# Capital Structure and Firm Performance: A Meta-Analysis of Empirical Evidence from the Tehran Stock Exchange

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**Abstract:** This study employs a meta-analytic approach to synthesize the findings of 71 Persian-language studies published in peer-reviewed scientific journals on the relationship between capital structure and firm performance in the Tehran Stock Exchange. These studies were published between 2007 and 2024. Correlation coefficients were combined using Fisher's z transformation and estimated under a random-effects model. The pooled effect size was 0.0096, with a 95% confidence interval ranging from −0.0564 to 0.0754, which included zero; therefore, no statistically significant overall linear relationship was observed. In contrast, heterogeneity across studies was extremely high ($I^2 = 92.96\%$, $\tau^2 = 0.0726$), indicating that an average effect close to zero does not imply the absence of an effect under all conditions. Data type did not produce a meaningful difference. During 2007–2015, a small positive effect was observed ($r = 0.114$), with marginal statistical significance, whereas during 2016–2024, the effect was close to zero and negative ($r = -0.041$). However, the difference between these two periods has not yet been examined using a between-group Q test. Egger's and Begg's tests did not indicate significant publication bias, although the statistical power of these tests is limited with 71 studies. The findings indicate that the relationship between capital structure and firm performance is context-dependent and suggest that meta-regression incorporating moderators such as industry, firm size, and performance measures is required to explain this relationship more comprehensively.

**Keywords:** capital structure, firm performance, meta-analysis, Tehran Stock Exchange, heterogeneity

## 1. Introduction

Capital structure is one of the central issues in corporate finance because financing decisions affect a firm's cost of capital, risk exposure, investment capacity, profitability, and ultimately its market value. The choice between debt and equity is not merely an accounting decision; rather, it reflects the interaction among managerial preferences, agency relationships, market conditions, firm characteristics, and the broader institutional environment. Accordingly, understanding whether and how capital structure influences firm performance remains a major concern for managers, investors, creditors, and policymakers. Contemporary research increasingly suggests that there is no universally optimal financing mix applicable to all firms, because the performance consequences of leverage vary according to organizational characteristics, governance mechanisms, financial constraints, macroeconomic conditions, and the nature of the market in which the firm operates [1-3].

From a theoretical perspective, the capital structure–performance relationship can be explained through several competing frameworks. Trade-off theory proposes that firms balance the tax advantages of debt against the

expected costs of financial distress, implying that leverage may improve performance up to an optimal level but become harmful beyond that point. Agency theory similarly suggests that debt may discipline managers by reducing free cash flow and limiting managerial opportunism, while excessive leverage may generate conflicts between shareholders and creditors and increase monitoring and distress costs. Pecking-order logic, in contrast, emphasizes financing preferences arising from information asymmetry, whereby firms favor internal funds, then debt, and finally external equity. These theoretical differences help explain why empirical evidence has remained inconsistent across countries, industries, firm sizes, and economic periods [1, 2, 4].

Empirical findings concerning the effect of capital structure on firm performance are notably heterogeneous. Some studies report that leverage enhances profitability and firm value by strengthening financial discipline, increasing the tax shield, or facilitating investment. Others find that high debt burdens reduce performance because of interest expenses, refinancing risks, liquidity pressures, and restricted managerial flexibility. A third stream of research reports weak, nonlinear, or statistically insignificant relationships, suggesting that capital structure may influence performance only under particular organizational or environmental conditions. Evidence from emerging markets illustrates this complexity, as firms often operate in financial systems characterized by limited access to long-term financing, stronger information asymmetries, institutional instability, and higher borrowing costs [4-6].

The context-specific nature of this relationship is also evident in research conducted across different sectors. In the banking sector, capital structure has a particularly important role because regulatory capital requirements, liquidity constraints, and risk-taking incentives directly interact with financial performance. Evidence indicates that the effects of capitalization can vary throughout economic cycles and that the benefits and costs of capital buffers depend partly on macroeconomic conditions [3]. Similarly, Bayesian evidence from banking research suggests that capital structure and liquidity jointly contribute to performance outcomes, reinforcing the view that financing decisions should not be analyzed in isolation from other balance-sheet characteristics [7]. In microfinance institutions, capital structure is likewise associated with sustainability and financial performance, but its effects depend on institutional features, funding sources, and operational models [6, 8].

Among manufacturing and industrial firms, the relationship is equally complex. Working capital management, leverage, profitability, and operating characteristics may interact in determining corporate outcomes, making it difficult to isolate a single uniform effect of debt financing [9]. Evidence from small enterprises further indicates that firms with different leverage profiles may display different financial performance patterns, although such differences are not necessarily stable across all indicators or organizational settings [10]. Studies of high-growth small and medium-sized enterprises also emphasize that business characteristics, financing structure, growth opportunities, and access to external funds jointly shape performance [11]. These findings imply that firm size, growth stage, industry conditions, and financing accessibility may serve as important sources of heterogeneity in the capital structure–performance nexus.

Corporate governance represents another important explanatory dimension. Financing policies are frequently shaped by ownership concentration, board monitoring, managerial incentives, and institutional oversight. Strong governance may improve the allocation and monitoring of financial resources and thereby alter the performance effects of debt. Empirical studies have shown that corporate governance can moderate the relationship between capital structure and firm performance, indicating that leverage may produce different consequences depending on the quality of governance structures [12, 13]. Similar evidence suggests that governance, capital structure, accounting conservatism, and financial performance are interconnected and should be considered within an integrated analytical framework rather than as separate corporate characteristics [14].

