


Investigating the predictive power of bankruptcy models based on real and accruals earning management models of corporations accepted in Tehran Stock Exchange

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ABSTRACT

One of the major challenges faced by major firms is the risk of financial instability and ultimately financial bankruptcy. Hence, the main objective of this paper is to predict bankruptcy based on real Earning management models and the accrual Earning management of companies admitted to the Tehran Stock Exchange. The research method is descriptive-applied and is a correlation study. The time domain of research was between 1382 and 1395, with a sample of 110 companies (65 bankrupt and 65 non-bankrupt companies) selected from the list of companies admitted to the Tehran Stock Exchange. Logistic regression model was used to test the research hypotheses. In general, the findings of the research hypothesis test show that the predictive power of bankruptcy models based on real profit management models and accruals management of companies accepted in Tehran Stock Exchange is significant. Therefore, it can be stated that the amount of real earning management and accrual earnings management affect the bankruptcy of the investigated companies.

1- Introduction

The rise and spread of bankruptcy and fraud among companies have been seen as a warning issued, and manipulations in recent years have created serious challenges for shareholders. Therefore, the existence of fraud in financial statement along with deliberate mistakes in firms financial information which have created through misrepresentation, deliberate disregard, and not suitable disclosure and transmission information to financial statements users, have led to the establishment of the Association of Certified Fraud Examiners (ACFE) (Igbanki

Weigbinovia, 2018: 238).

Of course, it is very difficult to identify potential fraud in organizations. But a relatively good model presented by Benish (1997) using eight-variable financial ratios has allowed the implicit identification of the existence of manipulation in financial reporting, especially manipulation of a firm's profits. Banish's (1997) model has been confirmed by Warafsky (2012), in fact, their model is similar to Altman's (1968), which does not only predict the possibility of corporate bankruptcy. Rather, it seeks to uncover the existence of corporate financial



fraud. From this perspective, firms that are high-level based on the model of Banish (1997) have a high probability of manipulating their financial statements (Banish, 1997, 1999, 2012). So, here is a substantial question: Could the risk of bankruptcy lead to companies get pressured into wearing financial apertures and creating false financial information in corporate financial statements?

In this regard, Franceschetti and Koschtial (2019), concluding with attempts to provide empirical evidence of a possible significant relationship between non-payment of debt and fraud, concluded that there is no significant direct relationship between profit manipulation and bankruptcy risk (threat). Therefore, in light of the results of Franceschetti and Koschtial (2019), another question was raised by Igbanki Weigbinovia (2018), whether financial distress could motivate profit manipulation?

In this regard, some empirical evidence suggests that insolvent companies are more likely to manipulate than healthy corporations (Rosner, 2003; Garcia Lara, Garcia Osma, & Mora, 2005; Kampa Vakamkho Minano, 2014). According to Deloitte's (2008) perspective, fraud and bankruptcy are seen together. Bankruptcies or companies that are close to bankruptcy are more likely to be fraudulent, including fraudulent financial accounts. In particular, most bankruptcies with a 300% probability are more likely to be exposed to fraud on their profit than healthy companies. The bankruptcy warning indicators and their impact on the manipulation of financial statements are examined. Their research findings did not provide any significant evidence, but they argued that bankruptcy cannot be identified since there is no likelihood of corporate profits being manipulated. Although their position is consistent with the theory that bankruptcies are more likely to have manipulated profit than

non-bankruptcies, they pointed out that more research is needed between different firms in a particular industry to ensure that there is sufficient evidence on the issue of bankruptcy and profit manipulation among developing countries and on research conducted in advanced economies or not?

Of course, the collapse of companies like Enron, WorldCom and others have led to more research into profit manipulation and bankruptcy in developed countries. However, in the years before corporate bankruptcy, there was also sufficient pressure or incentive to create high-profit management to prevent bankruptcy through poor performance concealment (Igbanki Weigbinovia, 2018: 239).

Therefore, in the light of the above, in this study, we seek to examine the fundamental question of whether it is possible to predict bankruptcy based on real earning management and accrual earning management models of listed companies in Tehran Stock Exchange? If so, to what extent can it be traceable? We want to investigate whether the variables of the accrual earning management model based on the Jones model and the real earnings management model based on the Roychowdhary (2006) model increase the predictive power of bankruptcy models. We will explain them in the following article.

Previous Literature, Theoretical Background, and Main Hypotheses Bankruptcy: Bankruptcy of a company is where the financial position of a corporation or individual is low and weak to the extent that it is both practically and legally incapable of paying its liabilities and obligations, the bankruptcy of a corporation is not merely a legal state but a state of pressure and the financial bottleneck in the earlier period is also called bankruptcy. Newton divided the

phases of the company's adverse financial situation into three periods (latency), cash deficit, and lack of paying debt and ultimately bankruptcy, but some companies may go into complete bankruptcy without going through all the steps (Kurdistan and Tuttle, 2014).

In the viewpoint of accounting, bankruptcy is possible in two ways: bankruptcy of business: If the value of a company 's assets is lower than its debt but the company continues to operate, the bankruptcy of activity has occurred, an obvious sign of that is company's unprofitable operations, but everything continues to work. Liquidity Bankruptcy: Liquidity bankruptcy has occurred when the debt maturity of the company reaches and the company is unable to pay it, and this type of bankruptcy occurs more often.

However, Gordon (1971) in one of the earliest academic studies on bankruptcy theory has defined it as a firm's lack of profitability that increases the likelihood of being unable to repay interest and the principal of debt (Raei & Falahpour, 2008: 18). Beaver describes bankruptcy as a company failure to payment of financial obligations (Scarlett and Dylkia, 2011: 19).

Earnings Quality: Earnings quality can be expressed as the reported earnings ability to reflect the true earnings of the company as well as the reported earnings usefulness to predict future earnings. Earnings quality refers to the consistency, continuity, and discrepancy of reported earnings. Thus, the qualified earning is which the accounting methods and estimates used to create it are devoid of bias (Francis et al., 2004, quoted in Kurdistan and Tuttle, 2014).

