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Behavioral governance and firm returns in the digital banking ERA: The role of CEO overconfidence, risk-taking, and CEO characteristics - evidence from Indonesia

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Abstract: This study examines behavioral corporate governance in Indonesia's digital banking sector by analyzing how CEO overconfidence influences firm returns through risk-taking behavior, while considering CEO age and gender as moderating governance mechanisms. Grounded in Upper Echelons Theory and Agency Theory, the study employs a quantitative approach using Structural Equation Modeling (SEM) to analyze 196 firm-year observations from seven Indonesian digital banks over the period 2018–2024. The results demonstrate that CEO overconfidence significantly increases risk-taking behavior, while risk-taking positively affects firm returns. CEO overconfidence does not exert a direct effect on firm returns, indicating that its economic impact materializes indirectly through strategic risk-taking decisions. CEO age significantly moderates the relationship between overconfidence and risk-taking, attenuating excessive risk escalation, while both CEO age and gender positively moderate the relationship between risk-taking and firm returns. These findings suggest that executive demographics function as behavioral governance filters that shape how managerial bias is translated into financial outcomes. This study reframes corporate governance as a behavioral system by integrating executive psychology and demographic heterogeneity into the governance–performance nexus. By providing emerging-market evidence from Indonesia's digital banking sector, the study demonstrates that firm returns depend not on executive optimism per se, but on how behavioral bias is governed through risk discipline and leadership composition in technology-driven financial institutions.

Keywords: *Behavioral corporate governance, CEO age, CEO gender, CEO overconfidence, Digital banking, Firm returns, Indonesia, Risk-taking.*

1. Introduction

1.1. Background

Indonesia's banking landscape has undergone substantial transformation through the rise of digital banks, institutions that operate predominantly through online platforms and mobile applications, which have redefined access to financial services through automation, artificial intelligence, and fintech integration. While digital transformation has enabled operational efficiency and financial inclusion, reaching previously unbanked populations [1, 2], it has also introduced new behavioral and governance challenges related to risk appetite, leadership decisions, and sustainability [3].

Digital banking's value creation relies not only on technological innovation and capability but also on managerial cognition, how CEOs perceive opportunities and threats within volatile technological ecosystems [4]. The leadership of digital banks often rests in the hands of CEOs who exhibit high confidence and innovation drive, attributes that can become double-edged swords. While overconfidence

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may stimulate bold strategic initiatives and rapid digital expansion, it may also induce excessive risk-taking, compromising financial stability and long-term firm returns [5-7].

The Indonesian Financial Services Authority (OJK) reports that the average Non-Performing Loan (NPL) ratio of the digital banking segment exceeded that of conventional banks in 2023 (2.4% industry average; digital segment 3.1%), largely due to unsecured lending and fintech collaborations. This raises an important behavioral governance question: to what extent does CEO overconfidence influence risk-taking and firm returns in digital banks? This question bridges two major fields, corporate governance and behavioral finance, by integrating classical notions of accountability, integrity, efficiency, and transparency [8] with the psychological constructs of managerial bias. As *A Tale of Corporate Governance* posited, corporate sustainability ultimately depends on the faithful implementation of governance principles rather than mere formal adoption. This behavioral dimension, when applied to digital banks, offers a compelling context to revisit how executive cognition and governance culture interact.

1.2. Research Problem

The central challenge in Indonesia's digital banking sector is aligning rapid digital innovation with responsible risk governance. Empirical evidence reveals that digital banks often face trade-offs between short-term growth and long-term returns preservation, especially when CEOs demonstrate strong optimism and self-assurance [9], which may lead to lower credit standards, higher leverage, and increased loan losses [10].

Previous research has not adequately addressed how CEO overconfidence interacts with firm returns through risk-taking behavior, nor how CEO characteristics moderate this linkage within the Southeast Asian context. Most prior studies have focused on developed markets, leaving a significant gap in understanding behavioral governance in emerging markets [5, 11].

Guided by the behavioral-governance framework, this study addresses three central questions: First, it examines how CEO overconfidence drives risk-taking in digital banks, whether managerial optimism fuels innovation or leads to excessive exposure. Second, it investigates how risk-taking shapes firm returns, determining whether strategic boldness enhances or undermines market performance. Finally, it explores whether CEO characteristics, age, and gender moderate these relationships, assessing how experience and diversity influence the translation of executive bias into financial outcomes.