Ownership structure is also relevant because different owners may have different risk preferences, monitoring capacities, and financing incentives. Institutional ownership, for example, may strengthen managerial discipline and influence the manner in which debt is used, thereby modifying the relationship between capital structure and performance [15]. Family ownership may also affect financing and valuation through concentrated control, long-term orientation, and distinct agency relationships, while capital structure itself can operate as a moderating mechanism in the ownership–firm value relationship [16]. At the same time, ownership structure, governance arrangements, leverage, profitability, and dividend policy may jointly influence corporate financial decisions, suggesting that capital structure is embedded within a wider system of strategic financial choices [17].

Recent research has further extended the capital structure literature by focusing on managerial characteristics and behavioral finance. Traditional capital structure theories generally assume rational financial decision-making, yet managerial overconfidence and other behavioral biases may influence debt choices. Overconfident chief executive officers may underestimate financial risk, overestimate future cash flows, and consequently prefer higher debt levels or pursue financing policies that differ from those predicted by conventional models. The effects of such behavioral tendencies may also vary according to CEO characteristics and broader corporate policies [18]. Investor sentiment may likewise affect financing adjustment behavior, particularly when firms face financial constraints and cannot immediately move toward their target capital structure [19]. These findings reinforce the argument that capital structure is dynamic and responsive to both internal decision-maker characteristics and external market conditions.

The dynamic nature of financing decisions has become increasingly prominent in recent studies. Firms do not necessarily remain at their optimal leverage ratio; instead, they adjust toward a target capital structure at different speeds depending on transaction costs, profitability, financing opportunities, and market conditions. Environmental, social, and governance performance has been shown to affect the speed of capital structure adjustment, suggesting that sustainable corporate practices may influence access to financing and firms' ability to rebalance debt and equity [20]. Fintech engagement may also facilitate faster adjustment by expanding financial access, improving information processing, and reducing financing frictions for non-financial firms [21]. These developments demonstrate that capital structure should be viewed as a dynamic corporate policy rather than a static balance-sheet ratio.

The increasing importance of environmental, social, and governance considerations has also introduced new dimensions into research on capital structure and performance. ESG performance may affect firms' financing costs, investor perceptions, reputation, and access to capital markets. It may also influence the relationship between capital structure and earnings management, particularly when managers attempt to balance financial reporting objectives with financing needs [22]. Research further indicates that ESG performance may alter the relationship between capital structure and market competition, implying that financing choices are partly shaped by firms' strategic positioning and sustainability orientation [23]. These developments make the capital structure–performance relationship increasingly multidimensional and may partially account for differences across empirical studies conducted in different periods.

Another emerging strand of the literature emphasizes the interaction between capital structure management and broader managerial capabilities. Financial policies may be more effective when integrated with other organizational systems, including customer relationship management, operational capabilities, and strategic resource allocation. Recent evidence indicates that the joint management of customer relationships and capital structure can contribute to company performance, suggesting that financial structure may complement rather than substitute for other

managerial capabilities [24]. This perspective is particularly important because it challenges explanations that treat leverage as an independent determinant of performance and instead highlights the need to examine financing decisions within a broader configuration of organizational practices.

Methodological innovation has also changed the way capital structure is investigated. Traditional empirical studies have relied heavily on panel regression, correlation analysis, and accounting ratios, whereas newer research increasingly uses structural equation modeling, dynamic models, Bayesian methods, and artificial intelligence. For example, structural equation modeling has been applied to evaluate the determinants of capital structure and financial performance in petrochemical firms, illustrating how multiple direct and indirect relationships can be modeled simultaneously [25]. Dynamic approaches have also been used in Iranian research to model capital structure using accounting-based performance criteria and to capture feedback mechanisms over time [26]. Moreover, artificial intelligence techniques, including artificial neural networks, support vector machines, and logistic regression, have been employed to predict capital structure, demonstrating the growing importance of computational approaches in corporate finance research [27].

Despite these methodological advances, the interpretation of empirical findings remains difficult because studies differ substantially in their definitions and measurements of both capital structure and performance. Capital structure may be operationalized through total debt ratios, short-term leverage, long-term debt ratios, debt-to-equity measures, or target leverage deviations. Firm performance may likewise be measured through return on assets, return on equity, Tobin's Q, market value, earnings quality, operational efficiency, or other accounting and market indicators. In some studies, capital structure functions as an explanatory variable, while in others it operates as a mediator or moderator. For example, research has examined the moderating role of capital structure in the relationship between earnings quality, corporate governance, and financial, operational, and economic performance [28]. Other studies have investigated the theoretical adjustment of capital structure-performance models in connection with earnings management, illustrating the multidirectional nature of these constructs [29].

The interaction between liquidity, governance, and financing policy further complicates the empirical picture. Capital structure and liquidity policies may influence each other reciprocally, while governance mechanisms can shape how these financial decisions affect corporate performance [30]. Consequently, a positive effect of debt found in one study may reflect favorable liquidity conditions, effective governance, or strong profitability, whereas a negative effect in another study may arise under financial distress, high financing costs, or weak institutional environments. This suggests that divergent empirical results do not necessarily indicate methodological failure; rather, they may reflect genuine variation in underlying economic and organizational conditions.

