Investigating the Relationship between the Probability of Bankruptcy and Firms’ Intentional Income Smoothing in Tehran Stock Exchange

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Abstract

Using a Regression model and through Panel data method, the essay wanted to examine the relationship between intentional income smoothing components and bankruptcy. To this aim, 81 distressed firms' financial data is gathered from Tehran stock exchange for the period of 1999-2008, to test the research hypotheses; first the probability of bankruptcy was assessed through the prediction model of Zavgren. Then real income smoothing was measured through Mean of Absolute Value of the percentage of real income deviations from its Trend; and artificial income smoothing was also measured by the model of Eckel at the levels of gross and operational profits. The results indicate that there is a relatively strong and direct correlation between the research variables. This means that managers of bankrupt enterprises (that are subject to the amended article 141of trade law) have a high inclination toward intentional income smoothing so that to magnify the firm's performance.

Keywords: Intentional Income Smoothing, Real Smoothing, Artificial Smoothing, Bankruptcy

Introduction

The research, as implied in its title (examining the relationship between the probability of firms' bankruptcy and intentional income smoothing in Tehran stock exchange, is intended to discuss two completely distinct issues in the areas of accounting and financial management. Thus, it is eventually in pursuit of finding the probable relationship between the two concepts of these subjects. To explain, the research tries to define the two concepts through absolutely distinct phenomena so to determine whether or not bankruptcy of firms leads to income smoothing. As the two phenomena can have a deserving effect on the efficiency of capital market and on decisions of investors and credit-givers of public organizations in Iran, and, if viewed broadly, on the whole society, it seemed necessary to do a research that can examine the probability of the existence of relationship between the two issues. Furthermore, a great deal of research has in the past been done, both in Iran and across the world, on each of the two issues of firms' income smoothing and bankruptcy separately; however, very few studies have been reported to examine the probability of the existence of relationship between the two issues. Therefore, the aim of this study, as discussed above, is to investigate the relationship between the probability of firms' bankruptcy and their decision to go through intentional income smoothing. The theoretical foundations of the research are presented first. Then the research goes on presenting the hypotheses and methodology and also testing each of the research models. In the end, the results, findings and suggestions for further research are introduced.

Review on Theoretical Basics and Earlier Researches

The phenomenon of firm's bankruptcy (such as the current bankruptcies of international big firms) has recently had a noticeable increase. Along with the development of capital market which took place after the absorption of many investors and shareholders who did invest in such markets with the hope of achieving the anticipated revenue.
To make financial decisions about any institute a unique scientific and real indicator is required. One of the indicators suitable to this aim is proper assessment of the probability of firms' bankruptcy. One of the tools used for the analysis of firms' financial matters is 'Financial Ratios'. Researchers such as Altman (1968), Fulmer (1984), Zavgren (1985) and others have managed, through combining such ratios, to present some multi-variable models for the prediction of bankruptcy. 'Bankruptcy prediction models' are one of the techniques and tools used for the prediction of firms' future status. to estimate the occurrence of bankruptcy probability through combining financial ratios (Alikhani and Meranjuri, 2010). Therefore, examining the probability of bankruptcy and predicting it phenomenon via the prevalent models can provide financial mangers of firms with a noticeable help for a prompt identification of the symptoms of financial crises in their firm, and then offering strategies to prevent the bankruptcies. Bankruptcy occurs when the liabilities of a firm is more than value of the assets existing in the firm (Gitman and Emery, 1996). On the other hand, based on the amended article 141 of the trade law, "if in consequence of the losses sustained, firm loses at least half of its capital, board of managers are responsible to immediately invite the firm's shareholders in a extra ordinary assembly. Vote for the break up or survival of the firm. If the foregoing assembly does not vote for the disbandment of firm, they should, in the same meeting and with obeying the regulations of the article 6 of the law, reduce the firm's capital to the existing amount of capital. If board of managers, contrary to the forgoing law, do not act as decided by the extra ordinary assembly, or, if the invited assembly cannot be held according to the legal regulations, each of the beneficiaries is allowed to refer to an authoritative court to claim the closedown of the firm" (Ebadi, 2011).

