A NOTE ON CHALLENGES AND SOLUTIONS FOR ENDOGENEITY IN CORPORATE FINANCE

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ABSTRACT

Endogeneity is a pervasive issue in empirical corporate finance, leading to biased and inconsistent parameter estimates that undermine the reliability of inferences. This paper explores the sources of endogeneity, its implications, and the econometric techniques used to address it. We review omitted variables, simultaneity, and measurement error as primary sources of endogeneity and discuss methods such as instrumental variables, difference-in-differences estimators, regression discontinuity design, matching methods, and panel data techniques.

Keywords: Corporate finance, endogeneity, simultaneity, measurement error, econometrics.

JEL classification: G30, C21, C23

1. Introduction

Endogeneity arises when explanatory variables in a regression model are correlated with the error term, leading to biased and inconsistent estimates. This issue is particularly significant in corporate finance, where complex interactions between variables often exist. Addressing endogeneity is crucial for making reliable inferences about causal relationships.

Despite the intricate decision-making processes that firms undergo and the limited data available to researchers, endogeneity concerns are prevalent in every study. How can corporate finance researchers address these challenges?

This survey paper aims to provide a practical guide, a starting point, and an update for empirical corporate finance researchers.

Roberts and Whited (2013) offer a comprehensive review of literature on endogeneity in empirical corporate finance. They focus on various sources of endogeneity—such as simultaneity, omitted variables, measurement error, and incorrect model specification—and demonstrate how a range of econometric methods can be employed to address these issues. These methods include traditional approaches like instrumental variables, fixed and random effects, and difference-in-differences estimators, as well as more recent techniques such as regression discontinuity and higher moment estimators. Since Roberts and Whited's (2013) publication, numerous studies have continued to grapple with the pervasive issue of endogeneity. This paper seeks to update the empirical literature on this topic.

When employing these econometric methods to address endogeneity, finance researchers must ensure their correct application within the specific context of the field. Over the past seven decades, corporate finance has introduced several groundbreaking concepts, such as the Miller and Modigliani (M&M) theorem on firms' financing decisions (Miller & Modigliani, 1961; Modigliani & Miller, 1958, 1963; Miller, 1977), capital asset pricing theory (Sharpe, 1964) and its extensions, the efficient market hypothesis (EMH) (Samuelson, 1965; Fama, 1970), portfolio theory (Markowitz, 1952, 1959), agency theory (Jensen & Meckling, 1976; Jensen, 1986), and option pricing theory (Black & Scholes, 1973; Merton, 1973). Additionally, the field has encountered challenges from behavioural finance, led by the work of Amos Tversky, Daniel Kahneman, Robert Shiller, Richard Thaler, Andrei Shleifer, and others. Miller (2000) provides a comprehensive overview of the field's seminal areas, while Shleifer and Vishny (1997), Thaler (2018) and Banerjee et al. (2025) present critiques of traditional finance theories. Harvey (2017, 2019) and Harvey & Liu (2020) have underscored the importance of robust methodologies, replication, and awareness of potential false discoveries in empirical finance research. For technical details and formal proofs of results, interested researchers should consult the relevant journal and econometric references, including Gujarati (2013) and Wooldridge (2022).

Despite the extensive use of econometric techniques to address endogeneity, there remains a significant gap in understanding the effectiveness and limitations of these methods in various corporate finance contexts. Specifically, the literature lacks comprehensive evaluations of how different econometric solutions perform under diverse conditions and the practical challenges researchers face when implementing these solutions. Providing detailed insights into the practical challenges and solutions for endogeneity can help researchers and practitioners improve their study designs and data analysis strategies. From a corporate policy standpoint, understanding and mitigating endogeneity can lead to more robust policy recommendations, enhancing the decision-making processes in corporate finance.

The rest of this paper proceeds as follows. Section 2 deals with the sources of endogeneity and their econometric remedies. Section 3 discusses some vital applications in corporate finance. Section 4 provides the conclusion. A summary table is provided in the appendix.

