,t} + \beta_2 AUDSPEC_{j,t} + \beta_3 LTASSET_{j,t} + \beta_4 PBEX_{j,t}
+ \beta_5 LEVER_{j,t} + \beta_6 LABTOACC_{j,t} + \beta_7 GRWH_{j,t} + \epsilon_{j,t} \tag{Eq. 2}
$$

Where; the earnings quality measure: $RMSE_{MA_{j,t}}$ is denoted as the standard deviation of the residual term estimated on a 5 year moving average basis that is related to firm j for the years: 2006, 2007 and 2008 (see section: 3.2.2.). $AUDS_{j,t}$ denotes dummy variable representing the size of an audit firm as defined based on the Big-4 affiliation status of the external auditor.
of firm $j$ for year $t$ \cite{5}, in which “0” represents firm $j$ being audited by a Japanese non Big-4 affiliated audit firm and “1” represents firm $j$ being audited by a Japanese Big-4 affiliated audit firm, at year $t$. $\text{AUDSPEC}_{i,k,t}$ \cite{6} denotes the dummy index variable: industry specialization, in which auditor $i$ that audits client firm $j$ which operates in industry $k$ at year $t$; audit firms falling below 15% of this percentile based index is treated as non industry specialized auditor and is coded as “0”, while the remainder of the index is treated as industry specialized auditor and coded as “1”. $\text{LTASSET}_{i,t}$ denotes natural logarithm of the total assets of firm $j$ for year $t$. $\text{PBEX}_{i,t}$ denotes the net income before taxes and extra ordinary items of firm $j$ for year $t$, deflated by the simple average of the total assets at year $t$ and $t-1$ of firm $j$. $\text{LEVER}_{i,t}$ denotes the financial leverage defined as total liabilities at year $t$ of firm $j$ divided by total assets of firm $j$ at year $t$. $\text{LABTOACC}_{i,t}$ is the natural logarithm of the absolute value of the total accruals of firm $j$ at year $t$ \cite{7}. $\text{GRWH}_{i,t}$ is the cumulative average growth calculated based on period (pd): 2000 to 2009 of firm $j$. $\epsilon_{i,t}$ represents the denotation for the residual or the error term of the regression equation and $\beta_1 - \beta_7$ represents the coefficients of the independent variables.

As indicated in the preceding sections, audit quality is primarily defined using the independent variable: $\text{AUDS}_{i,t}$ and is used in the cross-sectional regression analysis. The next section explains the expected model predictions.

3.3.2. Model predictions in testing the hypotheses

Amongst the several independent variables depicted in the regression equation (Eq 2) in the preceding section, the main independent variable under consideration is the dummy variable representing the size of an audit firm as defined based on the Big-4 auditor affiliation status ($\text{AUDS}_{i,t}$). The dummy index variable on industry specialization \cite{6} of audit firm ($\text{AUDSPEC}_{i,k,t}$), however, also represents audit quality. Therefore, to control for possible multicollinearity effects, testing of these two variables may require an individual and joint basis of testing in performing the cross-sectional regression analysis. Hence, three models are proposed as follows:

Model 1: Takes in to account only the size of an audit firm as defined based on the Japanese Big-4 affiliation dummy variable ($\text{AUDS}_{i,t}$) as the audit quality proxy variable of firm $j$.

Model 2: Considers only the industry specialization of auditor dummy variable ($\text{AUDSPEC}_{i,k,t}$) as the audit quality proxy variable of firm $j$.

Model 3: Utilizes both size of an audit firm as defined based on the Japanese Big-4 affiliation
dummy variable \((AUD_{S,j})\) and auditor's industry specialization dummy variable 
\((AUDSPEC_{i,k})\) as audit quality proxy variables on a joint basis of firm \(j\).

