Fitting the Antifragility Model in Iranian Financial Organizations Through Confirmatory Factor Analysis

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Abstract

This study was conducted to fit the antifragility model in Iranian financial organizations. The research method was quantitative, utilizing a correlational and descriptive approach. The statistical population comprised managers and experts from financial organizations in the northwest of Iran, totaling 488 individuals. Using Cochran's formula, a sample size of 208 participants was selected. The validity of the research instrument was confirmed through consultation and guidance from academic advisors, while its reliability was verified with a Cronbach's alpha coefficient above 0.7. Descriptive statistics were employed to describe demographic indicators, and inferential statistics were used for quantitative model analysis through confirmatory factor analysis, utilizing SPSS 25 and Lisrel 8.8 software. Statistical analysis was conducted on 19 components categorized into four groups: (1) the random and environmental category, which included the components of flexibility, financial crisis, resilient performance, agility, and adaptability; (2) the financial performance category, which included the components of cost control, institutional financial performance, central bank independence, inflation volatility, and cash flow management; (3) the managerial category, which included the components of risk management, economic growth improvement, capital management, financial policies, and government relations; and (4) the organizational category, which included the components of innovation and creativity, adaptability, resilience and resistance, integration, and service empowerment. The results of the confirmatory factor analysis, with observed factor loadings for all model components exceeding 0.4 within the acceptable range and a significant T-value test greater than 1.96, indicated that the theoretical model was well-fitted. Additionally, structural equation modeling results demonstrated that the research variables had a positive and significant impact on each other, as evidenced by path coefficients and significant T-values.

Keywords: Antifragility, Financial Organizations, Confirmatory Factor Analysis

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1. Introduction

The economic endurance and resilience of financial organizations refer to their ability to withstand various economic shocks and recover following crises [1, 2]. Among the most critical organizations affected by shocks such as sanctions are Iranian financial organizations, making their resilience to crises particularly important. To address these challenges, concepts such as agility, resilience, and sustainability have been introduced [3]. However, beyond these concepts, one of the key theories for preventing disruptions and failures in Iran's financial organizations is antifragility. Antifragility is the capability of a financial system to improve in situations of risk and disruption. In this state, not only do disruptions fail to damage the system, but they actually contribute to its growth. Accordingly, this theory must be designed in a way that prepares organizations for disruptions and enables them to respond effectively and efficiently [4].

The concept of antifragility extends beyond resilience and robustness. A resilient entity resists shocks and remains unchanged, whereas an antifragile entity emerges stronger than before. This characteristic applies to all things that evolve over time, including evolution, culture, ideas,

revolutions, political systems, technological innovations, cultural and economic achievements, legal systems, and even tropical forests. The distinction between resilience and antifragility delineates what is living and organic [5]. Financial and economic antifragility pertains to the ability to counter various economic shocks and recover after crises. The financial sector is one of the most affected areas of Iran's economy under external pressures such as sanctions, highlighting the importance of resilience and antifragility in financial organizations [6].

Antifragility is often used to describe an organization's ability to survive and thrive in unpredictable business environments. It serves as an effective tool for overcoming unknown events and environmental threats. Despite the evident potential of antifragility in designing new systems capable of functioning effectively in complex environments, its application in various organizations remains limited. Antifragility allows organizations to capitalize on unforeseen events, positioning themselves better than before [7].

Before the global banking crisis of 2007, Nassim Taleb's analyses and predictions regarding the collapse of financial markets were not taken seriously. This contemporary scholar gained significant credibility in the fields of statistics and risk management only after financial markets crashed, largely due to his substantial investments based on this prediction [8]. Human analytical thinking generally favors symmetrical decision-making and balanced solutions. However, in most cases, creating, sustaining, and increasing profitability lie in recognizing asymmetries. For example, if a company remains excessively cautious in its investments and avoids high-risk opportunities in new products and services, it creates fragility within its business model. The conservative approach leads to slow, linear growth, and when a competitor's high-risk investment succeeds, all the accumulated savings of the conservative company may be rendered obsolete [9].

Taleb's trading strategy is an antifragile strategy. For businesses, antifragility means avoiding dependence on a single product or strategy. Instead, an antifragile business diversifies its revenue streams so that if one fails, it can rely on others. Additionally, unnecessary debt and expenditures should be minimized to safeguard against bankruptcy and market downturns [10].

The absence of an evaluation and assessment system to measure the antifragility of Iran's financial organizations represents a research gap in this study. Managers must be able to shape the perceptions and behaviors of individuals, manage interactions with other financial organization managers, influence public perceptions of organizational actions, and engage in negotiations when necessary. How can an organization shape the perceptions of individuals, other organizations, and society regarding its performance and establish a consensus on this matter? It appears that designing an antifragility model for Iranian financial organizations can partially address issues such as weak performance and employees' lack of resilience.