2. Sources of Endogeneity and Econometric Techniques for Addressing the Problem

Omitted Variables: When relevant variables are omitted from the model, the error term captures their effect, leading to biased estimates.

Simultaneity: This occurs when explanatory variables are jointly determined with the dependent variable, creating a two-way causality.

Measurement Error: Inaccurate measurement of variables can lead to correlation between the explanatory variables and the error term.

2.1 Omitted variables and the endogeneity problem

Omitted variables are a significant source of endogeneity in corporate finance research. When relevant variables are excluded from a regression model, the error term captures their effects, leading to biased and inconsistent parameter estimates. This section delves into the implications of omitted variables, examples in corporate finance, and strategies to mitigate their impact.

2.1.1 *The Basic Regression Framework*

The single equation multiple linear regression model is:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k + \mu \qquad (1)$$

where Y is a random dependent variable, Xs are the independent variables or covariates, μ is the unobservable random error or disturbance term. The βs are the parameters to be estimated in order to give empirical content to the theory.

Implications of Omitted Variables

Omitted variables are those that should be included among the independent variables but are not, leading to significant issues in corporate finance. Firms and CEOs vary widely across numerous dimensions, many of which are difficult to observe. For example, executive compensation is influenced by abilities that are challenging to measure. Financing frictions, such as asymmetric information and incentive conflicts, are crucial but hard to quantify (Chen et al., 2024). Corporate decisions depend on both public and private information, making several factors unobservable to econometricians. These unobserved factors are captured in the error term. If they are uncorrelated with the included variables, inference remains valid. However, if they are correlated, endogeneity problems arise, causing inference to break down.

In other words, when a relevant variable is omitted from a regression model, the error term absorbs its effect. If this omitted variable is correlated with one or more included explanatory variables, the estimates of these variables will be biased. This bias occurs because the influence of the omitted variable is incorrectly attributed to the included variables, leading to erroneous inferences about causal relationships.

To illustrate how inference fails, consider the true economic relationship described by:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k + \gamma W + \mu \qquad (2)$$

where: W represents an unobservable independent variable with a coefficient γ. The population regression function that can be estimated is:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k + \upsilon \qquad (3)$$

where: $v = \gamma W + \mu$ is the composite error term. It can be assumed that W has a zero mean because any non-zero mean among the covariates would be absorbed by the intercept.

If the omitted variable W is correlated with any of the explanatory variables (***X*s**), it causes multicollinearity. Consequently, the composite error term $\boldsymbol{v}$ will also be correlated with the explanatory variables, leading to inconsistent estimates from the OLS estimation of equation (3). While it is possible to understand the direction and magnitude of the asymptotic bias when only one covariate (*Xi*) is correlated with the omitted variable, this scenario is uncommon in corporate finance. Therefore, researchers typically assume that all other identified covariates are partially uncorrelated with the omitted variable, resulting in zero coefficients for each covariate except the one correlated with the omitted variable (*Xi*).

Technically,

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$$\widehat{\beta_i} = \beta_i + \gamma\varphi_i, \quad i = 1, 2, 3, \ldots k \tag{4}$$

where: $$\varphi_i = \frac{cov\ (X_i, W)}{var\ (X_i)} \tag{5}$$

Equation (4) shows that the OLS of the endogenous variable's coefficient converges to the true value, β_i, plus a bias term as the sample size increases. Equation (5) is akin to the formula for the beta coefficient in the capital asset pricing framework where expected return is postulated to have a linear relationship with systematic risk whose proxy is beta. Specifically, beta (β_i) = $\frac{cov\ (R_i, R_m)}{var\ (R_m)}$, where β_i is the beta coefficient for security i, R_i is the return on security i, and R_m is the return on the market portfolio. If W and X_i are uncorrelated, then $\varphi_i = 0$ and OLS is consistent. On the other hand, if W and X_i are correlated, then $\varphi_i \neq 0$ and OLS would be inconsistent. If φ_i and γ have the same sign, then the asymptotic bias is positive. With different signs, the asymptotic bias is negative.