These issues are particularly relevant in emerging capital markets such as Iran, where firms face economic volatility, financing constraints, inflationary pressures, sanctions-related uncertainty, and a banking-oriented financial system. Under such conditions, the cost and availability of debt can change substantially over time, potentially altering the relationship between leverage and performance. Iranian studies have examined the effects of capital structure using a variety of analytical approaches, sectors, and performance criteria, including dynamic modeling and structural equation techniques [25, 26]. Other domestic evidence has emphasized the interaction of capital structure with governance and earnings quality, further suggesting that financing effects in Iranian firms are conditional rather than uniform [28]. Therefore, drawing a definitive conclusion from individual studies is difficult because their results may depend heavily on research design, sample composition, measurement choice, and the economic period under investigation.

The diversity of findings in the international literature reinforces the same conclusion. Evidence from Saudi-listed companies shows that leverage can have distinct effects depending on the performance indicator and financing composition [5], while evidence from Pakistan indicates that firm-specific and macroeconomic characteristics jointly influence both capital structure and financial performance [4]. Studies of small firms and microfinance institutions similarly demonstrate that the relationship varies across organizational forms and financing environments [8, 10]. In Sub-Saharan Africa, governance has been identified as an important moderator of the capital structure–performance relationship [13], whereas evidence from other settings emphasizes dynamic adjustment, ESG performance, ownership characteristics, or behavioral factors [18, 20]. Thus, the empirical literature increasingly points toward heterogeneity rather than a single universal relationship.

This heterogeneity creates a strong rationale for using meta-analysis. Whereas individual studies estimate relationships within specific samples, periods, sectors, and methodological frameworks, meta-analysis enables systematic aggregation of effect sizes and provides a quantitative assessment of whether an overall relationship exists. More importantly, it can determine whether variability across studies exceeds what would be expected from sampling error alone. Such an approach is particularly valuable when a literature contains apparently contradictory findings, because an average near zero may conceal meaningful positive and negative effects under different conditions. Meta-analysis can therefore distinguish between genuine absence of association and substantial contextual heterogeneity, while subgroup analysis and meta-regression can identify potential moderators of observed differences.

The need for synthesis is especially important for the Tehran Stock Exchange because the domestic literature has accumulated over many years without producing a clear consensus regarding the direction or magnitude of the relationship between capital structure and firm performance. Some studies suggest beneficial consequences of leverage, others report detrimental effects, and still others identify weak or conditional associations. Differences in industry composition, observation periods, financial ratios, governance variables, earnings management, firm characteristics, and economic conditions further reduce the comparability of individual findings. In addition, the growing literature on dynamic capital adjustment, governance, ESG, behavioral factors, digital finance, and integrated management systems indicates that the capital structure–performance relationship may be more complex than conventional linear models imply [19, 21, 24].

Accordingly, a systematic quantitative synthesis of the available domestic evidence can provide a more reliable basis for evaluating the overall relationship and determining whether the diversity of reported findings reflects sampling variation or substantive differences among studies. Such evidence is useful not only for academic theory development but also for corporate financial managers, investors, and policymakers seeking to understand whether debt financing tends to improve or weaken firm outcomes under the specific institutional and economic conditions of the Iranian capital market.

The aim of this study is to synthesize the empirical evidence on the relationship between capital structure and firm performance among companies listed on the Tehran Stock Exchange through meta-analysis and to assess the extent to which the observed effects vary across studies and relevant study characteristics.

## 2. Methods and Materials

This study is a quantitative meta-analysis that synthesizes the findings of domestic empirical studies examining the relationship between capital structure and firm performance. Meta-analysis is appropriate for bodies of research characterized by dispersed or inconsistent findings and where estimating an overall effect size is required. The

purpose of the present study is to determine whether, taken as a whole, domestic empirical evidence supports a reliable relationship between leverage and firm performance and, where substantial heterogeneity exists, to identify factors that may account for such heterogeneity.

The study population comprised Persian-language studies that quantitatively examined the relationship between capital structure and firm performance. The search period covered studies conducted or published from 2001 through summer 2024. Studies were selected through purposive sampling based on predefined inclusion and exclusion criteria. Ultimately, 71 studies were included in the analysis.

Information from each study was recorded using a coding form. The form included bibliographic characteristics, publication year, industry, data type, study period, measures of capital structure and performance, and reported statistical indices. Because the included studies reported different statistical measures, all relevant statistics were converted into correlation coefficients to enable comparability.

Because the correlation coefficient is a bounded statistic and its sampling distribution is not symmetric around zero, the r values were transformed to an approximately normal scale using Fisher's z transformation for statistical pooling. Each study was weighted by the inverse of its variance. Finally, the weighted mean was back-transformed into a correlation coefficient, and its 95% confidence interval was calculated (Borenstein et al., 2009; Hedges & Olkin, 1985). The analyses were conducted using Comprehensive Meta-Analysis, Version 2.

Both fixed-effect and random-effects models were estimated. Given the diversity of study periods, industries, and measurement approaches, the random-effects model was used as the primary basis for interpretation because it assumes that the true effect size varies across studies. Heterogeneity was assessed using Cochran's Q statistic, the $I^2$ index (Higgins & Thompson, 2002), and the between-study variance, $\tau^2$.

To investigate sources of heterogeneity, studies were categorized according to data type (firm-year or observation-level data) and publication period. The publication period was divided into two intervals to examine whether the relationship differed across two phases characterized by changing national economic conditions.

Potential publication bias was assessed using a funnel plot and statistical tests. Egger's test (Egger et al., 1997) was used to assess funnel-plot asymmetry, whereas Begg's test (Begg & Mazumdar, 1994) examined the association between effect size and study precision. Given the relatively limited number of included studies, the results of these tests were interpreted cautiously.