In terms of the model predictions, since being audited by a Big-4 affiliated audit firm 
\((AUD_{S,j})\) is coded as "1" and otherwise is coded as "0", a negative sign is expected in the 
coefficient of \(AUD_{S,j}\) in the cross-sectional regression results. This is because that the 
increase in the dependent earnings quality variable (i.e. \(RMSE_{MA,j}\)) characterizes poor 
earnings quality as increases in \(RMSE_{MA,j}\) depicts increasing accruals that leads to higher 
estimations errors and poor earnings quality. Next section elaborates the findings of the cross-
sectional multivariate regression analysis performed by pooling the information for years: 

### 4. Findings and Discussion

This section elaborates in detail the findings of the cross-sectional regression analysis 
suggested in the preceding section. First the descriptive statistics and next the regression 
results are discussed.

#### 4.1 Descriptive statistics

Descriptive statistics and the univariate analysis (i.e. correlation statistics) of the 
dependent and independent variables that are used in the regression specifications are 
depicted in Table 1 [8]. The mean of the Big-4 affiliation dummy \((AUD_{S,j})\) variable indicates 
that majority (75.52%) of the listed companies are audited by the Big-4 auditors for the period 
of 2006 to 2008.

The average growth (based on sales) for the period 2000 to 2009 is 3.6%. The leverage 
(total liabilities divided by total assets) approximates to an average of 0.53. Also Table 1 
presents descriptive statistics for earnings quality (dependent) variable: \(RMSE_{MA,j}\) and 
other control variables utilized under the cross-sectional regression model.
The Earnings Quality Status of Contemporary Big-4 Affiliated Auditors amidst ChuoAoyama Crisis

Table 1: Descriptive Statistics

<table>
<thead>
<tr>
<th>Variables(\text{t}_{i})</th>
<th>(n^{[9,10]})</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Lower Quartile (25%)</th>
<th>Median</th>
<th>Upper Quartile (75%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\text{RMSE}<em>{, \text{MA}</em>{,i}})</td>
<td>4897</td>
<td>0.0206</td>
<td>0.0350</td>
<td>0.0050</td>
<td>0.0119</td>
<td>0.0233</td>
</tr>
<tr>
<td>(\text{AUDS}_{,i})</td>
<td>4894</td>
<td>0.7552</td>
<td>0.4300</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>(\text{AUDSPEC}_{,i})</td>
<td>4160</td>
<td>0.6665</td>
<td>0.3905</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>(\text{LTASSET}_{,i})</td>
<td>4897</td>
<td>11.0385</td>
<td>1.4743</td>
<td>10.0009</td>
<td>10.8335</td>
<td>11.8538</td>
</tr>
<tr>
<td>(\text{PBEX}_{,i})</td>
<td>4897</td>
<td>0.0549</td>
<td>0.0531</td>
<td>0.0257</td>
<td>0.0480</td>
<td>0.0795</td>
</tr>
<tr>
<td>(\text{LEVER}_{,i})</td>
<td>4897</td>
<td>0.5278</td>
<td>0.1964</td>
<td>0.3869</td>
<td>0.5391</td>
<td>0.6751</td>
</tr>
<tr>
<td>(\text{LABTOACC}_{,i})</td>
<td>4897</td>
<td>7.4011</td>
<td>1.9740</td>
<td>0.2196</td>
<td>7.3524</td>
<td>8.5237</td>
</tr>
</tbody>
</table>

* See section 3.3.1 for the denotations of the variables.

Table 2 indicates the univariate correlation matrix drawn for all the dependent and independent variables denoted in the regression model that was explained under section 3.3. The D&D based earnings quality measure: \(\text{RMSE}_{, \text{MA}_{,i}}\) has a significantly \((p<.01)\) negative but less stronger correlation between Big-4 auditor affiliation dummy variable: \(\text{AUDS}_{,i}\), on a univariate basis. Further it is noted that the auditor’s industry specialization variable (denoted as and \(\text{AUDSPEC}_{,i,k}\)) is having a slightly negative correlation with the earnings quality variable: \(\text{RMSE}_{, \text{MA}_{,i}}\). Both the audit quality variables (i.e. \(\text{AUDS}_{,i}\) and \(\text{AUDSPEC}_{,i,k}\)) are having a strong (positive) and significant relationship indicating that in hypothesis testing, any multicollinearity effects needs to be considered.