Equation (4) can be used to assess the significance and extent of biases caused by omitted variables within the context of finance theory. For instance, firm size is a prevalent variable in the theory of firm literature (Coase, 1937; Grossman and Hart, 1986). Coase (1937) and others have explored why firms exist and how firm boundaries (or size) rationalize resource allocation between the market and the firm. These questions continue to be examined in both economics and finance (Dang et al., 2018). Firm size has been employed in numerous studies as both a dependent and an explanatory variable.

In corporate finance, firm size is often used as an explanatory variable in research on capital structure and dividend policy (e.g., Rajan & Zingales, 1995; Leary & Roberts, 2005; Lambrecht & Myers, 2017; Kumar et al., 2017; Ezeani et al., 2022; Paseda, 2016; Paseda, 2020; Paseda & Ayadi, 2023a, 2023b; Athari & Bahreini, 2023; Duarte et al., 2025; Paseda, 2025; Vega-Gutierrez et al., 2025). If larger firms are more likely to borrow and distribute a higher portion of their earnings compared to smaller firms, firm size becomes an endogenous variable, particularly when another potential regressor, such as firm maturity, is omitted but correlated with firm size. In the context of capital structure or dividend policy determinants, Y represents the capital structure ratio or dividend payout ratio, X represents firm size, and W represents firm maturity. The bias in the estimated size coefficient depends on the partial correlation between firm maturity and the financial phenomenon being explained (capital structure or dividend policy), as well as the partial correlation between size and firm maturity.

Below is a partial list of applications in corporate finance:

Corporate Governance and Firm Performance: Studies investigating the impact of corporate governance on firm performance often encounter omitted variable bias. For example, if variables such as industry competition or macroeconomic conditions are excluded, the estimated effect of corporate governance on performance may be skewed (Khatib, 2024).

Capital Structure Decisions: Research on the determinants of capital structure may overlook variables like managerial risk preferences (Jensen & Meckling, 1976) or firm-specific growth opportunities (Myers, 1977). These omissions can lead to biased estimates of the impact of traditional determinants such as profitability or asset tangibility (Rajan & Zingales, 1995; Abor, 2007; Lemmon et al., 2008; Paseda & Ayadi, 2023a, 2023b; Li & Zhou, 2025).

Investment Decisions: When examining the relationship between investment decisions and firm value, failing to account for variables such as market conditions or technological advancements can result in biased estimates (Xu, Cai & Zhu, 2025).

2.1.2 *Strategies to Mitigate Omitted Variable Bias*

A) Inclusion of Control Variables: Adding relevant control variables to the regression model can help mitigate omitted variable bias. These controls should capture the effects of the omitted variables, thereby reducing their correlation with the error term. Mitton (2022) emphasizes that methodological decisions, such as the selection of dependent variables, variable transformation, and outlier treatment, significantly impact the statistical significance of results. Mitton (2022) shows that discretion over these routine methodological decisions can lead to a high percentage of randomly generated variables being reported as statistically significant determinants of leverage.

B) Instrumental Variables (IV): Using instruments that are correlated with the endogenous explanatory variables but uncorrelated with the error term can help isolate the exogenous variation in the explanatory variables. This approach addresses the bias introduced by omitted variables.

C) Fixed Effects Models: Employing fixed effects models can control for unobserved heterogeneity that is constant over time. This method is particularly useful in panel data settings, where it can account for omitted variables that vary across entities but remain constant over time.

D) Difference-in-Differences (DiD): This method compares changes in outcomes over time between a treatment group and a control group. By controlling for time-invariant unobserved factors, DiD can help mitigate the bias from omitted variables.

