

Using Tax Avoidance Data and Survival Analysis to Predict the Financial Distress of Accepted Firms Listed in Tehran Stock Exchange

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Abstract: This study investigates the possible use of tax avoidance and survival analysis algorithm in predicting financial distress of firms listed in Tehran Stock Exchange. Uses of tax avoidance and survival analysis algorithm are unique features of this study that distinguish this study from the other in the bankruptcy prediction filed. The sample consisted of 38 financial distress firms and 38 non-distress firms in the period of 2006-2010. In order to measuring tax avoidance, the book-tax differences criteria was used. Furthermore five financial along with tax avoidance were used as control variables. These ratios were used in the previous studies as financial distress predictors: (1) Operating Income to Sales (OI/S); (2) Total Liability to Total Assets (TL/TA); (3) Quick Assets to Total Assets (QA/TA); (4) Sales to Current Assets (S/CA); (5) Interest Expense to Gross Profit (IE/GP). Since there is need to use time series of data to made survival analysis model, tax avoidance and financial ratios were measured for a period 5 years before financial distress occurrence. Using survival analysis and logistic regression, two financial distress prediction models were developed and their results were compared. The results show that survival analysis has better performance than logistic regression. The McNemar test shows that these differences are statistically meaningful.

Keywords: Financial Distress Prediction, Tax Avoidances, Book-Tax Differences, Survival Analysis.

Introduction

In the financial sphere, a company is considered distressed when faces trouble in the performance of the obligations to creditors. Debts of a company may be used to finance its operations, but is placed at a higher risk of experiencing financial distress. So, if the financial distress does not improve, it will lead to bankruptcy (). In one of the academic studies on the theory of financial turmoil, Gordon has defined it as the reduced earning power of company which increases the probability of inability to repay principal and interest of the debt (Etemadi, 2013).

Most companies enter financial distress as a result of poor management and economic distress. In the early stages of financial distress, the average operating profit of the company is measured based on non-adjusted earnings while in the later stages, it is measured after controlling other factors that make significant changes in the increase of company's performance. Jensen's hypothesis proven results suggest that financial distress is a kind of corrective action that improves the company's performance (Mehrani, 2014). From the economic standpoint, the company's financial distress is a natural phenomenon that should not be overlooked because it is considered as a social impact based on unemployment and purchasing power parity (Etemadi, 2012).

While the existing models in predict financial distress have been unresponsive to tax data of the companies, the introduction and the use of information related to behaviors of tax evasion and avoidance in the predictive models of financial distress of companies have made it possible for investors and analysts to identify companies with financial difficulties more accurately and thus, do their analyses more effectively and efficiently. Therefore, the results of research from the perspective of activists involved in the capital market including corporate executives, investors, tax authorities and analysts are very significant and can increase the efficiency of capital markets in addition to optimizing individual decisions. Also, using survival analysis makes the possibility of considering time process of financial distress occurrence possible.

Theoretical Foundation and Review of Literature

Newton divided the financial distress of companies in 1998 as: 1. incubation period, 2. cash deficit period, 3. the inability to pay financial or commercial debts, 4. complete insolvency and ultimately, 5. financial distress. Although most financial distresses follow these steps, some companies may reach complete financial distress without passing all the steps (Mansour, 2012).