Earnings management: In accounting, it is a deliberate act to influence the financial reporting process for personal gain. Earnings management involves changing financial

reports to mislead shareholders about the underlying performance of an organization or affecting contractual outcomes that relate to reported accounting figures (Shipiro, 1989).

Earnings management harms earnings quality and may impair the credibility of financial statements. Besides, in a speech in 1998, the chairman of the Stock Exchange, Arthur Levitt, addressed earnings management widely. Despite its pervasiveness, because of the complexity of accounting rules, it may be difficult for individual investors to discover and access it (Hayley & Wallen, 1999). Earning management is a measure whereby management makes changes in the actual earnings of the financial period to achieve certain goals. Earnings management can be in four ways:

Income maximization, income minimization, income smoothing, and taking bath. Earnings management can be done for personal managers purposes (opportunism) or to increase shareholder welfare (efficiency). For example, if the management of an enterprise through earning management merely seeks to provide for personal gain and receive more rewards, then his goal of earning management is to seek opportunism. But if the purpose of management is to make a profit management, affect stock prices, or provide more and more transparent information, then its purpose of earning management is to perform efficiently (Scott, 2008; Nicomaram & Benny Mahd, 2011).

Cash flow management is another name for earning management based on actual activities (Dichadri, 2006). Actual activities are activities that affect cash flows. Managers can manipulate accounting profits by taking actions that affect cash flow. The most important of these (actual activities) are:

Reduce the selling price of the product to

increase the sales volume of the product in the current period and report more income, or reduce the optional expenses and report more income in the current period. Although managers in the short run can influence their income and value of the company through cash flow management, they will not be able to influence the value of the company in the long run (Dichadri, 2006).

Thus, through efficient earnings management, the manager can transfer confidential information to the capital market and have a positive effect on the quality of profit, but from an opportunistic perspective, the manager benefits at the expense of other parties to the contract. Therefore, the quality of earnings is affected by the type of earnings management. Thus, the type of earnings management is expected to positively or negatively affect the level of earnings quality, whether management behavior is efficient or opportunistic.

Earning management is done through accruals or actual activities. Earnings management is usually done through actual activities during the year and accruals management at the end of the year. The relative degree of accruals management versus actual activities depends on the relative costs of the two methods that are affected by the operating and accounting environment of the firm (Kurdistan and Tatli, 2014). As the cost of applying one approach increases, management tends to use the other approach.

In other words, it balances the costs of the two earning management approaches. Generally, when the audit quality is high and accounting flexibility is low, the discover risk of accrual earning management increases. Thus, the tendency to approach actual activities increases. The same is true for companies with a high market share. It is difficult to manipulate actual activities in the presence of institutional

investors, and the company's financial distress does not allow this manipulation. Under these circumstances, the tendency to manage accruals is increasing (Rahmani & Ramshe, 2013; Zhang, 2012).

One of the ways that managers of distressed financial and bankrupt companies may use to concealing their poor performance to seize the opportunity and delay bankruptcy is to increase accounting profit manipulation. This reduces the reliability of accounting income and thus reduces the quality of earnings (Rosner, 2003). Garcia Lara, Osma, and Penalova (2009) also found that insolvent companies manage their earning incrementally in the four years before insolvency using two methods of accrual manipulation and actual activity manipulation. Therefore, the likelihood of profit manipulation in the face of financial distress highlights the importance of different analyzes of earnings management and earnings quality and its impact on the probability of bankruptcy.

It is expected that there will be a significant relationship between incremental earnings management and the likelihood of bankruptcy (Lynn et al., 2016). In this regard, Kampa et al. (2015) also argue that there is a presumption that bankruptcies are more likely to pressure and manage their profits than healthy ones. Especially incremental manipulation of profits. In this regard, profit manipulation can be one of the sources of information to determine the financial position of the company.

Given this, if profits manipulation status is potentially disclosed, it may provide specific information that is useful in identifying bankruptcies and therefore will be effective in predicting bankruptcy (Veganos & Surin, 2017). This issue has recently been confirmed by Jardin Research (2017). In his research, he demonstrated that accrual earning management measurement metrics can improve the

performance of bankruptcy forecasting models (Vegas & Surin, 2017).

Jardin's research (2017) had two major drawbacks. The first objection was that it only used accrual earning management variables for review, while researchers (Ditch et al. 1998; Pincas et al. 2002) recently confirmed that companies have adopted from accrual to real methods to manipulate profit. Therefore, both types of earnings management have been used in this study for review. And the second objection was that the study uses the traditional and classic paradigm of bankruptcy models in which the data set contained equal proportions of healthy and bankrupt companies.

In the real world, however, the number of healthy companies is far greater than that of bankruptcies, which results in uneven data balances. If the population of healthy and bankrupt companies is assumed to be equal, it may lead to a sampling error that may eventually lead to an error in the estimation of the statistical population (Zimzewski, 1984) (Vegansons & Surin, 2017). Wongsons and Surin (2017) also hypothesized that the financial status of companies in choosing the type of earning management could be important as a motivational factor.

Bankruptcies may be more likely to use accrual manipulation techniques to manage their profits because they can be used after the end of the financial year and when companies need to maximize profits. While healthy companies often tend to take advantage of real earning management.

Because these operations can occur in the ordinary course of business. Therefore, given the theory that the difference in the type of earnings management may indicate a healthy or bankrupt position of companies, therefore, the information obtained from the type of earnings manipulation can be useful in identifying the

financial status of the corporations (being healthy or unhealthy) and also leading to improve the performance of bankruptcy forecasting models (Vegas & Surin, 2017). Accordingly, the first and second hypotheses are formulated as follows:

Hypothesis 1: Accrual earnings management variables (Jones model) increase the predictive power of bankruptcy models.

Hypothesis 2: Real earning management model variables (Roychowdhary Model, 2006) increases the predictive power of bankruptcy models.

