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# Dynamic Analysis of the Effects of Profitability Ratio Shocks on Debt, Liquidity, Activity, and Market Ratios

1. Hamta. Bashirigoodarzi : Ph.D. student, Department of Accounting, Bo.C., Islamic Azad University, Borujerd, Iran
2. Alireza. Ghiyasvand *: Assistant Professor, Department of Accounting, Bo.c., Islamic Azad University, Borujerd, Iran
3. Farid. Sefaty : Assistant Professor, Department of Accounting, Bo.C., Islamic Azad University, Borujerd, Iran
4. Mahmud. Hematfar: Associate Professor, Department of Accounting, Bo.C., Islamic Azad University, Borujerd, Iran

*corresponding author's email: 4130700286@iau.ac.ir

**ABSTRACT**

This article examines the dynamic interactions of corporate financial behaviors using a nine-variable Panel Structural Vector Autoregression (PSVAR) framework. The purpose of the study is to investigate the mutual and dynamic effects of profitability ratios on debt ratios, liquidity ratios, activity ratios, and market ratios. A total of 219 companies were selected during the years 2001–2024. To analyze the causal behavior of the model variables and to impose the restrictions required for applying the PSVAR model, Directed Acyclic Graphs (DAG) were used, and the causal relationships were extracted using Tetrad4 software. The results indicate that a ROE shock strongly reinforces itself in the early stages and also increases ROA. Moreover, when a ROE shock occurs, market value grows more than book value, and companies facing a positive ROE shock reduce their need for debt financing for up to five periods. In the long run, companies can use debt to generate growth, yet in the short run, emphasis should be placed on improving profitability ratios.

**Keywords:** PSVAR models, Directed Acyclic Graphs (DAG), profitability ratios, debt ratios, market ratios, liquidity ratios, activity ratios

## Introduction

Understanding the dynamic behavior of corporate financial ratios has long been a central concern in empirical finance, particularly in environments where firms face evolving macroeconomic uncertainty, liquidity constraints, and market-driven valuation pressures. Profitability ratios such as return on equity (ROE) and return on assets (ROA) play a foundational role in measuring a firm's internal performance strength, yet their effects do not operate in isolation; rather, they propagate through leverage structures, liquidity positions, activity ratios, and market valuation channels in complex, time-dependent ways. The growing interconnectedness of financial markets and the integration of structural econometric techniques have encouraged researchers to examine corporate financial behavior through dynamic, system-based models that can capture reciprocal interaction patterns. In recent years, panel-based Structural Vector Autoregression (PSVAR) and Directed Acyclic Graphs (DAG) have emerged as powerful tools for disentangling contemporaneous causal relationships among financial variables, enabling researchers to infer how profitability shocks diffuse across a firm's financial architecture and affect decision-making.


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This modeling direction reflects broader methodological transitions in finance toward systems thinking, causality extraction, and structural inference, consistent with the need to move beyond static ratio analysis.

Corporate finance literature increasingly acknowledges that interactions among profitability, liquidity, leverage, activity efficiency, and market valuations cannot be defined by simple linear or unidirectional relationships. Studies that incorporate system dynamics frameworks have highlighted that corporate behavior often follows complex adaptive patterns shaped by internal and external feedback loops. For example, system dynamics research illustrates how firms adjust financial policies in response to internal shocks and market pressures, emphasizing the importance of endogenous feedback in corporate behavior (1). Such methodological approaches align with broader developments in economic modeling that favor dynamic simulation and structural estimation techniques capable of capturing non-linear, interdependent financial processes. Likewise, research on simultaneous financial behavior modeling emphasizes the need to account for uncertainty conditions, as firms listed on emerging markets often operate under fluctuating macroeconomic environments and rapidly changing market sentiments (2). These insights underscore the inadequacy of static financial analysis and highlight the necessity of dynamic frameworks such as PSVAR, which can capture reciprocal effects and identify the causal ordering of financial variables.

Profitability ratios are particularly influential in shaping broader financial behavior because they directly affect managerial expectations, investor sentiment, and external financing decisions. Working capital management and leverage adjustments, for instance, are known to interact with profitability measures in non-linear ways, as stronger profitability often reduces short-term reliance on debt financing while simultaneously improving long-term borrowing capacity. Empirical work on Iranian firms demonstrates that financial leverage and working capital management exhibit sensitive interactions with performance variables, indicating that profitability shocks can alter financial configurations across multiple horizons (3). Moreover, profitability ratios often operate as forward-looking indicators that influence expectations in capital markets. Investor sentiment—a factor with strong behavioral implications—has been shown to affect liquidity dynamics in the Tehran Stock Exchange, implying that shocks to profitability may propagate into market liquidity conditions through psychological and behavioral channels (4). Similar evidence suggests that investor sentiment interacts with liquidity to influence stock returns, supporting the idea that market reactions to profitability changes are contingent on prevailing sentiment conditions and liquidity imbalances (5). These relationships reinforce the relevance of profitability shocks in shaping market responses and liquidity structures, especially in emerging markets characterized by information asymmetry and speculative tendencies.

The link between market liquidity, macroeconomic shocks, and corporate profitability is also highlighted in broader financial economics. Research in the UK stock market demonstrates that illiquidity shocks can translate into significant macroeconomic effects, influencing the pricing and valuation dynamics of financial assets (6). These findings underline the possibility that profitability shocks may be absorbed differently depending on the liquidity environment in which firms operate. In developing markets, liquidity sensitivity is particularly pronounced, and investor sentiment amplifies fluctuations in stock valuations, as shown in emerging stock markets where sentiment strongly correlates with liquidity changes (7). Such behavioral influences interact with fundamental financial ratios, increasing the likelihood that profitability shocks will spill over to market valuation measures such as the market-to-book ratio.

