

EMPIRICAL EXAMINATION OF THE PECKING ORDER HYPOTHESIS AMONG PUBLICLY LISTED MINING FIRMS ON THE INDONESIA STOCK EXCHANGE IN THE POST-GLOBAL FINANCIAL CRISIS ERA (2011–2019)

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ARTICLE INFO	ABSTRACT
Accepted Accepted Accepted in the form of revisions Accepted in the form of revisions Keywords: External Funding, Indonesia Stock Exchange, Internal Funding, Mining, Pecking Order Hypotheses.	This study rigorously examines the empirical validity of the Pecking Order Hypothesis (POH) across heterogeneous investment intensities among 51 publicly listed mining firms on the Indonesia Stock Exchange (IDX) over the post-global financial crisis period of 2011–2019, utilizing panel data at a quarterly frequency. Employing a quantile regression approach, this research seeks to disentangle firm-level financing preferences by assessing the extent to which internal funds are prioritized relative to external financing, both debt and equity, under varying investment conditions. Key findings show limited support for the POH across the full sample. The empirical evidence reveals limited support for the POH across the full sample. Notably, external financing sensitivity exhibits a positive association with escalating levels of corporate investment, proxied through capital expenditure ratios, suggesting a deviation from the theoretical predictions of the hypothesis. The POH holds only within the metal and mineral extraction subsector, while firms with low leverage and low profitability show partial adherence at specific investment quantiles. Subsectoral analysis further indicates that the POH holds only within the metal and mineral extraction subsector, whereas firms with low leverage and diminished profitability exhibit partial adherence to the hypothesis at selective quantiles of investment intensity. Conversely, when disaggregated by ownership structure and firm size, the POH demonstrates no empirical validity whatsoever, underscoring the context-dependent and sector-specific nature of capital structure behavior in emerging markets. These results suggest that Indonesian mining firms deviate from traditional financing hierarchies, preferring external financing over internal funds during the post-crisis recovery period.

INTRODUCTION

The contemporary business ecosystem is characterized by rapid evolution and heightened volatility wherein elevated levels of market uncertainty have intensified competitive pressures across both domestic and international arenas (Chen et al., 2023; Kanda et al., 2021; Kohtamäki et al., 2019; Kokkonen et al., 2023; Palmié et al., 2022; Snihur & Bocken, 2022; Suuronen et al., 2024; Yoon et al., 2022). In navigating such an unpredictable and turbulent environment, firms are increasingly compelled to exhibit strategic agility and organizational resilience, often operating under conditions that may undermine stability and operational coherence. This volatile landscape necessitates that enterprises develop and sustain idiosyncratic competitive advantages to differentiate themselves and maintain viability across all functional domains of their business architecture. The imperative for adaptability is no longer optional but fundamental to long-term sustainability and strategic positioning.

According to the IMD World Competitiveness Ranking (2020), Indonesia was positioned 40th out of 63 countries assessed, reflecting a downward shift from its 2019 standing. Within the ASEAN bloc, Indonesia ranked fourth, trailing Singapore, Malaysia, and Thailand, which occupied the first, second, and third positions, respectively. The ranking methodology is predicated upon a multidimensional evaluation framework encompassing metrics such as real economic performance, business efficiency, governmental effectiveness, and the robustness of national infrastructure.

In light of the findings above, firms striving to remain competitive and enhance their market positioning must secure adequate financial resources to support their operational activities. These funds may be sourced internally, primarily through retained earnings, or externally, via debt instruments or equity issuance. The choice of financing sources reflects a core conceptual component of capital structure theory, which delineates how firms strategically balance debt and equity to finance their operations. Achieving an optimal capital structure represents a complex financial decision-making process that necessitates the careful calibration of leverage and equity proportions. The strategic allocation of financial resources is inherently challenging, as it is intricately linked to a multitude of interdependent financial variables. Capital structure decisions are not merely mechanical calculations; instead, they constitute an integral part of a firm's broader financing strategy, one that is often fraught with trade-offs and uncertainties. Given that the overarching objective of the firm is to maximize shareholder wealth, management is expected to pursue an optimal capital structure that not only supports sustainable growth but also accounts for its implications on financial risk, expected returns, and overall enterprise value. Consequently, the cost-benefit trade-off associated with each financing alternative must be rigorously evaluated, particularly in the context of minimizing the weighted average cost of capital (WACC) while preserving financial flexibility and mitigating agency conflicts (Vo, 2021). In an effort to elicit and sustain a favorable response from capital markets—an outcome anticipated to enhance shareholder value through increased stock prices—corporate managers often attempt to strategically

calibrate leverage levels that are presumed to optimize firm valuation. Debt financing, particularly when employed judiciously, offers certain fiscal advantages, most notably the interest tax shield, which can artificially inflate earnings per share (EPS) through reductions in corporate taxable income.

