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# THE EFFECT OF ASSESTS WRITE ON THE FIRM'S PERFORMANCE

**Min-Tsung Cheng**

Department of Finance
Chien Hsin University of Science and Technology, Taiwan

**ABSTRACT**

*This study uses empirical evidence to determine if management recognition asset write-offs improves firm performance. The examination focuses on take-a-bath and information content strategies. The available research on management write-offs behavior presents conflicting results, some of which are interesting. First, for samples positioned at the 1%, 10%, 20%, 90% and 99% quantile level of firm performance ranking, a number of write-offs was found to positively affect the firm's future performance, supporting the information content hypothesis. However, least squares estimates indicated a negative relationship. Second, under the least squares approach, firm performance was improved in the period following the write-offs at various quantiles, both of which support the take-a-bath hypothesis. Third, testing the equality of individual points can ensure the requisites for quantile analysis and most two-by-two matching coefficients had significant odds.*

**Keywords**: *Quantile regression, asset write-offs, take-a-bath, information content*

## INTRODUCTION

Asset write-offs have become a major issue in recent accounting research. Many academic studies consider management discretion regarding asset write-offs as a crucial tool of earnings management. These studies find that firms often engage with losses arising from asset impairment for earnings

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during low-level periods. In other words, firms in this way forego choosing financial years with low earnings in order to recognize impairment losses and improve future earnings. This behavior is called "taking a bath" (e.g. Strong & Meyer, 1987; Elliott & Shaw, 1988; Riedl, 2004). However, some authors have also discovered that firms that recognize losses from devaluated assets are simply attempting to accurately reflect their solid financial state and are not taking a bath. However, empirical studies in the literature are ambiguous as to whether asset write-offs are examples of the big bath approach

Moreover, several empirical studies have also examined the issue of the relationship between asset devaluations and future performance. Rees, Gill and Gore (1996) find that it can be a workable approach for a firm to write off assets in response to poor performance in a complex and changing environment. Francis, Hanna and Vincent (1996) indicate that the fact that investors are conventionally confident of write-offs indicates a better prospect for firms. Chen, Chen, Su and Wang (2004) show that recognizing devaluated assets represents good news for investors that management has fixed the problems and this implies healthier future performance. However, Elliott and Hanna (1996) argued that, even if a firm writes off assets, it can nonetheless fail to show better performance and that this requires continuous monitoring. Zucca and Campbell (1992) show that firms writing off assets in smaller amounts see better business improvements. Writing off larger amounts, however, will not result in any further improvement in performance. Aboody, Barth, and Kasznik (1999) argue that, though unrealized incremental value from revaluation can signal future performance—particularly during periods of economic fluctuation—the association between write-offs and firm performance is insignificant. Overall, previous investigations present conflicting opinions on whether there is a relationship between recognizing asset devaluations and the firm's performance.

US Financial Accounting Standards Nos. 142 and 144, issued in June and August 2001, establish the norm and require firms to adopt undiscounted future cash flows when assessing whether an asset value is reduced. If an asset is devaluated, using the discounted future cash flow is a more accurate approach to measure the actual reduced amount. Taiwan Financial Accounting Standard No. 35, promulgated in July 2004, called for asset values to be determined as the higher value of net fair value and use value (discounted future cash flows). The greater value is considered as a recoverable amount for further estimates on whether or not asset values will decrease and help gauge the cut-down amount. Regardless of U.S. or Taiwan accounting standards on write-offs, it is essential for firms to reevaluate assets by discounted future cash flows. As the assessment technology base involves numerous contrived subjectivities regarding estimates for asset write-offs, the way the market interprets and appraises management behavior beyond write-offs exerts a great draw on practitioners and academic scholars. On the other hand, reviewing the literature to date on whether firms recognize asset devaluations gives ambiguous results. In addition, whether or not the write-off amount is appropriate is related to fair presentation of financial statements, and has a substantial influence on investor decision-making for the future value of a firm. Thus, this subject, linking the influential aspects of asset write-off accounting standards and firm performance, is worthy of deeper investigation and analysis.

Using 181 listed firms which have implemented TSFAS No. 35 in its first year of 2005, this study delves deeper into the influence of this standard on a firm's performance for the subsequent year of 2006. Unlike previous empirical studies that have generally used ordinary least squares regression (OLS) as the research method, this study employs quantile regression (Koenker & Bassett, 1978) to make empirical analyses and to compare its results with OLS. The estimates obtained from OLS produce the likelihood of biased results, as they usually posit symmetric data distributions and ignore other possible patterns—that is, when OLS estimates conflict with or contradict the inherent data distribution, empirical results are more inaccurate. By applying quantile regression, the study expects to obtain more accurate and reliable empirical findings.

This study revealed several interesting results. In applying the quantile regression analysis, when the sample value positions are below 90%, the asset write-off amount has a significantly positive effect on the net income for the following year of the implementation of standard which supports the hypothesis put forward in this study. Entering at 1%, 10%, 20%, 90%, and 99% of sample values, significant and insignificant positive effects are seen in the next year's revenue which also support the research hypotheses. However, estimates from OLS show that these relationships are negative, whether significant or insignificant, are in contrast to the expected results. Based on above analysis, this research contributes to the literature by providing a reliable analytical tool—the quantile regression approach—that links different data distribution patterns to produce more explicit and persuasive evidence. Previous studies have generally overlooked the behavior of extreme data. In contrast, this study shows how these relationships vary with different data positions. As such, these results may serve as useful references for managerial practice and academic studies.

The remainder of this paper is organized as follows: Section 2 introduces the context of TSFAS No. 35 and reviews the arguments of existing studies on theoretical hypotheses related to asset write-offs. Section 3 introduces the research methods and research hypotheses. Section 4 presents and interprets the findings. Section 5 summarizes the results, discusses their implications for theory and managerial practice, and suggests interesting issues for future research.

## LITERATURE REVIEW

### TSFAS No. 35: Impairment of Assets

Taiwan Statements of Financial Accounting Standard No. 35, Impairment of Assets, was promulgated in July 2004 and took effect from January 1, 2005. Firms first judge the recoverable amount of an asset by referring to the higher of its fair value and its value in use, but its carrying amount may be greater or lower than its recoverable amount. Firms then apply this standard in order to determine whether the asset may be impaired and to calculate the impaired amount. When estimating an asset's value, firms need to comply with the requirement of the evaluation. First, the estimation of future cash inflows and outflows should include the continuing use of the assets and the disposal of the asset at the end of its useful life. Second, an asset's present value is obtained by discounting its future cash flows at an appropriate discounted rate.

In addition, the standard also requires the cash flow projections used to measure value in use are based on reasonable and supportable assumptions that represent management's best estimates of the economic conditions that will exist over the remaining useful life of the asset. The second requirement is to be based on the most recent financial budgets and forecasts approved by management. The duration for cash flow projections must be no more than five years. However, given the condition of sufficient and verified evidence showing economic and industrial prosperity, it is not subject to the time limits. Third, when in excess of a five-year estimated term, the growth rate in those years over regulated limitation should hold constant or should descend for measuring cash flows. Even so, with adequate and reliable evidence revealing a higher business growth rate, the rate limits are not applicable. The growth rate, as stated above, should not exceed the average long-term growth rate for the firm's products or for the sector or nation with which it is associated. Likewise, the state of satisfactory and perfect evidence indicate relatively high rate of growth is exceptional.