2-Research methodology

The purpose of the present study is to conduct applied research that results from a wide range of users. The present study is also a descriptive correlational study in nature of which it is attempted to examine empirically the relationship between real and accrual earning management and bankruptcy of listed companies in Tehran Stock Exchange. The purpose of this study was to collect information from sample members' documents including: Their set of financial statements (basic financial statements and accompanying notes) has been used. It is also worth noting that this information has been extracted through the Tehran Stock Exchange web site and the Tadbir Pardaz software.

Population and statistical sample:

The study population included all the listed companies in Tehran Stock Exchange from 2003 to 2016. Samples included two groups of bankrupt and non-bankrupt companies. The main criterion for selecting insolvent companies is article 141 of the commercial law. Accordingly, companies selected as insolvent have been subject to this provision for two consecutive years. The following limitations

have been considered for selecting healthy companies:

Table 1: Statistical Sample Selection Process

Row	Describe sampling restrictions	Number
1	All companies that were active in the Tehran Stock Exchange during the research period (from 2003 to 2016).	665
2	Companies that are not subject to article 141 of the commercial law during the period under review.	(264)
3	The intelligence of this group is similar to that of bankrupt companies.	(174)
4	Companies suspended or exempt from the stock exchange during the study	(19)
5	Companies listed on the Tehran Stock Exchange by the end of 2006.	(14)
6	Companies whose fiscal year is not March 29 or have changed the financial year	(17)
7	Financial intermediation companies (investment, holding, lending, and insurance)	(18)
8	Companies that not provided their financial statements at the time of this study	(14)
9	Companies whose required information was not available in the timeframe and research variables.	(35)
	The whole statistical sample can be tested with the assumptions	110

In general, the statistical sample consisting of 110 cases was selected from the companies listed in Tehran Stock Exchange during 2003-2016 based on the limitations stated in Table 1. Also, due to the comparability, homogeneity, and generalization of results, the fiscal year ending March is considered.

Describe how the operational variables of the research variables are measured: Research hypotheses are tested through logistic regression (logit analysis). The logit model assumes that the errors follow the logistic distribution. A logit model describes the relationship between the binary dependent variable and several explanatory variables. Therefore, the following section describes how to measure the operational variables of the research variables

Hypothesis Test Method 1: The following three models are used to test the first hypothesis (Lin

et al., 2016):

A) Integration of the Altman model and accrual earning management:

Model (1):

$$P(Z) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 AEM \times X_1 + \beta_7 AEM \times X_2 + \beta_8 AEM \times X_3 + \beta_9 AEM \times X_4 + \beta_{10} AEM \times X_5 + \varepsilon_{it}$$

$P(Z)$ = Bankrupt companies subject to Article 141 of the commercial law Equal code one and Non-Bankrupt Companies equal to Zero

X_1 = Ratio of working capital to total assets

X_2 = Ratio of retain earnings (losses) to total assets.

X_3 = Ratio of income before tax and interest (operating income and loss) to total assets.

X_4 = ratio of book value of equity to total debt.

X_5 = ratio of net sales to total assets.

AEM = dummy variable for estimating accrual earnings management (optional accruals) which is considered to be one if it is greater than the median and zero if it is less than median.

B) Integrating the Springsteen model and accrual earning management:

Model (2):

$$P(Z) = \beta_0 + \beta_1 Y_1 + \beta_2 Y_2 + \beta_3 Y_3 + \beta_4 Y_4 + \beta_5 AEM \times Y_1 + \beta_6 AEM \times Y_2 + \beta_7 AEM \times Y_3 + \beta_8 AEM \times Y_4 + \varepsilon_{it}$$

Y_1 = working capital to total assets.

Y_2 = Pre-tax and interest income (Operating income and Loss) to Total Assets.

Y_3 = Pre-tax income to current liabilities.

Y_4 = Net sales to total assets

(C) Integrating the Zimsky model and accrual earning management:

Model (3):

$$P(Z) = \beta_0 + \beta_1 Z_1 + \beta_2 Z_2 + \beta_3 Z_3 + \beta_4 AEM \times Z_1 + \beta_5 AEM \times Z_2 + \beta_6 AEM \times Z_3 + \varepsilon_{it}$$

Z_1 = Net income to Total Assets (Return on Assets).

Z_2 = Total debt to total assets (financial leverage).

Z_3 = Current asset to current debt (liquidity).

Second Hypothesis Test Method: The following three models are used to test the second hypothesis (Lin et al., 2016):

(A) Integration of Altman's model and real earnings management:

Model (4):

$$P(Z) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 REM \times X_1 + \beta_7 REM \times X_2 + \beta_8 REM \times X_3 + \beta_9 REM \times X_4 + \beta_{10} REM \times X_5 + \varepsilon_i$$

$P(Z)$ = Bankrupt and non-bankrupt companies subject to Article 141 of the Commercial law
 X_1 to X_5 = Altman model variables as previously defined.

REM = dummy variable for real earning management estimates (abnormal operating cash flow level, abnormal level of production cost and abnormal level of discretionary expences) which is considered to be one if it is greater than the median and zero if it is less than the median.

B) Integrating Springsteen Model and Real Earning Management:

Model (5):

$$P(Z) = \beta_0 + \beta_1 Y_1 + \beta_2 Y_2 + \beta_3 Y_3 + \beta_4 Y_4 + \beta_5 REM \times Y_1 + \beta_6 REM \times Y_2 + \beta_7 REM \times Y_3 + \beta_8 REM \times Y_4 + \varepsilon_i$$

Y_1 to Y_4 = Springsteen model variables previously defined.