There may be one or more unfavorable hidden situation for the commercial unit in the incubation period without being immediately identifiable. It is mostly in the incubation period that the economic loss occurs and assets return falls. The best situation for the company is to discover the problems at this stage. Cash deficit stage starts when the commercial unit has no access to cash for the first time to meet current obligations or urgent needs. Despite the fact that they may have physical assets several times more than their need, and adequate profitability background. The problem is that assets are not liquid enough and the capital is held (Mansour, 2012). In financial insolvency stage, management may identify and solve the problem by financial or commercial professionals establishing credited committee and financial restructuring. Otherwise, the value of total debts increases over assets of the company and the company can no longer avoid its full financial distress (Hanlon, 2005). Despite this process that leads to the company's distress, the researches conducted in the field of distress prediction have mainly neglected two issues. First, research in this field are focused on the usual financial data (financial ratios) and have neglected other information that can contain important messages about the incidence of distress. A great amount of research and literature review show that a clear relationship can be observed between the quality of information and tax avoidance measures (Blaylock et al., 2012; Hanlon, 2005; Lev & Nissim, 2004). Some other studies have also shown a correlation between credit ratings and associated tax behaviors of companies (Ayers et al., 2010; Crabtree & Maher, 2009). Hanlon (2005) also shows that the big gap between declare taxes and definite tax is associated with lower stability of cash flows. The relationship between tax behaviors of companies and their different aspects of business caused Wilson (2010) to propose the study between the tax information and bankruptcy of companies. The objective of this study though is to investigate the possibility of using tax data of companies in predicting their tax distress.

The second issue that researches have neglected is that only the information related tone year before the occurrence of distress are focused on in the proposed model for distress prediction. However, the analyzed process by Newton (2009) which was proposed previously showed that there is a long time needed for the financial distress of the company. Using data focusing on a limited period of the Company's financial distress cannot have a high reliability in the reflection of the status of a company. According to the two mentioned issues in this research, it is tried to propose a model for predicting the financial distress of companies using tax avoidance and survival analysis data to hire periodic data to predict the structure of financial distress model (Etemadi, 2012).

While the existing models in predicting financial distress have been unresponsive to tax data of the companies, the introduction and the use of information related to behaviors of tax evasion and avoidance in the predictive models of financial distress of companies have made it possible for investors and analysts to identify companies with financial difficulties more accurately and thus, do their analyses more effectively and efficiently. Therefore, the results of research from the perspective of activists involved in the capital market including corporate executives, investors, tax authorities and analysts are very significant and can increase the efficiency of capital markets in addition to optimizing individual decisions. Also, using survival analysis makes the possibility of considering time process of financial distress occurrence possible.

The relationship between the poor quality of accounting information and corporate tax avoidance have made Blaylock et al (2012) to propose tax avoidance to researchers as an indicator of company's bankruptcy in the future. If corporate tax avoidance is achieved as a result of using methods of earnings management, this information can indicate the proximity of bankruptcy.

If corporate tax avoidance contains a message about the poor quality of profits and low stability, corporate tax avoidance must contain information regarding the existence of a problem in the company's future cash flows. Cash flow problem means increasing the probability of financial distress in the future. In this regard, Hanlon (2005)

showed that the cash flows of companies that have tax avoidance are more unstable than other companies. The use of tax avoidance information as an indicator to predict the bankruptcy is justifiable in the view of the credit rating. Weber (2009) shows that tax avoidance is a key factor in determining the companies' risk and their credit ratings. Accordingly, Ayers et al (2010) reviewed the Company's credit rating and showed that the companies which have more tax avoidance will receive a lower credit rating. Wilson also suggested using tax avoidance as a marker for predicting bankruptcy.

However literature review shows that only in rare cases an indirect relationship between tax avoidance and bankruptcy prediction can be established. As the first and only research in this field, Noga and Schnder (2013) presented empirical evidence showing that there is a significant difference in the tax avoidance behavior of risky companies with other companies. These researchers used the difference of taxable profit variable and pre-tax profit in bankruptcy prediction model and showed that this variable can improve the performance of traditional models of predicting bankruptcy.

Studies conducted in the country have not paid attention to study the relationship between tax avoidance and risk of bankruptcy directly. However, the literature review inside the country suggests evidence in support of the possibility of this relationship. For example, by evaluating the discretionary accruals behavior of the company at the risk of bankruptcy, Etemadi et al (2012 and 2013) showed that these companies use reductive discretionary accruals (decrease earnings management) in pre-bankruptcy periods. This means applying conservative accounting practices by companies facing bankruptcy. While Etemadi et al (2012) have attributed their finding to the stress caused by auditors, Mehrani and Seidi (2014) show a positive association between conservatism and corporate tax avoidance and resulted that companies at the risk of bankruptcy which use conservative accounting tendencies try to have more cash flows to pay debts and postpone the financial distress by tax avoidance.