## The Impact of Asset Write-Offs

All financial accounting standards on asset impairments, whether they are regulated by US or Taiwan standards, require companies to use discounted future cash flows to estimate whether or not an asset may be impaired. The appraisal techniques involve numerous artificially subjective judgments and assessments where managers hold considerable discretion in recognizing the timing and amount of devaluation of an asset. Based on a review of previous literature on this topic, some researchers have investigated whether companies are exploiting asset write-offs as an artificial method of earnings management. This involves a one-time recognition of a large amount of impairment losses during years of slow earnings growth in order to further advance the likelihood of future earnings. This is called the take-a-bath approach. On the other hand, some studies suggest that there is a relationship between asset devaluations and future operational performance which corroborates the information content strategy. Such researchers argue that companies recognizing write-offs are simply conveying information that their future operational performance is likely to surge. The empirical studies described here include conflicting results on the effects of impairment losses on firms. These differences may arise from management's intention or behavior. The take-a-bath and information content hypotheses are the current two leading explanations.

The existing literature on asset impairment addresses the pros and cons of the take-a-bath hypothesis. Healy (1985) claims that firms perform asset write-offs in years of lower earnings in order to increase the likelihood of future earnings growth. Strong and Meyer (1987) find that the timing of asset devaluation over the period of management turnover or poorer business performance reveals how management exploits impairment losses to employ the bath strategy. Chen (1991) describes how firms with higher earnings appear to defer losses from current assets impaired across continuous years, but firms with negative earnings move ahead to recognize losses from asset devaluations. These behaviors of recognizing write-offs early or late are consistent with the take-a-bath hypothesis. Zucca and Cambell (1992) indicate that the management's purpose with impairment losses is to achieve earnings management and to take a bath. Heflin and Warfield (1997) support the take-a-bath hypothesis where the managers usually take write-offs for a rather prolonged period and recognize them over poorer earnings' years. Sunder (2002) indicates that managers decide to take a bath during a downturn in the industry. They attribute poor business performance to the weak market and not to themselves. Riedl (2004) argues that managers taking a bath on losses is the motive behind write-offs. Peetathawatchai and Acaranupong (2012) show that management opportunistically recognizes an impairment loss in order to smooth earnings when earnings increase which resulted in a misrepresentation of the value of the firm.

Some studies do not support the use of write-offs for taking a bath. Rees, Gill and Gore (1996) find no evidence showing that management recognition of impairment losses improves future performance. In other words, companies taking write-offs simply reflect their substantial capital and offer it as referral for the market's evaluation. Francis, Hanna and Vincent (1996) assume that assets are not written off in order to take-a-bath or to smooth earnings. Although the devaluated amount and the current operation are not related, it is likely to generate the perplexing problem that investors use net income to assess firm value. Jordan and Clark (2015) suggest that new CEOs do not practice big-bath earnings management through goodwill impairments. Siggelkow and Zülch (2013) also find no evidence for big bath accounting in German companies.

The information content hypothesis is another way to explore management behavior on the issue of asset write-offs. Elliott and Shaw

(1988) not only prove that in the years of recognizing impairments as a lower return is seen on assets and equity, but also show that the market considers firms taking write-offs are simply indicating that they are facing operational difficulties. Bunsis (1997) categorizes firms taking impairments into three groups: those with an increase as the outcome, those with a decrease, and those with unchanged future cash flows. His finding shows that, during a period when firms announce asset write-offs, investors present positive returns for those with increasing future cash flows and negative returns for those with decreasing future cash flows. Bartov and Ricks (1998) characterize firms into two groups by the factors that produce asset write-offs. The two groups are conventional accounting recognition and operational policy. When firms announce asset write-offs, investors respond to negative returns for the former and positive returns for the latter. Landsman, Miller and Yeh (2007) show that firms that write off assets not only increase their earnings in the following period but also receive a positive reward from investors.

In summary, although the standards set norms for firms that undertake impairment losses derived from assets, the appraisal procedures depend heavily on individual subjective judgments. Thus, the earning figures of a firm and any consequences that emerge from management decisions are worthy of further investigation. In addition, when reviewing existing studies on the take-a-bath and information content hypotheses, it can be observed that their empirical findings on asset write-offs are inconsistent. Therefore, what the information content hypothesis really conveys about firms undertaking asset impairment losses is worthy of further examination.

## RESEARCH METHOD

### Research Hypothesis

As mentioned earlier, the take-a-bath theory refers to how a firm's write-offs are gathered over the years of decelerated income in order to increase the possibility of its future earnings growth (Healy, 1985; Kinney & Trezevant, 1997; Kirschenheiter & Melumad, 2002). Some studies show that firms do not take the impact of write-offs on earnings into account and that the closer the timing of impairment loss recognitions, the worse the operating performance will be (Strong & Meyer, 1987; Elliott & Shaw, 1988; Zucca & Campbell, 1992). In general, firms may not straightforwardly recognize impairments due to the extent of losses, thus, immediately turning out the disadvantages of the earnings information that a firm releases in its financial report (Elliott & Hanna, 1996). In other words, unless the current year of earning performance is inferior to the previous year, the firm should not rashly recognize write-offs. Thus, the frequency of the take-a-bath approach can be tested by whether the operational performance of the write-off year is worse than that of the following year. On the basis of these arguments, this study proposes the following hypothesis:

**$H_1$**: Firm performance on the current asset write-offs period is much lower than that of the next period.

Previous empirical studies on the information content theory concluded that, after recognizing impairments, a firm's per share cash flows increases, hence, the market value of cash flows also rises. This implies that, after recognizing write-offs, a company's performance is improved (Strong & Meyer, 1987). However, some studies argue that firms with smaller losses on impairments improve their performance after recognition, but with larger losses, their leverage heightens and performance becomes worse (Zucca & Campbell, 1992; Rees, Gill & Gore, 1996). Since the assets' book values decrease after recognizing losses from devaluations, the cost required for depreciation decreases afterward which has a significantly positive impact on the next year performance. The following hypothesis is thus proposed:

**$H_2$**: The greater the amount of current asset write-offs in a period, the stronger the firm's performance in the next period.

## The Model

Based on the theoretical expectations and the two hypotheses put forward in this study regarding the issue of write-offs, the following two empirical models are used to explain firm performance.