(C) Integrating the Zimsky Model and Real Earning Management:

Model (6):

$$P(Z) = \beta_0 + \beta_1 Z_1 + \beta_2 Z_2 + \beta_3 Z_3 + \beta_4 REM \times Z_1 + \beta_5 REM \times Z_2 + \beta_6 REM \times Z_3 + \varepsilon_i$$

Z_1 to Z_3 = previously defined variables of the Zimsky model

3- Research findings

Descriptive statistics of research variables

In the descriptive statistics section, data analysis was performed using central indices such as mean and median, and standard deviation, skewness and drag coefficients. Also, the logistic regression model was used to test the research hypotheses. In general, a summary of the descriptive statistics of the model variables after screening and deletion of unused data is presented in Table 2.

Table 1: Descriptive statistics of research variables

Variable Statistical Properties	P (Z)	AEM	REM	X ₁	X ₂	X ₃	X ₄	X ₅
mean	5.63	0.81	0.60	0.20	3.08	4.54	0.44	14.24
median	4.12	0.65	0.58	0.02	2.42	3.95	0.20	14.15
maximum	12.04	0.92	0.85	1.00	48.02	7.63	0.62	18.26
Minimum	8.62	0.05	0.25	0.06	1.32	1.13	-0.33	11.82
Standard deviation	4.12	3.64	1.41	0.42	6.62	4.63	0.97	3.42
Skewness	1.21	4.66	1.22	1.89	5.72	2.81	1.74	1.81
Elongation	4.11	22.52	21.62	5.42	44.05	28.74	18.93	9.18
Observatins	1320	1320	1320	1320	1320	1320	1320	1320

Table 2: Descriptive statistics of research variables

Variable Statistical Properties	Y ₁	Y ₂	Y ₃	Y ₄	Z ₁	Z ₂	Z ₃
mean	0.48	0.82	2.86	19.22	0.62	0.77	0.15
median	0.42	0.78	2.52	17.44	0.59	0.75	0.12
maximum	0.85	0.96	8.72	25.66	1.57	1.52	0.90
Minimum	0.18	0.23	1.98	-1.82	0.06	0.63	0.001
Standard deviation	2.05	4.92	2.52	12.82	0.21	0.15	0.15
Skewness	3.98	5.21	2.81	7.41	0.56	2.43	2.40
Elongation	12.42	42.44	11.88	19.55	4.43	10.14	9.83
Observatins	1320	1320	1320	1320	1320	1320	1320

In summary, Table 2 shows the descriptive statistics including mean, median, maximum, minimum, standard deviation, skewness coefficient and the tensile coefficient for the independent research variables. As can be seen, the mean value for the bankruptcy probability variable ($P(Z)$) is 5.63, for the accrual earning management variable (Jones model) is 0.81, for the real earning management variable (Roychowdhary model, 2006) is 60 0, for

variable ratio of working capital to total assets (X1) equal to 0.20, for variable retain earnings (losses) to total assets ratio (X21) equal to 3.08, For variable pre-interest and tax income (operating income and loss) to total assets ratio (X3) equal to 4.54, for variable ratio of equity book value to total debts (X4) equals 0.44, For the ratio of net sales to total assets (X5) equal to 14.24, for the variable working capital to total assets (Y1) equal to 0.48, for-income before interest and taxes (operating income and loss) to total Assets (Y2) equal to 0.82, for pre-tax income variables on current liabilities (Y3) equal to 2.86, for net sales to total assets (Y4) equal to 19.22, for variable net income to total Assets (Return on Assets) (Z1) equal The 62/0 for a variable total debt to total assets (leverage) (Z2) equal to 77/0, for alternating current assets to current liabilities (liquidity) (Z3) equal to 15/0. Also 63% of synthetic variable probability of bankruptcy (dependent variable) which is not presented in descriptive statistics is equal to one and 44% of it is zero. Also, statistical descriptions based on other indicators describing research variables are reported in the table above.

4.1 Inferential statistics

4-1-1 Normalization of research dependent variable

In general, the dependent variable (bankruptcy probability (P (Z)) in this study is a dummy variable that in following the combination of Altman's model (1968) and accruals earning management (Lin et al., 2016), operated as zero and one measurement.

To determine the appropriate method for estimating the research models, between the Logit and Probit methods (which are for models with dummy dependent variables) it is necessary to first determine whether or not the dependent variable is normal. If the dependent

variable is normal, the probit method is appropriate for estimating the research models, but if the dependent variable is not normal, the Logit method should be used to estimate the research models (Plato, 2013). The results of the normalization of the dependent variable of the present study, namely, the probability of bankruptcy using the Jarco-Bra test are described in Table (3).

Table (3): Normality test statistic of dependent research variable

Statics variable	Jarco-Bara statistics	The significance level	Comparison with level (0.05)	Result
Probability of bankruptcy ((P (Z))	4.3691	0.0000	smaller	Not normal

According to Table (2), it is clear that the significance level of the Jarco-For statistic is less than 5% for the type of auditor which indicates that the dependent variable is normal. Therefore, the appropriate method for estimating the regression models of the present study is the logit (logistic regression) method.

4 -2-1-Estimation of empirical models of research

4 .1-2-1-Estimation of the first model for testing the first research hypothesis

In summary, the findings of the first model estimation are related to the test of the first research hypothesis as described in Table 4.

Table (4): Estimation of the first model for the first research hypothesis test - dependent variable of probability of bankruptcy
((P (Z))

