

Elucidating the Mechanism Through Which Debt Financing and the Book Value of Equity Affect Firm Value, with Emphasis on the Mediating Role of Capital Structure and Macroeconomic Factors among Companies Listed on the Tehran Stock Exchange



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Abstract: The purpose of the present study is to elucidate the mechanism through which debt financing and the book value of equity affect firm value, with emphasis on the mediating role of capital structure and macroeconomic factors among companies listed on the Tehran Stock Exchange. In terms of research design, this study is descriptive-correlational, and in terms of purpose, it is applied research. A library research method was used to collect the required information and data. To test the research hypotheses, correlations among the study variables were first examined, and where correlations existed among the variables, regression models were subsequently estimated. The statistical population consisted of all companies listed on the Tehran Stock Exchange. Using a systematic elimination (screening) method, 146 companies were selected over the five-year period corresponding to the 2021/2022–2025/2026 fiscal years. The final analyses were conducted using EViews software. Data analysis was performed using both descriptive and inferential statistics. The results indicate that board size, agency costs, the price-to-book ratio, and market capitalization have positive and significant effects on Tobin's Q, whereas debt has a negative and significant effect on Tobin's Q. Furthermore, an inverted U-shaped relationship was identified between market capitalization and firm performance when interacted with domestic credit provided by the financial sector.

Keywords: debt financing, book value of equity, firm value, capital structure, macroeconomic factors

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1. Introduction

Firm value is one of the most fundamental indicators used to evaluate corporate performance, managerial effectiveness, financial sustainability, and the capacity of a business entity to create wealth for its shareholders. In capital markets, firm value reflects not only the accounting position of a company but also investors' expectations regarding future profitability, risk, growth opportunities, and the quality of corporate decision-making. Consequently, identifying the determinants of firm value has remained a central issue in financial management, corporate finance, accounting, and investment analysis. In emerging capital markets, this issue acquires additional importance because firm-level financial decisions are made within economic environments that are often characterized by inflation, interest-rate volatility, credit constraints,

uncertainty, and institutional instability. Evidence from emerging economies suggests that corporate value is shaped by the interaction of internal financial policies, investment decisions, market competition, and information asymmetry, rather than by any single determinant in isolation [1]. Accordingly, examining the channels through which financing decisions and accounting-based indicators affect market valuation requires an integrated framework that incorporates both firm-specific and macroeconomic conditions.

Among the principal financial decisions of a firm, the choice between debt and equity financing occupies a central position because it directly influences the cost of capital, financial risk, ownership claims, managerial incentives, and ultimately firm value. Debt financing can provide firms with access to financial resources without diluting existing ownership, and under appropriate conditions it can contribute to capital discipline and efficient investment allocation. Nevertheless, excessive dependence on debt increases fixed financial obligations, exposure to interest-rate fluctuations, refinancing risk, and the probability of financial distress. Therefore, the relationship between leverage and firm value is theoretically ambiguous and may differ across firms and economic environments. Research on capital structure has increasingly emphasized that the financial consequences of leverage depend not only on firm-specific characteristics but also on wider macroeconomic conditions [2]. In emerging markets, debt financing may also be constrained by underdeveloped financial systems, limited access to external capital, and institutional conditions that affect the availability and pricing of credit. Firm-level interactions between financial development and productive capacity may therefore produce broader macroeconomic consequences [3].

The role of debt financing becomes particularly important when it is viewed as part of the broader capital structure mechanism. Capital structure represents the combination of debt and equity used to finance corporate assets and operations and is closely related to financial flexibility, bankruptcy risk, expected returns, and the market's perception of corporate quality. Different theoretical perspectives provide competing explanations for the effect of capital structure on firm value. Agency-based arguments suggest that debt can discipline managers by restricting discretionary free cash flow, while simultaneously creating conflicts between shareholders and creditors. Signaling arguments emphasize that financing choices may convey private information regarding expected firm performance, whereas pecking order reasoning proposes that firms prioritize internal funds, then debt, and finally external equity because of information asymmetry. The signaling function of debt can be particularly pronounced in markets where relationships between firms, government institutions, and financial intermediaries influence access to credit [4]. In addition, innovative debt-financing mechanisms have increasingly been examined as alternative channels for financial institutions and firms facing conventional financing constraints [5].

The costs associated with debt are equally important for understanding how financing decisions translate into firm value. The cost of debt affects the hurdle rate applied to investment projects, profitability after financing expenses, and the capacity of firms to generate returns in excess of the cost of capital. When borrowing costs rise, firms may reduce investment, experience lower cash flows, or adopt strategies designed to improve their perceived risk profile. Recent evidence has also connected debt-financing costs with stock returns and corporate strategic disclosure behavior, demonstrating that borrowing conditions can influence both financial-market outcomes and managerial responses [6]. Moreover, sustainable and labeled debt instruments, despite their potential reputational or strategic advantages, may involve implicit costs that are especially consequential in emerging markets [7]. These findings indicate that debt financing should not be evaluated solely in terms of the nominal quantity of borrowing; rather, its impact depends on financing costs, institutional context, information conditions, and the ability of the firm to transform borrowed resources into productive investment and sustainable market value.