In summary, the omitted variable bias occurs when relevant variables are excluded from a regression model, leading to biased and inconsistent parameter estimates. This bias arises because the omitted variable's influence is incorrectly attributed to the included variables. To mitigate this bias, researchers can include relevant control variables, use instrumental variables

(IV) to isolate exogenous variation, employ fixed effects models to control for unobserved heterogeneity, and apply difference-in-differences (DiD) methods to compare changes over time between treatment and control groups. These strategies help ensure more accurate and reliable inferences in empirical research.

2.2 Simultaneity and endogeneity in corporate finance

Simultaneity, also known as reverse causality, is a common source of endogeneity in corporate finance. It occurs when the explanatory variables and the dependent variable are determined simultaneously, leading to a two-way causality. This section explores the implications of simultaneity, provides examples in corporate finance, and discusses strategies to address this issue.

2.2.1 *Implications of Simultaneity*

Simultaneity results in biased and inconsistent parameter estimates because the explanatory variables are endogenous—they are correlated with the error term. This correlation occurs because changes in the dependent variable can influence the explanatory variables, creating a feedback loop. Consequently, traditional ordinary least squares (OLS) regression techniques fail to provide reliable estimates of causal relationships.

Examples in Corporate Finance

Investment and Firm Performance: The relationship between investment decisions and firm performance is often characterized by simultaneity. Higher firm performance can lead to increased investment, while investment decisions can also impact firm performance (Li, Hyung & Lee, 2025).

Capital Structure and Firm Value: The choice of capital structure (debt vs. equity) can influence firm value, but firm value can also affect capital structure decisions. The simultaneity between leverage and firm value is particularly salient in Rajan and Zingales (1995), where the authors acknowledge that firm valuation may itself influence financing decisions, complicating causal inference and necessitating econometric remedies. For instance, firms with higher market valuations may have better access to debt markets (Almustafa & Kalash, 2025).

Corporate Governance and Firm Performance: Effective corporate governance can enhance firm performance, but firms with better performance may also adopt stronger governance practices. This bidirectional relationship complicates the estimation of causal effects (Khatib, 2024).

2.2.2 *Strategies to Address Simultaneity*

A) Instrumental Variables (IV): One of the most common methods to address simultaneity is the use of instrumental variables. Instruments are variables that are correlated with the endogenous explanatory variables but uncorrelated with the error term. By isolating the exogenous variation in the explanatory variables, the IV method helps to identify causal relationships.

Instrument validity is crucial in addressing endogeneity through instrumental variable (IV) techniques. A valid instrument must be both relevant—strongly correlated with the endogenous regressor—and exogenous—uncorrelated with the error term. Without satisfying these conditions, IV estimates may be biased or inconsistent, undermining causal inference in corporate finance research.

Here are the key equations used in instrumental variables (IV) estimation:

1. First Stage Regression:

In the first stage, we regress the endogenous explanatory variable *X* on the instrument *Z* and other covariates *W*:

$$X_i = \pi_0 + \pi_1 Z + \pi_2 W + v \quad (6)$$

π_0, π_1, π_2 are coefficients to be estimated and v is the error term.

2. Predicted Values:

From the first stage regression, we obtain the predicted values of *X*:

$$\hat{X} = \pi_0 + \pi_1 Z + \pi_2 W \quad (7)$$

3. Second Stage Regression:

In the second stage, we regress the dependent variable Y on the predicted values $\hat{X}$ and other covariates W:

$$Y = \beta_0 + \beta_1 \hat{X} + \beta_2 W + \epsilon \tag{8}$$

where $\beta_0, \beta_1, \beta_2$ are coefficients to be estimated, and ϵ is the error term.

4. IV Estimator:

The IV estimator for β_1 can be expressed as:

$$\widehat{\beta_1} = (\boldsymbol{Z}^i \boldsymbol{X})^{-1} \boldsymbol{Z}^i Y \tag{9}$$

where $\boldsymbol{Z}$ is the instrument matrix, $\boldsymbol{X}$ is the matrix of endogenous explanatory variables, and Y is the dependent variable.