Model 1: $Q_{\theta}(\text{OperatingIncome}_{t+1}|x) = \alpha + \lambda_1 \text{ AssetWriteoff}_t + \lambda_2 \text{ OperatingIncome}_t + \lambda_3 \text{ MarketBook}_t + \lambda_4 \text{ Asset}_t + S(\theta)$

$$\text{Model 2: } Q_\theta(\text{NetIncome}_{t+1}|x) = \alpha + \beta_1 \text{AssetWriteoff}_t + \beta_2 \text{NetIncome}_t + \beta_3 \text{MarketBook}_t + \beta_4 \text{Asset}_t + S(\theta)$$

Given $H_1$—that firm performance in the period of recognizing a write-off is lower than that of the following period—income is taken as the proxy for firm performance. The dependent variable—either $\text{OperatingIncome}_{t+1}$ in Model 1 or $\text{NetIncome}_{t+1}$ in Model 2—refers to firm performance. $\text{OperatingIncome}_{t+1}$ is defined as the firm's operating income attributable to the period following the write-offs and is constructed by dividing the write-off amount in the next period plus the operating income by the total assets at the beginning of the current period; $\text{NetIncome}_{t+1}$ is defined as the firm's net income attributable to the period following the write-offs and is constructed by dividing the write-off amount at the next period plus operating income by the total assets at the beginning of the current period.

The independent variable, $\text{AssetWriteoff}_t$, refers to the asset write-off amount. Specifically, in testing the hypothesis $H_2$—that the greater the write-off amount, the better the performance in the next period—this study uses the amount of impairment loss of assets stated in the income statement divided by total assets at the beginning of the period. Another independent variable, $\text{OperatingIncome}_t$ in Model 1 or $\text{NetIncome}_t$ in Model 2, is defined as operational income or market value to book value at the current period with devaluated assets.

To control for possible confounding effects, the models in this study include two important variables: total assets ($\text{Asset}_t$) and market-to-book value ($\text{MarketBook}_t$). The former variable represents the firm's size while the latter variable represents the firm's prospective growth. Moreover, $\text{Asset}_t$ operationalizes the total assets at the current period of write-off recognition. $\text{MarketBook}_t$ is measured by the net market value to book value in the current write-off period.

## Analysis Tool

The conventional least squares regression used in research, when the dependent variable is taken from a right-skewed or left-skewed distribution, may give estimates that conflict and contradict the coefficients obtained from the real data distribution patterns. This oversight can produce biased empirical results. In contrast, quantile regression, introduced by Koenker and Bassett (1978), uses the absolute deviation approach to characterize the entire conditional distribution of a dependent variable given a set of regressors to give a robust measure of location based on a weighted sum of absolute deviations, with the aim of providing solutions for parameter vectors at different quantiles and interpreting estimates as differences in the response of the dependent variable to changes in the regressors at different points in the distribution (Buchinsky, 2004). On the whole, the conditional quantile regression model is performed as follows:

Let a random variable Y have the distribution function $F_Y$. Then, the θth sample quantile is defined as $Q_\theta(Y), \theta \in (0,1)$. Let $Q_\theta(Y)$ be equivalent to a certain value of $F_Y^{-1}(\theta)$, then

$$Q_\theta(Y) = F_Y^{-1}(\theta) = q_\theta$$

This equation indicates that, if θ is less than or equal to $q_\theta$ and (1-θ) is greater than or equal to $q_\theta$, then $q_\theta$ can be calculated by the following equation:

$$q_\theta = \arg\min \left[\theta \int_{y \geq q\theta} | y - q_\theta | \, dF_Y(y) + (1+\theta) \int_{y -< q\theta} | y - q_\theta | \, dF_Y(y)\right]$$

Let X and Y be random variables; if X establishes a conditional distribution of $F_{F|X}$, then the conditional quantiles of Y can be represented as

$$Q_\theta (Y|X) = F_{Y|X}^{-1}(\theta)$$

Where the conditional quantile $Q_\theta (Y|X)$ is a function of X. Let $Q_\theta (Y|X) = q_\theta (X)$, and under the condition that X = x, let us assume the probability of Y less than $q_\theta (x)$ is equal to θ, indicating the conditional quantiles while X = x.

Since existing analyses that use least squares regression may generate biased results, this study follows the procedure of Buchinsky (2004) who suggests that the use of quantile regression can reduce the bias resulting from skewed distributions and obtain a robust measure of location estimates.

### Sample and Data

The purpose of this study is to investigate the relationship between asset impairments enacted under TSFAS No. 35 in the first applicable year (2005) and the firm performance in the following year (2006). After omitting observations that represent incomplete financial data, the data set includes 181 firms listed on the Taiwan Stock Exchange, all of whom applied this standard in the first year of implementation. Investigating an effect of this type that results from the implementation of a standard requires covering a three-year period. In this case, the three-year period covers from 2004 to 2006. All data used in this research—including impairment amounts, total assets, net income, and share prices—were retrieved from the datasets of the Market Observation Post System and the Taiwan Economic Journal. To ensure the accuracy of the data, these two data-source systems were manually cross-validated.

## RESULTS

The hypotheses in this study were tested using a quantile regression procedure suggested by Buchinsky (2004). Model 1 uses operating income and Model 2 adopts net income as the dependent variable. The write-off amount is treated as a proxy for those who applied the asset impairment accounting principle, and firm performance in the year following the recognition of write-offs acts as a proxy for whether or not management manipulated the earnings. Market-to-book value and total assets are treated as control variables and are expected to be positive with firm performance.

### Model 1 Analysis

Table 1 provides the basic statistics of the major variables for all samples in Model 1. Using 181 listed firms, for sample means with logarithms, the highest is $Asset_t$ at 6.826 and the lowest is $AssetWriteoff_t$. For sample standard deviation, $MarketBook_t$—representing the firm's prospects—reaches the highest value (0.749) and $AssetWriteoff_t$ reaches the lowest (0.02). The sample in variance distribution is similar to a standard deviation. The preliminary determination of $OperatingIncome_{t+1}$—referring to the firm's operational performance in the period following the write-offs—is a left-skewed and leptokurtic distribution (-1.350 < 0; 13.879 >

3). Examining sample points at various positions reveal that each variable positioned at the 1%, 5%, 10%, 90%, 95% and 99% quantiles differs to some extent from its mean. Figures such as $OperatingIncome_{t+1}$ at the 1%, 5%, 10%, 90%, and 99% quantiles vary widely with their means (corresponding to -0.637, -0.105, 0.240, 0.331, and 0.421; 0.071). Therefore, when undertaking a quantile regression analysis, coefficient estimates of each variable should be noted at the above positions due to the great variance from the means.