From a theoretical perspective, this research assists managers, scholars, and specialists in Iranian financial organizations in identifying the unknown aspects of organizational antifragility. A major challenge in this area is the persistent presence of financial crises, requiring managers to adopt appropriate measures to counter economic fluctuations. One solution involves preparing for disruptive events, responding effectively during their occurrence, recovering post-crisis, and ultimately leveraging these experiences for competitive advantage [11, 12]. Antifragility measures should ensure that financial organizations can maximize these aspects with minimal cost and time. Financial organizations must possess an inherent capability to develop adaptive responses tailored to the nature of the risks they face [9, 13-15]. This means that financial organizations may need to modify their internal elements to respond appropriately to disruptive events rather than relying solely on predefined responses. This adaptive capability reflects the nature of financial disruptions, which are often unpredictable and necessitate context-specific financial responses. Over time, organizations can learn from past disruptions and develop new capabilities, making them increasingly antifragile in the face of future threats. This characteristic is particularly important for Iranian financial organizations.

Additionally, an improved method for assessing the antifragility of Iranian financial organizations must be introduced. Such an assessment would help organizations evaluate the effectiveness of their risk management strategies. Defining antifragility indices for Iranian financial organizations would facilitate pre- and post-intervention evaluations of risk management measures. It would also enable a continuous review of antifragility levels in uncertain environments over time. These assessments would provide deep insights into the systemic characteristics necessary to understand financial risk positions. Therefore, the absence of a comprehensive evaluation system for assessing antifragility in Iranian

financial organizations is a significant research gap. Managers must influence the perceptions and behaviors of individuals, shape interactions with other financial organizations, and manage public perceptions of their actions. The design of an antifragility model for Iranian financial organizations appears to offer a solution to performance weaknesses and employee resilience challenges.

From a practical perspective, this research is relevant to countries facing economic and financial shocks, which can lead to shifts in growth and development trajectories. The responses and measures adopted to mitigate such shocks depend on a country's financial robustness, economic volatility, and the intensity of weaknesses. Several Southeast Asian countries, including Indonesia, South Korea, Malaysia, Thailand, and the Philippines, suffered severe economic contractions during the 1997 Asian financial crisis. However, by implementing appropriate policies and learning from past crises, these nations were able to recover from the 2007 financial crisis significantly faster than many European and North American countries, returning to growth trajectories nine months earlier [12, 16].

In line with this, the Iranian government introduced the general policies of the Resistance Economy to strengthen economic resilience and achieve the goals outlined in the 20-Year Vision Plan. These policies emphasize increasing economic resilience and reducing vulnerability (Clause 12), managing economic risks through proactive, swift, and strategic responses to domestic and international disruptions (Clause 22), and reducing dependency on oil and gas export revenues (Clause 13). Enhancing economic resilience is a key objective of Iran's long-term economic strategy, as sustained and accelerated growth in a rapidly changing global environment requires strengthening national economic resilience [17].

Furthermore, a key factor in the fragility of banks in financial crises lies in their intermediary nature. Financial institutions cannot easily recall their extended credits, leading to a structural inflexibility in their asset holdings. Due to these vulnerabilities, financial organizations face inherent fragility, requiring continuous monitoring of financial stability risks [18].

Given these considerations, antifragility is a critical organizational trait that enables entities to emerge stronger when exposed to stress, shocks, or adversity. This concept goes beyond structural robustness, as it places organizations in a more favorable position than before the disturbance. However, there is no universal metric for measuring antifragility in Iranian financial organizations. Considering the structure of Iran's economy and the significant impact of various disruptions, antifragility in financial organizations can be conceptualized as the difference between resilience and vulnerability.

Therefore, a confirmatory factor analysis (CFA) approach was adopted, as it is a quantitative method suitable for fitting antifragility dimensions in Iranian financial organizations. While qualitative models for assessing antifragility in these organizations have been proposed previously, this study aims to validate the extracted components quantitatively. In conclusion, the primary research question addressed in this study is: "How can the antifragility model be quantitatively fitted to Iranian financial organizations?"

2. Methodology

This study is a quantitative research and falls under the category of correlational and descriptive studies. The statistical population consists of managers and experts from financial institutions and organizations in northwestern Iran (Zanjan, Tabriz, Urmia, and Ardabil), including financial managers, deputy managers, and financial and credit experts who responded to the research questionnaire. The total number of participants was reported as 488. The sampling method was stratified random sampling, and based on Cochran's formula, a sample size of 208 participants was selected. The validity of the instrument was confirmed through consultation with academic advisors, and its reliability was verified with a Cronbach's alpha coefficient above 0.7. Data analysis in the quantitative section was performed using LISREL and SPSS software. Confirmatory factor analysis (CFA) was used to fit the model, and structural equation modeling (SEM) was employed to examine variable relationships and determine path coefficients.