Conditions for Valid Instruments:

1. **Relevance:** The instrument Z must be correlated with the endogenous explanatory variable X.
2. **Exogeneity:** The instrument Z must be uncorrelated with the error term ϵ in the second stage regression.

By following these steps, researchers can use IV estimation to address endogeneity and obtain consistent parameter estimates.

B) Simultaneous Equations Models (SEM): These models explicitly account for the simultaneous determination of variables by estimating multiple equations simultaneously. Each equation represents a different causal relationship, allowing for a more accurate estimation of the parameters.

Examples of SEMs applied to common issues in corporate finance:

1. Investment and Firm Performance

Equations:

Investment Equation:

$$Investment_i = \alpha_0 + \alpha_1 Performance_i + \alpha_2 Control\,Variables_i + \epsilon_i \tag{10}$$

Performance Equation:

$$Performance_i = \beta_0 + \beta_1 Investment_i + \beta_2 Control\,Variables_i + v_i \tag{11}$$

Explanation:

- The investment equation models the firm's investment decisions as a function of its performance and other control variables.
- The performance equation models the firm's performance as a function of its investment decisions and other control variables as in Terry et al. (2023).
- The error terms ϵ_i and v_i capture unobserved factors affecting investment and performance respectively.

2. Capital Structure and Firm Value

Equations:

Capital Structure Equation:

$$Leverage_i = \gamma_0 + \gamma_1 Firm\ Value_i + \gamma_2 Control\ Variables_i + \mu_i \quad (12)$$

Firm Value Equation:

$$Firm\ Value_i = \delta_0 + \delta_1 Leverage_i + \delta_2 Control\ Variables_i + \vartheta_i \quad (13)$$

Explanation:

- The leverage equation models the firm's capital structure decisions as a function of its firm value and other control variables.
- The firm value equation models the firm's value as a function of its leverage and other control variables.
- The error terms $\mu_i\ and\ \vartheta_i$ capture unobserved factors affecting leverage and firm value respectively.

3. Corporate Governance and Firm Performance

Equations:

Governance Equation:

$$Governance_i = \theta_0 + \theta_1 Performance_i + \theta_2 Control\ Variables_i + k_i \quad (14)$$

Performance Equation:

$$Performance_i = \forall_0 + \forall_1 Governance_i + \forall_2 Control\ Variables_i + \sigma_i \quad (15)$$

Explanation:

- The governance equation models the firm's corporate governance practices as a function of its performance and other control variables.
- The performance equation models the firm's performance as a function of its corporate governance practices and other control variables (Khatib, 2024).
- The error terms k_i and σ_i capture unobserved factors affecting governance and performance respectively.

Estimation Methods

To estimate these simultaneous equations, researchers can use methods such as:

1. Two-Stage Least Squares (2SLS): This method involves first regressing the endogenous explanatory variables on the instruments and control variables to obtain predicted values, and then using these predicted values in the second stage regression.
2. Three-Stage Least Squares (3SLS): This method extends the 2SLS by accounting for potential correlations between the error terms of different equations, providing more efficient estimates.
3. Generalized Method of Moments (GMM): This method uses moment conditions derived from the model to obtain consistent parameter estimates, particularly useful for dynamic panel data models.

By employing these simultaneous equation models and estimation methods, researchers can effectively address endogeneity and obtain more reliable estimates of causal relationships in corporate finance.

C) Lagged Variables: Using lagged values of the explanatory variables can help mitigate simultaneity.

Lagged variables are predetermined and less likely to be influenced by the current period's dependent variable, helping to mitigate simultaneity and reverse causality issues.