Nonetheless, beyond a critical threshold, excessive reliance on debt introduces heightened financial distress costs, elevates bankruptcy probability, and may, in turn, diminish firm value due to escalating risk exposure. From the investor's vantage point, financing decisions are critically evaluated through the lens of risk perception, particularly financial risk emanating from leveraged capital structures. While debt may serve as a cost-effective financing mechanism under certain market conditions, its deployment must be meticulously managed to avoid adverse implications for firm solvency, investor confidence, and market signaling. Within this complex trade-off framework, capital structure decision-making remains one of the most nuanced and contentious aspects of corporate financial strategy. The inherent absence of a universally optimal leverage ratio, attributable to heterogeneous firm-specific characteristics and evolving market dynamics, continues to challenge both practitioners and scholars. This ambiguity has led to the emergence of multiple theoretical frameworks seeking to explain corporate financing behavior, especially those rooted in informational asymmetries, such as the Pecking Order Hypothesis (Myers, 1984), Static Trade-Off Theory, Agency Theory, and Market Timing Theory.

Among these paradigms, the Pecking Order Hypothesis posits a financing hierarchy wherein managers prioritize internally generated funds—retained earnings—to finance operations and investments. When internal funds are insufficient, firms prefer debt over equity, primarily to mitigate the negative market signaling and potential dilution associated with equity issuance. As articulated by Zeitun et al. (2022), this behavioral tendency reflects managerial aversion to asymmetric information and market misinterpretation. Expanding on this notion, Baker and Wurgler (2002) and Marsh (1982) argue that favorable market valuations, often driven by transient investor sentiment, can create misalignments between perceived and intrinsic firm value. Under such circumstances, managerial discretion may lead to opportunistic capital raising—opting for either equity or debt issuance—based on the firm's valuation status (undervalued vs. overvalued), effectively engaging in market timing behavior to optimize financing costs. This study situates its empirical investigation within the mining sector—a strategically significant industry in Indonesia—characterized by robust profitability, persistent upward momentum in stock valuations, and a pronounced escalation in capital expenditure across the post-crisis decade. These sectoral attributes render it an empirically fertile ground for assessing the applicability of capital structure theories, particularly under the lens of financing preferences and investment intensity in emerging market contexts.

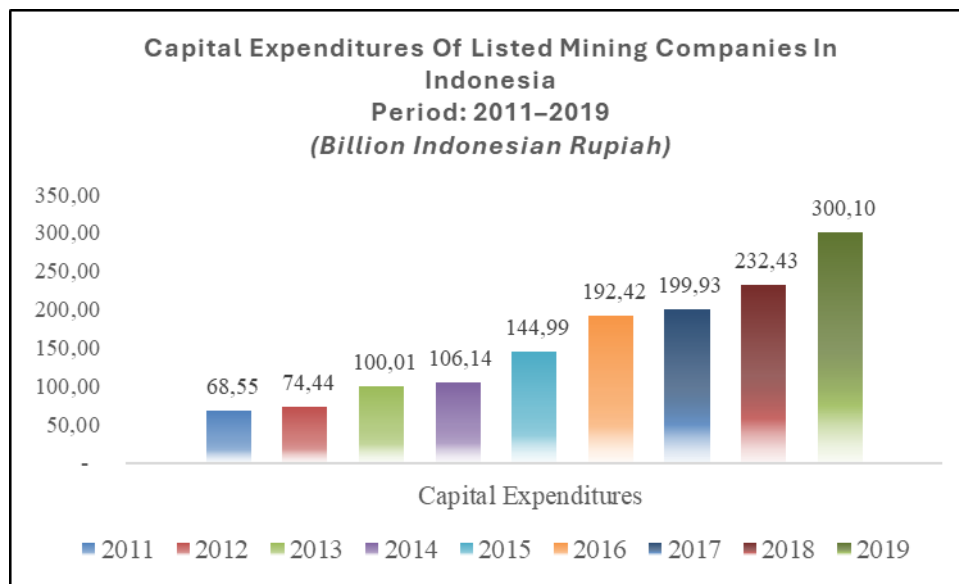


Figure 1. Trend of Capital Expenditure in the Mining Sector

Source: Refinitiv Eikon (processed by the authors)