The phenomenon of income smoothing is a common topic in Accounting and Financial Affairs. In this topic rather long studies have been done so that indicative of the specific and rather unique position of the issue of income in discussions regarding the two fields of Accounting and Financial Affairs. A review on the history and literature of accounting shows that very few concepts like that of income have so far been vastly and vehemently debated by professional theoreticians, analysts and accountants (Badri, 2000). As real operational activities become more and more distant from the anticipated operational activities, motivation to income smoothing also enhances. In fact, the more deviated the real operational activities from the expectation of users, the more motivation will be created for reported income smoothing (Purheydari and Allahani, 2007). When firms become increasingly pressed by an unfavorable economic status, the managers ask the accounting sector to improve the last line of financial statements (i.e. income) and thereby to change their informational content. One of the methods sometimes used for the informational arrangement of the favorable status of firms is 'the earning management'. The term 'earning management' refers to the common interference of manager in the process of determining income, which is often in line with desired goals of manager. Management of income is a method used by manger to manipulate data. 'Income smoothing', for instance, is a good example of data manipulation used to provide investors with more confidence about income stability. Such deeds may have a noticeable effect on the data existing in financial statements. When practicing earning management, Firm's manger obviously knows that the aim of the deed is to protect the firm's benefits against income owners (beneficiaries) (Nuravesh et al, 2006). Managers have various tools at hand to balance the trend of income within their firms. One example is to smooth firms' income through managing business activities (economic events). Managers can do so by, for example, accelerating or postponing the transmission of goods, or the issuing of bills or through changing the methods of asset depreciation. This proves that managers resort to various tools and techniques to smooth income. Income smoothing, as a deliberate attempt of firms to decrease periodical changes and fluctuations of reported or expected income through the use of selective techniques of accounting within the framework of generally accepted accounting principles (GAAP), is divided into two sectors of natural smoothing and intentional smoothing. In its turn, intentional smoothing is divided into real smoothing and artificial smoothing (Molla nazari and Yazdani, 2007).

Artificial smoothing is indicative of the intentional and consciously effort that artificially reduces fluctuations of income flow. Such a smoothing is formed by the income manipulation and has no effect on cash flows (Haeri, 2001). real income smoothing refers to the attempts of management to response the economic circumstances. Such a smoothing can affect cash flows (Bulu and Hosseini, 2009).

To recognize artificial income smoothing behavior, many researchers have used the model of Eckel (1981). According to this model, for a firm to be considered a smoother of income, it should do smooth the income of at least one of the operational levels of gross or net. The model uses the information related to a time period of several years instead of referring to the information of only one year. Based on this model, for a firm to be known as an artificial income smoother, the dispersion coefficient of the changes of a period of its gross income, operational income or net income should be smaller than the dispersion coefficient of the changes of a period of its sale. In other words, if \[ CV_{\Delta S} < CV_{\Delta A} \] is smaller than one, the firm is known to have smoothed its income.
Habib (2005), in a study entitled "specific determinants of income smoothing in Bangladesh", using the empirical valuation and the model of Eckel (1981) and also using the statistics of ANOVA, compared sale and income. The results indicate that income smoothing methods are often applied by smaller firms. It was also shown that firms whose ratio of debts to the equity is larger are more willing to use and apply income smoothing methods.

Huang et al (2009) in a study examined whether intentional income smooths and real income smoothing have equal effects on the value of firm. The results indicated that weaker firms have higher motivation to manipulate income (either through intentional or real smoothing). In fact, they do so through the use of some tools including the return of unusual items or through using derivative tools.

Sun (2011) examined the effect of analyst coverage on the informativeness of income smoothing. He found that income smoothing enhances earning informativeness more greatly for firms with high analyst coverage than for firms with low analyst coverage.

Asadi and Garizi (2008) did a study entitled "the effect of income smoothing on the unusual return of firms". The results indicated that all the firms participating in the statistical population did use income smoothing; but, the noticeable point was that income smoothing, type of industry and firm size have no significant effect on the return of firms.