## 3. Findings and Results

The included studies were published between 2007 and 2024, with the largest proportion published in recent years. Regarding publication language, 69 studies were in Persian and 2 were in English. In terms of data type, 61 studies used secondary financial-statement data, 7 used survey data, and 3 employed mixed or unspecified methods. Most studies focused on firms listed on the Tehran Stock Exchange. The independent variables included leverage, corporate governance, and audit committee quality, whereas firm performance was primarily measured using return on assets (ROA), return on equity (ROE), market value, and earnings management. This diversity of measurement approaches constitutes one source of heterogeneity.

Among the 71 studies included in the analysis, the pooled effect size under the fixed-effect model was 0.0084, with a standard error of 0.0088, whereas under the random-effects model, the pooled effect size was 0.0096, with a standard error of 0.0337 (Table 1). Under the random-effects model, the $Z$ statistic was 0.28, with $p = .776$. The 95% confidence interval for this estimate, ranging from −0.0564 to 0.0754, included zero. Therefore, at the aggregate level

and without consideration of subgroups, no statistically significant linear relationship was observed between capital structure and firms' financial performance.

**Table 1. Pooled Meta-Analytic Results**

| Model | *k* | Effect Size | SE | *Z* | *p* | Lower Limit | Upper Limit |
|---|---|---|---|---|---|---|---|
| Fixed effect | 71 | 0.0084 | 0.0088 | 0.95 | .342 | −0.0088 | 0.0256 |
| Random effects | 71 | 0.0096 | 0.0337 | 0.28 | .776 | −0.0564 | 0.0754 |

The larger standard error under the random-effects model is attributable to the inclusion of between-study variability in the estimation procedure.

Cochran's Q statistic was 994.07 with 70 degrees of freedom and $p < .001$, indicating rejection of the assumption of effect-size homogeneity. The $I^2$ statistic was 92.96%, indicating that more than 90% of the total variability in observed effect sizes was attributable to genuine between-study heterogeneity, while only a small proportion was associated with sampling error. The between-study variance ($\tau^2$) was 0.0726, and its corresponding standard deviation ($\tau$) was 0.2694. These findings indicate that the true effect varies substantially across populations and research conditions around an overall mean that is approximately zero. Consequently, the overall pooled estimate alone does not provide an adequate description of the available evidence.

Table 2 presents the subgroup-analysis results based on the random-effects model.

**Table 2. Subgroup Analysis by Data Type and Publication Period**

| Subgroup | *k* | *r* | *Z* | *p* | $I^2$ | $\tau^2$ |
|---|---|---|---|---|---|---|
| Firm-year | 40 | 0.0090 | 0.226 | .821 | 92.53% | 0.0586 |
| Observation | 31 | 0.0130 | 0.217 | .828 | 93.54% | 0.1024 |
| 2007–2015 | 24 | 0.1140 | 1.800 | .072 | 93.37% | 0.0859 |
| 2016–2024 | 47 | −0.0410 | −1.038 | .299 | 92.41% | 0.0652 |

Stratification by data type did not produce a meaningful difference, and the effect size in both subgroups was close to zero and statistically nonsignificant. Heterogeneity also remained high in both subgroups, indicating that data type alone is unlikely to represent the principal source of between-study variability.

Stratification by publication period revealed a somewhat more distinctive pattern. During 2007–2015, the effect size was positive and small ($r = 0.114$) and approached marginal statistical significance ($p = .072$). During 2016–2024, the effect size was negative ($r = −0.041$) and statistically nonsignificant. This change in direction may be regarded as a hypothesis for further investigation. Macroeconomic conditions, the high cost of debt, and changes in firms' financing structures in recent years may have contributed to this pattern; however, these potential explanations were not empirically tested in the present study. The substantial heterogeneity within each subgroup indicates that other factors, including industry, control variables, and profitability measures, may also play important roles.

Egger's regression test yielded an intercept of −0.4634 with a standard error of 1.4186. The corresponding *t* statistic was −0.3266 with 69 degrees of freedom and $p = .7449$. Therefore, no statistically significant funnel-plot asymmetry was detected. Begg's rank correlation test likewise yielded Kendall's $\tau = 0.0778$, $Z = 0.958$, and $p = .3380$, indicating no statistically significant association between effect size and study precision.

Nevertheless, with 71 studies, the statistical power of these tests to detect publication bias remains limited, particularly in the presence of extremely high heterogeneity. Therefore, the nonsignificant results of these tests should be interpreted as an indication that definitive evidence of publication bias was not detected, rather than as proof of its complete absence.

## 4. Discussion and Conclusion

The present meta-analysis synthesized the results of 71 studies examining the relationship between capital structure and firm performance in the Tehran Stock Exchange. The principal finding was that the pooled effect size under the random-effects model was very small and statistically nonsignificant ($r$ = 0.0096, $p$ = .776), with a 95% confidence interval ranging from −0.0564 to 0.0754. This result indicates that, when the available evidence is aggregated without considering differences in study characteristics, there is no reliable overall linear relationship between capital structure and firm performance. At the same time, the extremely high heterogeneity across studies ($I^2$ = 92.96%, $\tau^2$ = 0.0726) shows that the near-zero average effect should not be interpreted as evidence that capital structure is irrelevant to performance in all contexts. Rather, the findings imply that the direction and magnitude of the relationship differ substantially across firms, industries, measurement approaches, and economic conditions.