Statistics Variable	Coefficients of variables	standard deviation	Z statistic	Significant level of statistics (Z)	Comparison with level (0.05)	Result in the model
Width of β (β_1)	2.44	0.58	1.42	0.0029	does not have	does not have
X_1	2.66	0.61	1.64	0.0000	smaller	Significant positive impact
X_2	1.09	0.97	1.06	0.0000	Smaller	Significant positive impact
X_3	2.24	2.16	0.52	0.0021	Smaller	Significant positive impact
X_4	1.56	0.78	1.22	0.0001	Smaller	Significant positive impact
X_5	2.41	0.17	0.41	0.0004	Smaller	Significant positive impact
$AEM \times X_1$	-2.66	0.61	-1.64	0.0000	Smaller	Significant positive impact
$AEM \times X_2$	0.001	620	0.62	0.1201	Bigger	Significant positive impact
$AEM \times X_3$	0.42	6.02	2.53	0.2112	Bigger	Significant positive impact
$AEM \times X_4$	2.06	0.93	1.92	0.0041	Smaller	Significant positive impact
$AEM \times X_5$	2.33	0.54	1.27	0.0022	Smaller	No significant
Model determination coefficient (R^2)	0.44	Overall, forty-four percent of the dependent variables of probability of firms bankruptcy through independent variables are significantly explained.				
Statistic (LR)	41.55201	Based on this level of statistical significance (LR) the model is accepted.				
Significant level	0.0000	The model is significant because the statistical significance level (LR) is less than 5%.				
$P(Z) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 AEM \times X_1 + \beta_7 AEM \times X_2 + \beta_8 AEM \times X_3 + \beta_9 AEM \times X_4 + \beta_{10} AEM \times X_5 + \varepsilon_{it}$						

According to the results of Table (4), it can be said that the significance level of the standard normal function (Z) statistic for coefficient of research independent variables is accrual profit management variables based on Jones model including: ratio of working capital to total assets, retain earnings (losses) to total assets, pre-interest and tax income (operating income and loss) ratio to total assets, book value of equity to total liabilities, net sales to total assets ratio, interactive factor to working capital ratio to total Assets in the accrual earning management, or optional accruals ($AEM \times X_1$), the interactive coefficient of the retain earnings (losses) to total assets ratio in

accrual earning management ($AEM \times X_2$), the interactive factor-to- pre-interest and tax income (operating income and loss) to total assets in accrual earning management ($AEM \times X_3$), the interactive factor of equity book value to total debt ratio in accrual earning management ($AEM \times X_4$), the interactive coefficient of net Sales to total assets in accrual earning management ($AEM \times X_5$), respectively (0.0000), (0.000), (0.000), (0.021), (0.001). 0), (0.004), (0.000), (0.001), (0.02112), (0.041), (0.022), were less than 5%. Therefore, it can be claimed that, except for the interactive coefficient of the ratio of retain earnings (losses) to total assets in accrual earning management ($AEM \times X_2$), the

interactive ratio of pre-interest and tax income (operating income and loss) to total assets in accrual earning management ($AEM \times X_3$), the rest of the model variables have a significant effect on the dependent variables of bankruptcy of companies and are not excluded from the empirical estimation model.

4-1-2-1 Estimation of the second model for testing the first research hypothesis

In summary, the results of the estimation of the second model are related to the test of the first research hypothesis as described in Table (5).

Table (5): Estimation of the first model for testing the first research hypothesis-dependent variable of the probability of bankruptcy ((P (Z))

Statistics Variable	Coefficients of variables	The standard deviation	(Z) statistic	Significant level of statistics (Z)	Comparison with level (0.05)	Result in the model
Width of (β_1)	1.68	0.42	4.00	0.0029	does not have	does not have
Y_1	1.44	0.25	5.76	0.0000	smaller	Significant positive impact
Y_2	1.53	0.82	1.86	0.0221	smaller	Significant positive impact
Y_3	-3.38	2.62	-0.14	0.0001	smaller	Significant positive impact
Y_4	2.24	0.46	2.69	0.0000	smaller	Significant positive impact
$AEM \times Y_1$	2.82	-0.51	5.52	0.0020	smaller	Significant positive impact
$AEM \times Y_2$	-0.10	3.24	-0.03	0.1351	Bigger	Significant positive impact
$AEM \times Y_3$	-0.05	2.44	-0.02	0.5144	bigger	Significant positive impact
$AEM \times Y_4$	0.12	5.42	0.02	0.3516	bigger	Significant positive impact
Significant level	0.44	Overall, thirty-eight percent of the dependent variables of probability of firms bankruptcy through independent variables are significantly explained.				
Width of (β_1)	41.55201	Based on this level of statistical significance (LR) the model is accepted.				
Y_1	0.0000	The model is significant because the statistical significance level (LR) is less than 5%.				
$P(Z) = \beta_0 + \beta_1 Y_1 + \beta_2 Y_2 + \beta_3 Y_3 + \beta_4 Y_4 + \beta_5 AEM \times Y_1 + \beta_6 AEM \times Y_2 + \beta_7 AEM \times Y_3 + \beta_8 AEM \times Y_4 + \varepsilon_{it}$						

According to the results of Table (5), it can be said that the significance level of the standard normal function (Z) statistic for the coefficient of research independent variables is the accrual earning management variables based on the Jones model including the variables of the ratio of working capital to total assets (Y_1), Income

before interest and tax (operating income and loss) to total assets (Y_2), pre-tax income to current liabilities (Y_3), net sales to total assets (Y_4) were less than 5%.

Therefore, it can be claimed that the above variables have a significant effect on the dependent variable of bankruptcy prediction.

Also among the interactive coefficients, only the ratio of working capital to total assets in accrual earning management or the optional accruals ($AEM \times Y_1$) are on the bankruptcy dependent variable. But the interactive coefficient of the ratio of retain earnings (losses) to total assets in accrual earning management ($AEM \times Y_2$), the interactive coefficient of pre-tax income to current liabilities in accrual earning management ($AEM \times Y_3$), the interactive coefficient of net sales to total assets

in accrual earning management ($AEM \times Y_4$), do not affect the dependent variable of companies bankruptcy and are also omitted from the empirical estimation model of research.

4-1-2-1 .Estimation of the third model for testing the first research hypothesis

In summary, the findings of the estimation of the third model are related to the test of the first research hypothesis as described in Table 6.