In this situation, corporate tax avoidance must have information about the bankruptcy of the company in the future.

As was mentioned in the review of literature, research in the field of predicting financial distress have primarily focused on certain aspects of corporate financial activities such as profitability, liquidity and solvency. The present study tries to expand the literature review of the financial distress prediction to financial arenas which have not been paid attention to previously and use the companies' tax data as the predicting variable of the bankruptcy of companies. Meanwhile, survival analysis has been used in which time series data of companies are used in order to predict the financial distress. In research conducted in the Iran, these models have not been used. The importance of the issue is in this regard that financial distress does not happen suddenly. The signs of financial distress can be seen in the corporate activity direction which makes the use of survival analysis for making the financial distress prediction model completely justifiable.

Research hypotheses

Based on theoretical foundations and research review of literature, research hypotheses can be expressed as follows:

Hypothesis 1: There is a significant relationship between tax avoidance and financial distress.

Hypothesis 2: Using the survival analysis has more optimal performance compared to logistic regression model.

Research variables and how to measure them

Dependent variables

Financial Distress

This study has used Article 141 of the Commercial Code in the definition of companies with financial distress. Accordingly, the distressed company (bankrupt) has accumulated losses equal to or more than 50% of company's capital. However, Article 141 of the Commercial Code does not cause to immediate adjustment or breakup of the company and the activity stops only in case of beneficiary groups request (Mansour, 2012). In accordance with Article 141 of the Amendment Bill of Commercial Code Act 1968, some tasks of the company in case of bankruptcy is expressed as follows:

If half of the company's capital is lost as a result of losses, the Board of directors shall immediately invite the extraordinary general assembly of shareholders to discuss about the issue of company's dissolve or retention. Whenever the assembly does not vote to the dissolve of the company, it must reduce the company's capital to the amount of capital available at the same meeting and in compliance with the provisions of Article 6 of this Act. In contrast, if the board does not take this matter to call an extraordinary general assembly or the invited assembly cannot be concluded in accordance with legal regulations, any beneficiary person can request to dissolve the company in a competent court (Mansour, 2012).

Independent variables

The independent variable of the research is tax avoidance. According to the literature, the differences between taxable profit (the tax return) and pre-tax profit (according to income statement) have been used as corporate tax avoidance (Noga & Schnder, 2013; Blaylock et al, 2012; Weber, 2009; Mehrani & Seidi, 2014). In order to eliminate the effects of company size, the amount of the difference is been divided into the total company assets by the beginning of the course. Taxable profit is obtained by dividing the company's definitive tax into the lawful tax rate.

To calculate the lawful tax rate of the company, the actions were taken into measure according to Article 6 of the Law of developing financial tools and institutions. In this way, the lawful tax rates of all companies by the year 2009 were 22.5 per cent (considering 10 percent exchange market companies tax-exempt; Article 143 of Direct Tax Law) and from 2010 onwards, the lawful tax rates were 20 percent in case of at least 20% float share of company and 22.5 percent otherwise (Mehrani & Seidi, 2014). Corporate Tax avoidance has been calculated for a period of 5 years before the financial distress (t-5) until the occurrence of financial distress (t).

Other variables predicting financial distress

All related variables with financial distress, which have been used in previous research as predictors of distress or financial distress, are used in this research in order to ensure the relationship between tax avoidance and financial distress of companies. Based on Etemadi et al (2009), the following variables are among a broad set of variables which are appropriate for predicting the companies' distress and financial distress in the economic environment of Iran:

1. Operating profit to sales (profitability)
2. The whole debts to the entire assets (solvency)
3. The immediate assets to total assets (liquidity)
4. Sales to current assets (performance)
5. Interest expense to Gross profit (interest coverage)

Each of the selected proportions covers one of the important aspects of any company's financial position. The values of these financial ratios have been calculated for a period before the bankruptcy. This mode of operation is a standard procedure in the literature and makes it possible to predict bankruptcy before its occurrence.