This overall pattern is broadly consistent with the argument that the capital structure–performance relationship is conditional rather than universal. International evidence has repeatedly shown that leverage may have positive, negative, or statistically insignificant effects depending on the characteristics of firms and their environments. Research in emerging markets has emphasized that the consequences of debt depend on the balance between its disciplinary and tax advantages and the costs associated with financial distress, refinancing pressure, and reduced managerial flexibility [1, 4]. Similarly, evidence from Saudi-listed firms indicates that the effect of capital structure varies according to the performance indicator and the composition of financing, reinforcing the view that leverage does not generate a single uniform outcome across firms [5]. The present meta-analytic finding therefore supports a contextual interpretation in which the effect of capital structure depends on institutional, organizational, and financial conditions.

The negligible pooled correlation may also reflect the coexistence of opposing mechanisms that offset each other at the aggregate level. According to agency-based reasoning, debt can reduce managerial discretion and impose financial discipline, potentially improving efficiency and performance. However, the same debt can increase agency conflicts between shareholders and creditors, restrict investment flexibility, and intensify financial distress when leverage becomes excessive. Previous research on agency costs and capital structure similarly suggests that the relationship with corporate performance is shaped by competing effects rather than by a simple monotonic process [2]. Consequently, a pooled effect close to zero may emerge when positive effects in some firms are counterbalanced by negative effects in others.

The findings are also compatible with evidence showing that capital structure often interacts with other financial policies. Sumani and Roziq showed that capital structure and liquidity policies may have reciprocal relationships and that corporate governance can influence how these policies affect performance [30]. Similarly, evidence from the banking sector indicates that capital structure cannot be considered independently of liquidity and balance-sheet management, because these factors jointly shape performance outcomes [7]. Such findings help explain why studies focusing only on leverage may produce heterogeneous or weak average effects. If the contribution of debt to performance depends on liquidity, cash flow capacity, or financing flexibility, then ignoring these contextual variables can attenuate the estimated average association.

The very high heterogeneity observed in the present study is one of its most important findings. More than 90% of the total variability in effect sizes was attributable to real differences among studies rather than sampling error. This level of heterogeneity strongly suggests that moderator variables play a substantial role in explaining the capital structure–performance relationship. Previous research supports this interpretation. For example, corporate

governance has repeatedly been identified as a moderator of the relationship between financing structure and performance. Mansour et al. reported that the quality of corporate governance alters the performance implications of capital structure [12], while Bawuah found that governance mechanisms significantly shape the capital structure–performance nexus in Sub-Saharan African firms [13]. These findings imply that similar leverage ratios may generate different outcomes depending on the quality of monitoring, board effectiveness, ownership structure, and managerial accountability.

The role of ownership characteristics provides another explanation for the heterogeneity detected in this meta-analysis. Institutional ownership may strengthen monitoring and influence financing decisions in ways that alter the relationship between leverage and performance [15]. Family ownership may also shape financing behavior through concentrated control, long-term orientation, and distinctive agency relationships, with capital structure acting as a moderating mechanism in the relationship between family ownership and firm value [16]. In addition, ownership structure, governance, profitability, dividend policy, and capital structure are often jointly determined rather than independently selected [17]. Therefore, the large variation among effect sizes in the Tehran Stock Exchange may partly reflect differences in ownership concentration and governance arrangements across firms and industries.

The subgroup analysis based on data type showed no meaningful difference between firm-year studies and studies based on observation-level data. In both groups, the pooled effect remained close to zero and statistically nonsignificant, while heterogeneity remained very high. This finding suggests that the main source of inconsistency is unlikely to be the basic form of the dataset alone. Instead, more substantive factors such as variable definitions, industry characteristics, financing constraints, governance quality, and macroeconomic conditions are likely to account for the variation. This interpretation is consistent with studies showing that firm-specific characteristics and macroeconomic variables jointly determine both capital structure and financial performance [4]. Likewise, studies of high-growth small and medium-sized enterprises emphasize that business characteristics, access to finance, and growth conditions influence the performance effects of financing decisions [11].

The subgroup analysis by publication period revealed a more informative pattern. Studies published during 2007–2015 produced a small positive pooled effect ($r = 0.114$), approaching marginal significance, whereas studies published during 2016–2024 showed a small negative and nonsignificant pooled effect ($r = -0.041$). Although the difference between these two periods has not yet been formally tested using a between-group Q statistic, the directional change may indicate that the economic and financing environment has altered the consequences of leverage over time. This result is consistent with the broader literature showing that capital structure effects are sensitive to changing macroeconomic and financial conditions. Berger et al. demonstrated that the relationship between bank capital structure and performance varies across economic cycles, emphasizing that the benefits and costs of capital are not constant over time [3]. Similarly, studies on capital structure adjustment suggest that firms change their financing behavior in response to financial constraints, market conditions, and changes in the cost of capital [19, 20].

In the Iranian context, this temporal pattern may reflect changes in borrowing costs, inflation, financial market conditions, macroeconomic instability, and firms' access to external financing. Although these explanations were not directly tested in the current meta-analysis, they are theoretically plausible because firms operating under high financing costs may experience weaker or even negative returns from additional debt. Domestic studies have also shown that the effect of capital structure is intertwined with accounting performance, governance, and earnings quality [26, 28]. The observed shift from a small positive effect in the earlier period to a near-zero negative effect in

the later period therefore supports the need to examine time-specific financial and institutional conditions rather than assuming a stable leverage–performance relationship across decades.