Table (6): Estimation of the first model for testing the first research hypothesis - dependent variable of bankruptcy probability (P (Z))

Statistics Variable	Coefficients of variables	The standard deviation	statistic Z)(Significant level of statistics (Z)	Comparison with level (0.05)	Result in the model
Width of (β_1)	4.072	.488	8.344	.000	does not have	does not have
Z_1	.052	.005	9.898	.000	smaller	Significant positive impact
Z_2	-.157	.034	-4.578	.000	smaller	Significant neagative impact
Z_3	-.054	.032	-1.680	.093	bigger	No significant
$AEM \times Z_1$	-.060	.028	-2.105	.035	smaller	Significant neagative impact
$AEM \times Z_2$	-.062	.022	-2.826	.005	smaller	Significant neagative impact
$AEM \times Z_3$	-.128	.025	-5.152	.000	smaller	Significant neagative impact
Model determination coefficient (R²)	0/29	Overall, twenty-nine percent of the dependent variables of probability of firms bankruptcy through independent variables are significantly explained.				
Statistics LR	16.85	Based on this level of statistical significance (LR) the model is accepted.				
Significant level	0.0000	The model is significant because the statistical significance level (LR) is less than 5%.				
$P(Z) = \beta_0 + \beta_1 Z_1 + \beta_2 Z_2 + \beta_3 Z_3 + \beta_4 AEM \times Z_1 + \beta_5 AEM \times Z_2 + \beta_6 AEM \times Z_3 + \varepsilon_{it}$						

According to the results of Table (6), it can be said that the significance level of the standard normal function (Z) statistic for the coefficients of independent research variables is the accrual earning management variables based on Jones model including: the variables of net income to total assets (return on assets) (Z1), the ratio

of total liabilities to total assets (financial leverage) (Z2), except the ratio of current assets to current liabilities (liquidity) (Z3), is less than 5%. Therefore, it can be claimed that the above variables besides liquidity ratio have a significant effect on the dependent variable of bankruptcy prediction. Also among

the interactive coefficients of the ratio of net income to total assets in accrual earning management or the optional accruals (AEM × Z1), the interactive coefficient of the ratio of total liabilities to total assets in accrual earning management (AEM × Z2), the interactive ratio of current assets to Current liabilities in accruals earning management (AEM × Z3), all influence the dependent variable of corporate

bankruptcy and are not excluded from the empirical estimation model.

4-1-2-1 .Estimation of the first model for testing the second research hypothesis

In summary, the findings of the first model estimation are related to the testing of the second research hypothesis as described in Table (7).

Table (7): Estimation of the first model for testing the second research hypothesis-dependent variable of probability of bankruptcy ((P (Z))

Statistics Variable	Coefficients of variables	The standard deviation	(Z) STATISTIC	Significant level of statistics (Z)	Comparison with level (0.05)	Result in the model
Width of (β ₁)	4.207	.538	7.819	.000	Does not have	Does not have
X ₁	.063	.006	10.706	.000	Smaller	Significant positive impact
X ₂	-.151	.034	-4.452	.000	Smaller	Significant positive impact
X ₃	-.070	.032	-2.171	.030	Smaller	Significant positive impact
X ₄	-.080	.029	-2.749	.006	Smaller	Significant positive impact
X ₅	-.063	.022	-2.820	.005	Smaller	Significant positive impact
REM×X ₁	-.146	.028	-5.137	.000	Smaller	Significant positive impact
REM×X ₂	-.095	.025	-3.771	.000	Smaller	Significant positive impact
REM×X ₃	-.107	.025	-4.351	.000	Smaller	Significant positive impact
REM×X ₄	-10.079	9.791	-1.029	.303	Bigger	No significant
REM×X ₅	-15.880	6.591	-2.409	.016	Smaller	Significant positive impact
Model determination coefficient (R²)	0.31	In general, thirty-one percent of the dependent variables of probability of firms bankruptcy through independent variables are significantly explained.				
Statistics LR	13.138	Based on this level of statistical significance (LR) the model is accepted.				
Significant level	0.0000	The model is significant because the statistical significance level (LR) is less than 5%.				
$P(Z) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 REM \times X_1 + \beta_7 REM \times X_2 + \beta_8 REM \times X_3 + \beta_9 REM \times X_4 + \beta_{10} REM \times X_5 + \varepsilon_i$						

According to the results of Table (7), it can be said that the significance level of the standard normal function (Z) statistic for the

coefficient of research independent variables, is real earning management variables based on Altman model, including the ratio of working

capital to total assets, retained earnings (losses) to total assets ratio, pre-tax and interest income (operating income and loss) to total assets ratio, book value of equity to total liabilities ratio, net sales to total assets ratio, interactive coefficient of working capital to total assets ratio in the accrual earning management or optional accruals ($REM \times X_1$), the interactive coefficient of the ratio of retained earnings (losses) to total assets accrual earning management ($REM; X_2$), Interactive coefficient of pre-tax and interest income (operating income and loss) to total assets ratio in accrual earning management ($REM \times X_3$), interactive coefficient of net sales to total assets in accrual earning management ($REM \times X_5$), all other than the interactive coefficient of

the quality book value to total debt in accrual earning management ($REM \times X_4$) is less than 5%. Therefore, it can be claimed that the above variables except for the interactive coefficient of the equity book value to total liabilities in accrual earning management have a significant effect on the dependent variable of bankruptcy prediction and are not excluded from the empirical estimation model of research.

4-1-2-1- Estimation of the second model for testing the second research hypothesis

In summary, the findings of the second model estimation are related to the testing of the second research hypothesis as described in Table (8).