Here is a mathematical representation of how lagged variables can be used:

Investment and Firm Performance Equations (Without Lagged Variables):

Investment Equation (Without Lagged Variables):

$$Investment_i = \alpha_0 + \alpha_1 Performance_i + \alpha_2 Control\,Variables_i + \epsilon_i \quad (10)$$

Performance Equation (Without Lagged Variables):

$$Performance_i = \beta_0 + \beta_1 Investment_i + \beta_2 Control\,Variables_i + v_i \quad (11)$$

Investment Equation (With Lagged Variables):

$$Investment_i = \alpha_0 + \alpha_1 Performance_{t-1} + \alpha_2 Control\,Variables_{t-1} + \epsilon_i \quad (16)$$

Performance Equation (With Lagged Variables):

$$Performance_i = \beta_0 + \beta_1 Investment_{t-1} + \beta_2 Control\,Variables_{t-1} + v_i \quad (17)$$

By using lagged values of the explanatory variables ($Performance_{t-1}$ and $Investment_{t-1}$) in equations (16) and (17) respectively, we reduce the likelihood that these variables are influenced by the current period's performance or investment, thereby mitigating endogeneity.

D) Panel Data Techniques: Panel data methods, such as fixed effects and random effects models, can control for unobserved heterogeneity and help address simultaneity. These techniques exploit the variation across time and entities to provide more reliable estimates.

Fixed Effects Model

The fixed effects (FE) model is a powerful tool for addressing endogeneity in corporate finance by controlling for unobserved heterogeneity that is constant over time. This model assumes that individual-specific effects are correlated with the explanatory variables, and it removes the influence of these time-invariant characteristics.

Mathematical Representation:

Consider a panel data model where Y_{it} is the dependent variable for entity *i* at time *t*, X_{it} represents the explanatory variables, and α_i is the entity-specific effect.

$$Y_{it} = \beta X_{it} + \alpha_i + \epsilon_{it} \quad (18)$$

To estimate the FE model, we subtract the entity-specific mean from each observation:

$$Y_{it} - \overline{Y}_i = \beta(X_{it} - \overline{X}_i) + (\epsilon_{it} - \overline{\epsilon}_i) \quad (19)$$

where:

- $\overline{Y}_i$ is the mean of Y_{it} for entity *i*
- $\overline{X}_i$ is the mean of X_{it} for entity *i*
- $\overline{\epsilon}_i$ is the mean of ϵ_{it} for entity *i*

This transformation removes the entity-specific effect α_i, allowing for consistent estimation of β.

Random Effects Model

The random effects (RE) model assumes that the variation across entities is random and uncorrelated with the explanatory variables. This model is suitable when the entity-specific effects are assumed to be random and not correlated with the independent variables.

Mathematical Representation:

Consider a panel data model where Y_{it} is the dependent variable for entity *i* at time *t*, X_{it} represents the explanatory variables, and α_i is the random entity-specific effect.

$$Y_{it} = \beta X_{it} + \alpha_i + \epsilon_{it} \quad (20)$$

In the RE model, α_i is treated as a random variable with mean zero and variance σ_α^2. The composite error term μ_{it} is defined as:

$$\mu_{it} = \alpha_i + \epsilon_{it} \quad (21)$$

The RE model can be estimated using Generalized Least Squares (GLS), which accounts for the structure of the composite error term.

Choosing Between FE and RE Models

The choice between FE and RE models depends on the nature of the entity-specific effects and their correlation with the explanatory variables. The Hausman test is commonly used to determine whether the FE or RE model is more appropriate. The test compares the consistency of the FE and RE estimators:

- **Null Hypothesis:** The RE model is appropriate (entity-specific effects are uncorrelated with explanatory variables).
- **Alternative Hypothesis:** The FE model is appropriate (entity-specific effects are correlated with explanatory variables).