Table 2: Univariate Analysis: Correlation matrix\(^{[11]}\)

<table>
<thead>
<tr>
<th></th>
<th>(\text{RMSE}<em>{, \text{MA}</em>{,i}})</th>
<th>(\text{AUDS}_{,i})</th>
<th>(\text{AUDSPEC}_{,i})</th>
<th>(\text{LTASSET}_{,i})</th>
<th>(\text{PBEX}_{,i})</th>
<th>(\text{LEVER}_{,i})</th>
<th>(\text{LABTOACC}_{,i})</th>
<th>(\text{GRWH}_{,i})</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\text{RMSE}<em>{, \text{MA}</em>{,i}})</td>
<td>1</td>
<td>(-0.0637^*)</td>
<td>(0.7374^*)</td>
<td>(0.0557)</td>
<td>(-0.0171)</td>
<td>(-0.0139)</td>
<td>(-0.0130)</td>
<td>(0.1877)</td>
</tr>
<tr>
<td>(\text{AUDS}_{,i})</td>
<td>(-0.0637^*)</td>
<td>1</td>
<td>(0.1586)</td>
<td>(0.1584^*)</td>
<td>(1)</td>
<td>(-0.0038)</td>
<td>(-0.0147)</td>
<td>(-0.3505^*)</td>
</tr>
<tr>
<td>(\text{AUDSPEC}_{,i})</td>
<td>(0.7374^*)</td>
<td>(0.1586)</td>
<td>1</td>
<td>(1)</td>
<td>(1)</td>
<td>(1)</td>
<td>(1)</td>
<td>(1)</td>
</tr>
<tr>
<td>(\text{LTASSET}_{,i})</td>
<td>(-0.0394^*)</td>
<td>(0.1746^*)</td>
<td>(0.1584^*)</td>
<td>0.0116</td>
<td>(0.0274)</td>
<td>(0.0151)</td>
<td>(0.0151)</td>
<td>(1)</td>
</tr>
<tr>
<td>(\text{PBEX}_{,i})</td>
<td>(-0.0867^*)</td>
<td>(-0.1862^*)</td>
<td>(0.1612^*)</td>
<td>(0.0348^*)</td>
<td>1</td>
<td>(-0.0038)</td>
<td>(-0.0147)</td>
<td>(-0.3505^*)</td>
</tr>
<tr>
<td>(\text{LEVER}_{,i})</td>
<td>0.0530</td>
<td>(-0.0038)</td>
<td>(-0.0147)</td>
<td>(1)</td>
<td>(1)</td>
<td>(1)</td>
<td>(1)</td>
<td>(1)</td>
</tr>
<tr>
<td>(\text{LABTOACC}_{,i})</td>
<td>0.0688</td>
<td>(0.1324^*)</td>
<td>(0.1950^*)</td>
<td>(0.1945^*)</td>
<td>(1)</td>
<td>(1)</td>
<td>(1)</td>
<td>(1)</td>
</tr>
</tbody>
</table>

* Significant at 5%
\(^{[11]}\) See section 3.3.1 for the denotations of the variables.

Next section elaborates the findings for the hypothesis testing by way of the three
alternative cross-sectional regression models introduced in section 3.3.2.