**Table 1: Model 1 [Means, Standard Deviations and Skewness (N = 181)]**

| Variable | Operating $Income_{t+1}$ | Asset Write $off_t$ | Operating $Income_t$ | Market Book | $Asset_t$ |
|---|---|---|---|---|---|
| Obs. | 181 | 181 | 181 | 181 | 181 |
| Mean | 0.071 | 0.012 | 0.039 | 1.170 | 6.826 |
| Std. Dev. | 0.181 | 0.020 | 0.065 | 0.749 | 0.542 |
| Variance | 0.032 | 0.0004 | 0.004 | 0.561 | 0.294 |
| Skewness | -1.350 | 3.198 | 0.932 | 1.953 | 0.774 |
| Kurtosis | 13.879 | 14.715 | 6.601 | 8.907 | 3.821 |
| 1%Percentiles | -0.637 | 0.0002 | -0.130 | 0.3 | 5.9 |
| 5% Percentiles | -0.187 | 0.0004 | -0.045 | 0.39 | 6.062 |
| 10% Percentiles | -0.105 | 0.0007 | -0.026 | 0.45 | 6.194 |
| 50% Percentiles | 0.079 | 0.004 | 0.029 | 1 | 6.784 |
| 90% Percentiles | 0.240 | 0.030 | 0.116 | 2.19 | 7.503 |
| 95% Percentiles | 0.331 | 0.060 | 0.141 | 2.53 | 7.885 |
| 99% Percentile | 0.421 | 0.120 | 0.301 | 4.63 | 8.518 |

Table 2 presents the correlation matrices of the independent variables. Two sets of correlation estimates achieved statistical significance: the positive coefficient of $OperatingIncome_t$ and $MarketBook_t$, and the negative coefficient of $AssetWriteoff_t$ and $Asset_t$ (0.570, $p < 0.05$; -0.256,

$p < 0.05$). However, the variance inflation factors (VIF) for all coefficient estimates of the explanatory variables are below 10 ($AssetWriteoff_t$ 1.095; $OperatingIncome_t$ 1.520; $MarketBook_t$ 1.495; $Asset_t$ 1.078) which indicate that multicollinearity does not contaminate the results as suggested by Mason and Perreault (1991). More importantly, the distribution of the dependent variable, $OperatingIncome_{t+1}$, is pronouncedly left-skewed (-1.35, $p < 0.05$). This asymmetric distribution suggests that quantile regression analysis is rather efficient.

**Table 2: Model 1 [Correlation Matrices of Independent Variables (N = 181)]**

| | Asset Write $off_t$ | Operating $Income_t$ | Market $Book_t$ | $Asset_t$ |
|---|---|---|---|---|
| $AssetWriteoff_t$ | 1.0 | | | |
| $OperatingIncome_t$ | -0.122* | 1.0 | | |
| $MarketBook_t$ | -0.019 | 0.570*** | 1.0 | |
| $Asset_t$ | -0.256** | -0.015 | 0.034 | 1.0 |

*p < 0.1; ** p < 0.05; ***p < 0.01

**Table 3: Model 1 [Result from Skewness Analysis of Dependent Variable (N = 181)**

| | $OperatingIncome_{t+1}$ |
|---|---|
| Skewness | -1.350 |
| p-value | 0.000*** |
| Distribution | skewed to the left |

*** p < 0.01

Table 4 presents the least squares and quantile regression analysis results for Model 1. When performing the least squares regression analyses, the asset write-off amount in the current year shows a significantly negative effect on firm performance in the following year (estimated coefficient -1.186; $p < 0.05$). This suggests that take-a-bath behavior is inconsistent with $H_1$. The relation of operating incomes in the current and the following years of occurring write-offs is significant and positive (estimated coefficient 1.422, $p < 0.01$), which supports $H_2$ regarding the information content theory. In addition, the respective effects of the market-to-book value and the total assets in the write-off year on operating income is positive, but fails to achieve statistical significance (0.027, $p > 0.1$; 0.026, $p > 0.1$).

Model 1 applied the quantile regression analysis and showed that when $OperatingIncome_{t+1}$ ranks in the top 90%, the positive coefficient estimate AssetWriteoff but fails to achieve statistical significance (0.159; $p > 0.1$). This provides weak support for $H_1$ and contradicts the negative sign of least squares estimates. The coefficient estimate of $OperatingIncome_t$, by $OperatingIncome_{t+1}$ positioned at each point, is positive and significant which supports $H_2$ in a finding that is similar to that provided by the least squares approach. Model 1 also shows that the regression-coefficient estimate of the MarketBook variable by $OperatingIncome_{t+1}$ ranked at 50%, 70%, 90%, and 99%, is positive and significant. However, at 1%, 10%, and 20%, a negative relationship is found. This result differs from the least squares estimate. Moreover, the coefficient estimates of Asset by $OperatingIncome_{t+1}$ located at various quantiles are positive, whether significant or insignificant, this is similar to the estimate from the least squares method.

**Table 4: Model 1 [Results from Least Squares and Quantile Regressions Analyses (N = 181)]**

| | Asset Write off$_t$ ($\lambda_1$) | Operating Income$_t$ ($\lambda_2$) | Market Book$_t$ ($\lambda_3$) | Asset$_t$ ($\lambda_4$) |
|---|---|---|---|---|
| OLS | -1.186** | 1.422*** | 0.027 | 0.026 |
| 1*th Q*θ | -7.654*** | 4.854*** | -0.493*** | 0.125* |
| 10*th Q*θ | -1.962* | 1.823** | -0.054 | 0.028 |
| 20*th Q*θ | -2.074*** | 1.637*** | -0.021 | 0.011 |
| 50*th Q*θ | -1.891*** | 1.506*** | 0.027** | 0.005 |
| 70*th Q*θ | -1.552*** | 1.362*** | 0.060*** | 0.010 |
| 90*th Q*θ | 0.159 | 1.340*** | 0.102*** | 0.033 |
| 99*th Q*θ | -0.528*** | 1.390*** | 0.105*** | 0.104*** |

*p < 0.1; ** p < 0.05; ***p < 0.01

Figures 1, 2 3 and 4 show that the coefficient estimates and 95% confidence intervals for $AssetWriteoff_t$ by $OperatingIncome_{t+1}$ located at 1%, $MarketBook_t$ at 1% and 99%, and $Asset_t$ at 99% do not overlap with the means from the least squares regression. The estimated results from the least squares and quantile regressions may turn out to be conflicted.

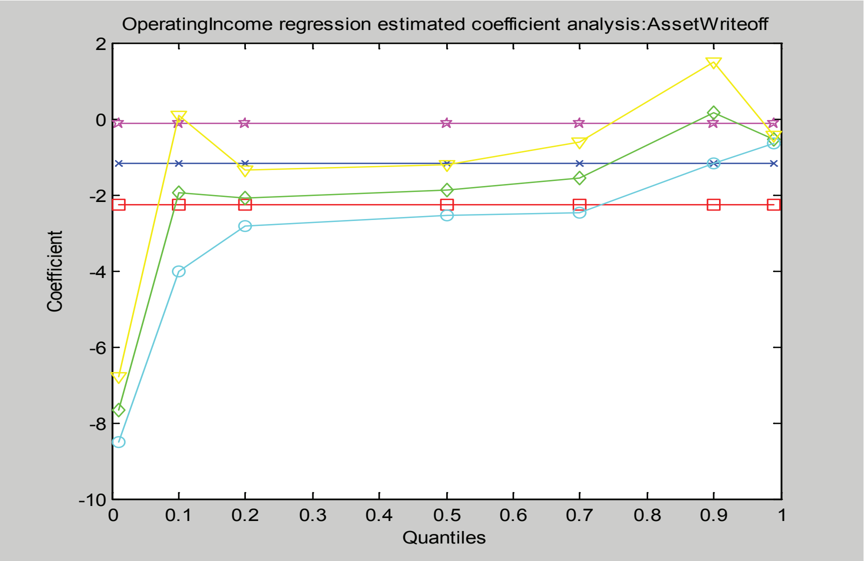


**Figure 1: Operating Income$_{t+1}$ Regression Estimated Coefficient Analysis: Asset Write off$_t$**

***Note***: —∇— Quantile estimated coefficient and the upper limit of 95% confidence interval
—◊— Quantile estimated coefficients
—○— Quantile estimated coefficients and the lower limit of 95% confidence interval
—☆— OLS estimated coefficient and the upper limit of 95% confidence interval
—*— OLS estimated coefficient
—□— OLS estimated coefficient and the lower limit of 95% confidence interval