3. Findings and Results

In previous studies, the model components were qualitatively extracted and are presented in Table 1.

Table 1. Components of the Conceptual Framework

Variables	Items	Source
Random and Environmental Variables	Flexibility Resilient Performance Agility and Adaptability Financial Crisis	Literature review: [7, 16, 19, 20] - Extracted from expert opinions
Financial Performance Variables	Cash Flow Management Institutional Financial Performance Inflation Volatility Central Bank Independence Cost Control	Literature review: [6, 17] - Extracted from expert opinions
Managerial Variables	Economic Growth Risk Management Capital Management Financial Policies Government Relations	Literature review: [14, 21] - Extracted from expert opinions
Organizational Variables	Resistance and Coping Adaptability Innovation and Creativity Integration Service Empowerment	Literature review: [14, 17, 22] - Extracted from expert opinions

To design the conceptual framework of the study and achieve the research objectives, the antifragility model of financial organizations in Iran was considered. Conceptual frameworks in management theory enhance understanding of a subject, concept, or field of study, providing structure for decision-making and action. This study identifies the components of the antifragility model for financial organizations in Iran, integrates findings from previous studies, and presents a comprehensive conceptual framework for analyzing antifragility in financial organizations. The qualitative analysis was followed by a quantitative approach to validate and examine relationships and effects among variables.

Before presenting the research findings, the demographic characteristics of the managers participating in the study are reported. Table 2 shows the demographic attributes of the respondents.

**Table 2.** Demographic Information of Respondents

Variable	Level	Frequency	Percentage
Gender	Male	178	85.6%
	Female	30	14.4%
	Total	208	100%
Age	Under 30	17	7.8%
	31 to 40	55	26.5%
	41 to 50	74	35.8%
	Above 50	62	29.9%
	Total	208	100%
Educational Qualification	Master's Degree	167	80%
	Doctorate	41	20%
	Total	208	100%
Work Experience	Less than 5 years	39	18.6%
	5 to 10 years	46	22%
	More than 10 years	123	59.4%
	Total	208	100%

In this study, a questionnaire was used to measure research variables. Consequently, confirmatory factor analysis (CFA) was employed to assess the relationships between latent variables and their observed indicators. CFA examines the relationship between survey items (questionnaire questions) and constructs. Thus, to ensure accurate data measurement, CFA was applied. The strength of the relationship between a factor (latent variable) and an

observed variable is indicated by the factor loading. Factor loadings range between 0 and 1. All observed factor loadings exceeded 0.4, indicating an acceptable correlation between latent variables (main constructs) and observed variables. After establishing the correlation between variables, a significance test was conducted. The significance of the relationships between variables was evaluated using the T-value statistic. Since significance was tested at a 5% error level, a T-value greater than the critical threshold of 1.96 indicates a significant relationship. The reliability of the measurement scales at a 5% confidence level was confirmed, as all T-values exceeded 1.96, demonstrating the significance of the observed correlations. Therefore, CFA was used to fit and assess the validity of the "Antifragility Model in Financial Organizations in Iran," as illustrated below.