**4.2 Testing for auditor's size and earnings quality**

This section explains the summary of the findings related to the regression models introduced in sections 3.3.1 and 3.3.2., which tests the hypothesis indicated in section 2.5. Table 3 summarizes these findings. In column titled: Model 1, out of the two proxy variables for audit quality, the size based Big-4 affiliation dummy variable (AUDS,) is considered while in column titled: Model 2, an audit firm's industry specialization dummy variable (AUDSPEC;i) is being considered. In column titled: Model 3, both of these audit quality proxy variables are considered together. It is noted that all three models considered are valid under a high significance level of (p<.01). Specifically, Model 1 indicates that the Big-4 affiliation (AUDS,) dummy variable has a negative and highly significant relationship (p<.01) with the earnings quality variable: RMSE_\( MA_{it} \) as predicted in section 3.3.2. In other words, this finding depicts that listed companies audited by a Japanese Big-4 affiliated auditor has significantly higher earnings quality than the listed companies audited by non Big-4 affiliated auditors. This findings leads to the conclusion of the testing of the hypothesis (see hypothesis: \( H_1 \) in section 2.5) as that the earnings quality of listed companies audited by Japanese Big-4 affiliated audit firms are higher and statistically significant than earnings quality (accrual based) of listed companies audited by Japanese non Big-4 affiliated audit firms (i.e. the alternative hypothesis: \( H_1 \) cannot be rejected). This result is in compliance with Becker et al.'s (1998) conclusion pertaining to the US context.
Table 3: Results of Regression Analysis

<table>
<thead>
<tr>
<th>Model Variables</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUDS_j</td>
<td>0.0501</td>
<td>0.0507</td>
<td>0.0490</td>
</tr>
<tr>
<td>AUDSPEC_j</td>
<td>-0.0006</td>
<td>-0.0036</td>
<td>-0.0048</td>
</tr>
<tr>
<td>LTASSET_j</td>
<td>-0.0052</td>
<td>-0.0051</td>
<td>-0.0051</td>
</tr>
<tr>
<td>PBEX_j</td>
<td>-0.0762</td>
<td>-0.0627</td>
<td>-0.0615</td>
</tr>
<tr>
<td>LEVER_j</td>
<td>0.0018</td>
<td>0.0012</td>
<td>0.0014</td>
</tr>
<tr>
<td>LABTOACC_j</td>
<td>0.0040</td>
<td>0.0037</td>
<td>0.0037</td>
</tr>
<tr>
<td>GRWHT_j</td>
<td>0.1173</td>
<td>0.0785</td>
<td>0.0787</td>
</tr>
<tr>
<td>Adjusted R^2</td>
<td>0.1246</td>
<td>0.0510</td>
<td>0.0524</td>
</tr>
<tr>
<td>f-value</td>
<td>4.884</td>
<td>117.0300</td>
<td>38.2300</td>
</tr>
<tr>
<td>n</td>
<td>4.160</td>
<td>4.160</td>
<td>4.160</td>
</tr>
</tbody>
</table>

**See section 3.3.1 for the denotations of the variables.**

**Significant at 1%  *Significant at 5%

Further it is noted that under Model 3, even after controlling the effects for auditor specialization variable: (AUDSPEC_j,.), the Big-4 affiliation (AUDS_j) dummy variable still has the predicted negative relationship with high statistical significance (p<.01). Hence, it can be safely concluded that the status of the Big-4 auditors are at a higher level compared to the non Big-4 auditors in terms of their clients’ accrual based earnings quality, further confirming the hypothesis H_j in section 2.5.

5. Robustness and Additional Tests

This section discusses results of the usage of an alternative earnings quality model and finally indicates the results on additional testing.

5.1. Results by utilizing an alternative Earning Quality measure

Dechow et al. (1995) indicates that the cross-sectional version of the modified Jones model also provides a reasonable basis for the estimation of discretionary accruals and thereby provides a measure for earnings quality of an entity. Accordingly, discretionary accruals (denoted as DACF_j) is estimated using equations (Eq. a) to (Eq. d), which are based on the modified Jones model (Jones, 1991; Dechow et al.,1995).
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\[ TACC_{jt} = SACC_{jt} - \Delta PROVRET_{jt} - \Delta PROVRET_{jt} - \Delta OTLTPRO{	ext{t}}_{jt} - DEP_{jt} \]  
\( \text{(Eq. a)} \)