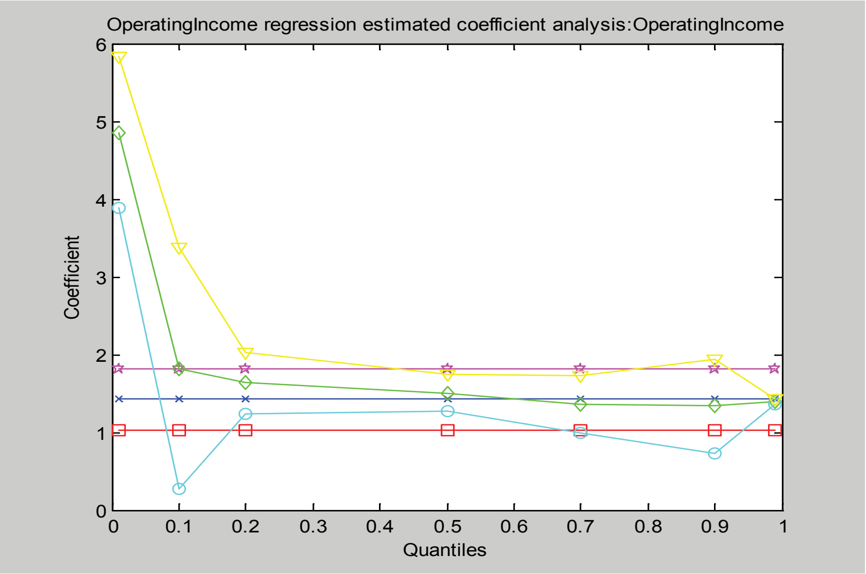


**Figure 2: Operating Income$_{t+1}$ Regression Estimated Coefficient Analysis: Operating Income$_t$**

***Note***: —∇— Quantile estimated coefficient and the upper limit of 95% confidence interval
—◊— Quantile estimated coefficients
—○— Quantile estimated coefficients and the lower limit of 95% confidence interval
—○— OLS estimated coefficient and the upper limit of 95% confidence interval
—*— OLS estimated coefficient
—□— OLS estimated coefficient and the lower limit of 95% confidence interval

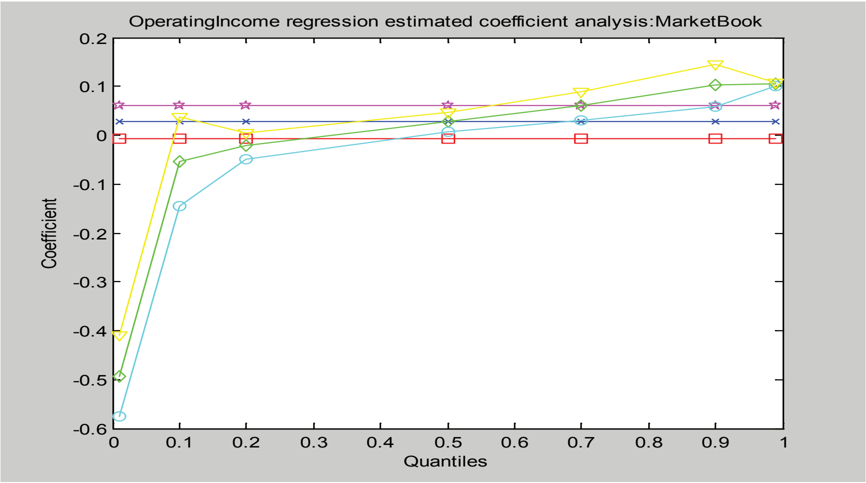


**Figure 3: Operating Income$_{t+1}$ Regression**
**Estimated Coefficient Analysis: Market Book$_t$**

***Note***: —∇— Quantile estimated coefficient and the upper limit of 95% confidence interval
—◊— Quantile estimated coefficients
—○— Quantile estimated coefficients and the lower limit of 95% confidence interval
—☆— OLS estimated coefficient and the upper limit of 95% confidence interval
—*— OLS estimated coefficient
—□— OLS estimated coefficient and the lower limit of 95% confidence interval

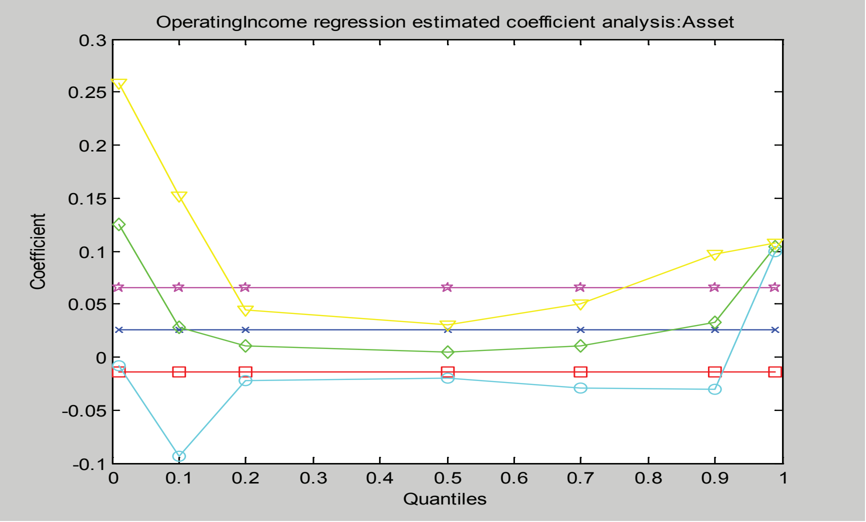


**Figure 4: Operating Income$_{t+1}$ Regression Estimated Coefficient Analysis: Asset$_t$**

***Note***: —∇— Quantile estimated coefficient and the upper limit of 95% confidence interval
—◊— Quantile estimated coefficients
—○— Quantile estimated coefficients and the lower limit of 95% confidence interval
—☆— OLS estimated coefficient and the upper limit of 95% confidence interval
—*— OLS estimated coefficient
—□— OLS estimated coefficient and the lower limit of 95% confidence interval

Table 5 provides a test for the equality of coefficients across quantiles for the asset write-off accounting principles on the OperatingIncome$_{t+1}$ variable. Most coefficients across quantiles are distinctive which indicate that the respective effects of profitability and market performance on debt ratio are asymmetric. Each pair of the 5th and 10th, the 5th and 20th, the 5th and 50th, the 10th and 20th, the 10th and 50th, the 10th and 70th, the 20th and 50th, the 10th and 70th, the 50th and 70th, and the 90th quantiles in the spectrum of quantile regression shows the same coefficients; other matching pairs have different coefficients. If the symmetry of simple regression to draw inferences was used, the estimates may be incompatible with the practical facts. Hence, using quantile regression into the analysis should produce more precision.