Alongside financing through debt, the book value of equity constitutes a fundamental accounting measure for evaluating a firm's financial position and its relationship with market valuation. Book value represents the accounting value of shareholders' residual claims on corporate assets and provides investors with information about the accumulated financial resources attributable to owners. Its relevance is particularly evident in valuation ratios such as the price-to-book ratio, which links market expectations with accounting fundamentals. Empirical evidence indicates that book value and earnings remain important components of equity valuation, although their value relevance may be influenced by ownership structure, earnings management, and other reporting characteristics [8]. Similarly, financial statement comparability and reporting obfuscation can affect the value relevance of earnings and book value per share, thereby altering the informational usefulness of accounting numbers for investors [9]. Hence, the association between book value and firm value depends not only on the magnitude of accounting equity but also on the credibility, comparability, and informational quality of the financial reports through which such values are communicated.

The reliability of reported book values is therefore an essential consideration in studies of firm valuation. Accounting figures are not perfect representations of economic value and may be affected by measurement error, estimation choices, internal control quality, and the financial condition of firms. Research concerning errors in unaudited book values highlights the importance of control procedures and financial conditions in determining the reliability of accounting information [10]. From an investor's perspective, book value becomes more informative when accounting systems provide credible signals about the resources, obligations, and residual ownership claims of the firm. This reasoning also explains the importance of the price-to-book ratio in capital-market research. A higher price-to-book ratio can reflect stronger expectations regarding growth, profitability, intangible resources, or future cash-generating capacity. Empirical studies have shown that price-to-book value, together with other market and earnings indicators, can explain movements in share prices and investor valuation [11]. Accordingly, examining book value and market-based valuation jointly can offer a more comprehensive understanding of firm value.

The significance of accounting and financial resources is also closely linked to intangible capabilities and strategic positioning. Modern firms increasingly derive value not only from physical assets but also from intellectual capital, organizational knowledge, human capabilities, and strategic resources that may not be fully recognized on conventional balance sheets. Intellectual capital has been associated with sustainability reporting and business strategy, suggesting that the value-creation process extends beyond traditional accounting measures [12]. This implies that differences between book value and market value may partly reflect investors' expectations regarding intangible resources and future strategic performance. Therefore, book value should not be interpreted as a substitute for market value, but rather as an accounting foundation against which market expectations can be assessed. In this context, the interaction of accounting value, market capitalization, financing structure, governance mechanisms, and external economic conditions becomes central to explaining why some firms command higher market valuations than others despite apparently similar balance-sheet positions.

Firm value is also influenced by corporate governance mechanisms that determine how financial resources are controlled, monitored, and deployed. Board characteristics, managerial authority, ownership concentration, and agency costs may alter the effectiveness with which debt and equity financing are translated into value creation. A larger or more capable board may improve monitoring and access to expertise, whereas excessive managerial discretion or agency conflicts may reduce investment efficiency and weaken shareholder value. At the same time, ownership concentration can enhance monitoring but may also create conflicts between controlling and minority

shareholders. These governance relationships become particularly important in emerging capital markets in which formal institutions and investor protections may differ from those in developed economies. The interaction between corporate decision-making and financial outcomes therefore requires consideration of governance quality alongside capital structure. Moreover, information asymmetry between managers and investors can affect both financing decisions and market valuation, reinforcing the importance of corporate transparency and credible financial reporting [1]. Consequently, governance-related factors may condition both the direct and indirect effects of financing choices on Tobin's Q and other measures of firm value.

Beyond firm-level characteristics, macroeconomic conditions constitute a critical external environment within which corporate financing and valuation decisions are made. Economic growth, money supply, domestic credit, inflation, and interest rates influence borrowing costs, investment opportunities, liquidity, consumer demand, and investors' required rates of return. Empirical evidence from capital markets consistently shows that macroeconomic indicators are associated with market performance, although the magnitude and direction of these relationships vary across economies and periods [13]. Studies of the Nigerian capital market, for example, have demonstrated meaningful relationships between selected macroeconomic variables and capital-market outcomes [14], while subsequent research has continued to emphasize the sensitivity of capital-market performance to macroeconomic indicators [15, 16]. A review of the determinants of stock-exchange performance in Iraq likewise underscores the importance of macroeconomic conditions for explaining market dynamics in developing and emerging financial systems [17]. Taken together, these studies suggest that firm value cannot be adequately understood without accounting for the macroeconomic environment surrounding corporate financial decisions.

The effects of macroeconomic variables may operate both directly and indirectly. Economic growth can strengthen corporate revenues and investment opportunities, while recessionary conditions can increase default risk and weaken expected cash flows. Monetary expansion may enhance liquidity and access to credit, but excessive money supply growth can contribute to inflationary pressures and financial instability. Interest rates directly affect the cost of debt and indirectly influence asset valuation by changing discount rates and portfolio allocation. Domestic credit provided by the financial sector can support investment by easing financing constraints, although excessive or inefficient credit expansion may also contribute to financial vulnerabilities. The importance of such relationships has encouraged the use of panel-data methods for analyzing how macroeconomic conditions shape outcomes across multiple observational units and over time [18]. In addition, macroeconomic risk can affect asset allocation and risk valuation, with risk aversion and value-at-risk dynamics becoming particularly relevant in environments characterized by substantial economic uncertainty [19]. These conditions can materially alter the effect of leverage on corporate performance.