Javadi (2008) in a study examined the relationship between income smoothing and firm's value and also the effect of income smoothing on the value of the enterprises participating in the stock exchanges of Tehran. The results are indicative of the existence of income smoothing behaviors in firms and the relationship between income smoothing, firm size and firm value was not approved.

The results of the research done by Haghighat and Rayegan (2009), entitled: "analyzing the informative role of income smoothing on the prediction of future incomes and its effect on the coefficient of income response in the stock exchange of Tehran" show that:

1. The current price of the shares of those firms that use more of income smoothing methods contains less information about future incomes and cash flows.
2. Income smoothing is mainly used for the purpose of distortion.

Using an artificial neural (hybrid bankruptcy) model, Slim (2007) devised a fuzzy clustering model and multivariate adaptive regression splines for bankruptcy prediction. In his model he used 17 financial ratios and compared the three models of linear analysis, post-distribution neural web and fuzzy neural model. The results showed that the accuracy of fuzzy neural model is more suitable than other models for the prediction of bankruptcy.

Using the pattern of artificial neural model, Wu et al (2007) compared the accuracy of six models of bankruptcy prediction. The results are indicative of better performance of the models that are based on artificial expert systems than statistical methods.

Using a regressive partition algorithm, Hung and Chen (2007) tried to compare the four models of Tree Decision, neural web, post-distribution algorithm and supportive vector techniques. The accuracy of such models for the prediction of bankruptcy was respectively %38, %72, %78.9 and %78.

Seuyoshi and Goto (2009) performed a study entitled "Methodological comparison between DEA (data envelopment analysis) and DEA-DA (discriminant analysis) from the perspective of bankruptcy assessment". The results showed that DEA is a managerial tool for the initial assessment of corporate failure and is useful for busy leaders and financial managers, while DEA-DA is useful for researchers and those individuals who are interested in detailed assessment of bankruptcy and its failure process in a time horizon.

In order to assess the accuracy of firms' bankruptcy, Maghsudlu (2011) used the DEA (data envelopment analysis) model and compared it with the model of Shirata in the stock exchange of Tehran. The accuracy of the two models was determined more than 50% for the prediction of bankrupt and non-
bankrupt firms. This finding shows that both the two models can be applied for the aim of bankruptcy assessment in the environment of Iran.

Charitou et al (2007) showed that managers of bankrupt firms find more motivation for the reduction of income and to have a more conservative behavior when there are more outer-organizational supervisory systems and/or when the auditors, in their statements, issue that the firm is qualified to continue its activities.

Rosner (2003) in a study found that the behavior of those bankrupt firms that have not revealed financial crises on the basis of real information, hence showing a noticeable amount of reduction in their cash flows is the same as those firms that have shown their income more than the actual amount both before and after their bankruptcy.

Using a sample of 859 members from American bankrupt firms, Anderson et al (2007) in a study evaluated earnings behaviors of managers during the period of bankruptcy via unusual promissory items in the years before bankruptcy. The results showed that the managers of the firms that are highly probable to experience bankruptcy decide to transfer their decreasing earnings.

Research Hypotheses
1. There is a relationship between the probability of firms' bankruptcy and real smoothing of gross income.
2. There is a relationship between the probability of firms' bankruptcy and real smoothing of operational income.
3. There is a relationship between the probability of firms' bankruptcy and artificial smoothing of gross income.
4. There is a relationship between the probability of firms' bankruptcy and artificial smoothing of operational income.

Methodology

The statistical population of the research consisted of the financial information of 96 bankrupt firms participating in Tehran stock exchange. In the meeting of 6.10.2008, the supervisory group of the stock exchange of Tehran was removed from the list of the firms accepted in Tehran Stock Exchange, based on the article 141 of trade law. The reason for this removal was that the group did not manage to attain the necessary conditions or qualifications of boards and markets. As a result, using Removal Sampling, 81 firms were selected from the whole population of 96 productive firms. In fact, this sample was selected on the basis of the following conditions:
1. accessibility to financial information of the assessed period
2. They should not be among investor firms and financial intermediaries (due to the specific structure of reporting).