Macroeconomic uncertainty further complicates the transmission of profitability shocks into other financial ratios. Studies on economic policy uncertainty in Iranian markets demonstrate that heightened uncertainty intensifies financial instability and reduces stock liquidity, thereby affecting firms' ability to manage debt, liquidity, and leverage ratios during profitability fluctuations (8). Research on technological shocks reveals the historical sensitivity of stock market volatility to structural innovations, suggesting that shocks to firm-level profitability occur simultaneously with broader economic disturbances (9). Similarly, cyclical shocks in oil markets—especially relevant to energy-dependent economies—have been found to influence fiscal positions and financial behavior at both macroeconomic and firm levels (10). Global spillovers from commodity markets further transmit into emerging economies' monetary and asset market conditions, creating vulnerabilities that may heighten the responsiveness of financial ratios to profitability changes (11). These global dynamics underline that profitability shocks within firms cannot be interpreted independently of the broader macro-financial landscape, especially in countries like Iran where corporate behavior is tightly intertwined with cyclical commodity markets, inflationary pressures, and capital-flow volatility.

Structural econometric modeling has proven indispensable for understanding such complex interactions. In particular, DAG-based identification has gained attention due to its ability to uncover contemporaneous causal directions in multivariate financial systems without relying solely on a priori economic theory. This approach has been effectively applied in various economic sectors, including the analysis of transmission mechanisms between real estate and other industrial sectors in China, illustrating the value of causality-based models in capturing real-world financial linkages (12). Directed acyclic graph modeling has also been deployed in agricultural economics to identify the causal effects of macroeconomic variables on agricultural price fluctuations in Iran, providing empirical support for DAG-SVAR methodologies in environments where theoretical causal structures are not well established (13). Likewise, SVAR and DAG have been utilized to examine the relationship between exports and agricultural sector growth in Iran, demonstrating the robustness of these models for identifying structural dynamics across different economic domains (14). In economic modeling more broadly, DAG methods are celebrated for their strengths in causal inference, especially when supported by robust computational tools and algorithmic search processes, as demonstrated by studies validating agent-based and structural models through advanced causal techniques (15). These methodological advancements justify the application of PSVAR-DAG modeling in financial analysis, where complex interactions necessitate rigorous causal identification.

Investors, managers, and policymakers rely on accurate modeling of financial ratio dynamics to make informed decisions about capital structure, liquidity management, and strategic planning. The interplay between profitability, liquidity, and leverage becomes especially significant under conditions of financial uncertainty. For example, research exploring the dynamic relationship among liquidity, returns, and profitability in the Tehran Stock Exchange confirms that market participants adjust their strategies in response to shifting profitability and liquidity conditions, often reacting more strongly to shocks in profitability variables than to other financial indicators (11). Moreover, global financial systems today are deeply integrated, meaning that shocks are not contained within national boundaries; studies show that oil-market uncertainty spills over into stock-market systemic risk, demonstrating how external volatility can shape firms' internal financial ratios and profitability dynamics (16). These interconnected conditions make it essential to examine firm-level financial responses within a comprehensive systemic framework.

Alongside structural modeling approaches, advances in statistical and computational methods continue to reshape the empirical landscape of corporate finance. Structural equation modeling and factor analysis have contributed to the refinement of financial measurement models by improving the reliability and validity of complex latent constructs, thereby enabling more robust empirical testing (17). Furthermore, the application of machine learning techniques in financial forecasting has marked a methodological shift toward hybrid models that incorporate econometric structure with predictive performance, highlighting the need for deeper understanding of the fundamental relationships underpinning financial ratios (9). These methodological innovations support a growing consensus that analyzing profitability shocks requires both structural insight and empirical rigor.

In contemporary financial research, PSVAR models have gained prominence because they integrate the strengths of panel data analysis with the structural interpretability of VAR systems. They allow researchers to exploit both cross-sectional and time-series variation while addressing heterogeneity across firms, making them particularly well suited for analyzing dynamic adjustment processes. When combined with DAG identification, PSVAR models can reveal instantaneous and lagged causal pathways that shape how profitability shocks diffuse across financial dimensions such as leverage, liquidity, activity efficiency, and market valuation. This integrated approach offers a realistic framework for understanding financial behavior in emerging markets, where firms face both internal performance pressures and external macroeconomic volatility.

Given the empirical gaps in the literature and the methodological strengths of PSVAR-DAG modeling, the present study situates itself at the intersection of corporate finance, dynamic econometrics, and causal analysis. While prior research has separately examined investor sentiment, liquidity conditions, leverage dynamics, and profitability behavior in Iranian and international contexts, few studies have systematically analyzed how shocks to profitability ratios propagate across debt ratios, liquidity metrics, activity measures, and market valuation indicators within a unified causal-structural framework. Moreover, understanding short-run versus long-run dynamics of profitability shocks is particularly important for emerging capital markets like Iran's, where financing constraints, market inefficiencies, and behavioral asymmetries may amplify or distort the transmission of financial shocks. By integrating PSVAR with DAG-based identification, this research aims to fill this gap by modeling the causal pathways through which profitability ratios influence the broader financial configuration of firms.