Materials and Methods

38 non-bankrupt companies were selected using random sampling method in compliance with the financially distressed companies (bankrupt).consequently the sample study include 76 companies (38 bankrupt companies and 38 non- bankrupt companies). Non-distressed financial companies have been adapted with the financial distressed companies from the perspective of activity industry, financial year of activity and the size.

The statistical population of this research included all companies listed on the Tehran Stock Exchange during the period of 2006-2012. The start of the research time period is been considered since 2006 according to the fact that survival analysis algorithm is been used in this research in order to make financial distress model in which 5-year time series data are used to predict the financial status of companies and the reliable data was available for the researcher to calculate the research variables since 2001. So, the data from 2001 to 2005 were used for the prediction of distress or the lack of helplessness in 2006.

The model used to test the hypotheses

The following methods are used respectively in this study in order to test hypotheses. The first research hypothesis predicts that there is a significant relationship between tax avoidance and financial distress. The following logistic regression tests this hypothesis in which the dependent variable is the possibility of company's financial distress in the future and the independent variable is the tax avoidance in the period before the financial distress:

$$P(\text{Financial_Distress}_{i,t+1}) = \beta_0 + \beta_1 \text{BTD}_{i,t} + \beta_2 \text{Controls}_{i,t} \quad (1)$$

In model (1), Financial Distress indicates that the occurrence of financial distress, BTD represents tax avoidance and Controls indicate the other factors reflecting the likelihood of company's bankruptcy in the future. These controlling variables are the financial ratios that have been used in previous research in order to predict financial distress.

In case of the relationship between companies' financial distress occurrence probability in the future and corporate tax avoidance behaviors in the current period, estimated coefficient for tax avoidance variable (β_1) must be statistically significant. If the estimated coefficient for tax avoidance variable is positive and significant, it means that the increase in corporate tax avoidance behaviors in the current period will increase the risk of financial distress in future periods.

The second research hypothesis predicts that financial distress prediction model made by survival analysis algorithm will have a greater ability in predicting companies' financial distress compared to model (1). The second research hypothesis test requires building a model to predict financial distress using survival analysis algorithm and comparing its performance accuracy with model (1-3). Nonparametric McNemar test will be used in order to test the accuracy of the two models.

Survival Analysis Algorithm

Statistical techniques used in survival analysis are based on the response time modeling and analysis. The response time of a person is positive random variable which shows the distance between a definite starting point and end point. In the company's survival analysis, the starting point is usually the time of the indication of first signs of financial distress and end point (failure) is the time when the company is experiencing financial distress. The interval is measured in days, months or years. Generally, the end point can also be any other event.

McNemar test

McNemar's test was used to test this notion that whether the performance of survival analysis model has significant statistical superiority on the performance of logistic regression model in the correct prediction of financial distress. McNemar test is a nonparametric test which is tested based on the hypothesis of the equality of two related divalent variables' means. "Classification accuracy of each model" is been proposed about predicting the financial distress. The meaning of model's accuracy is "the number of proper classification to the total number of companies included in the whole sample". In fact, McNemar test considers the differences in the predictions by the two models and judges based on them.

Results

Descriptive statistics

Table 1 shows descriptive statistics of the variables used in the study. In the table, the statistics related to the mean and standard deviation of variables are presented on the basis of two groups of financial distress and non-financial distress.

As it can be seen from the results presented in this table, there is a significant difference between the average ratio of operating profit to sales (OI/S) in both distressed and non-distressed groups. Mean value of the non-distressed group is higher and this difference is significant at the 0.000 level.

The total debts to total assets ratio is a leverage ratio which represents the company's use of debt in the capital structure. The higher proportion of this ratio shows the higher risk of the company. Therefore, it is expected that the proportion of this ratio is higher for companies at the risk of financial distress. The results of table 1 prove this and the result of mean comparison of these two ratios in two groups show that financial distressed companies are more leverage and the difference is statistically significant.