The reason why a ten-year period (from 1999 to 2008) was chosen to be investigated in the research for the sample firms participating in Stock Exchange was the reliability of financial statements of such firms during this period.

Financial information of the research has been compiled from the information database present in the library of Stock Exchange organization and informational databases of Dena Share, Rahavarde Novin, and the financial statements published by stock exchange organization. Eviews Software was used in this study. Probability of firms' bankruptcy is used as the independent variable while intentional income smoothing, which in turn encompasses real smoothing and artificial smoothing, is also used as the dependent variable.

The bankruptcy prediction model of Zavgren (1985) was used to make sure whether the selected sample firms are bankrupt. A great deal of research has been done across the world for the prediction of bankruptcy. Numerous methods and models have also been presented by researchers to this end (i.e. to predict the probability of firms’ bankruptcy). One of such models is that of Christine Zavgren (1985). In this model she uses a Logistic Analysis, which is explicated as follows:

\[ y = 0.23883 - 0.108x_1 - 1.583x_2 - 10.78x_3 + 3.074x_4 + 0.486x_5 - 4.35x_6 - 0.11x_7 \]

\[ X_1 = \text{average inventories} \cdot \text{sales} \]

\[ X_2 = \text{average accounts achievable} \cdot \text{average inventories} \]

\[ X_3 = \text{marketable securities} + \text{cash} \cdot \text{total assets} \]

\[ X_4 = \text{ouick assets} \cdot \text{current liabilities} \]

\[ X_5 = \text{operational profi} \cdot \text{total assets} - \text{current liabilities} \]

\[ X_6 = \text{long term debts} \cdot \text{total assets} - \text{current liabilities} \]

\[ X_7 = \text{sale} \cdot \text{net working capital} + \text{fixed assets} \]

\[ Y = \text{sum of (coefficient} \cdot \text{Ratio)} \]

\[ 1 \div (1 + e^{-y}) = \text{bankruptcy probability} \]

Usage of logit model entails four stages:
1. A series of seven financial ratios are calculated.
2. Each ratio is multiplied by its coefficients. Coefficients of each country are particular to that country.
   To calculate the coefficients in each country, Logit analysis is used.
3. The resulting value are summed together (y).
4. To calculate the probability of each firm’s bankruptcy, y is put into the above formula and a unique figure that shows the bankruptcy probability of a specific firm is acquired.

The method used to specify real income smoother firms was Mean of Absolute Value of the percentage of real income deviations from its Trend (T) (Molla Nazari and Karimi Zand, 2007). In this model to calculate T, first the absolute mean of sum of each year’s changes in comparison with the previous year is measured. The measurement variables are gross profit, operational profit and net profit. To determine the numerical amount of S, which represents the amount of dispersion of firms’ income and which specifies real income smoother firms, Median is used. The figure acquired by Median is used to separate smoother from non-smoother firms.

The mean of Trend (T) is calculated by the following formula:

\[
T = \frac{1}{n-1} \sum_{i=1}^{n-1} \left| \frac{y_{i+1} - y_i}{y_i} \right|
\]

Mean of Absolute Value of the percentage of real income deviations is calculated by the following formula:

\[
S = \frac{1}{n-1} \sum_{i=1}^{n-1} \left| \frac{y_{i+1} / y_i - T}{T} \right|
\]

Another one model was first proposed by Ickel (1981) and then applied by Albrecht and Richardson (1990), Michelson et al (1995), Belkaui and Picur (1984), Molla Nazari and Karimi Zand (2008), to recognize of artificial smoothing. In this model, it is assumed that an index lower than one in absolute value, indicates the presence of income smoothing because the coefficient of variation of net income would be smaller than CV of sales. In other words, the smoother firm is considered artificial if \( CV_{\Delta I} < CV_{\Delta S} < 1 \).