The aim of this study is to investigate the dynamic and causal impacts of profitability-ratio shocks on debt, liquidity, activity, and market ratios in firms listed on the Tehran Stock Exchange using a PSVAR–DAG framework.

## Methods and Materials

The present study employs a **nine-variable Panel Structural Vector Autoregression (PSVAR)** framework to analyze the dynamic and reciprocal effects of profitability-ratio shocks on debt, liquidity, activity, and market ratios in Iranian listed companies. According to the dataset described in the document, the analysis is performed on **219 companies** observed over the period **2001–2024**, and the data were extracted from audited financial statements and the CODAL system to construct the required panel variables . The methodological foundation of the PSVAR model requires imposing theoretical and data-driven restrictions on the **A** and **B** structural matrices, which connect the reduced-form disturbances to the underlying structural shocks. These restrictions are not arbitrary; they must emerge from a causal structure consistent with the observed data. To achieve this, the study makes use of **Directed Acyclic Graphs (DAG)** obtained from the residual correlation matrix of a preliminary PVAR model, allowing identification of contemporaneous causal relations among financial ratios using the **Tetrad4** software environment . The DAG methodology depends on the Fisher-Z test of zero conditional correlations, which evaluates whether removing an edge preserves conditional independence among variables, thus enabling a data-driven causal ordering .

Before estimating the PSVAR model, all variables must satisfy the **stationarity condition**, as non-stationary series would prevent the system from converging after shocks. The document states that all variables except the debt-to-equity ratio exhibited stationarity only after first-differencing, and that in their differenced form they became stationary at the 5% significance level according to Levin–Lin–Chu, Im–Pesaran–Shin, ADF-χ², and PP-χ² unit-root tests . The general requirement of stationarity in PSVAR can be expressed as ensuring that all eigenvalues of the companion matrix lie strictly inside the unit circle:

$$| \lambda_i | < 1 \text{for all } i,$$

where $\lambda_i$denotes each eigenvalue of the system's transition matrix. Satisfaction of this condition ensures that impulse responses decay over time rather than diverge.

Following confirmation of stationarity, the **PVAR model** is estimated to obtain residuals whose correlation matrix provides the foundational structure for DAG-based identification. The residual correlation matrix shown in the document includes the interaction patterns among variables such as DLCA, DLDROE, DLMB, DLROEA, LIR, LCR, LROA, and LROE, representing differenced liquidity, profitability, market, and activity ratios. This matrix is subsequently used to discover the causal ordering required to identify the PSVAR system . Once the DAG establishes the admissible causal directions, these constraints are imposed on structural matrices A and B in the following structural system:

$$A\mathbf{y}_t = B\mathbf{u}_t + \sum_{i=1}^{p} \quad C_i\mathbf{y}_{t-i},$$

where $\mathbf{y}_t$is the vector of nine financial ratios, $\mathbf{u}_t$is the vector of orthogonal structural shocks, and $C_i$are autoregressive coefficient matrices. The observed reduced-form disturbances $\mathbf{e}_t$relate to the structural shocks via:

$$\mathbf{e}_t = A^{-1}B\mathbf{u}_t,$$

and therefore, with $\Sigma_e = \text{Var}(\mathbf{e}_t)$, the following identity must hold:

$$A\Sigma_e A' = BB'.$$

The DAG structure provides exact zeros in A and B to satisfy this equation and identify each of the nine structural shocks.

In applying PSVAR, the study extracts the nine key financial ratios representing five major groups of financial performance measures (profitability, debt, liquidity, activity, and market ratios). Though the complete list is not enumerated in the retrieved text, variables explicitly present include **ROA, ROE, market-to-book ratio, liquidity ratio (LCR), interest coverage (LIR), activity ratio components**, and differenced forms of key profitability and market ratios . The PSVAR estimation follows the structural restrictions obtained from the DAG, allowing computation of **impulse response functions (IRFs)** that describe how each financial ratio reacts to an identified structural shock. For example, a positive shock to ROE significantly strengthens ROE in the initial periods, increases ROA, and raises market value relative to book value. Furthermore, firms experiencing a positive ROE shock reduce their need for debt financing for up to five periods, highlighting a short-run substitution effect between internal profitability and external debt financing, while still allowing for long-term debt-supported growth strategies .

The estimation process also includes a **Kao panel cointegration test**, confirming long-run equilibrium relationships among variables with a statistically significant test value of −20.28 ($p < 0.001$), thus validating the use of a structural dynamic panel model for analyzing long-run interactions among the financial ratios . This indicates that despite short-term fluctuations and differencing for stationarity, the financial ratios move together over time in a stable long-run relationship.

Finally, the PSVAR model is estimated using the constraints derived from the DAG and the cleaned, stationary panel dataset. The Tetrad4 and EViews 12 software environments are used for causal structure estimation and model execution, respectively. The final impulse response analyses derived from this estimation provide the empirical basis for interpreting how profitability shocks dynamically influence debt, liquidity, market, and activity ratios over both short-term adjustment horizons and long-term strategic periods.