Chi-Square=592.46, df=146, P-value=0.00014, RMSEA=0.078
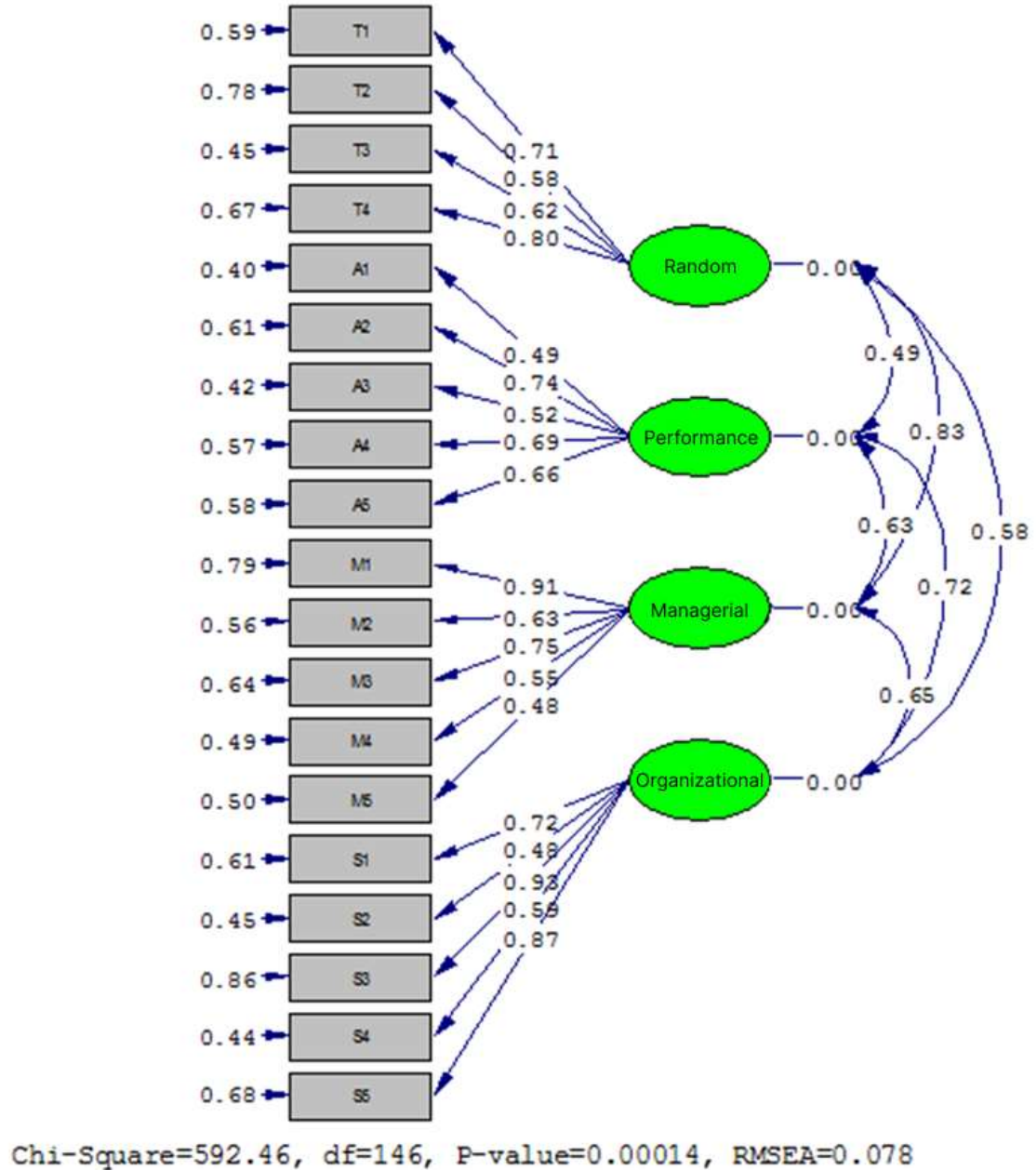
Figure 1. Factor Loadings of the Antifragility Model in Financial Organizations

The results in Figure 1 confirm that for random/environmental variables (4 components), financial performance variables (5 components), organizational variables (5 components), and managerial variables (5 components), the model was validated. Since all observed factor loadings exceeded the standard threshold of 0.4, the

model is interpretable. For instance, factor loading for T1 was 0.71 with an error of 0.59, while factor loading for A3 was 0.52 with an error of 0.42, both exceeding 0.4. Thus, none of the four main dimensions or their components were removed, confirming the model's validity.

To validate the significance of the coefficients and the extracted model, the T-value statistic was utilized.

