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Modeling Water Management Accounting on the Financial Performance of Listed Companies: A Dynamic Stochastic General Equilibrium Approach (with Emphasis on Cultural and Social Policies)

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1. Introduction

Effective water governance requires timely and reliable information, yet water data is often fragmented or missing. Water accounting organizes existing data to provide decision makers with the best possible information.

The present study is contributed in three aspects: First, unlike most previous studies that have focused on developed markets, this study focuses on the capital market and the characteristics of the Iranian economy, relying on stakeholder and legitimacy theories, to develop a local model of management accounting on the financial performance of listed firms, which takes into account the specific cultural and social characteristics of the country. Second, the study specifically analyzes the financial performance of listed firms using traditional (return on assets and return on equity) and modern (economic value added) measures, which are key mechanisms in investor decision-making and corporate value creation, and examines the

role of water management accounting on financial performance. Third, this study used both questionnaire data and actual financial statement data. For this purpose, accounting experts and managers of listed firms were used in the qualitative part, and financial indicators and information of companies active in the capital market and macroeconomic indicators were used; therefore, since the data scale of these two parts was different, the dynamic stochastic general equilibrium model approach was used to determine the equilibrium points in the four sectors of consumption, producers, central bank, and government to create interaction between these two parts; which was estimated using Monte Carlo and Bayesian simulation through two calibration and maximum likelihood methods. For this purpose, the stochastic general equilibrium approach was employed to determine the equilibrium points in the four sectors: household consumption, production, the central bank, and the government. These equilibrium points were estimated using Monte Carlo and Bayesian simulations through two calibration and maximum likelihood methods.

This study is important in several important aspects: First, water management accounting, as a sub-branch of social responsibility accounting, is trying to quantitatively reveal the level of managers' responsibility towards water resources and the various uses of water in different sectors, and by identifying the causes of the imbalance between supply and demand in this area, it also considers the productivity and efficiency of using these resources in line with profitability growth. Second, there are very high demands for water supply and delivery in Iran. In the future, our need for water resources will increase with population growth. Water management accounting can play a key role in the accounting and management of the future of water in society by providing the information needed by managers to make correct decisions. In other words, water management accounting can help create a common language for interpreting and communicating water resources data to different actors involved in water management who have different backgrounds, cultures, interests, and levels of knowledge, and lead to sustainable development (Taheri et al., 2025). Third, the need for effective water management has led to the increasing development of water accounting tools and the reporting of accurate information related to water and its costs. However, to date, most of the work of accountants has focused on accountability and external reporting requirements. But, determining the effects of cultural and social policies resulting from the application of

management accounting in the water sector on the firm's financial performance is also of great importance and can help firm managers to improve the company's financial performance. Modeling these dimensions in the field of water management accounting can help improve the managers' decision-making models, households, investors, the government, and also the evaluation of auditors in the auditing profession. Accordingly, the main issue of the study is modeling the process of the impact of water management accounting on the financial performance of listed firms through the channel of cultural and social policies.

2. Hypotheses

There are several theories in the field of the importance of applying water management accounting in firms. These theories include legitimacy, stakeholder, social responsibility, and resource-based theory. According to the legitimacy theory, companies try to maintain their legitimacy and credibility from the perspective of stakeholders through water reporting. According to the social responsibility theory, firms demonstrate through water reporting that they adhere to the professional ethics and values of the company, contributing to sustainable development and a better environment, and strive to fulfill their social responsibility more effectively. In general, it can be inferred that firms that provide more comprehensive and transparent information, including water-related reports, may experience better financial performance due to improved decision-making, reduced information asymmetry and increased investor confidence, and reduced cost of capital. Based on the theoretical foundations, the research hypotheses are as follows:

Main hypothesis 1: Water management accounting with an emphasis on cultural factors has a significant effect on the financial performance of listed firms.

Sub-hypothesis 1-A: Water management accounting with an emphasis on cultural factors has a significant effect on the economic added value of listed firms.

Sub-hypothesis 1-B: Water management accounting with an emphasis on cultural factors has a significant effect on the ROA of listed firms.