## Findings and Results

The findings of the study are based on the estimation of a nine-variable PSVAR model using an unbalanced panel of 209 firms listed on the Tehran Stock Exchange over the period 2001–2024, with all variables transformed to logarithms. Pre-estimation diagnostics confirm that, except for the debt-to-equity ratio, all variables are stationary in levels, while the debt-to-equity ratio becomes stationary after first differencing. Levin–Lin–Chu, Im–Pesaran–Shin, ADF–$\chi^2$ and PP–$\chi^2$ panel unit-root tests all reject the presence of a unit root at the 5% level once the appropriate transformation is applied; for example, the ADF statistics for LnROA, LnROE, LnROEA, LnLEAVE, LnMB, LnIR, LnCR, LnCA and LnDROE are −14.69, −17.10, −5.01, −11.09, −6.80, −12.40, −10.44, −8.12 and −48.06 respectively, all with p-values below 0.05. The optimal lag length for the underlying PVAR is selected using the Schwarz–Bayesian and Hannan–Quinn criteria, both of which point to a one-period lag ($p = 1$) as the most parsimonious and efficient specification, with SC ≈ 6.91 and HQ ≈ 6.52 at lag 1 compared with substantially higher values at longer lags. Stability tests show that all inverse roots of the companion matrix lie strictly inside the unit circle, indicating that the dynamic system is stable over the sample period. In addition, the Kao cointegration test yields a t-statistic of −20.28 with $p = 0.000$, confirming the existence of a statistically significant long-run cointegrating relationship among the profitability, leverage, liquidity, activity and market ratios included in the PSVAR framework. The residual correlation matrix of the PVAR reveals meaningful contemporaneous associations—for instance, the correlation between LROE and LROA is 0.833, between LCR and LIR is 0.899, between DLCA and DLDROE is 0.370 and between DLLEAVE and LCR is −0.550—providing a statistically grounded basis for the DAG-based identification strategy used to recover structural shocks. Against this diagnostic background, the impulse–response functions trace the dynamic propagation of profitability shocks (ROE and ROA) to debt, liquidity, activity and market ratios over multiple periods.

The responses to a positive shock in return on equity (ROE) show that profitability shocks are powerful but non-permanent and that they propagate across other financial dimensions in an economically intuitive manner. The impulse–response function for ROE to its own structural shock rises sharply on impact and remains strongly positive during the first few periods, but the effect gradually decays and converges towards its baseline path after about the fifth period, indicating that firms cannot sustain abnormal profitability indefinitely. Competitive pressures, rising cost of capital and upward adjustment in operating and financing costs erode the initial gain, and the pattern of ROE responses is consistent with a cyclical profit behavior where temporary booms are followed by normalization. When ROE is shocked, return on assets (ROA) also exhibits a steep short-run increase: managers appear to intensify the efficient use of existing assets, boosting sales, productivity and investment returns in the first periods; however, as capital expenditures accumulate and the asset base expands more slowly than profit in the long run, the ROA response is gradually absorbed and tends to converge, reflecting the asset-structure dependence of ROA compared with the more purely profitability-oriented ROE. The market-to-book (MB) ratio responds positively but somewhat less aggressively than ROA in the short run, capturing the fact that the market reacts quickly to profitability news and embeds value creation for shareholders into prices; nonetheless, as initial excitement and speculative sentiment dissipate, and as dividends and capital increases mechanically expand the book value of equity, the MB response is dampened and the shock is fully absorbed over the long horizon. The behavior of leverage variables reveals a clear substitution between internal and external financing. The overall leverage ratio (LEAVE) falls in the early periods after a positive ROE shock, indicating that firms experiencing high equity returns are less inclined to incur additional debt and prefer to avoid short-term debt risk; only after around the fifth period does LEAVE begin to trend upward, consistent with firms later exploiting improved creditworthiness to issue debt and finance profitable projects. The debt-to-equity ratio (DROE) initially declines, as the equity side is revalued more rapidly than debt on the back of higher profitability, but subsequently rises relatively quickly in later periods when firms start to use more borrowing to support growth and expansion. For the equity-strength indicator (ROEA), the immediate effect of a ROE shock is a very small, even slightly negative, reaction because the shock first materializes in the income statement; only with a delay does it translate into higher retained earnings and equity on the balance sheet, leading to a slow, gradual increase in ROEA in the medium to long term. Liquidity and activity ratios adjust more modestly. The interest-coverage or interest-related ratio (IR) shows a slight short-run decline, reflecting short-term stress and rebalancing in the asset and cost structure, followed by an upward trend in the longer term as new investments start yielding returns and interest-servicing capacity improves. The current ratio (CR) exhibits a very small short-run increase and almost negligible long-run change, underscoring that a large part of the change in ROE is driven by accrual-based accounting items and does not immediately translate into higher current assets or cash; much of the profit is recorded as retained earnings rather than cash or other liquid assets. Finally, the activity ratio (CA), representing sales or asset turnover, tends to fall immediately after a positive ROE shock and then rise in subsequent periods: the initial phase reflects the fact that profitability improvements do not instantly trigger higher sales, while over time the firm’s stronger financial position enables asset growth, commissioning of new productive assets and ultimately higher capacity utilization and sales growth, so that in the long run the growth of sales can outpace the growth of assets.

Table 1 summarizes the direction and horizon of these ROE-driven responses across the different financial ratios, distinguishing between short-run (impact to approximately period 4–5) and long-run (beyond period 5) dynamics and explicitly indicating the number of periods over which the main effect is observed.