Table (8): Estimation of the second model for testing the second research hypothesis-dependent variable of bankruptcy probability ((P (Z))

Statistics Variable	Coefficients of variables	The standard deviation	(Z) statistic	Significant level of statistics (Z)	Comparison with level (0.05)	Result in the model
Width of (β_1)	3.735	.583	6.406	.000	Does not have	Does not have
Y_1	.089	.006	13.929	.000	smaller	Significant positive impact
Y_2	-.138	.039	-3.562	.000	smaller	Significant neagative impact
Y_3	-.216	.036	-5.936	.000	smaller	Significant neagative impact
Y_4	.297	.033	9.129	.000	smaller	Significant positive impact
$REM \times Y_1$	-.225	.025	-8.897	.000	smaller	Significant neagative impact
$REM \times Y_2$	-.175	.028	-6.159	.000	smaller	Significant neagative impact
$REM \times Y_3$	-.164	.034	-4.861	.000	smaller	Significant neagative impact
$REM \times Y_4$	-.103	.032	-3.234	.001	smaller	Significant neagative impact
Model determination coefficient (R²)	0.31	In general, seventeen percent of the dependent variables of probability of firms bankruptcy through independent variables are significantly explained.				
Statistics LR	13.138	Based on this level of statistical significance (LR) the model is accepted.				
Significant level	0.0000	The model is significant because the statistical significance level (LR) is less than 5%.				

$$P(Z) = \beta_0 + \beta_1 Y_1 + \beta_2 Y_2 + \beta_3 Y_3 + \beta_4 Y_4 + \beta_5 REM \times Y_1 + \beta_6 REM \times Y_2 - \beta_7 REM \times Y_3 + \beta_8 REM \times Y_4 + \varepsilon_{it}$$

According to the results of Table (8), it can be said that the significance level of the standard normal function (Z) statistic for coefficient of research independent variables is real earning management variables based on Altman model including variables of the ratio of working capital to total assets (Y1) income before tax and interest to total assets (operating income and loss) (Y2), pre-tax income to current liabilities (Y3), net sales to total assets (Y4) were less than 5%. Therefore, it can be claimed that the above variables have a significant effect on the dependent variable of bankruptcy prediction. Also, among the interactive coefficients of the ratio of working capital to total assets in accrual earning management or optional accruals (AEM × Y1), the interactive coefficient of

retained earnings to total assets in accrual earning management (AEM × Y2), interactive coefficient Pre-tax income to current liabilities in accrual earning management (AEM × Y3), interactive coefficient of net sales to total assets in accrual earning management (AEM × Y4), all affect the dependent variable of corporate bankruptcy and empirical estimation model of the research is also not eliminated.

4-1-2-1 Estimation of the third model for testing the third research hypothesis

In summary, the findings of the estimation of the third model are related to the testing of the second research hypothesis as described in Table 9.

Table (9): Estimation of the third model for testing the second research hypothesis-dependent variable of bankruptcy probability ((P (Z))

Variable	Statistics	Coefficients of variables	The standard deviation	(Z) statistic	Significant level of statistics (Z)	Comparison with level (0.05)	Result in the model
Width of) β_1 (3.813	.460	8.292	.000	Does not have	Does not have
Z_1		.044	.005	8.888	.000	smaller	Significant positive impact
Z_2		-.013	.032	-3.397	.001	smaller	Significant negative impact
Z_3		-.078	.030	-2.589	.010	smaller	Significant negative impact
REM× Z_1		-.136	.027	-5.085	.000	smaller	Significant positive impact
REM× Z_2		-.119	.021	-5.747	.000	smaller	Significant negative impact
REM× Z_3		.033	.023	1.396	.163	Does not have	Does not have
Model determination coefficient (R²)		0.30	In general, seventeen percent of the dependent variables of probability of firms bankruptcy through independent variables are significantly explained.				
Statistics LR		19.82	Based on this level of statistical significance (LR) the model is accepted.				
Significant level		0.000	The model is significant because the statistical significance level (LR) is less than 5%.				
$P(Z) = \beta_0 + \beta_1 Z_1 + \beta_2 Z_2 + \beta_3 Z_3 + \beta_4 REM \times Z_1 + \beta_5 REM \times Z_2 + \beta_6 REM \times Z_3 + \varepsilon_{it}$							

According to the results of Table (9), it can be said that the significance level of the standard normal function (Z) statistic for the coefficient of independent research variables is real earning management variables based on Altman model including net income to total assets (return on assets) (Z_1), the ratio of current assets to current liabilities (liquidity) (Z_3), except of total liabilities to total assets (financial leverage) (Z_2) were less than 5%. Therefore, it can be claimed that the above variables besides the liquidity ratio have a significant effect on the dependent variable of bankruptcy prediction. Also among the interactive coefficients of the net income to total assets ratio in accrual earning management or the optional accruals ($REM \times Z_1$), the interactive coefficient of the total liabilities to total assets ratio in accrual earning management ($REM \times Z_2$), except current assets to current liabilities in accruals earning management ($REM \times Z_3$) all influence the dependent variable of corporate bankruptcy and are not excluded from the empirical estimation model of the research.

5- Conclusion

Basic financial statements are one of the most important resources available to users and the primary role of information in financial markets is to provide the necessary background for optimal resource allocation. In economic affairs, users always rely on accurate and reliable information to make their decisions, and the lack of suitable and relevant information will naturally disrupt their decision making (Preacher, 2011). According to accounting standards, the purpose of financial statements is to provide information on financial position, financial performance, and financial flexibility to help users make economic decisions (Firouzian & Qatabee, 2014).

One of the most important information

presented in financial statements that is particularly relevant to the economic decisions of the stakeholders is the net income figure that is disclosed in the periodic profit and loss statement (Nasrollahi & Aref Manesh, 2010). Income is the product of the accounting information system that all stakeholders of an entity, including shareholders, investors, creditors, sellers and suppliers of raw materials, government and management, somehow value and rely on it above all other criteria.

Therefore, it can be said that profit is one of the most important criteria for measuring and evaluating the performance of companies, and managers also, the value creation and activity continuity of each economic unit largely depends on its profitability (Salehi, 2011). Through the profitability of the entity, shareholders are interested in continuing to operate and maintain their capital, thereby predicting the value of their stocks. So, profit is one of the most important criteria for deciding whether or not to invest. The creditors review the profitability and reliability of the entity's repayment and providing the facilities. Sellers and suppliers of raw materials determine their sales credit policies, taking into account the profitability and ability of purchasing power to make more discounts. Through the profitability of the entity, the government can receive the social rights of individuals or taxes. Management's remuneration depends on the amount of profit the entity has, so increasing or decreasing it, is highly effective in compensating management services and managers' job security.