The results also align with evidence from sector-specific studies. In manufacturing firms, working capital management and capital structure jointly affect financial performance, suggesting that debt may produce different consequences depending on operational efficiency and liquidity management [9]. Among small enterprises, capital structure has been associated with differences in financial performance, although the strength and direction of these differences vary across indicators and firms [10]. In microfinance institutions, capital structure has likewise been linked to financial sustainability and performance, but institutional design and funding patterns influence the results [6, 8]. Such sectoral evidence provides additional support for the high heterogeneity observed in the current meta-analysis.

Another possible source of heterogeneity is the diversity of performance measures used in the primary studies. Financial performance was commonly assessed using ROA, ROE, market value, and earnings-related measures. These indicators capture different dimensions of performance and may respond differently to leverage. Accounting-based measures such as ROA and ROE are directly affected by interest expenses, asset structure, and equity financing, whereas market-based measures incorporate investor expectations and may respond to information about growth opportunities and risk. The literature has also linked capital structure to earnings management and earnings quality, which further complicates the interpretation of accounting performance [22, 29]. In Iran, the moderating role of capital structure in the relationship between earnings quality and financial, operational, and economic performance has also been highlighted [28]. Consequently, combining different performance measures may contribute substantially to between-study variation.

The growing importance of ESG and sustainability factors further supports the contextual interpretation of the present findings. ESG performance can influence access to finance, cost of capital, investor confidence, and the speed with which firms adjust toward target leverage levels [20]. It may also affect the relationship between capital structure and competitive conditions [23]. These findings imply that the same level of leverage may produce different performance outcomes depending on a firm's sustainability profile and stakeholder relationships. Since many earlier studies of the Tehran Stock Exchange did not incorporate ESG-related moderators, some of the unexplained heterogeneity may reflect omitted strategic and nonfinancial factors.

Managerial characteristics may also account for part of the unexplained variation. Alosaimi showed that CEO overconfidence can influence capital structure decisions and that the effect depends on managerial and corporate policy characteristics [18]. Such behavioral mechanisms are important because financing decisions are not always made under fully rational conditions. Differences in executive risk tolerance, confidence, experience, and strategic orientation may therefore affect both debt choices and subsequent performance. These behavioral differences are rarely captured in conventional archival studies and may contribute to heterogeneous findings.

Recent developments in financial technology and capital structure adjustment provide another perspective. Li et al. found that fintech engagement can influence the speed of capital structure adjustment by reducing financing frictions and improving access to financial resources [21]. Likewise, investor sentiment and financial constraints may affect firms' ability to move toward desired leverage targets [19]. These findings suggest that the capital structure–performance relationship may increasingly depend on the flexibility and responsiveness of financing systems. Firms that can rapidly adjust their leverage in response to changing conditions may experience different performance outcomes from firms constrained by limited access to capital.

The findings also resonate with research emphasizing the integration of capital structure management with broader organizational capabilities. Spitsina et al. showed that capital structure management can interact with customer relationship management in influencing company performance, suggesting that financial policy generates value partly through complementary managerial systems [24]. Similarly, Wibowo et al. demonstrated that governance, capital structure, and accounting conservatism jointly contribute to financial performance [14]. These studies support the interpretation that leverage alone is an incomplete predictor of performance and that its effects depend on how financing decisions are embedded in the firm's governance and managerial architecture.

The lack of statistically significant publication bias according to Egger's and Begg's tests is another noteworthy finding. This result suggests that there was no clear evidence that the included literature was systematically dominated by studies reporting large or statistically significant effects. However, this conclusion must be interpreted cautiously because publication-bias tests can have limited power under conditions of strong heterogeneity. The high $I^2$ observed in the present study reduces the certainty with which funnel-plot asymmetry tests can be interpreted. Therefore, the absence of significant bias tests should be regarded as reassuring but not definitive.

Overall, the present results suggest that the capital structure–performance relationship in the Tehran Stock Exchange cannot be adequately summarized by a single universal coefficient. The near-zero pooled effect indicates that leverage does not have a consistent positive or negative relationship with performance across all studies, while the very high heterogeneity demonstrates substantial contextual variation. This conclusion is consistent with a broad body of international evidence showing that capital structure interacts with governance, ownership, liquidity, ESG performance, managerial characteristics, market competition, firm size, and macroeconomic conditions [12, 13, 18, 20]. It is also consistent with methodological developments showing that capital structure is a dynamic and multidimensional phenomenon that may be better understood through structural, dynamic, Bayesian, and computational approaches [25-27]. Accordingly, the most important implication of the present meta-analysis is not that capital structure has no effect on performance, but that its effect is contingent on the financial, organizational, and institutional context in which firms operate.

One limitation of this study is the substantial heterogeneity among the included studies in terms of industries, operational definitions, performance indicators, capital structure measures, sample periods, and analytical methods. Although the random-effects model accommodates between-study variability, it does not identify the specific sources of that variability. Another limitation is that the subgroup analyses were restricted to data type and publication period, while potentially important moderators such as firm size, industry, ownership concentration, governance quality, inflation, financing constraints, and specific performance measures were not examined. In addition, the comparison between the two publication periods was descriptive because a formal between-group heterogeneity test was not conducted. Finally, despite the absence of statistically significant evidence of publication bias, the ability of Egger's and Begg's tests to detect such bias is reduced when heterogeneity is very high.