The ratio of sales to current assets (S/CA) for non-distressed companies is larger than the distressed ones. Distressed companies have been able to cover their financial costs with lower ratio. However, there is no significant difference between the proportions of their assets to the total assets of the two companies' groups.

The most important presented descriptive statistics in Table 1 is related to tax avoidance mean (BTD) in two groups of distressed and non-distressed companies. As the results show, the difference between the recorded taxes as tax avoidance in distressed companies group is equal to 0.205. This amount is 0.102 for non-distressed companies. In this way, tax avoidance one year before the occurrence of financial distress for distressed companies is two times more than the non-distressed ones. This difference is statistically significant at the 0.000 level.

Table 1. Descriptive statistics of research variables at the level of financial distressed and non-distressed companies.

	Financial non-distressed	Financial distressed	Mean comparison test
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Independent variable	Mean	Standard deviation	Mean	Standard deviation	Mean difference
OI/S	0.235	1.112	0.104	0.2030	0.131**
TL/TA	0.635	0.212	0.773	10.24	0.138**
S/CA	0.6261	0.750	1.022	0.7275	0.640**
IE/GP	0.253	3.853	0.4060	356.3	0.153**
QA/TA	0.310	0.771	0.3300	0.863	0.020
BTD	0.1020	2485.0	0.205	0.020	0.103**

OI: operational increment, S: sales, TL: total liabilities, TA: total assets, CA: current assets, GP: gross profit, QA: instantaneous assets, BTD: tax avoidance

**,*significant at the error level of 5% and 1% respectively

Table 2 shows the mean values and tax avoidance in both distressed and non-distressed companies during the five-year period before the financial distress. The results presented in this table show that an almost upside process can be observed in the tax avoidance of eventually distressed companies. In this way, the tax avoidance amount of these companies will increase by approaching to the year in which the company is distressed. However, this trend cannot be observed in non-distressed companies.

As it can be seen, the highest rate of tax avoidance is related to a period before the onset of the financial distress. In the year of financial distress, tax avoidance scheme of distressed companies is partially reduced. This could be an evidence of using tax avoidance data to predict financial distress.

Table 2. Time distribution of tax avoidance variable during the 5-year output before the financial distress in two distressed and non-distressed groups of companies.

Year	t-5	t-4	t-3	t-2	t-1	t year
Part A: tax avoidance for financial distressed companies						
Tax avoidance mean	0.115	0.149	0.164	0.198	0.205	0.188
Tax avoidance median	0.195	0.131	0.186	0.177	0.235	0.210
Part A: tax avoidance for financial non-distressed companies						
Tax avoidance mean	0.094	0.053	0.103	0.106	0.102	0.096
Tax avoidance median	0.082	0.119	0.100	0.113	0.098	0.111

Testing hypotheses

The first hypothesis test

According to the first research hypothesis, it is expected that the companies that are at risk of financial distress do more tax avoidance compared to the healthy financial distressed companies. The results of the first study hypothesis test are provided in table 3. Based on these results, the coefficient of tax avoidance is equal to 15.32. This coefficient is significant at a confidence level of 0.000. This means that with an increase of tax avoidance in the current period, the probability of financial distress increases in later periods. This finding is consistent with the first hypothesis of the study that predicted a significant relationship between tax avoidance and financial distress in future periods.

In regard to controlling variables that are predictor variables of financial distress, research findings show that there is a significant negative relationship between the ratio of instantaneous assets to total assets and the financial distress in the future. Since this ratio reflects the Company's liquidity, this has meant that companies with less liquidity are more seeking tax avoidance. The finding is in compliance with those of existing theories that suggest that one of the major reasons for corporate tax avoidance is liquidity problem. Based on the theory of providence, companies with low liquidity are trying to save more cash and hold the Company through tax avoidance.

Table 3. The relationship between tax avoidance and the occurrence of financial distress.