Together, these questions capture the study's core inquiry: how executive behavior and demographics shape return creation in Indonesia's digital banking sector.

1.3. Research Contribution

This study makes three interrelated contributions to the body of literature on behavioral corporate governance and financial decision-making in digital banking institutions. First, it extends the classical paradigm of corporate governance, traditionally grounded in the structural and procedural principles of accountability, integrity, efficiency, and transparency [8], by integrating them with the behavioral finance perspective, particularly the concept of CEO overconfidence. While corporate governance research has long emphasized institutional frameworks and compliance mechanisms, this study repositions governance as a *behavioral system*, where managerial cognition and psychological biases play an important role in shaping organizational risk behavior. The behavioral extension proposed in this paper reflects a paradigm shift: from governance as a static control mechanism to governance as a dynamic, cognition-driven process that evolves through executive perception, optimism, and decision-making under uncertainty.

Second, this study contributes to the emerging-market evidence base by examining behavioral governance dynamics within Indonesia's digital banking sector. Existing empirical work on CEO overconfidence and bank risk-taking has predominantly focused on developed financial systems [11, 12], leaving a limited understanding of how behavioral biases operate in emerging economies

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characterized by rapid digital transformation, evolving regulatory oversight, and financial inclusion mandates. Using data from seven Indonesian digital banks over the period 2018–2024, this study provides robust empirical evidence that executive cognitive bias materially affects firm returns through its influence on strategic risk-taking. In doing so, the Indonesian context illustrates that behavioral governance can simultaneously function as a catalyst for innovation and a source of financial fragility when executive optimism is insufficiently disciplined by governance mechanisms.

Third, the study enriches Upper Echelons Theory [13, 14] by incorporating CEO demographic characteristics, age, and gender, as behavioral governance mechanisms rather than merely control variables. The findings demonstrate that demographic traits condition how executive bias is translated into organizational outcomes, but at different stages of the behavioral process. Specifically, CEO age moderates the relationship between overconfidence and risk-taking, indicating that accumulated experience and historical awareness temper excessive risk escalation driven by managerial optimism. In contrast, CEO gender does not significantly influence the formation of risk-taking behavior but instead moderates the relationship between risk-taking and firm returns, strengthening the effectiveness with which risk exposure is converted into sustainable financial performance. This distinction highlights that demographic diversity operates not as a uniform behavioral constraint but as a selective governance filter that shapes the economic consequences of executive decisions.

By integrating executive psychology, demographic heterogeneity, and institutional context within a unified analytical framework, this study offers a more nuanced understanding of how governance operates in digital banking. It demonstrates that firm returns depend not simply on technological capability or executive confidence, but on how behavioral bias is governed through experience, diversity, and risk discipline. In doing so, the study advances behavioral corporate governance as a critical lens for understanding value creation and sustainability in the digital era.

2. Literature Review

2.1. Behavioral Corporate Governance and Firm Failure

Corporate governance research increasingly recognizes that firm sustainability is shaped not only by formal governance arrangements but also by the behavioral conduct of those entrusted with decision-making authority. Historical corporate failures demonstrate that breakdowns in governance frequently stem from distorted managerial judgment rather than from the absence of formal rules or institutional safeguards. High-profile collapses such as Enron revealed that compliance structures may coexist with behavioral deviations that undermine accountability and ethical discipline [8, 15, 16].

From a behavioral perspective, governance failure arises when executives selectively interpret information, rationalize excessive risk exposure, or suspend ethical constraints under conditions of optimism and perceived control. Rather than being purely financial in origin, many governance breakdowns reflect cognitive distortions such as overconfidence, confirmation bias, and moral disengagement, which gradually weaken the integrity of internal control systems [12, 17]. In this sense, governance quality is inseparable from the behavioral consistency with which its principles are enacted.

This behavioral interpretation is especially relevant for financial institutions, where risk decisions are frequent, complex, and forward-looking. In banking systems, governance effectiveness depends on how executive judgment interacts with uncertainty, regulatory constraints, and market pressure. When behavioral biases go unchecked, formal governance mechanisms may fail to prevent excessive risk accumulation, even in institutions that seem well governed on paper.