Sub-hypothesis 1-C: Water management accounting with an emphasis on cultural factors has a significant effect on the ROE of listed firms.

Main hypothesis 2: Water management accounting with an emphasis on social factors has a significant effect on the financial performance of listed

firms.

Sub-hypothesis 2-A: Water management accounting with an emphasis on social factors has a significant effect on the economic added value of listed firms.

Sub-hypothesis 2-B: Water management accounting with an emphasis on social factors has a significant effect on the ROA of listed firms.

Second Sub-Hypothesis -C: Water management accounting with an emphasis on social factors has a significant effect on the ROE of listed firms.

3. Methods

The research method is scientific in nature and applied for a purpose. The research method is mixed and presented in the form of a qualitative-quantitative approach. The research period is 13 years (2011-2023). The present research model has 4 sectors: households, producers, government, and the central bank. The four main relationships are as follows:

1-Household

$$\underbrace{Max}_{C_t,N_t,B_{t+1},M_t,K_{t+1}} = E_0 \sum_{t=0}^{\infty} \beta^t \left(\frac{{C_t}^{1-\sigma}}{1-\sigma} - \frac{{N_t}^{1+\eta}}{1+\eta} + Ln \frac{M_t}{P_t} \right)$$

2-Central Bank

$$g_t^m = (1-\rho_m) log\pi - log\pi_t + \rho_m g_{t-1}^m + \rho_m \pi_{t-1} + \varepsilon_t^m$$

3-Producers

$$Y_t = A_t K_t^{\alpha} N_t^{\lambda} Z_t^{1-\alpha-\lambda}$$

4- The government

$$G_t = WA_t Z_t$$

4. Results

Based on the results, policies based on cultural factors in the field of water management accounting have a stronger impact on firms' performance indicators than social factors. Policies based on improving education in the field of water management accounting have the highest impact on performance indicators. The higher impact of cultural policies in the field of water management accounting than social policies is based on the direct impact of these policies on firm performance, while social policies in the field of water management accounting affect performance through the channel of corporate social responsibility. The cultural and social factors had the highest impact on the ROA performance index. The results confirm the

stakeholder theory based on the role of corporate culture and social responsibility in the field of water sustainability towards society.

5. Conclusion

In this study, the relationships between the four sectors of households, producers, the central bank, and the government were first formulated; to localize the relationships between the four sectors, information from the financial statements of listed firms and macro indicators of the Central Bank of the Islamic Republic of Iran were used. Due to the lack of information on cultural and social policies in the field of water accounting management, experts were consulted. The principal component analysis approach was used to unify the questionnaire information with financial and macro information, and the Monte Carlo, Metropolis-Hastings, and Bayesian approaches were utilized to calculate the calibration of the research data. Also, the DYNARE extension was employed in the MATLAB software to examine the effect of water management accounting policies on the financial performance of listed firms, and to examine the stability of the results, the log-likelihood simulation between variables, and the calculation of the loss function of the policies were used.

Based on the calculation of the policy's loss function, it was observed that if policymakers and managers in the capital market implement policies in the field of water management accounting, the priority is given to implementing cultural policies in the 75% shock scenario. Because, according to the calculation of the policy loss function, this policy has the highest impact on the firm’s performance and the lowest cost if implemented. Also, according to the macro-metric modeling of water management accounting; it was observed that numerous stakeholders are involved in this area and interact with each other; As a result, to improve the implementation of socio-cultural factors of water management accounting policies; the possibility of the presence of all stakeholders to implement water management accounting policies, such as promoting the optimal water model and effective use of human resources and their training, should be considered; In addition, according to the Brroks and Gelman stability and sustainability tests and Monte Carlo simulation, it was concluded that the results of the macro-metric model are a reliable estimate, and this indicates that there should be a systemic view in implementing policies in this area. The results confirm the perspective of stakeholder theory in the area of the

role of corporate cultural and social responsibility in the area of water sustainability towards society.

Keywords: Water Management Accounting, Cultural Factors, Social Factors, Dynamic Stochastic General Equilibrium.
JEL classification: M41, L25, Q56.