Application in Corporate Finance

Example: Capital Structure and Firm Value

Fixed Effects Model:

$$Leverage_i = \beta_1 Firm\,Value_{it} + \alpha_i + \epsilon_{it} \tag{22}$$

Random Effects Model:

$$Leverage_i = \beta_1 Firm\,Value_{it} + \alpha_i + \epsilon_{it} \tag{23}$$

By employing FE and RE models, researchers can control for unobserved heterogeneity and obtain more reliable estimates of the impact of capital structure on firm value.

In sum, simultaneity is a significant source of endogeneity in corporate finance, leading to biased and inconsistent estimates. By employing strategies such as instrumental variables, simultaneous equations models, lagged variables, and panel data techniques, researchers can mitigate the impact of simultaneity and draw more reliable inferences about causal relationships.

2.3 Measurement error and endogeneity in corporate finance

Measurement error is a critical source of endogeneity in corporate finance research. It occurs when the variables used in a regression model are measured with error, leading to biased and inconsistent parameter estimates. This section explores the implications of measurement error, provides examples in corporate finance, and discusses strategies to address this issue.

To deal with the measurement error bias, researchers utilize the instrumental variables (IV) technique, error-in-variables models, panel data techniques and multiple measurements tactic. Specifically, the multiple measurements technique employs multiple proxies or repeated measurements of the same variable in order to average out the measurement error, leading to more accurate estimates.

3. Applications in Corporate Finance

It is clear from the foregoing discussion that endogeneity is a critical concern in studies examining the impact of corporate governance, capital structure, and investment decisions on firm performance. This section highlights the application of econometric techniques to address endogeneity in various areas of corporate finance.

3.1 The capital structure decision

Capital structure decisions are crucial in corporate finance as they determine the mix of debt and equity financing used by a firm. Endogeneity issues often complicate the analysis of capital structure determinants and their effects. Methods to address endogeneity in capital structure decisions include IV, panel data techniques, DiD, and matching methods.

Rajan and Zingales (1995) provide seminal cross-country evidence on the empirical regularities in capital structure determinants, but also highlight the limitations of interpreting the correlations causally due to potential endogeneity arising from omitted variables and reverse causality.

3.2 Corporate governance

Corporate governance plays a crucial role in ensuring that firms are managed in the best interests of shareholders and other stakeholders. Research in this area often faces endogeneity problems, which can obscure the true effects of governance mechanisms on firm performance. Methods to address endogeneity include IV, GMM, DiD, and matching methods.

3.3 Mergers and acquisitions

Mergers and acquisitions (M&A) are significant corporate events that can reshape industries and impact firm performance. Research in this area often faces endogeneity problems, which can obscure the true effects of M&A activities. Methods to address endogeneity include IV, DiD, matching methods, and panel data techniques.

3.4 Investment decisions

Investment decisions are critical in corporate finance as they determine how firms allocate resources to various projects and assets. Endogeneity issues often complicate the analysis of investment decisions and their effects.

A common measurement error in empirical research on investments is the use of the Tobin's q as proxy for investment or growth opportunity. The marginal q is the ratio of the market value of an additional unit of capital to its replacement cost. It is the theoretically correct measure for investment decisions, as it reflects the value of new investments. Average q, on the other hand, is the ratio of the total market value of a firm's assets to their total replacement cost. It is more easily observable and calculated, which rationalizes its more frequent use in empirical studies. Hayashi's (1982) work clarifies the condition under which average q and marginal q are equivalent. Hayashi (1982) establishes that if a firm operates under constant returns to scale and perfect competition, then average q will be equal to marginal q. However, in real world scenarios, these conditions often do not hold, leading to discrepancies between the two measures. Hayashi highlights that using average q as a proxy for marginal q can lead to inaccurate investment decisions. His work has been very influential in empirical work that utilizes Tobin's q ratio (Piluso, 2025; Soto, 2025; Li, Fei & Fei, 2025; Mykhayliv & Zauner, 2025).

Methods to address endogeneity include IV, panel data techniques, DiD, and matching methods.

3.5 Financial policy

Financial policy decisions are crucial in corporate finance as they determine how firms manage their capital, distribute earnings, and handle financial risks.