The Iranian capital market provides an especially relevant setting for examining these interactions. Companies listed on the Tehran Stock Exchange operate in an environment characterized by significant macroeconomic fluctuations, changing financial conditions, inflationary pressures, and institutional characteristics that can influence both corporate reporting and financing behavior. Evidence from Iran indicates that financial distress at the firm level may contain information relevant to the prediction of broader macroeconomic measures, suggesting a two-way relationship between corporate financial conditions and the wider economy [20]. Furthermore, macroeconomic instability and governance conditions have been linked to earnings-management behavior in the Iranian capital market, underscoring the importance of external economic circumstances and institutional quality for corporate financial reporting [21]. Related evidence similarly indicates that macroeconomic instability and good-governance indicators can affect managerial financial behavior in Iranian listed firms [22]. These findings

imply that the valuation consequences of debt, equity, and accounting information in Iran may vary systematically according to macroeconomic conditions.

An integrated analytical framework is therefore necessary to explain how debt financing and the book value of equity influence firm value when capital structure and macroeconomic variables operate simultaneously. Examining direct relationships alone may provide an incomplete picture because the impact of debt can change with economic growth, credit conditions, monetary policy, and interest rates. Similarly, the market relevance of book value can vary with financial reporting quality, agency conditions, growth opportunities, and investor expectations. The empirical literature has frequently analyzed these dimensions separately: some studies focus on capital structure and firm-specific determinants of financial performance [2], others investigate macroeconomic determinants of capital-market performance [13, 15, 16], and another stream examines the value relevance of accounting information [8, 9]. However, relatively limited attention has been directed toward a unified mechanism in which debt financing, book value, capital structure, governance-related variables, and macroeconomic conditions are assessed jointly in explaining market-based firm value, particularly in the Tehran Stock Exchange.

Addressing this gap is important from both theoretical and practical perspectives. Theoretically, an integrated model can contribute to a more refined understanding of agency, signaling, stewardship, concentrated ownership, and pecking order explanations by examining whether their predicted relationships remain stable after macroeconomic interactions are introduced. Practically, identifying how leverage, book value, market capitalization, governance mechanisms, and macroeconomic indicators jointly affect Tobin's Q can provide useful information for corporate managers, investors, creditors, regulators, and policymakers. Managers may benefit from understanding how financing choices affect valuation under different macroeconomic conditions, while investors may improve the interpretation of accounting and market indicators when assessing listed firms. Regulators and policymakers can also benefit from evidence concerning whether monetary conditions, credit availability, and interest rates amplify or moderate firm-level financial risks. This broader perspective is particularly relevant for emerging markets, where financing structures, institutional arrangements, and macroeconomic volatility can interact more strongly than in mature capital markets [3, 7].

Accordingly, the aim of the present study is to elucidate the mechanism through which debt financing and the book value of equity affect firm value, with emphasis on the mediating role of capital structure and macroeconomic factors among companies listed on the Tehran Stock Exchange.

2. Methodology

In terms of research design, the present study is descriptive-correlational, while in terms of purpose, it is applied research. A library research method was used to collect the required information and data. To test the research hypotheses, correlations among the research variables were initially examined, and where correlations were identified, the corresponding regression models were estimated. The statistical population consisted of all companies listed on the Tehran Stock Exchange, from which the sample was selected using a systematic elimination (screening) procedure. The criteria applied for sample selection were as follows; companies that did not meet any of the following criteria were excluded from the research sample:

1. Companies whose financial statements have a fiscal year-end corresponding approximately to March 20.
2. Companies that are not classified as investment companies or financial intermediaries.
3. Companies that did not change their fiscal year or become delisted during the period under investigation.
4. Companies for which the required financial information was available.

5. Companies with at least five years of activity on the stock exchange.

Based on the above criteria and using the systematic elimination (screening) method, 146 companies were selected over the five-year period corresponding to the 2021/2022–2025/2026 fiscal years, as presented in the following table.

Table 1. Screening and Elimination Procedure for Research Sample Selection

No.	Company Exclusion Criterion	Number
—	Total number of companies listed on the Tehran Stock Exchange	672
1	Companies whose financial statements did not have the required fiscal year-end	145
2	Companies classified as investment companies or financial intermediaries	83
3	Companies that changed their fiscal year or were delisted from the stock exchange	54
4	Companies for which the required financial information was unavailable	39
5	Companies with fewer than five years of activity on the stock exchange	205
—	Final sample size	146

After defining the research problem and formulating the hypotheses, the next stage of scientific research is data collection. It is through the examination and analysis of the collected information that research hypotheses are rejected or supported and, consequently, research questions are answered. Therefore, failure to exercise sufficient care in the data-collection process may affect the research findings, divert them from their actual course, and ultimately produce erroneous findings that nevertheless appear to be supported by scientific research and may subsequently be used as a basis for future studies, decision-making, and forecasting. This demonstrates the importance of data collection for ensuring the confirmability and reliability of research findings. In the present study, information and data were collected using the library research method. Accordingly, the theoretical foundations and research background were primarily obtained from reputable articles published in specialized Persian- and English-language journals as well as published books in the field. The data required for the empirical analyses were extracted from financial statements available through Rahavard Novin software. The final analyses were conducted using EViews software. Data analysis was performed using both descriptive and inferential statistics. Descriptive statistics included measures of central tendency, such as the mean and median, as well as measures of dispersion and distributional characteristics, including the standard deviation, skewness, and kurtosis, to describe the variables and their data distributions. Inferential statistics included the Jarque–Bera normality test, the Durbin–Watson test for autocorrelation, tests of homogeneity of variance, and statistical tests of the research hypotheses.