\[ NDAJ_{jt} = \hat{\alpha}_1 (1/TA_{jt}) + \hat{\alpha}_2 [(\text{SALES}_{jt} - \text{AREC}_{jt})/TA_{jt}] + \hat{\alpha}_3 (\text{PPE}_{jt}/TA_{jt}) \]  
\( \text{(Eq. b)} \)

\[ TACC_{jt}/TA_{jt} = \hat{\alpha}_1 (1/TA_{jt}) + \hat{\alpha}_2 [(\text{SALES}_{jt} - \text{AREC}_{jt})/TA_{jt}] + \hat{\alpha}_3 (\text{PPE}_{jt}/TA_{jt}) + \epsilon_{jt} \]  
\( \text{(Eq. c)} \)

\[ DACJ_{jt} = TACC_{jt} - NDAJ_{jt} \]  
\( \text{(Eq. d)} \)

Where \( TACC_{jt} \) denotes the total accruals of firm \( j \) at year \( t \). \( SACC_{jt} \) is the denotation of short term accruals of firm \( j \) for the year \( t \) (see section 3.2.2. for the denotation). \( \Delta PROVRET_{jt} \) is the change in the provision for retirement benefits of firm \( j \) form year \( t-1 \) to \( t \). \( \Delta PROVRET_{jt} \) denotes the change in the provision for directors' retirement benefits of firm \( j \) from \( t-1 \) to \( t \). \( \Delta OTLTPRO_{jt} \) represents the denotation for other long-term provisions of firm \( j \) from year \( t-1 \) to \( t \). \( DEP_{jt} \) denotes the depreciation and amortization amount of firm \( j \) for year \( t \). \( NDAJ_{jt} \) denotes the non discretionary accruals of firm \( j \) for the year \( t \) estimated using the coefficient parameters of (Eq. c). \( \hat{\alpha}_1 \), \( \hat{\alpha}_2 \), and \( \hat{\alpha}_3 \) are the coefficients of (Eq. b) estimated using and corresponding to \( \alpha_3 \), \( \alpha_2 \) and \( \alpha_3 \) of (Eq. c). \( \alpha_3 \), \( \alpha_2 \) and \( \alpha_3 \) are the coefficients of (Eq. c) that are estimated by regressing (Eq. c) on a cross-sectional industry sector (Tokyo Stock Exchange industry classification) specific basis for years: 2006, 2007 and 2008, which are inputted in (Eq. c) coefficients as \( \hat{\alpha}_1 \), \( \hat{\alpha}_2 \) and \( \hat{\alpha}_3 \) in calculating non discretionary accruals: \( NDAJ_{jt} \). \( TA_{jt} \) is the simple average of the total assets at year \( t \) and \( t-1 \) of firm \( j \). \( \Delta \text{SALES}_{jt} \) denotes the change in net sales from year \( t-1 \) to year \( t \) of firm \( j \). \( \Delta \text{RE C}_{jt} \) denotes the changes in trading notes and accounts receivable of firm \( j \) from year \( t-1 \) to \( t \). \( \text{PPE}_{jt} \) is the value of property, plant, and equipment (gross) at the end of year \( t \). \( DACJ_{jt} \) is the denotation of discretionary accruals of firm \( j \) for the year \( t \) which is the difference between \( TACC_{jt} \) and \( NDAJ_{jt} \) denoted above.

For the purposes of the regression analysis and testing the hypotheses indicated under section 2.5, the absolute value of \( DACJ_{jt} \) (i.e. \( |DACJ_{jt}| \)) is used as the dependent variable (as discretionary accruals can be either positively or negatively managed) in regression equation \( \text{[1]} \) [see (Eq. e) that follows] that was introduced in section 3.3.1 and further modeled in section 3.3.2 for both of the audit quality measures (all other independent variables are the same). The results are indicated in Table 4.

\[ |DACJ_{jt}| = - \alpha + \beta_1 \text{AUDS}_{jt} + \beta_2 \text{AUDSPEC}_{jt} + \beta_3 \text{LTASSET}_{jt} + \beta_4 \text{PBEX}_{jt} + \beta_5 \text{LEVER}_{jt} + \beta_6 \text{LABTOACC}_{jt} + \beta_7 \text{GRWH}_{jt} + \epsilon_{jt} \]  
\( \text{(Eq. e)} \)
Table 4: Results of Additional Regression Analysis [a]