**Table 5: Model 1 [Equality Test of Coefficients Across Quantiles: Operating Income$_{t+1}$ (N = 181)]**

| | 5th $Q_\theta$ | 10th $Q_\theta$ | 20th $Q_\theta$ | 50th $Q_\theta$ | 70th $Q_\theta$ | 90th $Q_\theta$ |
|---|---|---|---|---|---|---|
| 5th $Q_\theta$ | | | | | | |
| 10th $Q_\theta$ | F-test = 0.902 | | | | | |
| 20th $Q_\theta$ | F-test = 0.977 | F-test = 0.296 | | | | |
| 50th $Q_\theta$ | F-test = 1.526 | F-test = 0.593 | F-test = 1.25 | | | |
| 70th $Q_\theta$ | F-test = 1.978* | F-test = 0.840 | F-test = 2.58** | F-test = 1.299 | | |
| 90th $Q_\theta$ | F-test = 2.779** | F-test = 2.056* | F-test = 6.23*** | F-test = 5.03*** | F-test = 3.03** | |
| 95th $Q_\theta$ | F-test = 2.965** | F-test = 2.088* | F-test = 6.93*** | F-test = 4.41*** | F-test = 2.64** | F-test = 0.504 |

*p < 0.1; ** p < 0.05; ***p < 0.01

## Model 2 Analysis

Table 6 presents the basic statistics on the major variables for the total samples in Model 2. The number of observations, Asset$_t$ representing firm size, and AssetWriteoff$_t$, and MarketBook$_t$ representing firm growth are the similar to Table 1. NetIncome$_{t+1}$, referring to firm operation performance in the period following the write-offs, is a left-skewed and leptokurtic distribution (-1.569 < 0; 13.649 > 3). Examining sample points at different locations shows that each variable positioned at the 1%, 5%, 10%, 90%, 95%, and 99% quantiles has a larger difference from its means. The values of NetIncome$_{t+1}$ variable at the 1%, 5%, 10%, 90%, and 99% quantiles differ widely from their means (corresponding to -0.306, -0.110, -0.051, 0.160, and 0.189; 0.044). The results from different quantiles should be noted when performing quantile regression analyses.

**Table 6: Model 2 [Means, Standard Deviations and Skewness (N = 181)]**

| Variable | Net $Income_{t+1}$ | Asset Write $off_t$ | Net $Income_t$ | Market Book | $Asset_t$ |
|---|---|---|---|---|---|
| Obs. | 181 | 181 | 181 | 181 | 181 |
| Mean | 0.044 | 0.012 | 0.018 | 1.170 | 6.826 |
| Std. Dev. | 0.102 | 0.020 | 0.101 | 0.749 | 0.542 |
| Variance | 0.010 | 0.0004 | 0.010 | 0.561 | 0.294 |
| Skewness | -1.569 | 3.198 | -0.303 | 1.953 | 0.774 |
| Kurtosis | 13.649 | 14.715 | 3.722 | 8.907 | 3.821 |
| 1%Percentiles | -0.306 | 0.0002 | -0.253 | 0.3 | 5.9 |
| 5% Percentiles | -0.110 | 0.0004 | -0.179 | 0.39 | 6.062 |
| 10% Percentiles | -0.051 | 0.0007 | -0.111 | 0.45 | 6.194 |
| 50% Percentiles | 0.046 | 0.004 | 0.021 | 1 | 6.784 |
| 90% Percentiles | 0.160 | 0.030 | 0.136 | 2.19 | 7.503 |
| 95% Percentiles | 0.189 | 0.060 | 0.149 | 2.53 | 7.885 |
| 99% Percentile | 0.225 | 0.120 | 0.301 | 4.63 | 8.518 |

The correlation matrices of explanatory variables indicate negative and significant coefficients between $AssetWriteoff_t$ and $NetIncome_t$ (-0.305, $p < 0.01$) while there are positive and significant coefficients between $AssetWriteoff_t$ and $Asset_t$ (0.475, $p < 0.01$). While the variance inflation factors (VIF) for all the coefficient estimates of the explanatory variables are below 10 ($AssetWriteoff_t$ 1.186; $NetIncome_t$ 1.464; $MarketBook_t$ 1.322; $Asset_t$ 1.075), multicollinearity does not contaminate the results. In order to determine the data distribution of the dependent variable, the estimate of the skew test for $NetIncome_{t+1}$ indicates significant left-skewness (1.569, $p < 0.01$).

**Table 7: Model 2 [Correlation Matrices of Independent Variables (N = 181)]**

| | Asset Write $off_t$ | Operating $Income_t$ | Market $Book_t$ | $Asset_t$ |
|---|---|---|---|---|
| Asset Write $off_t$ | 1.0 | | | |
| Operating $Income_t$ | -0.305*** | 1.0 | | |
| Market $Book_t$ | -0.019 | 0.475*** | 1.0 | |
| $Asset_t$ | -0.256*** | 0.145 | 0.034 | 1.0 |

*p < 0.1; ** p < 0.05; ***p < 0.01

**Table 8: Model 2 [Result from Skewness Analysis on Dependent Variable (N = 181)]**

| | Operating $Income_{t+1}$ |
|---|---|
| Skewness | 1.569 |
| p-value | 0.000*** |
| Distribution | skewed to the right |

Model 2 uses the write-off amount as a proxy for firms applying the asset write-off accounting principle and net income for whether or not firms actually used take-a-bath behavior for earnings management. Table 9 presents the results from least squares and quantile regression analysis for Model 2. Using the least squares regression analyses, the effect of the asset write-off amount in the current year on firm performance in the following year is negative and significant (estimated coefficient -1.186; $p < 0.05$). This result does not support $H_1$, the take-a-bath hypothesis. The association between operating incomes in the write-off year and in the following year is positive and significant (estimated coefficient 0.582, $p < 0.01$) which supports $H_2$, the information content theory. In addition, the respective effects of market-to-book value and total assets in the write-off year on operating income are positive but insignificant (0.011, $p > 0.1$; 0.012, $p > 0.1$).

Applying the quantile regression analysis in Model 2, under the condition that the $NetIncome_{t+1}$ sample point is at positions below 1%, 10%, 20%, and above 90% and 99%, the relationship of AssetWriteoff and $NetIncome_{t+1}$ is positive, whether significant or insignificant, which supports $H_1$ and disagrees with the negative coefficient from the least squares estimates. The coefficient estimate of $NetIncome_t$ by $NetIncome_{t+1}$ located at each point is positive and significant which supports the $H_2$ hypothesis on information content theory and provides a result similar to results from the least squares analysis. Model 2 also indicates that the regression-coefficient estimate of the MarketBook variable by $NetIncome_{t+1}$ at the 50%, 70%, 90%, and 99% quantiles is positive and significant; at the 1%, 10%, and 20% quantiles it is negative and significant, which is dissimilar to the least squares estimate. In addition, the coefficient estimates of Asset by

$NetIncome_{t+1}$ located at various quantiles are positive, whether significant or insignificant, which is similar to the estimate from the least squares method.