3. Findings and Results

The descriptive statistics for the research variables present the descriptive parameters for each variable separately. These parameters primarily include measures of central tendency, such as the maximum, minimum, mean, and median, as well as measures of dispersion and distributional characteristics, including the standard deviation, skewness, and kurtosis. The dataset contains 690 observations for each variable, obtained from the financial statements of 146 companies over the five-year study period.

Table 2. Measures of Central Tendency and Dispersion for the Research Variables

Variable	Mean	Median	Maximum	Minimum	Standard Deviation	Skewness	Kurtosis
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TQ	2.611	1.938	6.861	-3.378	2.261	4.613	36.512
CDEBT	0.017	0.009	1.704	-0.790	0.125	4.812	54.436
AGCOST	-0.042	-0.039	1.156	-0.781	0.182	-1.216	18.093
BRDSZE	0.017	0.028	3.541	-2.037	0.511	-0.729	38.217
CEO	0.187	0.144	4.026	-4.061	0.894	0.211	24.054
BDIV	0.032	0.006	1.651	-0.713	0.088	3.097	78.165
MKTCPT	-0.011	0.000	0.041	-0.048	0.008	-1.587	35.893
PBRATIO	0.093	0.067	4.165	-3.054	0.487	0.892	32.613
GDPPC	0.191	0.176	1.546	-1.712	0.398	2.816	24.824
M2	0.083	0.065	1.237	0.004	0.031	4.519	47.034
DCREDIT	0.657	0.698	2.646	0.165	0.189	-2.032	22.218
INTEREST	0.149	0.543	2.387	0.182	0.564	3.945	14.681

Table 3. Correlation Matrix

No	Variable	1	2	3	4	5	6	7	8	9	10	11
1	TQ	1.000										
2	DEBT	0.919	1.000									
3	AGCOST	0.327	0.241	1.000								
4	BRDSZE	0.192***	0.395	0.373	1.000							
5	CEO	0.287	0.421	0.119	0.602	1.000						
6	MKTCPT	0.332	0.471	0.413	0.326	0.512	1.000					
7	PBRATIO	0.341	0.603	0.713	0.414	0.274	0.191	1.000				
8	GDPPC	0.449	0.213	0.141	0.127	0.311	0.281	0.521	1.000			
9	M2	0.126	0.215	0.971	0.821	0.504	0.637	0.271	0.128	1.000		
10	CREDIT	0.178	0.175	0.236	0.152	0.832	0.217	0.367	0.173	0.325	1.000	
11	INTEREST	0.442	0.283	0.886	0.118	0.526	0.243	0.639	0.133	0.172	0.316	1.000

The estimates indicate positive and statistically significant correlations between BRDSZE (i.e., $r = .193$, $p < .090$) and MKTCPT (i.e., $r = .332$, $p < .000$) and Tobin's Q, supporting stewardship theory and pecking order theory, respectively. Although the other results were statistically negligible, they indicated the direction of the relationships among the variables. Specifically, AGCOST, CEO duality, and PBRATIO were positively correlated with Tobin's Q, providing support for concentrated ownership theory, stewardship theory, and pecking order theory, respectively. At the same time, CDEBT exhibited a negative correlation with Tobin's Q, which supports the agency problem perspective. The macroeconomic factors, including GDPPC, M2, and DCREDIT, reduced firm value, whereas the real interest rate was positively correlated with Tobin's Q. The macroeconomic factors exhibited weak relationships with Tobin's Q; therefore, in this study, they were incorporated as interacting factors with CDEBT and MKTCPT to assess their effects on Tobin's Q. These interaction effects were examined through panel regression analysis to test alternative and plausible capital structure theories and obtain robust inferences.

The following table examines the potential problem of multicollinearity using the variance inflation factor (VIF) and confirms that there is no multicollinearity problem in the regression model.

Table 4. Variance Inflation Factor (VIF)

Variable	VIF	1/VIF
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BRDSIZE	1.231	0.823
AGCOST	1.896	0.519
CEO	2.123	0.481
CDEBT	1.401	0.719
PBRATIO	1.109	0.895
MKTCPT	1.104	0.926
CDEBT × GDPPC	1.139	0.472
CDEBT × INTEREST	2.398	0.409
CDEBT × M2	1.897	0.541
MKTCPT × MCREDIT	2.732	0.369

The results indicate that the VIF values fall within the range of 0 to 10; therefore, the reported panel estimates can be regarded as empirically valid and are justified on the basis of their statistical significance. None of the individual VIF values exceeds the threshold value of 10 or falls below 0; hence, the statistical validity of the results is supported. After confirming the absence of a multicollinearity problem, the study analyzed the principal predictors exerting significant effects on Tobin's Q.

The following table presents changes in the R-squared value using an incremental regression approach.