<table>
<thead>
<tr>
<th>Model Variables</th>
<th>Model 1 (Auditor ( \text{AUDS}_j ))</th>
<th>Model 2 (Industry Specialist ( \text{AUDSPEC}_j ))</th>
<th>Model 3 (Auditor &amp; Industry Specialist ( \text{AUDS}_j &amp; \text{AUDSPEC}_j ))</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONSTANT ( (\alpha) )</td>
<td>0.1144 **</td>
<td>0.1143 **</td>
<td>0.1124 **</td>
</tr>
<tr>
<td>( \text{AUDS}_j )</td>
<td>-0.0032 *</td>
<td>-0.0081 **</td>
<td>-0.0074 **</td>
</tr>
<tr>
<td>( \text{AUDSPEC}_j )</td>
<td>0.0004</td>
<td>0.0074 **</td>
<td></td>
</tr>
<tr>
<td>( \text{LTASSET}_{it} )</td>
<td>-0.0177 **</td>
<td>-0.0178 **</td>
<td>-0.0177 **</td>
</tr>
<tr>
<td>( \text{PBEX}_{it} )</td>
<td>-0.0501 **</td>
<td>-0.0537 **</td>
<td>-0.0517 **</td>
</tr>
<tr>
<td>( \text{LEVER}_{it} )</td>
<td>0.0155 **</td>
<td>0.0143 **</td>
<td>0.0147 **</td>
</tr>
<tr>
<td>( \text{LABTOACC}_{it} )</td>
<td>0.0156 **</td>
<td>0.0156 **</td>
<td>0.0155 **</td>
</tr>
<tr>
<td>( \text{GRWTH}_{it} )</td>
<td>0.0903 **</td>
<td>0.0922 **</td>
<td>0.0930 **</td>
</tr>
<tr>
<td>Adjusted ( R^2 )</td>
<td>0.2007</td>
<td>0.2060</td>
<td>0.2089</td>
</tr>
<tr>
<td>( t )-value</td>
<td>176.1300 **</td>
<td>180.8600 **</td>
<td>157.8600 **</td>
</tr>
<tr>
<td>( n )</td>
<td>4,187</td>
<td>4,160</td>
<td>4,160</td>
</tr>
</tbody>
</table>

[a] See section 3.3.1 for the denotations of the variables.
**Significant at 1% *Significant at 5%

Table 4 above, further confirms the results that had been obtained under the regression analysis performed and reported under section 4.2 (see Table 3 for the findings that uses \( \text{RMSE}_WMA_{it} \), as the earnings quality measure as the dependent variable). It is observed that under Model A and Model C in Table 4 above, the Big-4 auditor affiliation measure: \( \text{AUDS}_j \), is having the expected negative relationship with the earnings quality measure: \( \text{DAC}_j \), in a statistically significant manner, which is explained as; listed companies audited by Japanese Big-4 affiliated audit firms are having higher accrual based earnings quality than the listed companies that are audited by Japanese non Big-4 affiliated audit firms, which is again a confirmation of the hypotheses indicated in section 2.5. The next section elaborates an additional analysis pertaining to smaller listed companies.