Future research should extend this meta-analysis by applying meta-regression models to identify the determinants of between-study heterogeneity. Particular attention should be given to industry, firm size, debt maturity structure, ownership concentration, corporate governance, financial constraints, inflation, exchange-rate conditions, and alternative measures of financial and market performance. Future studies should also distinguish between short-term and long-term leverage and examine nonlinear relationships to determine whether an optimal debt range exists. A formal test of differences between historical periods should be conducted, and additional temporal classifications may help identify structural changes in the Iranian financial environment. Researchers

should also investigate whether methodological choices, including estimation technique, sample size, model specification, and the use of accounting versus market-based performance measures, systematically influence reported effect sizes.

For practice, managers should avoid treating leverage as a universally beneficial or harmful financing strategy and should instead determine debt levels according to firm-specific operating conditions, cash-flow stability, borrowing costs, industry risk, and financing flexibility. Boards of directors and financial managers should integrate capital structure decisions with liquidity management, governance quality, investment policy, and risk management rather than setting leverage targets in isolation. Investors and creditors should likewise evaluate debt ratios together with profitability quality, debt maturity, cash-flow coverage, ownership structure, and economic conditions. Policymakers and capital-market regulators can support more efficient financing decisions by improving access to diversified financing instruments, enhancing disclosure quality, reducing financing frictions, and promoting conditions that allow firms to adjust their capital structures more flexibly in response to changing economic circumstances.

## Authors' Contributions

Authors equally contributed to this article.

## Ethical Considerations

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

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## Conflict of Interest

The authors report no conflict of interest.

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## References

[1] L. Chen, Y. Zhang, and X. Wang, "Capital structure and firm performance in emerging markets: A trade-off theory perspective," *Emerging Markets Finance and Trade,* vol. 59, no. 4, pp. 876-893, 2023, doi: 10.1080/1540496X.2022.2045897.

[2] E. Kontuš, "Agency Costs, Capital Structure and Corporate Performance," *Ekonomski Vjesnik,* vol. 34, no. 1, pp. 73-85, 2021, doi: 10.51680/ev.34.1.6.

[3] A. N. Berger, C. H. Bouwman, and T. Kick, "Bank capital structure and performance during economic cycles," *Journal of Corporate Finance,* vol. 84, p. 102490, 2024, doi: 10.1016/j.jcorpfin.2024.102490.

[4] A. Ullah, C. Pinglu, S. Ullah, M. Zaman, and S. H. Hashmi, "The Nexus Between Capital Structure, Firm-Specific Factors, Macroeconomic Factors and Financial Performance in the Textile Sector of Pakistan," *Heliyon,* vol. 6, no. 8, p. e04741, 2020, doi: 10.1016/j.heliyon.2020.e04741.

[5] H. Muhammad, B. Shah, and Z. u. Islam, "The impact of capital structure on firm performance: evidence from Saudi-listed firms," *International Journal of Disclosure and Governance,* vol. 20, no. 1, pp. 15-26, 2023, doi: 10.1057/s41310-022-00154-4.

[6] A. A. Somo, "Capital Structure and Financial Performance of Micro-Finance Institutions in Mombasa County, Kenya," *strategicjournals.com,* vol. 10, no. 4, 2023, doi: 10.61426/sjbcm.v10i4.2731.

[7] T. T. Kim, D. V. Nguyen, H. Vu Le, and K. D. Duong, "How capital structure and bank liquidity affect bank performance: Evidence from the Bayesian approach," *Cogent Economics & Finance,* vol. 11, no. 2, pp. 541-575, 2023, doi: 10.1080/23322039.2023.2260243.

[8] S. S. Parvin, B. Hossain, M. Mohiuddin, and Q. Cao, "Capital Structure, Financial Performance, and Sustainability of Microfinance Institutions in Bangladesh," *Sustainability,* vol. 12, p. 6222, 2020.

[9] M. A. Mufti, "Examining the Critical Role of Working Capital Management and Capital Structure on Financial Performance of Manufacturing Firms: An Empirical Assessment," *International Journal of Business and Economic Affairs,* vol. 8, no. 3, 2023, doi: 10.24088/ijbea-2023-830015.

[10] A. Stoiljković, S. Tomić, and O. Uzelac, "Does Capital Structure Affect the Differences in the Financial Performance of Small Enterprises?," *Strategic Management,* vol. 26, pp. 72-80, 2021.

[11] O. O. Adeoye, T. O. Olubiyi, W. O. Ajiteru, and L. O. Adaranijo, "Unveiling Capital Structure Determinants, Business Characteristics and High-Growth Performance of Small and Medium-Sized Enterprises: Evidence From Nigeria," *Journal of Interdisciplinary Socio-Economic and Community Study,* vol. 3, no. 2, pp. 86-98, 2023, doi: 10.21776/jiscos.03.2.05.

[12] M. Mansour, H. Al Amosh, A. Y. Alodat, S. F. A. Khatib, and M. W. A. Saleh, "The Relationship between Corporate Governance Quality and Firm Performance: The Moderating Role of Capital Structure," *Sustainability,* vol. 14, p. 10525, 2022.

[13] I. Bawuah, "The moderator role of corporate governance on capital structure-performance nexus: Evidence from Sub-Saharan Africa," *Cogent Business & Management,* vol. 11, no. 1, p. 2298030, 2024, doi: 10.1080/23311975.2023.2298030.