Table 5. Incremental Regression Analysis

Model	R-squared	Change in R-squared
R-squared (original model)	0.791	—
R-squared (after removal of MKTCPT)	0.769	0.02
R-squared (after removal of PBRATIO)	0.798	0.04
R-squared (after removal of DEBT)	0.798	0.04
R-squared (after removal of CEO)	0.779	0.06
R-squared (after removal of AGCOST)	0.786	0.04
R-squared (after removal of BRDSIZE)	0.789	0.01

The results indicate that the coefficient of determination (R-squared) declines considerably by 0.02 when MKTCPT is removed from the original regression model. This finding therefore demonstrates the potential role of MKTCPT within the corporate governance mechanism, as it substantially affects firm value and contributes to robust inferences. The endogeneity problem can substantially affect conventional regression estimation and may consequently bias coefficient estimates. Therefore, the present study employed a two-stage regression procedure to determine whether the proposed model was affected by problems arising from the endogenous characteristics of the candidate variables in the capital structure framework. The literature suggests that ownership structure may generate an endogeneity problem in capital structure models.

To ensure the reliability of the research findings, verify that the relationships identified through the regression analyses were not spurious, and assess the statistical significance of the variables, stationarity tests were conducted and the unit roots of the research variables were examined.

Table 6. Unit Root Tests for the Research Variables (Stationarity Tests)

Variable	Levin, Lin, and Chu Statistic	<i>p</i>	Im, Pesaran, and Shin Statistic	<i>p</i>	Fisher-ADF Statistic	<i>p</i>	Fisher-PP Statistic	<i>p</i>
TQ	-15.242	0.0000	-1.881	0.0175	172.88	0.0305	249.53	0.0000
DEBT	-18.435	0.0000	-7.101	0.0000	235.302	0.0000	275.831	0.0000
AGCOST	-67.658	0.0000	-17.981	0.0000	363.235	0.0000	451.590	0.0000
BRDSIZE	-16.270	0.0000	-3.615	0.0011	204.97	0.0004	254.43	0.0000
CEO	-24.056	0.0000	-173.107	0.0001	285.74	0.0000	335.85	0.0000
MKTCPT	-11.250	0.0000	-4.121	0.0000	159.80	0.0000	166.61	0.0000
PBRATIO	-6.453	0.0000	-2.761	0.0000	50.030	0.0000	41.421	0.0000
GDPPC	-26.959	0.0000	-12.458	0.0000	410.634	0.0000	481.910	0.0000
M2	-8.523	0.0000	-11.539	0.0000	367.411	0.0000	457.07	0.0000
CREDIT	-11.250	0.0000	-4.121	0.0000	159.80	0.0000	166.61	0.0000
INTEREST	-36.633	0.0000	-20.379	0.0000	180.85	0.0128	233.48	0.0000

The above tests were performed using EViews 8 and the Levin–Lin–Chu test (Levin et al., 2002), the Im–Pesaran–Shin test (Im et al., 2003), the Fisher augmented Dickey–Fuller unit root test, and the Fisher Phillips–Perron unit root test (Phillips & Perron, 1994). In unit root testing, the null hypothesis indicates the presence of a unit root. When the probability value reported in the table is less than .05, the null hypothesis is rejected at the 95% confidence level. The stationarity test results indicate that the research variables are stationary according to all of the applied methods. Based on these findings, the null hypothesis indicating the presence of a unit root in the variables is rejected.

Table 7. Endogeneity Test

Variable	Coefficient	<i>p</i>
Constant	0.507	0.109
Ln(BRDSIZE)	0.089	0.523
AGCOST	-0.004	0.978
CEO	0.147	0.469
DEBT	-0.043	0.000
PBRATIO	0.078	0.000
MKTCPT	5.54	0.000
Residuals	-0.036	0.867
Statistical Tests		
R-squared	0.212	—
Adjusted R-squared	0.167	—
F-statistic	6.432	0.000

The results presented in the above table indicate that the residual term explains Tobin’s Q only negligibly; therefore, the capital structure model does not appear to suffer from an endogeneity problem. Accordingly, the estimated results are valid and empirically acceptable for deriving policy implications.

Table 8. Effects of Board Size After Excluding CEO Duality (and Vice Versa) on Tobin’s Q

Variable	CEO Duality Excluded	Board Size Excluded
Constant	1.367 (0.439)	0.698 (0.012)
Ln(BRDSIZE)	-0.318 (0.722)	—
AGCOST	0.313** (0.027)	0.311* (0.021)
CEO	—	0.706 (0.534)
DEBT	-0.008** (0.043)	-0.007** (0.032)
PBRATIO	0.014** (0.050)	0.112** (0.039)
MKTCPT	1.20E-09* (0.000)	1.20E-09* (0.000)

AR(1)	0.912** (0.000)	0.912** (0.000)
Statistical Tests		
R-squared	0.782	0.783
Adjusted R-squared	0.767	0.768
F-statistic	131.342** (0.000)	131.343** (0.000)