Digital banking amplifies these governance challenges. The sector operates at the intersection of rapid technological innovation, algorithmic decision-making, and evolving regulatory oversight. Executives in digital banks often manage opaque risk structures embedded in data analytics and platform-based lending models. As a result, behavioral deviations can propagate quickly, widening the gap between perceived and actual risk exposure. Understanding governance in digital banking,

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therefore requires moving beyond institutional design toward an examination of how executive cognition shapes risk behavior in real time.

2.2. CEO Overconfidence

CEO overconfidence represents a systematic cognitive bias in which executives exhibit inflated beliefs about their judgment accuracy, strategic foresight, or ability to control outcomes. Rather than random error, overconfidence reflects a persistent psychological tendency to assign greater weight to internally generated beliefs than to external signals or objective constraints [5, 11, 18]. This bias influences how executives interpret uncertainty, evaluate investment opportunities, and assess downside risk.

Empirical research consistently associates CEO overconfidence with assertive strategic behavior, including increased investment intensity, delayed divestment from underperforming assets, and higher leverage [6, 19, 20]. Overconfident executives are more likely to pursue ambitious growth strategies and interpret favorable outcomes as validation of their superior judgment. Adverse signals are often discounted or reframed as temporary deviations, reinforcing optimistic expectations.

In financial institutions, the implications of overconfidence are particularly consequential. Banking decisions involve asymmetric payoffs, where small misjudgments can generate disproportionate losses. Overconfident CEOs may underestimate tail risks, rely excessively on internal risk models, or overtrust technological solutions designed to manage credit and operational uncertainty. These tendencies can elevate firm exposure even when conventional risk indicators appear stable.

Within digital banking, overconfidence gains additional importance. The sector's reliance on data-driven lending, automated decision systems, and rapid scaling creates an environment conducive to optimism about predictive accuracy and technological control. Executives may assume that algorithmic sophistication mitigates traditional banking risks, leading to aggressive expansion in unsecured lending or experimental financial products. Consequently, CEO overconfidence in digital banks functions not merely as a psychological trait but as a governance-relevant factor shaping strategic risk posture and long-term performance sustainability.

2.3. Risk-Taking Behavior

Risk-taking constitutes a central strategic mechanism through which firms pursue growth and competitive advantage, particularly in financial institutions where returns are intrinsically linked to risk exposure. In banking, risk-taking encompasses deliberate decisions related to credit allocation, balance-sheet leverage, earnings volatility, and investment in uncertain technological or market opportunities. When aligned with firm capabilities and governance discipline, risk-taking can enhance performance; when misaligned, it becomes a source of fragility.

Behavioral research indicates that executive risk-taking is not purely a function of objective opportunity sets but is shaped by managerial perception and cognitive bias. Overconfident executives tend to form overly favorable expectations regarding project outcomes, leading them to accept higher levels of financial exposure while underestimating downside scenarios [21, 22]. This behavioral inclination can manifest in relaxed lending standards, rapid portfolio expansion, or tolerance for earnings volatility.

Importantly, risk-taking is not inherently detrimental. In innovation-driven sectors such as digital banking, strategic risk-taking enables experimentation, technological learning, and financial inclusion. The critical distinction lies between calibrated risk-taking, supported by monitoring, diversification, and governance oversight, and excessive risk-taking driven by biased judgment. The former contributes to sustainable returns, while the latter undermines financial resilience.

In this study, risk-taking is conceptualized as the behavioral transmission channel linking CEO overconfidence to firm returns. It represents the mechanism through which psychological orientation is translated into observable financial outcomes. In digital banks, this translation is evident in patterns such as accelerated loan growth in unsecured segments, reliance on fintech partnerships, and

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investments in platform ecosystems. Whether these strategies enhance or erode firm returns depends on how behavioral risk impulses are moderated by governance structures and leadership characteristics.

2.4. CEO Characteristics

CEO age and gender have long been recognized as demographic proxies for cognitive orientation and behavioral stability. According to *Upper Echelons Theory* [13], these observable characteristics reflect deeper psychological dispositions shaped by experience, risk preference, and socialization.