\[
CV_{\Delta I} = \sqrt{\frac{\sum (\Delta I - \bar{\Delta I})^2 / n-1}{\bar{\Delta I}}}
\]
\[
CV_{\Delta S} = \sqrt{\frac{\sum (\Delta S - \bar{\Delta S})^2 / n-1}{\bar{\Delta S}}}
\]

\( \Delta I \) = income change in one period  
\( \Delta S \) = sale change in one period  
\( CV \) = coefficient of variation  
\( S \) = mean of sale  
\( L \) = mean of profit

In this research, probability of firms’ bankruptcy is considered as independent variable while income smoothing was known as dependent variable. Regression model was used to test the hypotheses (Haghighat and Rayegan, 2009). This model also had Dummy variables. Although we can implicitly suppose that the explained variables can be quantitative, qualitative, or a combination of the two, the dependent variable should anyway be measurable and quantitative. This variable by nature indicates two groups of values (0 and 1). Number 1 shows income smoother firms while 0 is indicates non-smoother firms.

To determine real income smoother firms Mean of Absolute Value of the percentage of real income deviations from mean of changes was used; this model was applied on the three different types of income (gross, operational and net income). To identify at which of these levels a firm does real smoothing, median
of changes coefficient was used. Based on gross income, the median was determined 0.2687, based on operational income, it was 0.3753, and based on net income it was determined 0.4825. On the basis of this model, the number of real smoother firms at the level of gross income was 62 firms, while at the level of operational and gross income 61 firms were real smoother. To recognize artificial income smoother firms, the model of Ickel(1981) was used. If a firm does smoothing at least in one of the operational, gross or net, it is known as artificial smoother. Based on this model, the 65 firms were decided to be artificial income smoother.

Based on the statement of Stock Exchange Organization for the bankruptcy of 96 firms, 81 firms were selected from theses bankrupt firms and formed the sample firms of the research. The probability of the bankruptcy of the sample firms was evaluated using the model of Zavgren (1985).

Results

The results are illustrated in table 1:

Table 1. Percentage and number of bankrupt firms in the stock exchange of Tehran, based on the model of Zavgren

<table>
<thead>
<tr>
<th>Total results acquired from the model of Zavgren</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of hidden bankruptcy (0 to 20%)</td>
<td>Number</td>
<td>10</td>
<td>15</td>
<td>11</td>
<td>16</td>
<td>14</td>
<td>18</td>
<td>25</td>
<td>24</td>
<td>26</td>
</tr>
<tr>
<td>Percentage of the number of hidden bankrupt firms</td>
<td>Percent</td>
<td>12.35</td>
<td>18.52</td>
<td>13.58</td>
<td>19.75</td>
<td>17.28</td>
<td>22.22</td>
<td>30.86</td>
<td>29.63</td>
<td>32.10</td>
</tr>
<tr>
<td>Partial bankruptcy (20% to 60%)</td>
<td>Number</td>
<td>24</td>
<td>25</td>
<td>27</td>
<td>25</td>
<td>25</td>
<td>27</td>
<td>25</td>
<td>22</td>
<td>23</td>
</tr>
<tr>
<td>Percentage of the number of Partial bankrupt firms</td>
<td>Percent</td>
<td>29.63</td>
<td>30.86</td>
<td>33.33</td>
<td>30.86</td>
<td>30.86</td>
<td>33.33</td>
<td>30.86</td>
<td>27.16</td>
<td>28.40</td>
</tr>
<tr>
<td>Complete bankruptcy (60% to 100%)</td>
<td>Number</td>
<td>47</td>
<td>41</td>
<td>43</td>
<td>40</td>
<td>42</td>
<td>36</td>
<td>31</td>
<td>35</td>
<td>32</td>
</tr>
<tr>
<td>Percentage of the number of complete bankrupt firms</td>
<td>Percent</td>
<td>58.02</td>
<td>50.62</td>
<td>53.09</td>
<td>49.38</td>
<td>51.85</td>
<td>44.44</td>
<td>38.27</td>
<td>43.21</td>
<td>39.51</td>
</tr>
</tbody>
</table>

The First Hypothesis Test

To analyze the first hypothesis, Hausman test was used to select either fixed or random effects. To test this hypothesis, Chi square was utilized. If the P-value be less than 5%, i.e. at the significance level of 95%, fixed effects are preferred to random effects.