**Table 1. Effects of ROE Shocks on Financial Ratios**

| Shocked variable | Affected ratio | Short-run effect (periods 1–4/5) | Long-run effect (periods >5) | Horizon of main effect (periods) |
|---|---|---|---|---|
| ROE | ROE | Strong positive increase | Decline and convergence | ≈ 1–5 |
| ROE | ROA | Steep positive increase | Gradual absorption | ≈ 1–6 |
| ROE | MB | Positive, smaller than ROA | Full absorption | ≈ 1–5 |
| ROE | LEAVE | Initial decline | Rising trend | Decline ≈ 1–4; rise >5 |
| ROE | DROE | Initial decline | Rapid subsequent increase | ≈ 1–6 |
| ROE | ROEA | Very slight negative | Slow positive increase | Low but persistent |
| ROE | IR | Slight negative | Positive, improving | ≈ 1–7 |
| ROE | CR | Very small positive | Almost no change | Mostly short-run |
| ROE | CA | Initial decline | Subsequent increase | ≈ 1–6 |

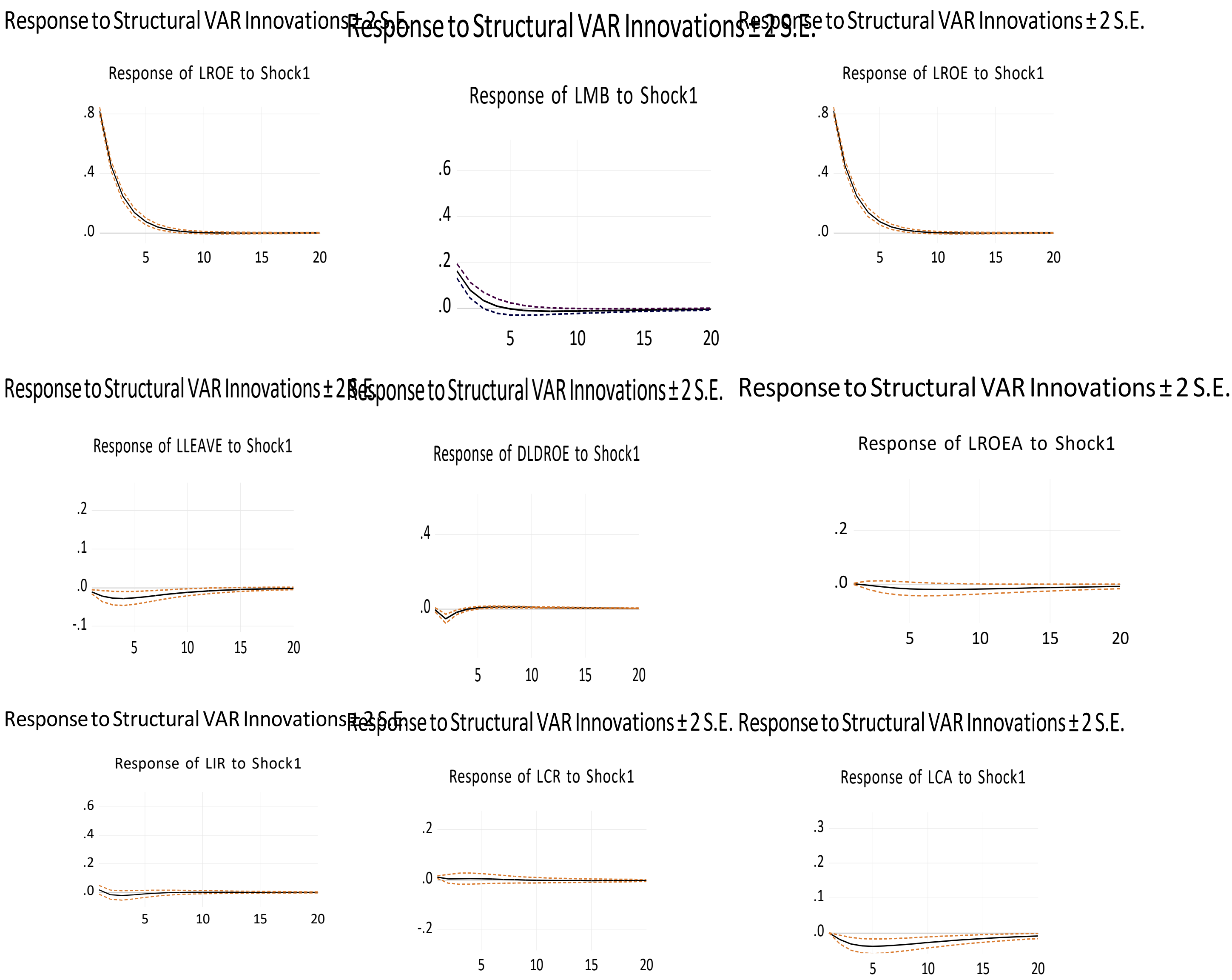


**Figure 1. Effects of ROE Shocks on Financial Ratios**

The results for shocks to return on assets (ROA) confirm the non-permanent nature of profitability shocks and highlight the differing roles of operational efficiency and capital structure in shaping firm dynamics. When ROA is subjected to a positive structural shock, its own response is positive and sizable in the short run, but the impact gradually decays over time, with the impulse–response function converging towards zero as competitive forces, cost adjustments and demand saturation limit the persistence of above-normal operating performance. A shock to ROA also raises ROE in the early periods, indicating that improvement in asset productivity quickly feeds through into higher returns for shareholders; however, over the longer horizon the ROE path turns downward relative to baseline, as firms respond to improved operating performance by increasing equity through capital injections, retained earnings and possibly dividend and capitalization policies, so the effect of ROA on ROE is weakened and diluted by an expanding equity base. In the stock market, MB initially rises in response to a ROA shock, suggesting that investors interpret the efficiency gain as a positive but largely short-term signal about firm performance; over time, as ROA-driven investments raise the book value of assets and equity, the MB ratio falls back and may even dip below its pre-shock level, consistent with higher book value moderating the market-to-book multiple. The leverage ratio LEAVE falls in the short run after a ROA shock, reflecting temporarily lower reliance on debt and cautious risk management by firms that prefer not to take on additional obligations while integrating operational improvements; in the long run, the leverage response becomes positive and convergent, as firms eventually exploit their improved profitability and stronger balance sheets to take on debt and finance profitable projects. The debt-to-equity ratio DROE shows only a very slight short-run increase followed by a slight decline. This