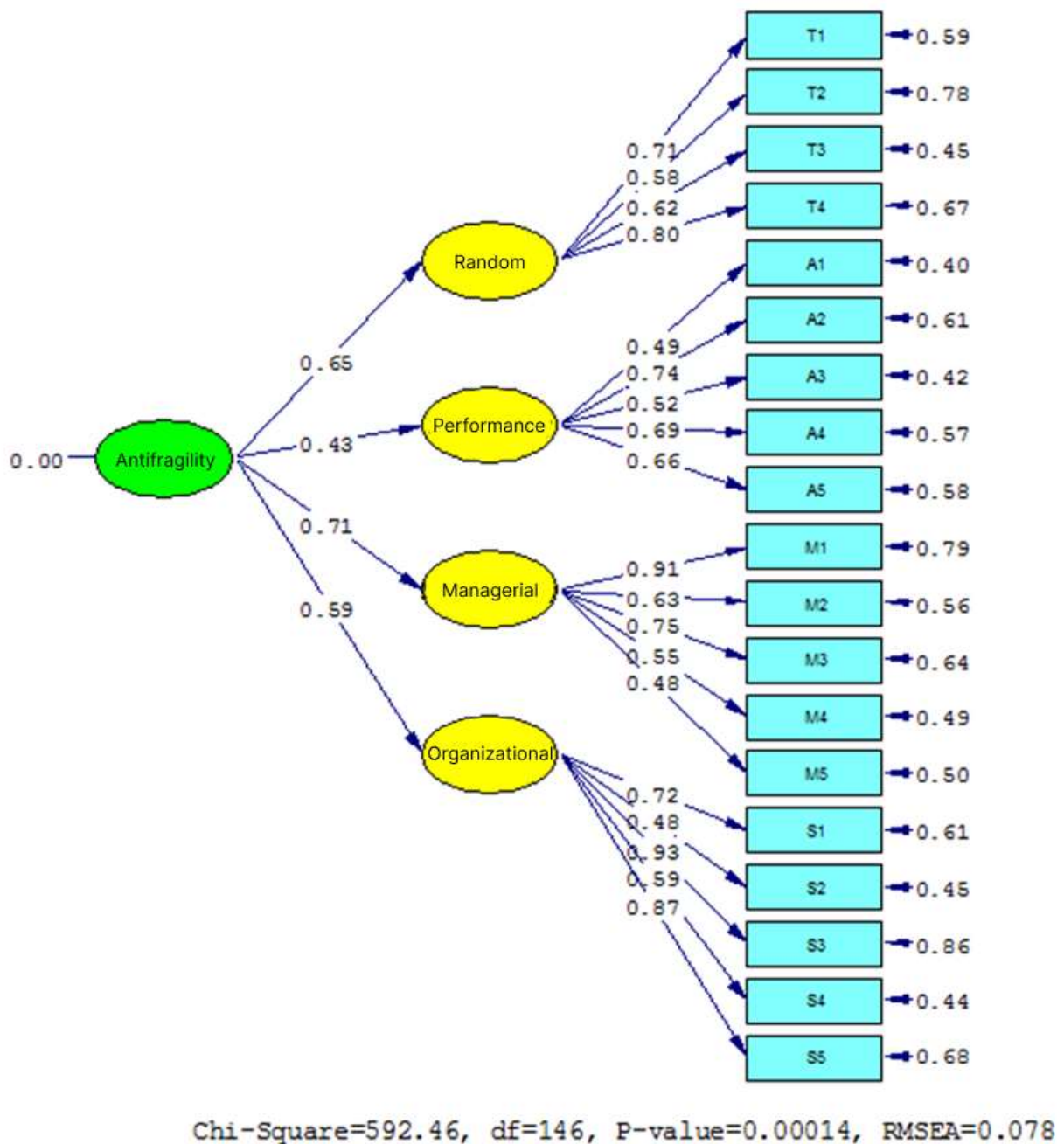Chi-Square=592.46, df=146, P-value=0.00014, RMSEA=0.078
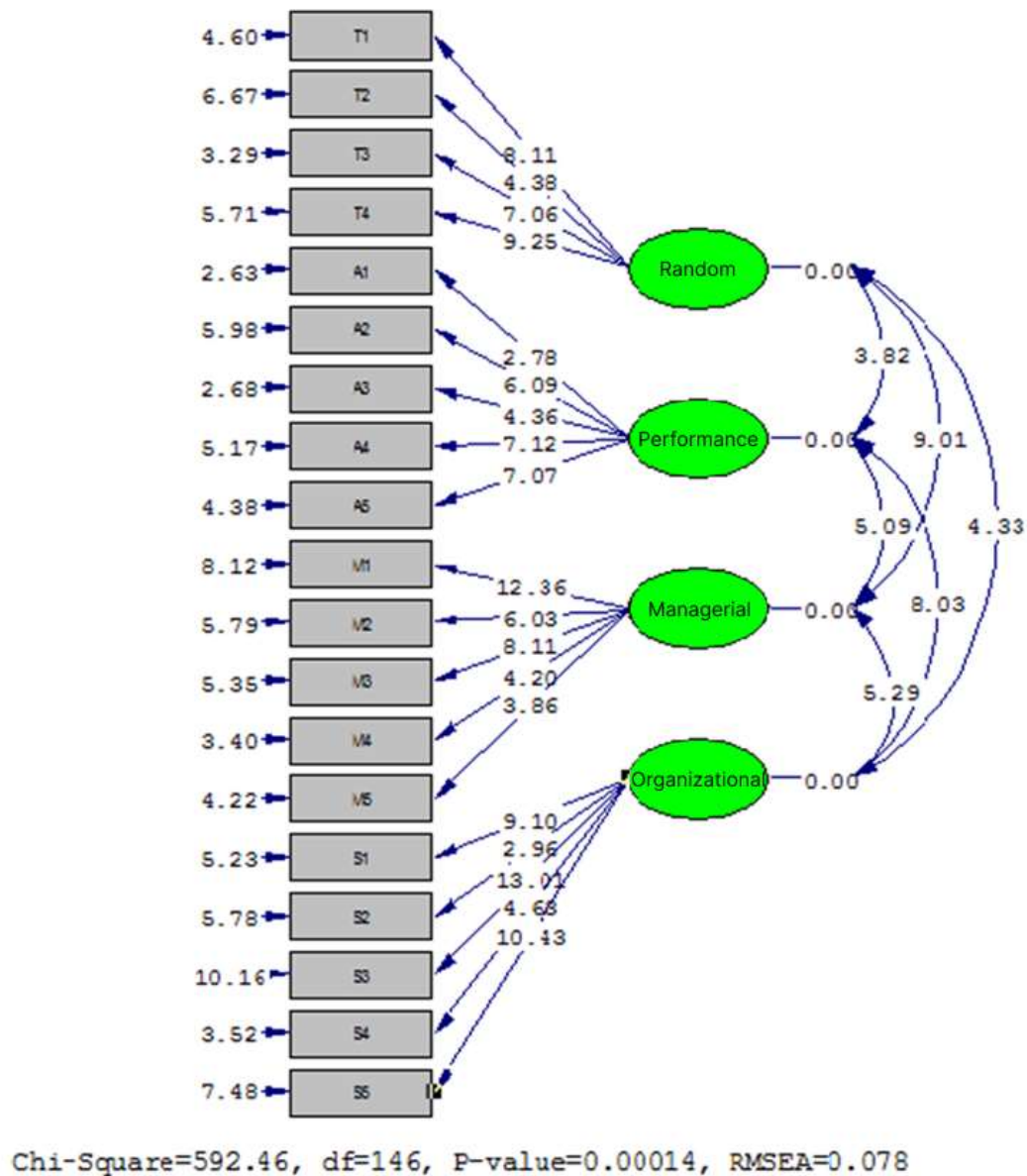
Figure 2. T-Value Significance Coefficients for the Antifragility Model in Financial Organizations