[14] I. T. Wibowo, K. H. Ts, and B. Mursito, "Determinants of Good Corporate Governance, Capital Structure and Accounting Conservatism in Influencing the Financial Performance of Ipo Companies," *Jurnal Ilmiah Global Education,* vol. 4, no. 4, pp. 2265-2276, 2023, doi: 10.55681/jige.v4i4.1257.

[15] A. M. Rahma, N. Nurcahyono, A. Sinarasri, and L. M. Ifada, "Moderating Effects of Institutional Ownership on the Relation Between Capital Structure and Firm Performance," presented at the International Conference on Business, Accounting, Banking, and Economics (ICBABE 2022), 2023/05, 2023. [Online]. Available: https://doi.org/10.2991/978-94-6463-154-8_26.

[16] M. B. A. Sumantri, I. Waspada, M. Sari, and T. Heryana, "The Moderation Effect of Capital Structure on the Influence of Family Ownership on Firm Value," *Implementasi Manajemen & Kewirausahaan,* vol. 6, no. 1, pp. 220-236, 2026, doi: 10.38156/imka.v6i1.741.

[17] C. W. Lee and M. T. Junaid, "Exploring the Impact of Ownership Structure, Corporate Governance, Capital Structure, and Profitability on Dividend Payout Ratio," (in English), *Journal of Risk & Control,* vol. 13, no. 1, pp. 1-19, 2026. [Online]. Available: https://ideas.repec.org/a/spt/rmkjrc/v13y2026i1f13_1_2.html.

[18] A. K. Alosaimi, "CEO Overconfidence and Capital Structure Decisions: Do CEO Characteristics and Corporate Policy Matter?," *Humanities and Social Sciences Communications,* vol. 13, p. 958, 2026, doi: 10.1057/s41599-026-07649-3.

[19] M. Jafaei Rahni, "Examining the relationship between investor sentiment and the speed of capital structure adjustment considering the role of financial constraints," (in Persian), *Quantitative Research in Intelligent Financial Systems,* vol. 1, no. 4, 2026.

[20] Y. B. Adeneye, I. Kammoun, and S. N. A. Ab Wahab, "Capital structure and speed of adjustment: The impact of environmental, social and governance (ESG) performance," *Sustainability Accounting, Management and Policy Journal,* vol. 14, no. 5, pp. 945-977, 2023, doi: 10.1108/SAMPJ-01-2022-0060.

[21] B. Li, J. Sun, L. Xu, and F. Guo, "Fintech engagement by non-financial firms and the speed of capital structure adjustment," *Pacific-Basin Finance Journal,* vol. 95, p. 103011, 2026, doi: 10.1016/j.pacfin.2025.103011.

[22] Y. Adeneye and I. Kammoun, "Real earnings management and capital structure: Does environmental, social and governance (ESG) performance matter?," *Cogent Business & Management,* vol. 9, no. 1, p. 2130134, 2022, doi: 10.1080/23311975.2022.2130134.

[23] I. Chasiotis, G. Georgakopoulos, A. Rezitis, and K. Toudas, "The role of ESG performance in the capital structure-market competition nexus: Some evidence from Japan," *Theoretical Economics Letters,* vol. 13, no. 3, pp. 525-534, 2023, doi: 10.4236/tel.2023.133033.

[24] L. Spitsina, D. B. Vukovic, and V. Spitsin, "The joint effect of customer relationship management and capital structure management on company's performance," *Journal of the Knowledge Economy,* vol. 17, pp. 8640-8673, 2026, doi: 10.1007/s13132-026-03140-1.

[25] A. Elahiari, S. Shahabi, and M. Omidi, "Examining the Determinants of Capital Structure on Financial Performance of Petrochemical Companies: A Structural Equation Modeling Approach (PLS-SEM)," (in English), *Studies in Economics, Financial Management and Accounting,* vol. 9, no. 4, pp. 88-104, 2023.

[26] H. Abdoli, R. Tehrani, A. Khadivar, and M. Shoar, "Capital Structure Modeling with Accounting Performance Evaluation Criteria Using a Dynamics Approach (Case Study: Iran Telecommunication Company)," *Journal of Governmental Accounting,* vol. 10, no. 18, pp. 33-58, 1403 2024. [Online]. Available: https://gaa.journals.pnu.ac.ir/article_9530.html?lang=fa.

[27] J. C. Tellez Gaytan *et al.*, "AI-Based Prediction of Capital Structure: Performance Comparison of ANN, SVM, and LR Models," (in English), *Computational Intelligence and Neuroscience,* vol. 2022, no. 1, p. 8334927, 2022, doi: 10.1155/2022/8334927.

[28] M. Akbarzadeh Zahmati, H. A. Sofi, and A. Dowlat Abadi, "Investigating the Impact of Corporate Governance on the Relationship Between Earnings Quality and Performance (Financial, Operational, Economic) with the Moderating Role of Capital Structure," *Accounting and Economics,* vol. 33, 2025. [Online]. Available: https://civilica.com/doc/1463484/.

[29] S. Brandak and S. Yousefpour, "Earnings management and theoretical adjustment of the capital structure performance model," presented at the First International Conference on Advances in Management Sciences, Economics and Accounting, 2021.

[30] S. Sumani and A. Roziq, "Reciprocal Capital Structure and Liquidity Policy: Implementation of Corporate Governance Toward Corporate Performance," *Journal of Asian Finance Economics and Business,* vol. 7, no. 9, pp. 85-93, 2020, doi: 10.13106/jafeb.2020.vol7.no9.085.