In light of the foregoing, corroborated by insights from industry analysts and capital market specialists, the sustained optimistic outlook for the operational performance of the majority of firms within the mining sector has progressively facilitated their capacity to embark upon sizable and strategically significant capital expenditures. As such, managerial determinations to initiate and execute these substantial outlays constitute a salient area of academic scrutiny. The multifaceted nature of investment endeavors among mining enterprises—each characterized by idiosyncratic financial decision-making paradigms—engenders heterogeneity in financing modalities. The temporal dynamics surrounding project initiation, equity issuance, and debt instrument deployment to underwrite mining ventures reveal a spectrum of corporate financial behaviors that merit rigorous empirical examination.

This investigation draws methodological and theoretical inspiration from the seminal work of Yıldırım and Çelik (2020), who conducted an extensive 18-year longitudinal study on 179 manufacturing firms listed on Borsa Istanbul. This study diverges by concentrating on the mining sector and augmenting the analytical framework with supplementary covariates, including asset tangibility, profitability metrics, and a more constrained adjustment for cash flows, specifically focusing on free cash flow (FCF), while preserving the core variable set of the antecedent research. Moreover, the temporal scope of this research encompasses the post-global financial crisis interval spanning 2011 through 2019, preceding the onset of the COVID-19 pandemic. This epoch was deliberately chosen due to the observed trajectory of recovery and expansion exhibited by mining companies following the global economic downturn, coupled with consistent year-on-year growth culminating in 2019. Consequently, this period is expected to yield robust, contextually relevant insights into the financial structuring and capital allocation strategies prevalent in contemporary mining firms.

Finally, the selection of this timeframe is further justified by the requisite representativeness and statistical adequacy afforded by the population of mining companies listed on the Indonesia Stock Exchange (IDX), thereby ensuring empirical rigor and generalizability of findings.

This study builds on Yıldırım and Çelik's (2020) methodology while focusing specifically on Indonesian mining firms during the post-global financial crisis recovery period (2011-2019). The research incorporates additional variables including asset tangibility, profitability metrics, and free cash flow to provide a comprehensive analysis of financing behavior.

Research Objective this study aims to empirically test whether Indonesian mining firms follow the Pecking Order Hypothesis financing hierarchy during the post-crisis recovery period, examining how firm-specific characteristics influence financing preferences across different investment intensities.

RESEARCH METHOD

This study uses a type of quantitative research with an explanatory approach to empirically test the validity of the Pecking Order Hypothesis in mining companies in Indonesia. The data source used is secondary data obtained from the quarterly financial statements of 51 mining companies listed on the Indonesia Stock Exchange (IDX) for the period 2011-2019, as well as additional data from Refinitiv Eikon. The data collection technique is carried out through documentation of annual reports, financial statements, and official publications of capital market authorities.

Regression analysis is a statistical methodology employed to develop a mathematical model that delineates the relationship among variables (Saragih & Umanto, 2006). The regression model with a dependent variable y and i independent variables with the formula:

$$y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \beta_3 x_{i3} + \dots + \beta_i x_{it} + \varepsilon_i$$

With:

$\beta_0 = \text{Intercept}$

$\beta_i = \text{slope}$

$\varepsilon_i = \text{error}$

Random error in the regression model is quantified by the error variance (σ^2), which is estimated from the sample and serves as an indicator of the model's precision. A smaller estimated error variance (σ^2) corresponds to a more accurate and reliable regression model (Saragih & Umanto, 2006). Equation (3.9) represents a simplified form of the i simultaneous equations.

$$y_1 = \beta_0 + \beta_1 x_{11} + \beta_2 x_{12} + \beta_3 x_{13} + \dots + \beta_i x_{i1} + \varepsilon_1$$

$$y_2 = \beta_0 + \beta_1 x_{21} + \beta_2 x_{22} + \beta_3 x_{23} + \dots + \beta_i x_{i2} + \varepsilon_2$$

$$y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \beta_3 x_{i3} + \dots + \beta_i x_{it} + \varepsilon_i$$