Variable	Prediction	Coefficient	Significance
Constant value	+/-	1.482	0.086
OI/S	-	-4.213	0.000

TL/TA	+	0.674	0.025
S/CA	-	-0.052	0.000
IE/GP	+	1.896	0.034
QA/TA	-	-2.431	0.048
BTD	+	15.32	0.000
K ² statistics (significance)		109.113	(0.000)
Psuedo R ²		0.753	

OI: operational increment, S: sales, TL: total liabilities, TA: total assets, CA: current assets, GP: gross profit, QA: instantaneous assets, BTD: tax avoidance

As expected, companies in which debts have a great share of the capital structure and leverage companies are at greater risk of financial distress. Also, profitable firms are less likely to suffer from a financial distress in the future. On the other hand, since tax avoidance is a way to manage profits, it is natural for the profitable companies to need less to tax avoidance methods to manage profits. Finally, the obtained results show that there is a significant positive relationship between the probabilities of financial distress compared to the ratio of interest to gross profit. Also, companies that have more current turnover assets are less likely to suffer from financial distress in the future. In addition, logistic regression model has managed to achieve the 73.7 percent coefficient of determination. This means that among 76 observations in the sample, distress or lack of financial distress could have identified 56 companies correctly. The accuracy of the model is a criterion for the performance evaluation of model based on survival analysis algorithm. Results from logistic regression model format are provided in table 4.

Table 4. The results of the logistic regression model.

The real group of companies	The anticipated group by logistic model		
	Bankrupt	Non-bankrupt	Total
Bankrupt (number)	27	11	38
Non-bankrupt (number)	9	29	38
Bankrupt (per cent)	71.1%	29.9%	100
Non-bankrupt (per cent)	23.7%	76.3%	100
Total (per cent)			73.7%

The second hypothesis test results

The second research hypothesis predicted that the model based on survival analysis algorithm has better performance in predicting company's financial distress compared to the traditional model of logistic regression. Testing this hypothesis requires designing a model based on survival analysis and comparing the performance of this model with the performance of the model based on logistic regression which was done in the form of the first hypothesis of the research. Table 5 shows the summaries of the estimated coefficients for survival analysis which has used the hazard function to estimate the model and determining the coefficients:

Table 5. Survival analysis model coefficients.

Variable	Coefficient	t statistics
OI/S	-4.65	-6.12
TL/TA	2.66	7.35
S/CA	-1.52	8.44
IE/GP	1.13	5.38
QA/TA	-2.60	5.73
BTD	5.77	6.31
Observations number	76 companies	
Financial distress numbers	38 companies	50%
Psuedo R ²	92.2%	
K ² statistics	796.4	

OI: operational increment, S: sales, TL: total liabilities, TA: total assets, CA: current assets, GP: gross profit, QA: instantaneous assets, BTD: tax avoidance

Table 6 displays disturbance matrix of survival analysis model on the research sample. As you can see, the Survival Analysis model could have classify about 92 percent of observations correctly in the financial distressed and non-distressed companies groups.

Table 6. The results of survival analysis algorithm model.

The real group of companies	The anticipated group by survival analysis model		
	Bankrupt	Non-bankrupt	Total
Bankrupt (number)	35	3	38
Non-bankrupt (number)	3	35	38
Bankrupt (per cent)	92.1%	7.8%	100
Non-bankrupt (per cent)	7.8%	92.1%	100
Total (per cent)			92.1%

The final conclusion of the second hypothesis takes place through nonparametric McNemar test. This test uses different classifications of the two models to determine significant difference in the accuracy of predicting models. McNemar test results showed that there were significant differences in the predictions of the two models. This result in the support of the second hypothesis means that the model based on survival analysis algorithm has better performance compared to the traditional model of logistic regression.

Discussion and Conclusion

The results of the research hypotheses showed that a significant difference can be observed between the tax avoidance behaviors of companies at the risk of financial distress with other companies. So that companies at risk of financial distress have more tax avoidance compared to the healthy financial companies. Similar to the results of Noga and Schnder (2013), the results obtained in this study indicated that companies at risk of financial distress do tax avoidance.