Table 2. Results of Hausman Test

| Hausman test (fixed versus random effects) | | |
|------------------------------------------|------------------------------------------|
| Chi square | 64.643 |
| P-value | 0.000 |
| Fixed effect,5% percent level | | | | | |
Based on Panel data method, the results of the statistical analysis on this hypothesis are exemplified as follows:

**Table 3. First Hypothesis Test**

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>3.06278</td>
<td>0.17412</td>
<td>-12.7223</td>
<td>0.00001</td>
</tr>
<tr>
<td>Independent Variable</td>
<td>0.8213</td>
<td>0.0327</td>
<td>-20.598</td>
<td>0.00001</td>
</tr>
<tr>
<td>Mean dependent var.</td>
<td>656036.8</td>
<td>0.76</td>
<td>F-statistic</td>
<td>1588.088</td>
</tr>
<tr>
<td>S.D.dependent var.</td>
<td>692690.1</td>
<td>0.57</td>
<td>Prob(F-statistic)</td>
<td>0.000</td>
</tr>
<tr>
<td>Sum square resid</td>
<td>2.22E+12</td>
<td>0.49</td>
<td>Durbin-Watson stat</td>
<td>1.89</td>
</tr>
</tbody>
</table>

Based on the results of the statistical analysis, H1 was approved. Moreover, the reliability of 76% (R=%76) is indicative of the existence of correlation between the variables. The amount of F is also high and significant, which is indicative of the existence of linear relationship between the variables. The amount of D.W also shows that there is no correlation between error values.

**The Second Hypothesis Test**

To analyze the 2\textsuperscript{nd} hypothesis, Hausman test was used to choose either fixed or random effects. To test this hypothesis, Chi square was used. If the P-value is 5%, i.e. at the significance level of 95%, fixed effects are preferred to random effects.

**Table 4. results of Hausman Test**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi square</td>
<td>55.428</td>
<td></td>
</tr>
<tr>
<td>P-value</td>
<td>0.000</td>
<td></td>
</tr>
</tbody>
</table>

Fixed effect, 5% percent level

Based on Panel data method, the results of the statistical analysis on this hypothesis are illustrated as follows:

**Table 5. Second Hypothesis Test**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>2.2887</td>
<td>0.18319</td>
<td>-14.7003</td>
<td>0.00001</td>
</tr>
<tr>
<td>Independent Variable</td>
<td>0.8373</td>
<td>0.0276</td>
<td>-15.9308</td>
<td>0.00001</td>
</tr>
<tr>
<td>Mean dependent var</td>
<td>554020.8</td>
<td>0.60</td>
<td>F-statistic</td>
<td>988.088</td>
</tr>
<tr>
<td>S.D.dependent var</td>
<td>596010.1</td>
<td>0.36</td>
<td>Prob(F-statistic)</td>
<td>0.000</td>
</tr>
<tr>
<td>Sum square resid</td>
<td>2.22E+12</td>
<td>0.29</td>
<td>Durbin-Watson stat</td>
<td>1.89</td>
</tr>
</tbody>
</table>

Based on the results of the statistical analysis, H0 was rejected; however, considering the existence of significant relationship between the probability of firms' bankruptcy and real smoothing of gross income, H1 was approved. Moreover, the reliability of 60% (R=%60) is indicative of the existence of correlation between the variables. The amount of F is also high and significant, which is indicative of the existence of linear relationship between the variables. The amount of D.W also shows that there is no correlation between error values.
The Third Hypothesis Test

To analyze the 3rd hypothesis, Hausman test was used to select one of the two fixed versus random effects. To test this hypothesis, Chi square was used. If the P-value is 5%, i.e. at the significance level of 95%, fixed effects are preferred to random effects.