Endogeneity issues often complicate the analysis of financial policy determinants and their effects. Methods to address endogeneity include IV, panel data techniques, DiD, and matching methods.

4. Conclusion

Addressing endogeneity is essential for robust empirical research in corporate finance. By employing appropriate econometric techniques, researchers can mitigate the biases introduced by endogeneity and draw more reliable conclusions about causal relationships.

Endogeneity presents a significant challenge in corporate finance research, potentially leading to biased and inconsistent estimates that can undermine the validity of empirical findings. This paper has explored various sources of endogeneity, including omitted variable bias, measurement error, and simultaneity, and has highlighted the importance of addressing these issues to ensure robust and reliable results.

Several methodological approaches have been discussed as potential solutions to endogeneity, such as instrumental variable techniques, difference-in-differences, and fixed effects models. Each of these methods has its own strengths and limitations, and the choice of approach should be guided by the specific context and research question at hand.

In conclusion, while endogeneity remains a pervasive issue in corporate finance, the development and application of sophisticated econometric techniques offer promising avenues for mitigating its impact. Future research should continue to refine these methods and explore new strategies to address endogeneity, thereby enhancing the credibility and rigour of empirical studies in this field.

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.APPENDIX

Sources of Endogeneity in Corporate Finance, Examples/Cases in Finance and Remedies

S/N	Source of Endogeneity	Cases in Finance	Options to Address Them	Relevant Studies
1.	Omitted Variables	Firm performance influenced by unobserved managerial skill	Include relevant control variables	Terry, Whited & Zakolyukina (2023)
		Investment decisions affected by unobserved market conditions	Use fixed effects models	Houston & Shan (2022)
		Firms' market power influenced by macroeconomic policy such as monetary policy	Fixed effects models	Duval et al. (2024), Carletti et al. (2024)
		Financial distress influenced by unobserved economic factors	Use panel data techniques	Balboula & Shemes (2025), Giannellis & Tzanaki (2025), and Zhao et al. (2025)
		Mergers and acquisitions influenced by unobserved strategic motives	Apply difference-in-differences	Ellahie et al. (2025), Feyisetan et al. (2025), and Shams et al. (2025)
2.	Simultaneity	Capital structure decisions influencing firm value and vice versa	Use simultaneous equations models (SEMs)/ IV estimation	Li & Zhou (2025), Abdulkadir et al. (2025), Xu et al. (2025), Priyan et al. (2024)
		Corporate governance affecting firm performance and vice versa	Apply instrumental variables/ SEMs/ Lagged variables/ panel data techniques	Khatib (2024), Biju et al. (2025), Khan et al. (2025), Pavicevic & Keil (2025), Kim et al. (2025)
		Investment decisions influencing stock prices and vice versa	Use two-stage least squares (2SLS)/ IV estimation	Li & Xu (2025), Sood et al. (2025), Kaur & Singh (2025)

S/N	Source of Endogeneity	Cases in Finance	Options to Address Them	Relevant Studies
		Dividend policy affecting firm value and vice versa	Apply three-stage least squares (3SLS)	Paseda (2020), Aljbour et al. (2025), Ben Salah & Jarboui (2024), Boda & Jerabek (2025)
3	Measurement Error	Inaccurate reporting of financial metrics	Use higher-order moments estimators	Boda & Jerabek (2025), Chalak &Kim (2024)
		Errors in survey data on managerial practices	Implement robust measurement techniques	Hajek & Munk (2024), Mitton (2024), Zhang et al. (2024)
		Misreporting of earnings	Use scenario analysis/ Error-in-variable/ panel data	Kim-Duc & Nam (2024), Wisniewska et al. (2024)
		Inaccurate valuation of assets	Apply sensitivity analysis/ Error-in-variable/ panel data	Hajek & Munk (2024), Piluso (2025), Soto (2025)

Source: Authors' Review of the Literature