pattern indicates that better asset utilization initially makes a small increase in borrowing appear acceptable because higher asset productivity supports a modest rise in leverage; however, as profits accumulate in the equity account, the equity base begins to grow more quickly and the DROE ratio declines. The response of ROEA to a ROA shock is negative in the short run and positive in the long run: the improvement in operating profitability first manifests itself in income, while the translation of these gains into equity (through retained earnings and other balance-sheet channels) occurs with a lag, so that only in later periods does ROEA begin to rise meaningfully as operating gains are capitalized into equity. For IR, the impulse–response functions show a small short-run increase followed by a small long-run decline; this reflects the fact that higher ROA initially raises cash flows and improves the firm's ability to service interest, but as additional liquidity is allocated to long-term projects or used to repay short-term debt, the ratio can normalise or slightly decrease. The current ratio CR shows a similarly modest pattern: a small short-run increase and a small long-run decline, highlighting the weak correlation between profitability and liquidity ratios and the mediating role of accrual-based accounting, whereby changes in profitability may be recorded in receivables or retained earnings rather than in cash and other current assets. Finally, the activity ratio CA tends to decline in the short run and rise in the long run after a ROA shock; initially, firms appear to focus on expanding their asset base in order to consolidate and stabilize higher returns, which temporarily reduces asset turnover, but as new assets become operational and begin generating revenue, sales growth accelerates and the activity ratio improves.

Table 2 provides a compact overview of how ROA shocks transmit to the different financial ratios, again distinguishing short-run and long-run directions and indicating the typical horizon over which the principal effects occur.

**Table 2. Effects of ROA Shocks on Financial Ratios**

| Shocked variable | Affected ratio | Short-run effect (periods 1–4/5) | Long-run effect (periods >5) | Horizon of main effect (periods) |
|---|---|---|---|---|
| ROA | ROA | Positive increase | Gradual absorption | ≈ 1–6 |
| ROA | ROE | Positive in early periods | Declining effect on ROE | ≈ 1–7 |
| ROA | MB | Short-run increase | Decline as book value grows | ≈ 1–6 |
| ROA | LEAVE | Decrease | Increase and convergence | Drop ≈ 1–4; rise >5 |
| ROA | DROE | Very slight increase | Slight decline | Low-magnitude, medium-run |
| ROA | ROEA | Short-run decline | Long-run upward trend | Persistent but lagged |
| ROA | IR | Small increase | Small decrease | Mostly moderate-term |
| ROA | CR | Small increase | Small decrease | Mostly short- to medium-term |
| ROA | CA | Decline | Subsequent increase | ≈ 1–6 |

