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Entropy of Accrual Items of Modified Jones Model and Financial Stability and Their Estimation Based on Whale and Genetics Algorithm[1]

Mohammadreza Hajireza[2], Roya Darabi[3], Ali Najafi Moghaddam[4]

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Research Paper

INTRODUCTION

With the growth of sciences and the removal of the border between sciences and the interaction of sciences with each other, the concepts of different sciences such as physics have been proposed in humanities. Entropy is one of these concepts, which has been proven in physics under the title of the second law of thermodynamics. The higher the entropy, the more information the system needs. Considering that the International Financial Reporting Standards (IFRS) has emphasized the importance of the accrual part of profit, updating the accrual items and reporting it in the financial statements for the use of stakeholders and investors is of great importance. One of the benefits that will be achieved by determining financial stability is increasing transparency and timely identification of losses and risks with a forward-looking approach, which leads to increasing the effectiveness of agency contracts between companies and managers and shareholders and achieving effective corporate governance. The purpose of the research is to update the fixed assets and calculate the entropy of the mentioned items taking into account the inflation included in the accrual items. This research has practical goals, and the results of it can be considered in companies and specific fields of activity and industry,

1. DOI: 10.22051/JERA.2023.42452.3082
2. Ph.D. Student, Department of Accounting, South Tehran Branch, Islamic Azad University, Tehran, Iran. (mohammadrezahajireza@gmail.com).
3. Associate Professor, Department of Accounting, South Tehran Branch, Islamic Azad University, Tehran, Iran. (Corresponding Author). (Royadarabi110@yahoo.com).
4. Assistant Professor, Department of Accounting, South Tehran Branch, Islamic Azad University, Tehran, Iran. (alirezanm@yahoo.com).

similar to the activity and organizational structure of insurance companies. Most of the research done on accruals has been done with the Jones model of 1991, so in this research, by adjusting the Jones model, especially in countries with high inflation like Iran, accruals and as a result financial stability are measured more accurately. The current research is the first research, adjusting the Jones model and considering the inflation factor in the accruals, makes the decisions of the users of the financial statements more useful, according to the emphasis of the international financial reporting standards, and shows the effect of these items on financial stability.

MATERIALS AND METHODS

This research is of an applied type to calculate the entropy of accruals, determine financial stability, and separate the inflationary component of accruals, which will be used by users and decision-makers of financial information, regulatory bodies, and legislators. Considering that it is extracted based on the information from financial statements, library studies, and referring to academic centers, it is an after-event. The current research has a descriptive nature and is causal in terms of the relationship between the variables because to find the relationship between the research variables, regression and correlation techniques, and meta-heuristic algorithms using the mean square error index and standard error of the mean techniques which measure the accuracy of the statistical model, has benefited. In this regard, 33 companies are the target society, all of which have been selected as samples. Therefore, the observations during the period of 2015 to 2021 reach 231 years of the company. To analyze the data, quantitative research information and variables have been extracted from the financial statements and sorted, coded, organized, classified, and analyzed in Excel software. To test the hypotheses, Eviews, Matlab, Smart Pls software, as well as the meta-heuristic algorithm of whale and genetics have been used. In this research, econometric methods and meta-heuristic algorithms have been used to analyze data and test hypotheses. First, the descriptive statistics of the variables are presented, and then the research hypotheses are tested using two regression analysis approaches and meta-heuristic algorithms of whale and genetics. The Granger causality test was used to investigate the causality relationship between independent and dependent variables, and the Pearson correlation coefficient was used to determine the correlation between independent variables. Each of the statistical models of the research hypotheses has been estimated and

analyzed using the ordinary least squares (OLS) method. Also, the F statistic was analyzed to determine the significance of the regression as a whole, and Durbin-Watson's test was used to test the autocorrelation for each of the research hypotheses.

RESULTS AND DISCUSSION

Based on the data analysis of the first hypothesis, it can be said that there is a significant relationship between the entropy of discretionary and nondiscretionary accrual items of the modified Jones model and financial stability, and the first sub-hypothesis was confirmed. Also, the results of the second hypothesis showed that there is a significant relationship between the Shannon entropy of discretionary and nondiscretionary accrual items of the modified Jones model and financial stability, so the second hypothesis of the research is confirmed. The results of the third and fourth hypotheses show that in both models, the whale algorithm has been able to estimate the financial stability with less error than the regression method and the genetic algorithm according to the entropy of accrual items of the Jones adjusted model. Therefore, the third and fourth hypotheses are also confirmed.

CONCLUSION

It can be concluded, that by updating the accruals due to fixed assets and adjusting the Jones model, financial stability can be predicted more accurately. The research results showed that the obtained entropy of the adjusted Jones model has reduced the ambiguity of accruals; This timeliness in accrual items reduces abnormality in these items and increases comparability and transparency in financial reporting. According to the definition of financial stability, this update will reduce financial imbalance and ultimately increase financial stability. The obtained results showed that discretionary accruals are more accurate than nondiscretionary accruals in both Rennie entropy and Shannon's accrual models of the adjusted Jones model in predicting financial stability. It is suggested that supervisory institutions such as Central Insurance, Central Bank, and Securities and Exchange Organization, in line with transparency in financial reporting, reducing the uncertainty of decision makers and stakeholders, should act on the requirement of financial stability reporting in the form of regulations and guidelines; Also, decision-makers and users of financial statements should be careful about long-term accrual items and whether these items are up-to-date. According to the results of the third

and fourth hypotheses of the research, it is suggested that supervisory institutions, including the Central Insurance and the Securities and Exchange Organization, for effective financial supervision, use financial stability models using meta-heuristic algorithms along with financial wealth to determine the financial status, compared to Compile the regulation of rating companies, which leads to increasing the effectiveness of agency contracts between companies and managers and shareholders and achieving effective corporate governance. With the help of the aforementioned algorithms, accounting and organizational standards can be developed to implement future operations to determine financial stability.

Keywords: Financial Stability, Accrual Items, Rennie Entropy, Shannon Entropy.

JEL Classification: M40, M41, M49.