The results confirmed that both corporate governance instruments remain statistically insignificant in the absence of the other when they are alternately omitted from the same regression framework, indicating that neither factor produces a substantial marginal reduction independently. Accordingly, each may affect firm performance; however, when both elements are incorporated simultaneously into a single regression framework, they provide little incremental improvement relative to one another within the capital structure framework. Therefore, the resulting effect reflects the absence of complementarity between corporate governance mechanisms among companies listed on the Tehran Stock Exchange. Overall, the findings lead to the following conclusions. A larger board size improves firm value, supporting stewardship theory. Greater ownership concentration enhances firm performance, supporting concentrated ownership theory. A higher level of debt deteriorates firm value, supporting the agency problem perspective; however, when debt is interacted with per capita income, this process is reversed and produces a U-shaped relationship, supporting the signaling hypothesis. The interaction between broad money (M2) and debt tends to reduce Tobin's Q, suggesting that contractionary monetary policy may contribute to stabilizing firm-related issues associated with M2 within a country. A higher price-to-book ratio positively affects Tobin's Q, supporting pecking order theory. Market capitalization has a positive effect, whereas its interaction with domestic credit provided by the financial sector tends to support an inverted U-shaped relationship with firm performance. These findings are reinforced by several statistical robustness tests, including the variance inflation factor, the endogeneity test, and complementarity tests between corporate governance mechanisms.

4. Discussion and Conclusion

The present study examined the mechanism through which debt financing and the book value of equity influence firm value, with particular emphasis on the role of capital structure, corporate governance characteristics, and macroeconomic factors among companies listed on the Tehran Stock Exchange. The findings indicate that board size, agency costs, the price-to-book ratio, and market capitalization exert positive effects on Tobin's Q, whereas debt has a negative effect on firm value. The results also reveal that macroeconomic variables alter the relationship between financing structure and firm value. In particular, the interaction of debt with per capita income changes the pattern of the debt-value relationship and produces a U-shaped association, while the interaction between broad money and debt negatively affects Tobin's Q. Furthermore, although market capitalization positively affects firm value directly, its interaction with domestic credit provided by the financial sector produces an inverted U-shaped relationship with firm performance. Diagnostic analyses further indicated that the regression models did not suffer from serious multicollinearity or endogeneity problems, and the panel unit-root tests confirmed the stationarity of the variables. These findings collectively demonstrate that firm value in the Tehran Stock Exchange is shaped by the interaction of firm-level financing decisions, accounting-based valuation indicators, governance mechanisms, and macroeconomic conditions rather than by capital structure decisions in isolation.

One of the most important findings was the negative relationship between debt financing and Tobin's Q. This result suggests that higher reliance on debt is associated with deterioration in firm value among the sampled

companies. From an agency perspective, although moderate leverage may discipline managers by limiting discretionary cash flows, excessive debt increases financial commitments, refinancing pressures, default risk, and potential conflicts between shareholders and creditors. Under such circumstances, investors may discount highly leveraged firms because of their increased financial vulnerability. This finding is consistent with the broader evidence that capital structure and firm-specific financial characteristics significantly influence corporate financial performance and that the effect of leverage depends on the institutional and macroeconomic environment in which firms operate [2]. It also accords with the argument that debt financing in emerging markets may contain additional costs resulting from financing constraints, risk premia, and imperfections in financial markets [7]. Therefore, the negative coefficient of debt in the present study can be interpreted as evidence that, within the Iranian capital-market environment, the marginal costs associated with greater leverage may outweigh its potential disciplinary or tax-related benefits.

The negative association between debt and firm value can also be explained through signaling and institutional perspectives. Debt may convey favorable information when creditors interpret borrowing as evidence of expected future cash flows; however, the credibility of this signal depends on institutional arrangements, access to financial markets, and the quality of relationships between firms and financing institutions. Evidence concerning the signaling role of government-market relationships in debt financing shows that institutional connections can materially influence the information conveyed by borrowing decisions [4]. In the Iranian context, where external financing conditions may be affected by macroeconomic instability and restrictions in financial markets, additional borrowing may be interpreted less as a positive signal and more as an indication of financing constraints or increased exposure to economic uncertainty. The development of alternative debt-financing mechanisms, including crowdfunding-based models for financial institutions, similarly reflects the need for firms to diversify financing channels when conventional debt financing is costly or constrained [5]. Accordingly, the adverse relationship between debt and Tobin's Q in the current study appears economically plausible.

Another important result concerns the positive relationship between the price-to-book ratio and firm value. This finding suggests that firms whose market prices are high relative to their book values tend to exhibit higher Tobin's Q. The price-to-book ratio incorporates investors' expectations concerning future profitability, growth opportunities, intangible assets, managerial quality, and the capacity of firms to generate value beyond the accounting value of shareholders' equity. Previous evidence has shown that price-to-book value constitutes an important market indicator associated with share prices and investor valuation [11]. The finding is also compatible with studies emphasizing the value relevance of accounting measures, particularly earnings and book value, in equity valuation [8]. When investors perceive reported book value as credible and informative, the relationship between market prices and accounting equity becomes an important indicator of expected corporate performance.

At the same time, the informational usefulness of book value depends on the quality and transparency of financial reporting. Financial statement comparability and reporting obfuscation may influence the extent to which earnings and book value per share are incorporated into market valuations [9]. Similarly, accounting book values may contain measurement errors arising from internal control procedures, valuation methods, or deteriorating financial conditions [10]. The positive association identified in the present study therefore suggests that market participants do not evaluate accounting equity mechanically; instead, they appear to interpret book value jointly with market information and expectations concerning future firm performance. Moreover, some components of corporate value, such as intellectual capital and strategic organizational resources, may not be fully reflected in traditional accounting figures. Evidence that intellectual capital contributes to sustainability performance reporting

and business strategy reinforces the notion that differences between book value and market value may partly reflect unrecognized intangible value [12].