5.2. The case of smaller listed companies and earnings quality

In Section 4.2: Table 3, under all three models (Model 1-Model 3), the size as defined as natural logarithm of total assets at year \( t \) of firm \( j \) : \( \text{LTASSET}_{it} \) is a highly statistically significant variable \((p<.01)\). Hence, students’ \( t \)-test was performed to compare the accrual based earnings quality (using the time series based D&D measure: \( \text{RMSE}_WMA_{it} \)) of listed companies audited by Big-4 affiliated and non Big-4 affiliated audit firms stratified based on the size deciles (i.e. deciles are calculated based on \( \text{LTASSET}_{it} \)) of the listed companies. The results (not shown) indicate that for the first 2 deciles (i.e. first 20% of the listed companies),
earnings quality is significantly \( p<.05 \) higher of listed companies audited by Japanese Big-4 affiliated audit firms than companies audited by Japanese non Big-4 affiliated audit firms. This might imply that the smaller listed companies need to be given much more attention by non Big-4 affiliated firms in terms of strengthening their audit quality control procedures related to smaller audit clients as the earnings quality of smaller listed companies are significantly lower compared with their counterparts audited by Big-4 affiliated audit firms.

Having discussed the results of the robustness and additional tests under this section, the next section summarizes the findings and conclusions derived under the current research.

## 6. Conclusion

This research study was motivated by the fall of ChuoAoyama, once a Big-4 affiliated audit firm, which questions the status of Japanese Big-4 affiliated auditors in Japan. Extant empirical research has indicated a strong and positive relationship between auditor size (as defined based on US Big-n audit firm status) and accrual based earnings quality. Hence, this research study investigated the status of Japanese Big-4 auditors (i.e. ShinNihon, Azsa, Tohmatsu and PwC Arata taken together) in terms of their clients’ (i.e. listed companies) earnings quality. A time-series version of the Dechow and Dichev’s (2002) model (D&D model) was used for the measurement of earnings quality of the listed companies for the period: 2006-2008. In terms of the findings, after controlling for alternative explanations, the cross-sectional multivariate regression analysis performed between accrual based earnings quality and Japanese Big-4 affiliated auditors indicates that there is a significantly higher earnings quality of listed companies audited by Japanese Big-4 affiliated audit firms compared to listed companies audited by Japanese non Big-4 affiliated audit firms. This principle finding concludes that of a higher status of Big-4 affiliated audit firms on the basis of significantly higher accrual based earnings quality than non Big-4 affiliated audit firms.

As a matter of robustness, a cross-sectional version of Modified Jones model (Jones, 1991; Dechow et al.,1995) was used as an alternative earnings quality measure that further confirmed the conclusion derived above. Finally, an additional student's \( t \)-test was performed to compare the earnings quality (using the time-series based D&D earnings quality measure: \( RMSE_{MA} \)) of listed companies audited by Japanese Big-4 affiliated and Japanese non Big-4
affiliated audit firms stratified based on the size deciles of the listed companies, indicated that for the first 2 size deciles (i.e. first 20% of the listed companies), the earnings quality is significantly ($p<.05$) higher for listed companies audited by Big-4 affiliated audit firms than companies audited by non Big-4 affiliated audit firms pointing out the necessity to pay much audit attention to smaller clients (i.e. listed companies) by non Big-4 affiliated audit firms.

The hypothesis that the size (as defined and operationalized as based on US Big-n affiliation status) leads to superior earnings quality has been interpreted in the other direction as well (see Balvers et al., 1998). The survey of extant empirical literature indicates majority of existing research, however, supports the first postulate by indicating auditor's size leads to higher earnings quality via deep-pocket hypothesis and reputation hypothesis (see Lennox, 1999).

This research compared the status of the Japanese Big-4 affiliated and Japanese non Big-4 affiliated auditors on the basis of accrual based earnings quality of their clients. As for future research directions, other alternative bases are also recommended with an expanded scope.

[Notes]

[1] Since it is beyond the scope of this paper to discuss related concepts on earnings quality at a length, the interested reader is directed towards the works of Jonas and Blanchet (2000) for dimensions in quality of financial reporting and Pemman and Zhang (2002) for related further insights.

[2] Banking corporations, Insurance companies and other financial institutions are excluded in the industrial database and are not used for the purposes of the analysis due to being highly regulated industries (see Becker et al. 1998, Chen et al. 2005).