**Table 9: Model 2 [Results from Least Squares and quantile Regressions Analyses (N = 181)]**

| | Asset Write off$_t$ ($\beta_1$) | Net Income$_t$ ($\beta_2$) | Market Book$_t$ ($\beta_3$) | Asset$_t$ ($\beta_4$) |
|---|---|---|---|---|
| OLS | -0.001 | 0.582* | 0.011 | 0.012 |
| 1*th* $Q_\theta$ | 2.064*** | 3.124*** | 0.199*** | 0.929*** |
| 10*th* $Q_\theta$ | 0.521 | 0.874*** | -0.051*** | 0.009 |
| 20*th* $Q_\theta$ | 0.031 | 0.809*** | -0.012* | 0.005 |
| 50*th* $Q_\theta$ | -0.234 | 0.605*** | 0.012* | -0.004 |
| 70*th* $Q_\theta$ | -0.148 | 0.407*** | 0.039*** | 0.001 |
| 90*th* $Q_\theta$ | 0.120 | 0.394*** | 0.052*** | 0.0004 |
| 99*th* $Q_\theta$ | 0.036 | 0.130*** | 0.057*** | 0.029*** |

*p < 0.1; ** p < 0.05; ***p < 0.01

The linear patterns shown in Figures 5–Figure 8 illustrate that the coefficient estimates and their 95% confidence intervals for $AssetWriteoff_t$ by $NetIncome_{t+1}$ located at 1%, by $NetIncome_t$ at 1% and 99%, and by $MarketBook_t$ at 1%, 10%, and 99%, do not overlap with the means of the least squares regression. Therefore, estimates from the least squares and quantile are inconsistent.

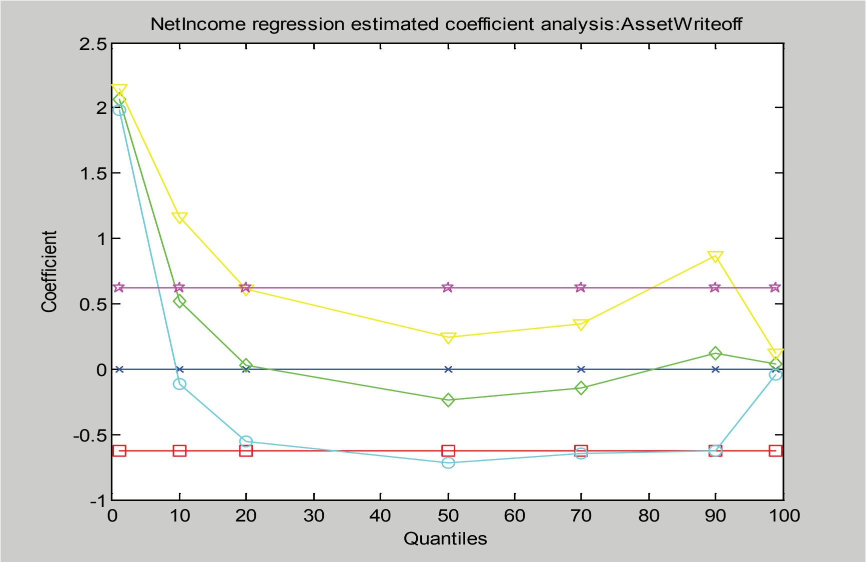


**Figure 5: NetIncome$_{t+1}$ Regression**
**Estimated Coefficient Analysis: AssetWriteoff$_t$**

***Note***: —∇— Quantile estimated coefficient and the upper limit of 95% confidence interval
—◊— Quantile estimated coefficients
—○— Quantile estimated coefficients and the lower limit of 95% confidence interval
—☆— OLS estimated coefficient and the upper limit of 95% confidence interval
—*— OLS estimated coefficient
—□— OLS estimated coefficient and the lower limit of 95% confidence interval

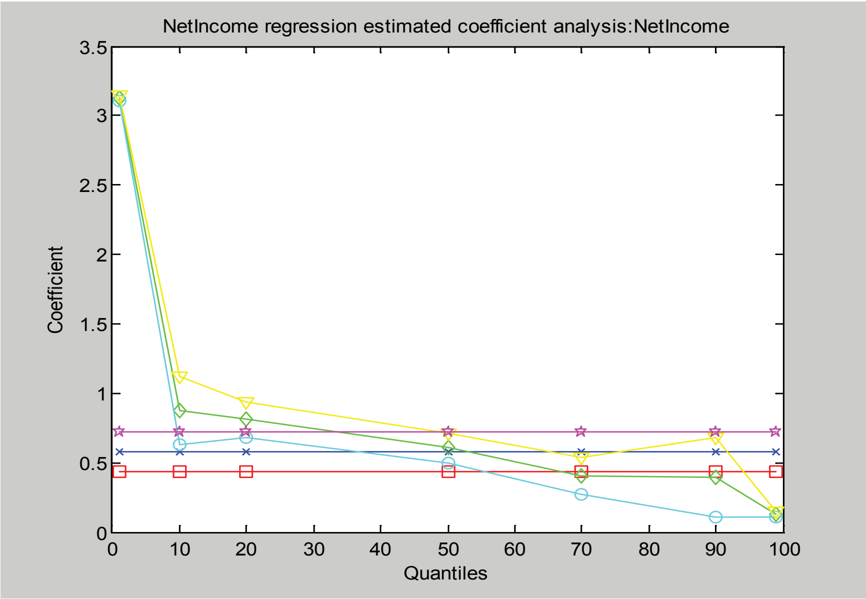


**Figure 6: NetIncome$_{t+1}$ Regression Estimated Coefficient Analysis: NetIncome$_t$**

***Note***: —∇— Quantile estimated coefficient and the upper limit of 95% confidence interval
—◊— Quantile estimated coefficients
—○— Quantile estimated coefficients and the lower limit of 95% confidence interval
—☆— OLS estimated coefficient and the upper limit of 95% confidence interval
—*— OLS estimated coefficient
—□— OLS estimated coefficient and the lower limit of 95% confidence interval