The positive effect of market capitalization on Tobin's Q is likewise consistent with the view that larger market valuation signals greater investor confidence, stronger expected cash flows, and more favorable growth prospects. Firms with greater market capitalization may benefit from superior access to financing, higher visibility, stronger information environments, and greater capacity to absorb economic shocks. In emerging markets, market value can therefore act as both an outcome of corporate performance and a signal of financial strength. The importance of investment, market competition, and information asymmetry in determining firm value has also been demonstrated in research on firms in the Middle East and North Africa [1]. The present findings extend this argument by showing that market capitalization remains an important determinant of Tobin's Q even when capital-structure, governance, and macroeconomic variables are considered simultaneously.

However, the interaction between market capitalization and domestic credit provided by the financial sector displayed an inverted U-shaped relationship with firm performance. This result implies that greater financial-sector credit may initially reinforce the valuation advantages of firms with strong market capitalization, but beyond a certain point additional credit may become detrimental. One explanation is that increased availability of credit initially relaxes financing constraints and enables firms to undertake profitable investments, but excessive credit expansion may encourage overinvestment, inefficient capital allocation, leverage accumulation, or speculative behavior. Research has emphasized that financial development interacts with firm characteristics in ways that produce both firm-level and macroeconomic consequences [3]. The present result therefore suggests that credit availability is not uniformly beneficial; its effect depends on the amount of credit and the financial position of the firm. This nonlinear relationship is also compatible with the broader literature demonstrating that capital-market performance responds to changes in macroeconomic and financial conditions [13-15].

The positive association between board size and Tobin's Q provides support for the stewardship interpretation of corporate governance. Larger boards may provide broader professional expertise, more diverse knowledge, improved access to external resources, and stronger advisory capacity. In environments characterized by uncertainty, a larger board may enable firms to evaluate financing alternatives, manage risk, and respond more effectively to changes in market conditions. Nevertheless, the supplementary analysis in which board size and CEO duality were alternately excluded suggests that their independent effects are relatively limited when considered as potentially complementary governance mechanisms. This finding indicates that the contribution of governance variables to firm value may emerge primarily through their interaction with other organizational and financial characteristics rather than through strong isolated effects. In emerging markets, where corporate governance structures operate within broader institutional constraints, the effectiveness of individual governance mechanisms may be particularly dependent on the overall governance configuration.

The finding that agency costs were positively associated with firm value requires more nuanced interpretation. Conventionally, higher agency costs are expected to reduce firm value because they represent inefficiencies arising from conflicts of interest between managers, shareholders, and other stakeholders. However, the direction observed in the present analysis may reflect the way agency costs are operationalized or may indicate that expenditures associated with monitoring, governance, and control produce value-enhancing effects when they reduce managerial opportunism. In this interpretation, higher governance-related expenditures should not necessarily be treated as pure economic losses but may represent investments in organizational monitoring. Such an explanation is consistent with the broader importance of governance quality and institutional control in financial reporting and

corporate decision-making. Studies in the Iranian capital market have demonstrated that governance conditions interact with macroeconomic instability in shaping corporate financial behavior and earnings management [21, 22]. Thus, the observed positive association may indicate that certain governance costs generate compensating benefits through improved monitoring and information quality.

The interaction between debt and per capita income represents another noteworthy result. Although debt was negatively associated with firm value in the direct model, its interaction with per capita income produced a U-shaped pattern. This finding implies that the detrimental effect of debt may weaken or eventually reverse as broader economic conditions improve. Higher per capita income can reflect stronger economic activity, increased purchasing power, improved business opportunities, and greater capacity of firms to service their financial obligations. In relatively favorable macroeconomic conditions, debt may therefore become more productive because firms can employ borrowed funds in profitable investment opportunities. Conversely, under weak economic conditions, debt repayment commitments may amplify financial distress. This interpretation is consistent with evidence that macroeconomic variables materially influence capital-market outcomes and interact with firm-level financial performance [16, 17]. It is also compatible with evidence from Iran showing that firm-level financial distress and macroeconomic conditions are interconnected [20].

The negative interaction between broad money (M2) and debt suggests that monetary expansion does not necessarily improve the market valuation of leveraged companies. Although greater money supply can increase liquidity in the financial system, persistent monetary expansion may also be associated with inflationary expectations, declining purchasing power, increased uncertainty, and changes in borrowing and investment behavior. In such circumstances, firms carrying substantial debt may experience greater difficulty maintaining the real value of cash flows and managing financing costs. Macroeconomic instability may additionally encourage discretionary managerial responses and increase uncertainty surrounding reported performance [21, 22]. Research examining risk aversion and value at risk in macroeconomic asset portfolios similarly demonstrates that economic risk conditions shape financial valuation and investment decisions [19]. Consequently, the adverse M2–debt interaction found in this study supports the view that liquidity expansion cannot be considered independently of inflation, uncertainty, and firms' existing financial obligations.