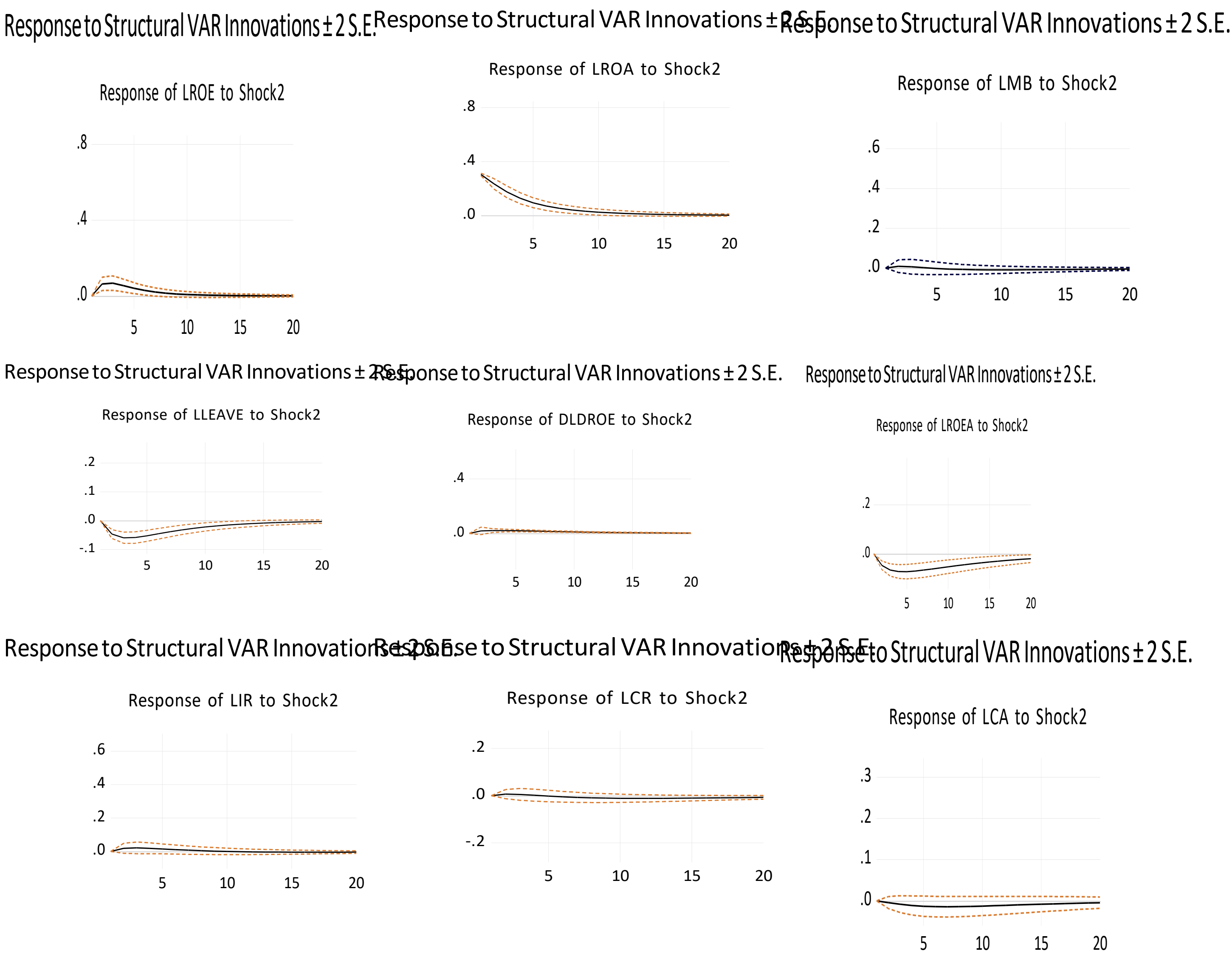


**Figure 2. Effects of ROA Shocks on Financial Ratios**

Overall, the findings demonstrate that profitability shocks in Iranian listed firms are economically meaningful yet transitory, with significant spillovers to leverage, liquidity, activity and market ratios. ROE shocks generate faster and stronger reactions in market valuation and capital-structure metrics, while ROA shocks primarily capture operational efficiency and transmit more slowly to equity and liquidity measures. In both cases, firms appear to reduce leverage in the immediate aftermath of positive profitability shocks and then gradually increase debt usage as they seek to exploit growth opportunities, pointing to a dynamic and state-dependent interaction between internal profitability and external financing over horizons spanning roughly one to six periods.

## Discussion and Conclusion

The purpose of this study was to investigate how profitability shocks—specifically shocks to ROE and ROA—propagate through a firm's financial structure and influence leverage, liquidity, activity, and market valuation indicators within a PSVAR–DAG analytical framework. The findings reveal that profitability shocks behave dynamically and asymmetrically across financial dimensions, generating substantial short-run reactions that gradually dissipate over time. These results are consistent with previous research suggesting that profitability is inherently cyclical, non-permanent, and strongly conditioned by internal firm behavior, investor sentiment, and broader macro-financial environments (1, 2). The dynamic nature of profitability shocks uncovered here reinforces the argument that static financial ratio analysis fails to capture interaction patterns essential to understanding corporate financial behavior.

In the present study, shocks to ROE produced the strongest and fastest transmission effects among all profitability shocks. These shocks elevated ROE sharply in the initial periods before decaying toward a long-run equilibrium, reflecting competitive pressures, increasing marginal costs, and the natural dissipation of abnormal returns. Such non-persistent profit dynamics align with the literature on financial behavior under uncertainty, which indicates that firms cannot sustain abnormally high profitability for extended durations and that profitability gains tend to normalize due to rising costs or market competition (3). The responsiveness of ROA to ROE shocks further demonstrates how profitability interacts with asset utilization efficiency. Short-run surges in ROA likely emerge from more effective use of existing assets, intensified managerial effort, and temporary operational efficiencies. Over the long run, however, capital investment increases the asset base more rapidly than profit, diluting ROA—a phenomenon consistent with findings in agricultural, real estate, and macroeconomic SVAR models demonstrating that structural shocks diminish over time and converge to equilibrium paths (12-14).

Shocks to ROE also affected market valuation through the MB ratio. The initial positive response of MB reflects market participants' quick reaction to profitability improvements, which is consistent with research showing that investor sentiment and liquidity conditions amplify valuation responses to firm-level fundamentals (4, 5). However, the long-run decline in MB following capital increases, dividend distributions, and rising book values parallels findings in emerging markets, where sentiment-driven market reactions weaken once accounting adjustments absorb profitability shocks (7). The attenuation of MB over time therefore reflects both behavioral and structural phenomena: while investors initially price in abnormal profitability, the market subsequently corrects expectations as the firm's book value rises.

Leverage dynamics reveal an important substitution mechanism between internal funds and external borrowing. The study showed that positive ROE shocks reduce leverage in the short run but increase it in the long run. This pattern is consistent with prior literature documenting that firms with temporarily strong profitability decrease reliance on debt due to reduced liquidity pressure and improved internal financing capacity (8). Later, as profitable firms accumulate financial strength and creditworthiness, they strategically increase debt usage to fund expansion—mirroring findings in macro-financial studies showing that financially strong periods encourage increased borrowing and investment after initial consolidation phases (10). Additionally, the rise in DROE in later periods after a profitability shock corresponds with the documented tendency of firms in emerging markets to use financial leverage more aggressively following performance improvements, especially when expectations of future growth are sustained (11).

The reaction of ROEA to profitability shocks also warrants interpretation in light of previous research. The delayed and gradual increase in ROEA following ROE and ROA shocks reflects the inherent lag between income-statement improvements and balance-sheet reinforcement, a relationship well documented in studies emphasizing the time delays embedded in financial decision-making and corporate accounting systems (1, 17). This dynamic highlights the importance of modeling balance-sheet variables within causal systems, as delayed adjustments can significantly alter long-run firm behavior.