[3] A main feature of D&D model (Dechow and Dichev, 2002) is that it takes in to consideration the changes of short-term working capital (i.e. change in short-term accruals). They use the concept of operating cycle (as defined in this research as: $360/(Sales/Average Trading Notes and Accounts Receivable) + 360/(Cost of Goods Sold)/ (Average Inventory)$) to test for this short-term requirement. The results for the operating cycle calculated based on 4,847 firm years used under this research indicate that the operating cycle is below 360 days (i.e. median 162 days) and satisfy the said short-term requirement which imply that the variant of the D&D model is applicable and justified to be used under this research.

[4] Variables are standardized using the simple average of the total assets at year $t$ and $t-1$ of firm $j$ where it is applicable as per the extant literature.

[5] From this point onwards, $t$ stands for the periods 2006, 2007 and 2008 for which the data is pooled for the cross-sectional analysis and the alternative regression models are indicated in this section 3.3.2.

[6] An auditor's industry specialization is estimated using a variant of Chen et al. (2005) that uses a market share based measure determined on sales of clients. Hence, a client-sales-based market share is used to estimate the industry specialization of auditors (denoted as $AUDSPEC_{t, s}$) as follows (see Chen et al. 2005...
for a similar operationalization):

\[
AUDSPEC_{i,k} = \frac{\sum_{j=1}^{J_k} SALES_{i,j,k}}{\sum_{j=1}^{J_k} \sum_{t=1}^{T_j} SALES_{i,j,k,t}}
\]

Where: \(AUDSPEC_{i,k}\) is the auditor industry specialization index (variable) of audit firm \(i\) that audits client firm (i.e. listed company) \(j\) which operates in industry \(k\) at year \(t\). \(SALES_{i,j,k,t}\) is sales of client firm \(j\) in industry \(k\) audited by auditor \(i\) at the year \(t\). \(i\) (\(i = 1, 2, \ldots, I\)) is an index for audit firms. \(j\) (\(j = 1, 2, \ldots, J\)) is an index for client firms. \(k\) (\(k = 1, 2, \ldots, K\)) is an index for client industry. \(J_k\) is the number of clients served by audit firm \(i\) in industry \(k\). \(I_k\) is the number of audit firms \(i\) in industry \(k\). The resulting auditor industry specialization index was converted into percentiles and the first 15% is treated as a non industry specialized auditors (see Chen et al., 2005). For the purpose of industry classification, the Tokyo Stock Exchange classification has been used and an industry sector having less than 30 listed companies has been removed as per extant literature.

[7] Natural logarithmic value is used for the absolute value of total accruals as the absolute value of total accruals is highly skewed and the converted natural logarithmic value resembles a normal distribution.

[8] Please see section 3.3.1 for the denotations of the variables.

[9] Due to further cleaning of the data such as removal of companies audited by Misuzu, removal of listed companies that had changed the auditors within and during the period (2000 to 2008) and removal of joint auditors, firm years has reduced from 5,919 sample years (see Exhibit 1) to 4,897 firm years. Further throughout this research, \(n\) represents firm years unless otherwise indicated.

[10] Apart from the reason cited in note 9 above, firm years are further reduced to 4,160 under the auditor industry specialization (\(AUDSPEC_{i,k}\)) variable as only listed companies having Tokyo Stock Exchange (TSE) industry classification (33 categories) code is being used (i.e. JASDAQ companies are omitted) for the estimation of auditor industry specialization (\(AUDSPEC_{i,k}\)). Further, industry sectors having less than 30 listed companies are removed as explained in note 6 above.

[11] As per the practice followed in extant literature (see Kothari et al., 2005) related to the application of the cross-sectional version of the modified Jones model (Jones, 1991; Dechow et al., 1995), all variables are winsorized at the 1st and 99th percentiles except for dummy variables: \(AUDS_{i,j}\) and \(AUDSPEC_{i,p}\). This is deemed appropriate as under this model the discretionary accruals (\(DAC_{i,j}\)) is estimated using only 3 years of data compared to using 10 years of data in computing the D&D based time-series version of the earnings quality measure: \(RMSE\_MA_{i,p}\).

[References]


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