The real interest rate exhibited a positive correlation with Tobin's Q, although the macroeconomic variables generally displayed weaker direct correlations with firm value than did some firm-specific variables. The relationship between interest rates and capital-market performance is theoretically complex. Higher interest rates raise borrowing costs and discount rates, which may reduce firm value, but they may also accompany tighter monetary conditions, stronger real returns, or shifts toward firms with superior financial fundamentals. International evidence demonstrates that the relationship between macroeconomic indicators and capital-market performance differs across institutional settings and time periods [13-16]. Consequently, the weak but positive relationship found in the present study may reflect the distinctive structure of the Iranian capital market rather than a universal effect of interest rates.

The findings also underscore the methodological importance of analyzing corporate value using panel-data techniques. Firm-level financial outcomes develop over time while being exposed to common macroeconomic shocks, making methods that incorporate both cross-sectional and temporal variation particularly appropriate. Panel-based approaches have been used to evaluate relationships between macroeconomic variables and institutional or organizational outcomes because they allow researchers to control for unobserved heterogeneity and capture dynamic variation [18]. In the present study, the stationarity tests confirmed that the variables were

stationary under multiple unit-root procedures, while the VIF results indicated no serious multicollinearity problem. Moreover, the endogeneity analysis showed that the residual term was statistically insignificant, suggesting that the estimated relationships were not materially distorted by endogeneity. These robustness checks strengthen confidence that the observed relationships represent substantive financial patterns rather than purely statistical artifacts.

Overall, the findings demonstrate that firm value among companies listed on the Tehran Stock Exchange is determined through a complex interaction of financing structure, market valuation, corporate governance, and macroeconomic conditions. The results support the proposition that debt can reduce firm value when financial obligations outweigh the benefits of leverage, while the valuation consequences of debt change when macroeconomic circumstances improve or deteriorate. They also emphasize the informational importance of book value and price-to-book measures, consistent with the literature on accounting value relevance [8, 9]. At the same time, the results show that market valuation and financial-sector credit interact nonlinearly, suggesting that access to credit can facilitate value creation only up to a certain level. These conclusions accord with broader research emphasizing the interdependence of financial development, capital structure, macroeconomic conditions, and corporate performance [2, 3]. They also complement evidence concerning the financing costs and strategic consequences of debt [6, 7], thereby providing a more integrated explanation of how financing and economic conditions jointly influence firm value in an emerging capital market.

The present study has several limitations that should be considered when interpreting its findings. First, the sample was restricted to companies listed on the Tehran Stock Exchange and excluded financial intermediaries and firms that did not satisfy the screening criteria; therefore, the findings may not be generalizable to privately held companies, financial institutions, or firms operating in other capital markets. Second, the study covered a five-year period, which may not fully capture longer-term changes in financing behavior or structural shifts in macroeconomic conditions. Third, the empirical analysis relied on accounting and market data available in financial databases, and these data may be affected by differences in reporting quality, accounting practices, or measurement error. Fourth, although several governance and macroeconomic factors were incorporated, other potentially influential variables, such as ownership type, board independence, corporate liquidity, industry competition, political risk, and exchange-rate volatility, were not explicitly modeled. Finally, the use of observational panel data limits the extent to which strict causal relationships can be established, even though diagnostic tests were employed to reduce concerns regarding endogeneity and model misspecification.

Future studies could extend the present analysis by examining longer time periods and incorporating different economic cycles to determine whether the identified relationships remain stable during periods of recession, expansion, financial crisis, or major policy change. Comparative studies involving other emerging and developed capital markets could also clarify whether the observed effects are specific to the institutional characteristics of the Tehran Stock Exchange. Researchers may further distinguish among short-term and long-term debt, bank borrowing, bonds, and other financing instruments to determine whether different forms of leverage exert heterogeneous effects on firm value. Future models could incorporate additional governance characteristics, ownership concentration, institutional ownership, board independence, audit quality, financial constraints, and measures of information asymmetry. Nonlinear models, dynamic panel estimators, structural equation modeling, and threshold regression methods may also help identify more precisely the conditions under which debt shifts from being value-reducing to value-enhancing. Finally, future research could examine industry-specific differences

and investigate whether macroeconomic variables moderate the financing–value relationship differently across manufacturing, technology, service, and resource-intensive sectors.

Managers of listed firms should adopt a balanced approach to financing decisions and avoid excessive reliance on debt, particularly when macroeconomic conditions increase borrowing costs or financial uncertainty. Capital structure decisions should be periodically reassessed in light of changes in economic growth, money supply, credit availability, and interest rates rather than being based solely on internal financing needs. Firms should also improve the quality, comparability, and transparency of financial reporting because credible book values and related valuation ratios provide important signals to investors. Boards of directors should strengthen their monitoring and advisory functions and ensure that governance-related expenditures contribute to effective oversight rather than unnecessary administrative costs. Investors and financial analysts should evaluate leverage together with market capitalization, price-to-book ratios, and prevailing macroeconomic conditions instead of relying on a single indicator of financial strength. Regulators and policymakers should also consider the heterogeneous effects of credit expansion and monetary conditions on highly leveraged firms and design policies that facilitate productive access to finance while limiting excessive borrowing and inefficient credit allocation.

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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