This research utilizes quantile regression methodology, initially formulated by Koenker and Bassett (1978), articulated through the following functional specification:

$$Q_{\tau}(Y | X) = \beta_0 + \beta_{1\tau}X_1 + \beta_{2\tau}X_2 + \beta_{3\tau}X_3 + \dots + \beta_{t\tau}X_{it} + \varepsilon_{it}$$

With:

$Q_{\tau}(Y | X)$ = The τ quantile function of the variable Y conditional on X

τ = quantile index

$\beta_{1\tau}, \beta_{2\tau}, \beta_{t\tau}$ = The i-th regression coefficient at the τ quantile

This methodology constitutes a robust regression framework predicated on a specified quantile criterion, wherein the objective function minimizes a weighted, asymmetric absolute deviation to estimate the conditional quantile function of the underlying data distribution (Koenker & Bassett, 1978). By optimizing the least absolute deviations (LAD) criterion, quantile regression elucidates the heterogeneity in the conditional distribution of the response variable, as encapsulated by the quantile-specific parameter estimates. This approach circumvents the restrictive assumptions characteristic of the classical ordinary least squares (OLS) paradigm, thereby offering a more resilient alternative for modeling distributional dynamics across various conditional quantiles.

RESULT AND DISCUSSION

Table 1. Mining Company Financing Preference Pattern Based on Ranking Order Hypothesis

	<i>First Rung</i>	<i>Second Rung</i>	<i>Pecking Order Hypotheses</i>
By Ownership			
<i>Private</i>	EXTF > CF	Equity > Debt	Contrary
<i>Foreign</i>	EXTF > CF	Equity > Debt	Contrary
<i>Government</i>	EXTF > CF	Equity > Debt	Contrary
Size			
<i>Large</i>	EXTF > CF	Equity > Debt	Contrary
<i>Small</i>	EXTF > CF	Equity > Debt	Contrary
Leverage			
<i>High</i>	EXTF > CF	Equity > Debt	Contrary
<i>Low</i>	EXTF < CF	Equity > Debt	In concordance with the first rung, but opposed to the second rung
By Subsektor			
Batu Bara	EXTF > CF	Equity > Debt	Contrary
Logam Mineral	EXTF < CF	Equity < Debt	Fit
Migas	EXTF > CF	Equity > Debt	Contrary
TBG	EXTF > CF	Equity < Debt	Opposed to the first rung but in concordance with the second rung
Profitability			
<i>High</i>	EXTF > CF	Equity > Debt	Contrary
<i>Low</i>	EXTF > CF	Equity < Debt	Opposed to the first rung but in concordance with the second rung

	<i>First Rung</i>	<i>Second Rung</i>	<i>Pecking Order Hypotheses</i>
<i>Tangibility</i>			
<i>High</i>	EXTF > CF	Equity > Debt	Contrary
<i>Low</i>	EXTF < CF	Equity > Debt	In concordance with the first rung, but opposed to the second rung

Discussions

- a. About ownership structure, firms owned by domestic private entities, foreign private investors, and government bodies consistently demonstrate that, at the First Rung, external financing constitutes a preferred alternative over internal cash flow. At the Second Rung, equity issuance emerges as the predominant financing choice.
- b. In terms of firm size, both large-scale and small-scale enterprises exhibit analogous patterns, wherein external financing is favored over cash flow at the First Rung. At the same time, equity issuance is predominantly selected at the Second Rung.
- c. Concerning leverage, firms with high leverage display divergent financing behavior compared to those with low leverage at the First Rung. Nevertheless, at the Second Rung, both highly leveraged and low-leverage firms converge in their preference for equity issuance as the optimal financing mechanism.
- d. When analyzed by subsector, mining firms within the Coal, Crude Oil and Natural Gas, and Earth and Rock Mining categories display a consistent tendency to rely more heavily on external financing rather than internal cash flows. This pattern stands in contrast to the traditional pecking order hypothesis, which asserts that firms preferentially utilize internal financing before seeking external sources. In contrast, firms operating within the Metals and Minerals subsector predominantly favor internal cash flows, thereby exhibiting financing behavior that is congruent with the pecking order theory. At the secondary level of financing preferences, entities within the Coal and Crude Oil and Natural Gas subsectors show a proclivity toward equity issuance over debt financing. This, again, deviates from the hierarchical financing preferences proposed by the pecking order hypothesis, which posits debt as the preferred external financing method before equity. Conversely, firms in the Metals and Minerals and Earth and Rock Mining subsectors demonstrate a preference for debt over equity, in alignment with the theoretical framework. These findings suggest that adherence to the pecking order hypothesis varies across mining subsectors, indicating that sector-specific factors may influence firms' capital structure decisions and financing behavior.
- e. With respect to profitability, firms consistently demonstrate that, at the First Rung, external financing functions as a viable substitute for internal cash flow. Conversely, at the Second Rung, heterogeneous outcomes are observed between firms exhibiting high versus low profitability.
- f. About asset tangibility, firms characterized by differing levels of tangibility present divergent financing behaviors at the First Rung; notably, those with high tangibility consider external financing as a preferable alternative to internal cash resources. At