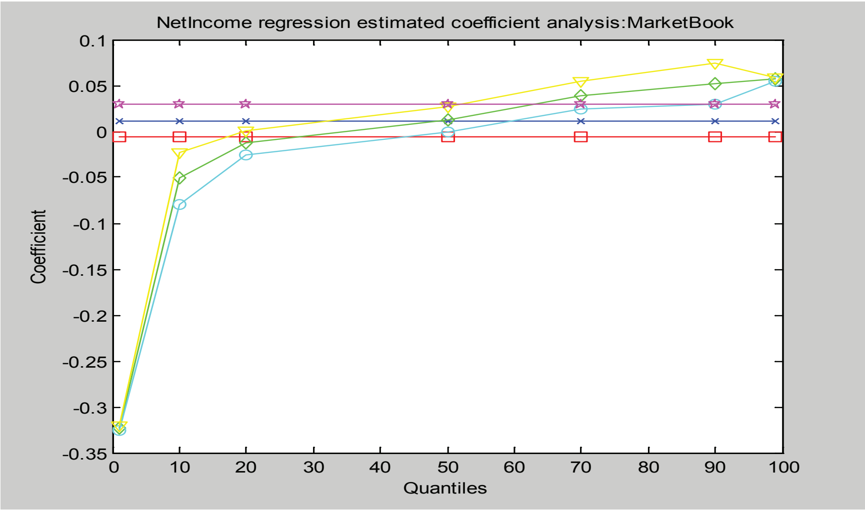


**Figure 7: NetIncome$_{t+1}$ Regression Estimated Coefficient Analysis: MarketBook$_t$**

***Note***: —∇— Quantile estimated coefficient and the upper limit of 95% confidence interval

—◊— Quantile estimated coefficients

—○— Quantile estimated coefficients and the lower limit of 95% confidence interval

—☆— OLS estimated coefficient and the upper limit of 95% confidence interval

—*— OLS estimated coefficient

—□— OLS estimated coefficient and the lower limit of 95% confidence interval

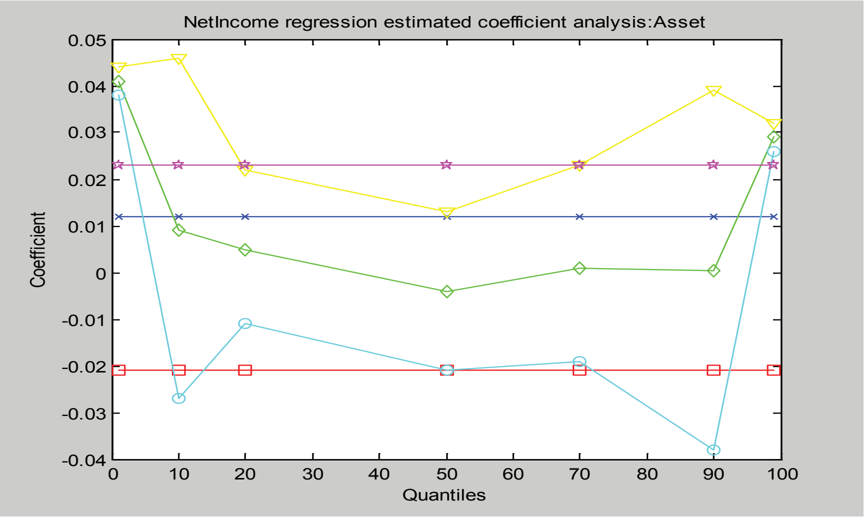


**Figure 8: NetIncome$_{t+1}$ Regression E stimated Coefficient Analysis: Asset$_t$**

***Note***: —∇— Quantile estimated coefficient and the upper limit of 95% confidence interval
—◊— Quantile estimated coefficients
—○— Quantile estimated coefficients and the lower limit of 95% confidence interval
—☆— OLS estimated coefficient and the upper limit of 95% confidence interval
—*— OLS estimated coefficient
—□— OLS estimated coefficient and the lower limit of 95% confidence interval

Table 10 provides the test results for the equality of the coefficients across quantiles for the NetIncome$_{t+1}$ data. Each pair of the 5th and 10th, the 5th and 20th, the 5th and 50th, the 5th and 70th, the 5th and 90th, the 20th and 50th, and the 70th and 90th quantiles indicates the same coefficients and the coefficients of other pairs differ. This indicates that the distribution of NetIncome$_{t+1}$ is asymmetric. Due to the asymmetric characteristic of the dependent variable, drawing inferences by the conventional least squares approach may not reflect the actual state. Hence, adopting quantile regression can increase the accuracy of the measurements.

**Table 10: Model 2: Test for Equality of Coefficients Across Quantiles: $NetIncome_{t+1}$**

| | 5th Qθ | 10th Qθ | 20th Qθ | 50th Qθ | 70th Qθ |
|---|---|---|---|---|---|
| 5th Qθ | | | | | |
| 10th Qθ | F-test = 0.199 | | | | |
| 20th Qθ | F-test = 0.517 | F-test = 1.983* | | | |
| 50th Qθ | F-test = 0.864 | F-test = 2.851** | F-test = 1.479 | | |
| 70th Qθ | F-test = 0.995 | F-test = 3.561*** | F-test = 3.257** | F-test = 2.781** | |
| 90th Qθ | F-test = 1.099 | F-test = 3.648*** | F-test = 4.164*** | F-test = 2.606** | F-test = 0.298 |

*p < 0.1; ** p < 0.05; ***p < 0.01

## DISCUSSIONS AND IMPLICATIONS

This study uses empirical evidence to determine whether or not management recognition of asset write-offs improves firm performance. The examination focuses on the take-a-bath and information content strategies. The analysis is based on data from firms that implemented the asset write-off accounting principle in its first year and made use of data on firm performance in the year following the write-off, taking operating income and net income as proxies for firm performance. With net income as the dependent variable, the results were more consistent with the hypothesis of the take-a-bath behavior.

Using operating income to proxy for firm performance, the results derived from the quantile-regression analysis showed that the amount written off in the current period negatively (significantly or insignificantly) impacts operating income in the following period at various sample point positions, except for the upper 90th quantile. This finding does not support the hypothesis constructed in this study.

On the other hand, taking net income to represent firm performance, the effect of the write-off amount on the net income in the following period is positive (significant or not), with sample points located at the 1%, 10%, 20%, 90% and 99% quantiles, in terms of firm performance ranking at the upper 1% and 10% levels and the lower 1%, 10% and 20% levels, which also supports the take-a-bath hypothesis and is consistent with Healy (1985), Kinney and Trezevant (1997), Kirschenheiter and Melumad (2002), Riedl (2004), and Peetathawatchai and Acaranupong (2012).

The above empirical differences are mainly due to asset write-offs losses being characterized as non-operating expenses or losses in the firm financial statements. However, when net income is taken to stand for firm performance (as it already includes the write-off amount), the empirical result show a positive effect, whether significant or insignificant, of write-offs on firm performance, which is consistent with $H_1$. Therefore, choosing net income to represent the dependent variable can achieve a more effective result.

These findings have several implications for research and commercial practice. First, even though TSFAS No. 35 has closely regulated special matters or items for firm assessing asset write-offs, the assessment procedures rely heavily on human subjective judgment. As investors review financial statements or reports, they should pay special attention to earnings figures and the potential effects of the subjective judgment. Second, reviewing historical studies on both take-a-bath and the information content approaches has shown a consensus. However, with empirical results, severing the sample points at different quantiles may serve as a prototype of a methodological design for academic studies. The limitation lies in the findings that are barely determined by the quantiles at 1%, 10%, 20%, 50%, 70%, 90%, and 99%/Thus, follow-up studies could profitably use more finely subdivided sample positions in their analysis.

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