The liquidity ratios (IR and CR) responded more modestly, as expected. The slight decline in IR after profitability shocks, followed by improvement in later periods, can be explained by short-term financial restructuring and delayed impacts of investment performance. This result aligns with evidence showing that liquidity conditions respond slowly to internal profitability signals and are strongly influenced by uncertainty, financial stress, and external shocks (6, 8). Similarly, CR exhibited only marginal changes, confirming the weak correlation between liquidity and profitability. The accrual basis of financial reporting implies that increases in profitability may not immediately translate into higher cash or current assets, as supported by studies that document the divergence between accounting profits and cash-flow-based liquidity measures (6). Together, these results underscore the necessity of distinguishing between accounting-driven and cash-driven components of financial behavior.

Activity ratios (CA) displayed a distinct cyclical pattern in response to profitability shocks. Initially, CA declined, reflecting asset expansion without immediate sales growth. Over time, sales increased as new assets became operational, producing long-run improvements in activity levels. This delayed reaction is consistent with the literature on production adjustment lags, capacity expansion, and the temporal distribution of investment benefits (10, 12). These findings are further reinforced by research in dynamic management modeling that identifies similar time-lag mechanisms in the interplay between capital investment, operational efficiency, and financial outcomes (2). Thus, the empirical results highlight the importance of recognizing lag structures in activity ratios when assessing the broader financial impact of profitability changes.

Turning to shocks originating from ROA, the study found that ROA-to-ROA impulse responses were positive in the short run but gradually diminished. This aligns with multi-sector SVAR research demonstrating that fundamental performance shocks in productive sectors generate temporary increases in efficiency that fade as competitive and cost pressures adjust margins (13, 14). The brief but strong effect of ROA on ROE confirms that improvements in asset efficiency translate quickly into shareholder returns, yet these effects decline in the long run due to capital structure adjustments, equity issuance, and dividend distribution policies. This pattern echoes findings from system dynamics research indicating that equity structure evolves more slowly than operational profitability, creating long-term dilution effects that offset short-run gains (1).

The MB ratio's reaction to ROA shocks mirrors its response to ROE shocks: short-run optimism followed by accounting-related corrections. This supports behavioral-market research demonstrating that investor sentiment reacts quickly to performance information before moderating as accounting numbers adjust and sentiment normalizes (5, 7). Activity ratios similarly displayed delayed positive responses, which can be linked to investment-driven capacity expansion documented in earlier studies on sectoral linkages and real asset dynamics (12). The combined effects of ROA shocks therefore reflect both operational and behavioral dimensions, reinforcing the utility of PSVAR-DAG modeling in capturing causality across multiple financial layers.

Collectively, these findings contribute to the literature by demonstrating how profitability shocks distribute across financial ratios in emerging markets, where liquidity constraints, investor sentiment, and macroeconomic uncertainty play significant roles. The short-run versus long-run asymmetries observed here align with broader evidence on shock transmission in financial systems, including cross-market spillover effects documented in oil, stock, and monetary markets (11, 16). These connections affirm that corporate financial behavior cannot be understood without considering external instability pressures. The results also underscore the importance of causal identification using DAG, consistent with arguments emphasizing that model-based inference must incorporate structural clarity to avoid misleading interpretations of contemporaneous relationships (15).

This study therefore reinforces the theoretical proposition that profitability shocks—while significant—are inherently temporary and transmitted asymmetrically across financial dimensions. The empirical evidence also supports the broader consensus that financial ratios interact through complex causal pathways shaped by behavioral, structural, and macroeconomic forces. These insights justify the use of PSVAR–DAG models for future research in corporate finance, especially in emerging markets where dynamic interactions among financial ratios are more sensitive to sentiment, uncertainty, and structural volatility.

This study, although methodologically rigorous, is limited by dependence on secondary financial data, which may contain reporting inconsistencies inherent in accounting practices. The PSVAR–DAG approach, while powerful, relies strongly on the accuracy of residual correlation structures for causal identification, meaning results may be sensitive to outliers or measurement errors. Additionally, the analysis is conducted within a single emerging market context, limiting generalizability to other environments with different financial regulations or institutional frameworks. Finally, the study does not model nonlinearities or regime shifts that may occur during periods of crisis or extreme volatility.

Future research should explore nonlinear PSVAR or Markov-switching frameworks to assess whether profitability shocks behave differently in high-uncertainty regimes. Longitudinal studies incorporating firm-level heterogeneity could improve understanding of how firm size, industry type, or governance indicators moderate the transmission of profitability shocks. Further research may also extend the DAG framework using machine learning–based causal discovery algorithms to increase robustness. Finally, comparative cross-country studies would help determine the extent to which financial dynamics observed in Iran resemble those of other emerging markets.

Practitioners should interpret profitability shocks with caution, recognizing their temporary nature and asymmetrical effects on leverage, liquidity, activity, and market valuation. Managers may strategically use periods of high profitability to strengthen internal financing capacity and reduce short-term reliance on debt before pursuing long-term investment opportunities. Investors should consider both short-run sentiment-driven market reactions and long-run accounting adjustments when evaluating firm performance. Policymakers can use these insights to design regulations that stabilize leverage and liquidity cycles across firms.


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## Authors' Contributions

All authors equally contributed to this study.

## Declaration of Interest

The authors of this article declared no conflict of interest.

## Ethical Considerations

All ethical principles were adheried in conducting and writing this article.

## Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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