Figure 2 shows the research model evaluated based on the T-value statistic, confirming its acceptance. Since all coefficients exceeded 1.96, the model demonstrated sufficient fit. For example, the T-value significance for M3 was approximately 8.11, while for S3, it was 4.63, both above the 1.96 threshold. This indicates that the proposed model is well-fitted and all components are significant.

Structural equation modeling (SEM) is a set of statistical methods for modeling relationships between independent and dependent variables (structural model) and latent and observed variables (measurement model). It incorporates techniques such as factor analysis, regression, and path analysis. One of the most powerful and appropriate analytical methods in behavioral and social sciences research is multivariate analysis. Covariance structure analysis, causal modeling, or SEM is among the primary techniques for analyzing complex and multivariate data

structures. The results of the structural modeling are presented in the figures below.

Chi-Square=592.46, df=146, P-value=0.00014, RMSEA=0.078

Figure 3. Estimated Path Coefficients for the Antifragility Model in Financial Organizations

The structural equation modeling results in Figure 4, generated by LISREL software, indicate that random variables contributed 0.65, financial performance variables 0.43, managerial variables 0.71, and organizational variables 0.59 to explaining financial organizations' antifragility. These coefficients demonstrate positive and significant impacts, supporting further interpretation of the model's paths.
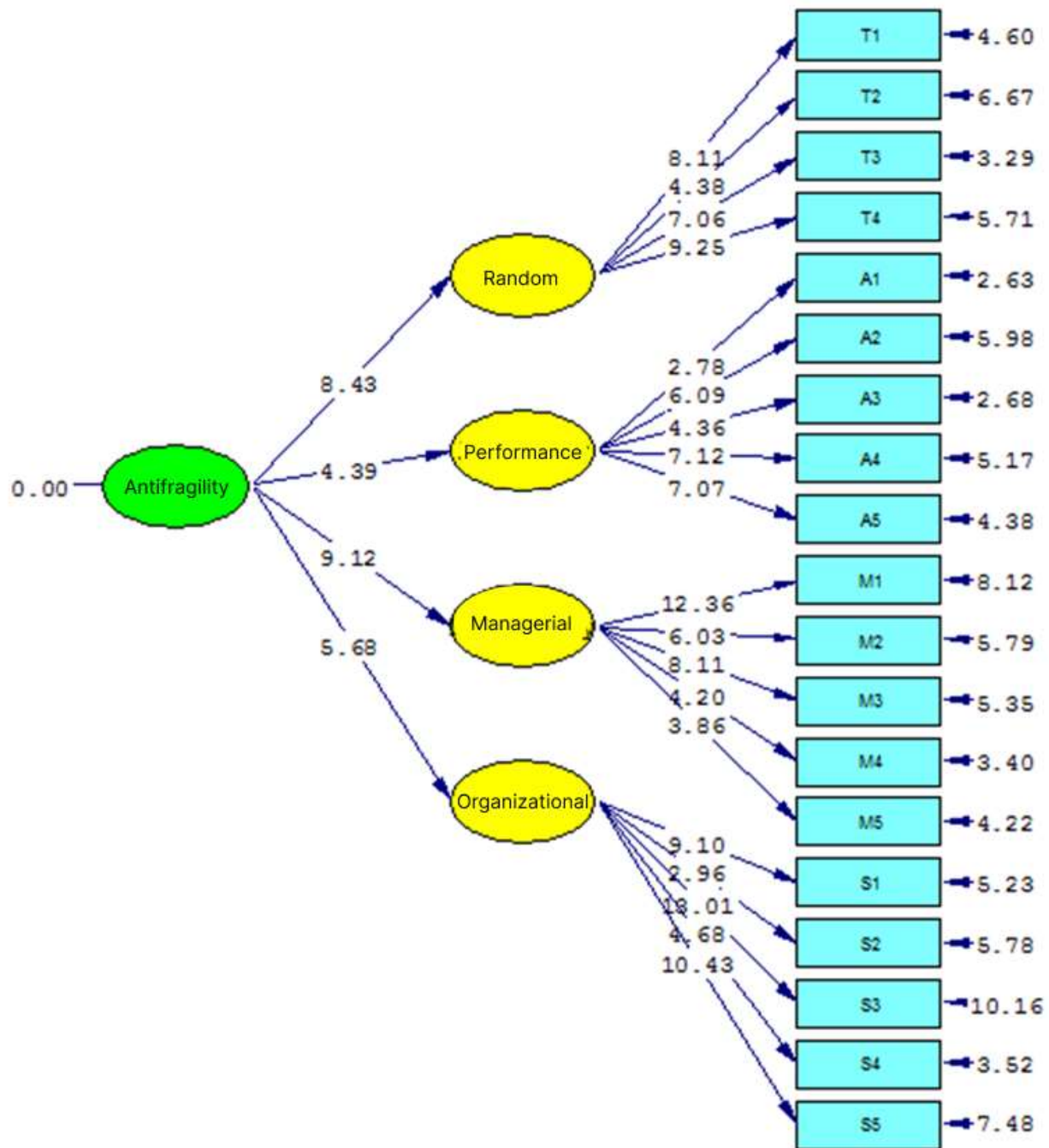
Chi-Square=592.46, df=146, P-value=0.00014, RMSEA=0.078

Figure 4. T-Value Significance Test for the Antifragility Model in Financial Organizations

Figure 4 presents the T-value significance test, which allows for determining whether each pathway in the model is statistically significant. If the T-value is greater than the critical absolute threshold of 1.96, the corresponding path is considered significant at a 95% confidence level.

The calculated T-values for the model confirm that all path coefficients exceed 1.96, indicating statistical significance. For instance, the T-value for environmental and random variables is 8.43, for financial performance variables is 4.39, for managerial variables is 9.12, and for organizational variables is 5.68. Since all these values are

greater than 1.96, the proposed model is considered well-fitted and statistically valid.

Table 3. Model Fit Indices for the Antifragility Model in Financial Organizations

Fit Index	Acceptable Range	Item Value	Result
χ^2/df	≤5	4.054	Accepted
IFI	>0.9	0.91	Accepted
RMSEA	<0.08	0.078	Accepted
CFI	>0.9	0.96	Accepted
RMR	<0.1	0.09	Accepted
AGFI	Closer to 1	0.69	Accepted

4. Discussion and Conclusion

This study aimed to quantitatively fit the "Antifragility Model in Financial Organizations" as part of descriptive-correlational research. The statistical population included financial managers and experts from financial organizations in northwestern Iran. The results of the confirmatory factor analysis indicated that all model components had factor loadings above 0.4, confirming a good model fit. Structural equation modeling also demonstrated positive and significant relationships among variables and dimensions. Therefore, antifragility has extensive applicability in various financial and economic issues. Consequently, this study examined financial fragility in financial organizations and proposed an antifragility model, with its components outlined as follows.

The component of "flexibility" was identified as a significant factor in designing the antifragility model for financial organizations. Flexibility is crucial in financial antifragility as it enables financial organizations to adapt during crises and bankruptcies through organizational recovery mechanisms. This aligns with the "resilient performance" component of this study. Furthermore, flexibility was confirmed as an influential political factor in economic resilience in prior studies [16, 20, 21, 23].

"Risk management" emerged as the most critical process among financial organizations, indicating strong interactions with other financial organization processes. Pandri and Azar (2017) emphasized that risk management plays a vital role in the antifragility of financial organizations, as risk management processes span across financial institutions to minimize risk. Thus, the findings of this study regarding the impact of risk management on the antifragility of financial organizations in Iran align with prior studies [3, 5, 7, 24, 25].