In explaining the research findings, second hypothesis can be stated. First, companies at risk of financial distress may do tax avoidance deliberately or unintentionally. The intentional tax avoidance behavior of these companies is justified in the sense that tax avoidance will directly cause the company to pay less tax. Pay less tax means more cash available within the company to carry out daily operations, especially to pay short-term debts that help the company greatly to eliminate or postpone the financial distress status (Etemadi, 2012). So, the companies at risk of financial distress consciously keep more cash in the company by tax avoidance and will benefit from its advantages.

On the other hand, corporate tax avoidance may not be the direct result of executives' motives and behaviors of companies at the risk of financial distress. In other words, companies at risk of financial distress carry out actions the indirect consequence of which is lower tax payments and tax avoidance. Etemadi et al (2012 and 2013) showed that due to capital market sensitivity and auditors, companies at the risk of bankruptcy do the management of decrease profits due to the sensitivities of capital market and auditors.

This means that these companies use less discretionary accruals, which means adopting conservative accounting procedures. The company's conservative accounting practices will cause the company to pay less tax as well as identifying less income. From now on, the tax avoidance behavior of companies is not a conscious act but the consequences of decisions and actions of the company as a result of pressure from other factors. Also, the results showed that when survival analysis uses time series information to predict corporate financial distress, the obtained model enjoys a higher degree of accuracy compared to the logistic regression model that is obtained only from the data of the previous year financial distress occurrence to predict the financial distress.

The finding of the research is consistent with the existing theories that suggest signs of distress appear to occur much sooner than it seems. Using a model of survival analysis, Noga and Schnder (2013) showed that this model benefits a good ability in predicting financial distress.

Conflict of interest

The authors declare no conflict of interest

References

- Ayers B, LaPlante S, McGuire S, 2010. Credit ratings and taxes: The effect of book/tax differences on ratings changes. *Contemporary Accounting Research*. 27(2): 359–402.

- Blaylock B, Shevlin T, Wilson R, 2012. Tax avoidance, large positive book-tax differences, and earnings persistence. *The Accounting Review*. 87(1): 91–120.
- Crabtree A, Maher J, 2009. The influence of differences in taxable income and book income on the bond credit market. *The Journal of the American Taxation Association*. 31: 75–99.
- Etemadi H, Anvary Rostamy AA, Dehkordi HF, 2009. A genetic programming model for bankruptcy prediction: Empirical evidence from Iran. *Expert Systems with Applications*. 36(2): 3199-3207.
- Etemadi H, Dastgir M, Momeni M, Dehkordi HF, 2012. Discretionary Accruals Behavior of Iranian Distressed Firms. *Middle Eastern Finance and Economics*. 16: 44-53.
- Etemadi H, Dehkordi HF, Amirkhani K, 2013. Effect of auditor opinion on discretionary accruals behavior of distressed firms: Empirical evidences from Iran. *African Journal of Business Management*. 7(20): 1956-1965.
- Hanlon M, 2005. The persistence and pricing of earnings, accruals, and cash flows when firms have large book-tax differences. *The Accounting Review*. 80(1): 137–166.
- Lev B, Nissim D, 2004. Taxable income, future earnings, and equity values. *The Accounting Review*. 79 (4): 1039–1074.
- Mansour J, 2012. Commercial Code along with Cheque Code. the Amendment Bill of non-commercial institutions registration. Didar publishing. Eighth Edition.
- Mehrani S, Seidi SJ, 2014. Effect of income tax and conservative accounting on corporate tax avoidance and management auditing. summer of 2014. 3(10): 13-23.
- Noga TJ, Schnder AL, 2013. Book-Tax Differences as an Indicator of Financial Distress. *Accounting Horizons*. 27(3): 469–489.
- Sun J, Li H, Huang QH, He KY, 2014. Predicting financial distress and corporate failure: A review from the state-of-the-art definitions. modeling, sampling, and featuring approaches. *Knowledge-Based Systems*. 57: 41–56.
- Weber D, 2009. Do analysts and investors fully appreciate the implications of book-tax differences for future earnings? *Contemporary Accounting Review*. 26(4): 1175–1206.