Table 6. Results of Hausman Test
Hausman test (fixed versus random effects)

<table>
<thead>
<tr>
<th>Chi square</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>70.221</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Fixed effect, 5% percent level

Based on Panel data method, the results of the statistical analysis on this hypothesis are illustrated as follows:

Table 7. Third Hypothesis Test

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>3.9312</td>
<td>0.2349</td>
<td>-16.0178</td>
<td>0.00001</td>
</tr>
<tr>
<td>Independent Variable</td>
<td>0.4683</td>
<td>0.04192</td>
<td>-17.8120</td>
<td>0.00001</td>
</tr>
<tr>
<td>Mean dependent var</td>
<td>61220.21</td>
<td>R</td>
<td>0.74</td>
<td>F-statistic 862.035</td>
</tr>
<tr>
<td>S.D.dependent var</td>
<td>67201.66</td>
<td>R-squared</td>
<td>0.55</td>
<td>Prob(F-statistic 0.000</td>
</tr>
<tr>
<td>Sum square resid</td>
<td>1.97E+12</td>
<td>Adjusted R-squared</td>
<td>0.47</td>
<td>Durbin-Watson stat 1.936</td>
</tr>
</tbody>
</table>

Based on table 7 and taking into account the significance level which is less than 5%, H0 was rejected; moreover, considering the existence of significant relationship between the probability of firms' bankruptcy and artificial smoothing of gross income, H1 was approved. Moreover, the reliability of 74% (R=%74) is indicative of the existence of correlation between the variables. The amount of F is also high and significant, which is indicative of the existence of linear relationship between the variables. The amount of D.W also shows that there is no correlation between residuals.

The Fourth Hypothesis Test

To test the 4th hypothesis, Hausman test was used to select between fixed versus random effects. To test this hypothesis, Chi square was used. If the P-value is 5%, i.e. at the significance level of 95%, fixed effects are preferred to random effects.

Table 8. results of Hausman Test
Hausman test (fixed versus random effects)

<table>
<thead>
<tr>
<th>Chi square</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>69.221</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Fixed effect, 5% percent level

On the basis of Panel data method, the results of the statistical analysis on this hypothesis are illustrated as follows:

Based on table 9 and taking into account the significance level which is less than %5 into account, H0 was rejected; moreover, considering the existence of significant relationship between the probability of firms' bankruptcy and artificial smoothing of operational income, H1 was approved. Moreover, the reliability of 86% (R=%86) is indicative of high generalizability of the model. The amount of F is also high and significant, which is indicative of the existence of linear relationship between the variables. The amount of D.W also shows that error values are independent from each other. Preconditions for the validity of regression model are illustrated in table 10.
Table 9. Testing the Fourth Hypothesis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>2.4484</td>
<td>0.5178</td>
<td>-6.0477</td>
<td>0.000001</td>
</tr>
<tr>
<td>Independent Variable</td>
<td>0.71601</td>
<td>0.04623</td>
<td>-10.5223</td>
<td>0.00001</td>
</tr>
<tr>
<td>Mean dependent var</td>
<td>58152.21</td>
<td>R</td>
<td>0.86</td>
<td>F-statistic 862.035</td>
</tr>
<tr>
<td>S.D.dependent var</td>
<td>43462.66</td>
<td>R-squared</td>
<td>0.74</td>
<td>Prob(F-statistic 0.000</td>
</tr>
<tr>
<td>Sum square resid</td>
<td>1.97E+56</td>
<td>Adjusted R-squared</td>
<td>0.68</td>
<td>Durbin-Watson stat 1.8</td>
</tr>
</tbody>
</table>

Table 10. Regression Validity Test

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>white</td>
<td>2.837</td>
<td>1.956</td>
<td>10.420</td>
<td>2.470</td>
</tr>
<tr>
<td>J-B</td>
<td>4.4662</td>
<td>1.09</td>
<td>3.2541</td>
<td>4.4012</td>
</tr>
<tr>
<td></td>
<td>0.107</td>
<td>0.579</td>
<td>0.320</td>
<td>0.210</td>
</tr>
</tbody>
</table>

\[ y_{it} = 2.4484 + 0.71601 x_{it} + \varepsilon_{it} \]

One of the main problems in the estimated regression is heterogeneity of the variance of error sentences. Such a problem in regression will cause the results to be no longer the most efficient. White test was used to determine the existence of homogeneity between the variances. H0 shows variance homogeneity while H1 indicates lack of homogeneity between variances. Considering the amount of F and the significance level (P-value) which is more than 0.05, H0 is accepted.