Another influential component in the antifragility model is "cash flow management," which focuses on the efficient allocation of financial resources across different sections of financial organizations. "Inflation volatility" significantly impacts financial organizations by influencing capital structures, disrupting managerial focus on maintaining and enhancing profitability, and affecting cash flow management, fixed asset inventory, liquidity growth, deposit rates, and lending rates. These findings align with prior studies [1, 6, 11, 21].

"Service empowerment" is another key component, emphasizing customer perception of provided services. The findings of this study are partially aligned with prior studies [2, 7].

"Financial crisis" or "economic crisis" refers to situations where organizations and individuals lose a substantial portion of the nominal value of their financial assets. A financial crisis occurs when numerous financial institutions suddenly lose a large part of their financial asset value. Financial organizations must proactively prepare for financial crises by implementing measures to mitigate the likelihood of shocks and controlling their impact. These findings align with prior studies [1, 11, 19, 26].

"Resilient performance" refers to an organization's ability to endure economic shocks, recover quickly, and return to pre-crisis performance levels, thereby contributing to the strengthening of financial institutions [6]. "Adaptability" entails adjusting to harsh conditions to achieve effective outcomes and practical objectives. Adaptability enables individuals and organizations to remain open-minded, prepared, and responsive to challenges and changes, ensuring optimal performance under prevailing circumstances. From the perspective of alignment with flexibility and agility, the components of "financial crisis" and "innovation" are consistent with the findings of this study. Additionally, these results align with prior studies [1, 15, 27].

Enhancing "innovation" fosters motivation and capacity for discovering new ideas, processes, and technologies that prevent and mitigate disruptions. This, in turn, reduces

vulnerability and strengthens preparedness against disturbances [16]. Consequently, the findings of this study are somewhat aligned with prior studies [5, 14-16, 20, 22, 23].

"Cost control" involves identifying expenses and selecting appropriate strategies to prevent excessive increases or reductions while eliminating unnecessary financial expenditures. Therefore, this component's influence on the antifragility model of Iran's financial organizations is partially consistent with the prior findings [6, 17].

"Economic growth" is defined as the increase in the production of goods and services within a country over a specific period (usually one year). The findings of this study align to some extent with the prior results [6, 18].

"Adaptability capability" refers to the ability to learn from past experiences with shocks, utilizing social capital to reorganize resources and personnel for optimal responses to changes. This component was also identified as a significant factor in economic resilience in the study by Mohammadi et al. (2017), indicating consistency with the present findings [17].

"Resistance and coping" are also key components; resistance enhances strength and endurance in the face of initial shocks while maintaining previous capabilities and functions. The findings of Mohammadi et al. (2017) demonstrated that adaptability and "resistance and coping" play crucial roles in economic resilience [17]. These dimensions are also significant for antifragility in financial organizations, reinforcing the prior findings [3, 17].

"Capital management" entails managing cash inflows and outflows while considering factors such as market depth, transparency, quality, and interconnections with other financial markets. The findings of this study are consistent with prior findings [18, 28].

"Central bank independence" is another critical component influencing the antifragility of financial institutions, encompassing national oil revenues, liquidity levels, banking structures, and institutional quality.

"Fiscal policies" refer to financial policies that include reducing expenditures, increasing transparency, and implementing stability-enhancing strategies. Fiscal policies involve government interventions in the economy using taxation and government spending to influence economic conditions. The primary goals of fiscal policy include promoting economic growth, controlling inflation, and ensuring equitable income distribution. Research in economic policy indicates that targeted inflation control

significantly extends economic expansion periods and accelerates recovery [29].

Government involvement in financial organizations, particularly state-owned financial institutions, is substantial and indispensable. The findings of this study align with the prior research [6, 18].

- Financial organization managers should optimize banking liquidity management, capital management, and resource mobilization while leveraging modern technologies for overdue loan management and customer credit assessment to strengthen financial institutions against crises.
- Financial managers should develop crisis response strategies that facilitate rapid financial recovery and restructuring following disruptions.
- Policymakers should reform Iran's financial system and institutional relationships between the government, monetary authorities, and financial organizations to reduce systemic fragility.
- Establishing comprehensive supervision and evaluation mechanisms will help mitigate financial risks and improve organizational resilience.
- Organizations should train their top managers in antifragility principles through workshops to strengthen financial organizations against market volatility.
- Future research should develop an evaluation tool for financial antifragility, incorporating key indicators identified in this study.
- Comparative studies should explore the four antifragility dimensions across different financial sectors, examining pre- and post-crisis conditions.

Authors' Contributions

Authors equally contributed to this article.

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Declaration of Interest

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Ethical Considerations

All procedures performed in this study were under the ethical standards.

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