the Second Rung, however, firms, irrespective of tangibility, converge in their preference for equity issuance as the predominant capital-raising strategy.

CONCLUSION

This study aims to examine the extent to which the financing behavior of firms in the mining sector aligns with the theoretical predictions of the pecking order hypothesis. The empirical analysis yields the following key findings: 1) The ratio of Free Cash Flow (FCF) to Capital Expenditures relative to Net Fixed Assets (CAPEX/NFA) does not exhibit a statistically significant impact on firms' investment activities within the mining sector during the post-global financial crisis period. This outcome suggests a notable divergence from the foundational tenets of the Pecking Order Hypothesis, which posits a preferential reliance on internally generated funds for capital investment. 2) External financing through debt instruments demonstrates a statistically significant and positive association with the CAPEX-to-Net Fixed Assets ratio, implying a pronounced reliance on debt capital as a primary funding mechanism for investment activities in the aftermath of the global financial crisis. This finding challenges the conventional financing hierarchy prescribed by the Pecking Order Hypothesis, wherein debt is considered a secondary option following internal resources. 3) Similarly, external equity issuance exerts a statistically significant influence on the CAPEX/NFA ratio, indicating that mining firms increasingly resort to equity markets as a viable source of capital investment financing in the post-crisis period. This behavior further contravenes the sequential financing preferences articulated by the Pecking Order framework. 4) The Market-to-Book ratio, often conceptualized as a proxy for growth opportunities and the degree of information asymmetry, fails to demonstrate a statistically significant effect on capital investment decisions—measured through the CAPEX/NFA ratio. This finding implies that market-based valuation signals may not materially shape financing strategies in the mining sector during the observed post-crisis timeframe.

Based on a comprehensive examination of the empirical findings, it can be inferred that mining sector firms listed on the Indonesia Stock Exchange in the post-global financial crisis period do not conform to the theoretical underpinnings of the Pecking Order Hypothesis. This divergence suggests a departure from the conventional financing hierarchy, wherein internally generated funds are theoretically prioritized over debt and external equity issuance. 7) Advisory Directive or Recommendations for Investors and Prospective Investors, this study is anticipated to furnish critical insights into the funding preferences predominantly adopted by firms during capital investment undertakings, for Corporate Management, it is imperative that firms not only reinforce but also rigorously adhere to prudential governance principles in the stewardship and strategic decision-making about external financing, given the demonstrably greater deleterious effects such funding mechanisms exert on firm valuation, for Creditors, the empirical findings offer substantive guidance regarding liquidity management and credit risk assessment in loan structuring, particularly in the calibration of credit ceilings. Firms exhibiting a proclivity towards equity financing necessitate a nuanced evaluation of the trade-offs involved in

debt instrument utilization, alongside a comprehensive risk appraisal informed by historical funding modality patterns, for Capital Market Regulators, the results proffer a pivotal evidentiary basis to fortify regulatory frameworks governing the disclosure of corporate financing instruments and quantum, especially in scenarios involving foreign capital infusion through debt or equity channels and for the Academic Community, this research provides a robust foundation for advancing theoretical frameworks through the enhancement and segmentation of extant analytical models, thereby facilitating more granular and sophisticated empirical investigations.

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