Thus, with these explanations, it can be said that profit is one of the most important criteria for measuring and evaluating the performance of companies and managers and the value creation and continuity of each economic unit activities largely depends on its profitability

(Salehi, 2011). Due to the sensitivity and wide scope of earnings application, accuracy in different dimensions and consideration of the different perspectives that exist in the calculation and reporting of earnings seems necessary (Haghighat & Panahi, 2010).

According to some scholars and analysts, accrual accounting earning is considered to be the most important source of information, but due to inherent flaws such as the authority of managers to interpret and apply accounting methods, how to evaluate and identify accruals and the likelihood of errors in accrual estimations may not reflect the actual performance of companies and their management. In other words, measuring the accounting profit of firms is influenced by accounting estimates and accounting practices that management has the freedom to choose. This allows management to action freedom and decision-making power in identifying and measuring expences and revenues, as well as making judgments and estimates and this discreation management because of errors in identifying and evaluating the accounting estimations, as well as management's incentives to manipulate earnings (earnings management) to achieve specific goals, has made the companies' actual profit differ from the reported profit in the financial statements and the quality of the disclosed information reduces, in particular, the earning quality and its usefulness for investment decision making. On the other hand, this behavior may lead to inaccurate allocation of scarce economic resources to low-efficiency investments and would reduce efficiency too.

The inherent limitations of accrual accounting, the existence of moutivation to manipulate and manage earnings by corporate governance pillars and recent financial crises and financial reporting scandals have

diminished investors' confidence in the accuracy and correctness of accounting profits reported by the financial reporting system.

Therefore, financial analysers had to make efforts to assess the accuracy and correctness of reported earnings. In line with these efforts, a concept called earning quality was born that illustrates the significance of what is important in addition to the quantity and amount of companies' income. In fact, the theory of profit quality was first put forward by financial analysts and stock brokers. Because they felt that reported earnings did not reflect the firm's earnings power as it had in mind (Bullow & Talebi, 2010).

Researchers have always sought to discover the causes and factors affecting the quality of earnings since the emergence of the issue of earnings quality to this day, and this has always been one of the most interesting topics in accounting earnings research. The most important factors affecting the earning quality can be mentioned as unique characteristics of the company such as company size, type of industry and board independence, aspects of corporate governance and governance principles, sustainability of earnings components, multiple accounting methods, Deficiencies in the estimation and forecasting process, managers' discreation, and the effectiveness of the reporting and discretionary fundamentals of managers (Desai et al., 2009).

However, to accept the above claim empirically, it is necessary to examine the claim in the form of research. Given the above discussion, the main question in the present study is whether or not the prediction of bankruptcy based on real earning management and accrual earning management models of companies listed in Tehran Stock Exchange is high? In this research, to answer this question, we tried to use the Logit regression model

to investigate the effect of accruals earning management variables (Jones model) on the predictive power of bankruptcy models and the effect of real earning management model variables (Roychowdhary model, 2006) on the predictive power of bankruptcy models Empirically tested.

Therefore, in general, the empirical findings from testing the hypotheses of the present study using the Logit model shows that the prediction of bankruptcy models based on real earning management models and accrual earning management of companies accepted in Tehran Stock Exchange is significantly. Therefore, it can be stated that the amount of real earnings management and accrual earnings management affect the bankruptcy of the companies studied. Based on the findings, it can be concluded that companies in Tehran Stock Exchange are less likely to manage real earnings and accrual earnings.

Of course, it is necessary for the companies that manage their earnings to be audited by first-tier auditors to make the necessary disclosures to the users of the financial statements. Therefore, the variable of audit behavior regarding the financial position of the companies listed in the Tehran Stock Exchange has information content about the amount of earnings management in accrual and real way, so that depending on the type of auditor of these companies, can understand the amount of earning management they make.

Based on the above results, it is recommended that all users of accounting information (including investors, creditors, etc.) consider the earning quality of companies to make their decisions among the Tehran Stock Exchange companies and from this way estimate the reliability of accounting information published by those companies, Because, according to

the evidence obtained in the present study, the accrual and real earnings management variable contains information content about the extent of such measures as their earnings management, Therefore, paying attention to earnings management in the accrual or real manner of companies can help estimate the approximate reliability of accounting information of companies. It should be noted that among the studies conducted, the results of the present study are consistent with those of Rosner (2003), Garcia Lara, Garcia Osma Vomura (2005), Deloitte (2008), Kampa and Kamkho Minano (2014), Francisgti and kosteval (2019). , Banish (1997), Warafsky (2012), Lane et al (2016), Jardine (2017), Vaganesons and Sorin (2017), Igbanyaki Weigbinovia (2018), Kurdistani and Tatley, (2014), Rahmani and Ramshe (2013).

Practical suggestions from the research

Based on the findings of the research hypotheses that have been confirmed, it is recommended to all users of accounting information, especially investors, to determine the quality of corporate accounting information along with such categories as relevance and reliability of financial statements, note the prediction of bankruptcy models based on real and accrual earning management of companies listed in Tehran Stock Exchange because base on the evidence obtained in the present study is more likely to lead bankrupt to companies that are more inclined to manage actual earnings of accruals.

Therefore, the quality of a company's financial statements scrutiny can be informed by the earning management and its financial statements quality to check for companies bankruptcy status. Therefore, in order to identify the factors affecting the selection between real or accrual earnings management,

it is recommended that other researchers use the following topics in their research.

- Investigate the impact of voluntary disclosure quality of financial information on predicting potential bankruptcy. Also, its results are discussed with the results of the present study.
- Investigate the effect of accounting conservatism and the quality of financial information on predicting the probability of corporate bankruptcy. Also, its results are discussed with the results of the present study.
- Investigate the simultaneous impact of the transparency of financial statements, the quality of accruals and the relevance of accounting information to predicting the probability of bankruptcy. Also, its results are discussed with the results of the present study

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