Normality of differences test was used to determine whether the remainders have normality (normal distribution). This test is done by the statistics of Jark Bra (J-B). H0 is used for normal distribution and H1 shows that distribution is not normal. The results indicate that differences are normal. As the significance level is more than 0.05, H0 is not rejected.

Discussion and conclusion

The results obtained from testing the research hypotheses at different levels of income are indicative of the approval of the main idea of the research which is about the probability of the existence of strong motivation on the part of managers (of active bankrupt firms of the stock exchange of Tehran) to smooth their firms' gains and losses. In order to pretend their firms' financial condition and performance is as desired. The results acquired from testing the first hypothesis show that there is a relationship between probability of firms' bankruptcy and real smoothing of gross income. The coefficient of independent variable (0.8213) and the significance level of 0.000 are indicative of the approval of this hypothesis. Moreover, the reliability of 0.76 (R=0.76) shows that there is a strong and positive relationship between probability of firms' bankruptcy and real smoothing of gross income. It also shows that the independent variable is effective on the dependent variable. The results obtained from testing the second hypothesis show that there is a relationship between probability of firms' bankruptcy and real smoothing of operational income. The coefficient of independent variable (0.8373) and sig = 0.000 are indicative of the approval of this hypothesis. Moreover, the reliability of 0.60 (R=0.60) shows that there is a strong and positive relationship between probability of firms' bankruptcy and real smoothing of operational income and that 60% of the changes of the dependent variable 'real smoothing of operational income' can be explained by the independent variable 'probability of bankruptcy'. The results of testing the third hypothesis show that there is a relationship between probability of firms' bankruptcy and artificial smoothing of gross income. The coefficient of independent variable (0.4683) and Sig = 0.000 are indicative of the approval of this hypothesis at the significance level of 95%. Moreover, the reliability of 0.74 (R=0.74) shows that there is a strong and direct relationship between probability of firms' bankruptcy and artificial smoothing of gross income and that 74% of the changes of the dependent variable can be explained by independent variable, which is a high coefficient. The results of testing the fourth hypothesis show that there is a relationship between probability of firms' bankruptcy and artificial smoothing of operational income. The coefficient of independent variable (0.7160) and Sig = 0.000 are indicative of the approval of this hypothesis. Moreover, the reliability of 0.86 shows that there is a strong and direct relationship between probability of firms' bankruptcy and artificial smoothing of operational income. In other words, 86% of the changes of the variable 'artificial smoothing of operational
income’ can be explained by the independent variable. Taking Figure 1 into account, and considering the approval of the existence of relationship between probability of bankruptcy and real and artificial smoothing of income, the purpose of the study which is to investigate the relationship between probability of firms’ bankruptcy and managers’ decision to do intentional smoothing is also accepted. In fact, as bankrupt firms get closer and closer to complete bankruptcy, their managers find more motivation to skillfully manipulate the values of their profits and losses.

**Suggestions**
- Execution of well-organized and effective controlling and supervisory mechanisms on the performance of firms that are facing financial crises.
- Periodical and regular investigations of the bankruptcy status as well as continuing operation of firms accepted in stock exchange.
- Declaration of Annual warning to the firms that are in loss and preparing a list of their names.
- Directing the attention of investors to firms’ auditing statements, especially with respect to their declaration of having no problem to persist activity.

**References**


Haeiri F, 2001. investigating the amount of relationship between income smoothing and the wealth of shareholders, doctoral dissertation, Azad University of Tehran, Research and science branch.