Older CEOs tend to be more cautious, guided by accumulated experience and heightened risk awareness [23]. They are more likely to value organizational continuity and reputational protection, often resisting impulsive strategic moves. Younger CEOs, conversely, show higher tolerance for ambiguity and greater propensity for innovation, characteristics that can drive performance in high-growth environments but also increase exposure to uncertainty.

Gender adds another layer of behavioral differentiation. Numerous studies find that female CEOs adopt more risk-averse, ethically consistent, and stakeholder-oriented decision patterns [24, 25]. In the banking sector, female leadership has been empirically linked to lower non-performing loan ratios, higher capital adequacy, and improved compliance culture. These tendencies derive not from capability differences but from divergent social cognition, where women executives exhibit greater loss aversion and longer-term orientation.

In the digital banking context, where the CEO's strategic horizon must balance innovation with prudence, these demographic attributes become critical moderators. This study, therefore, postulates that age and gender do not act merely as control variables but actively moderate the behavioral translation of overconfidence into risk-taking and firm returns, shaping how optimism is expressed and constrained within governance systems.

3. Theoretical Framework

3.1. Upper Echelons Theory

The Upper Echelons Theory (UET) [13] provides the behavioral foundation for this research. UET posits that organizational outcomes reflect the cognitive bases, values, and personality traits of top executives. Leaders interpret strategic environments through their mental models, and their demographic and psychological characteristics directly shape firm performance.

In the context of digital banking, the CEO's cognitive schema, formed through technological expertise, prior career experiences, and confidence in digital transformation, becomes the principal filter for strategic choice. Overconfidence, in this sense, represents an exaggerated form of the cognitive simplification process described by UET: the CEO's belief in their superior insight and control leads to selective perception, heightened optimism, and a preference for bold strategies.

This study extends UET by empirically linking psychological bias (overconfidence), strategic behavior (risk-taking), and performance outcomes (firm returns) within a single structural model. Moreover, by incorporating CEO age and gender as moderating variables, it reaffirms UET's proposition that observable demographic traits serve as valid proxies for underlying cognitive differences. The interaction effects capture how demographic diversity conditions the expression of bias in complex decision environments.

3.2. Agency Theory

While Upper Echelons Theory explains how executive cognition shapes strategic outcomes, Agency Theory provides the institutional rationale for constraining managerial discretion. Agency Theory conceptualizes the firm as a contractual relationship in which decision-making authority is delegated to managers, whose preferences and perceptions may diverge from those of owners [26]. Such divergence creates vulnerability to inefficient risk choices, particularly when managerial judgment is distorted by cognitive bias.

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In banking organizations, agency frictions are especially pronounced because risk decisions generate asymmetric payoffs and are often difficult for principals to observe or evaluate ex ante. Overconfidence exacerbates these frictions by altering the manager's internal assessment of risk and return, leading executives to perceive aggressive strategies as value-enhancing even when they exceed the firm's optimal risk tolerance. The resulting misalignment does not necessarily stem from opportunistic intent but from biased belief formation under uncertainty.

These challenges are amplified in digital banks, where technological complexity and algorithmic decision systems reduce transparency for boards, shareholders, and regulators. Credit allocation based on proprietary models, platform-based investments, and fintech partnerships introduces layers of informational opacity that widen behavioral information gaps. In such settings, overconfident executives may expand risk exposure under the conviction that technology substitutes for prudential judgment.

By integrating Agency Theory with Upper Echelons Theory, this study adopts a behavioral–agency perspective in which governance failures arise not only from incentive misalignment but also from bounded rationality and psychological distortion. Effective governance, therefore, requires mechanisms that address both structural agency costs and behavioral agency costs. Traditional tools, such as board oversight, audit committees, and incentive design, remain essential, but they are insufficient on their own. Behavioral correctives, including leadership diversity, transparency in strategic reasoning, and awareness of cognitive bias, play a complementary role in sustaining firm returns in technologically intensive banking environments.

3.3. Conceptual Framework

The conceptual model combines the insights of UET and Agency Theory into an integrated behavioral-governance structure. It positions CEO overconfidence as an antecedent influencing firm returns indirectly through risk-taking, while CEO characteristics moderate both the overconfidence-risk and risk-returns relationships.

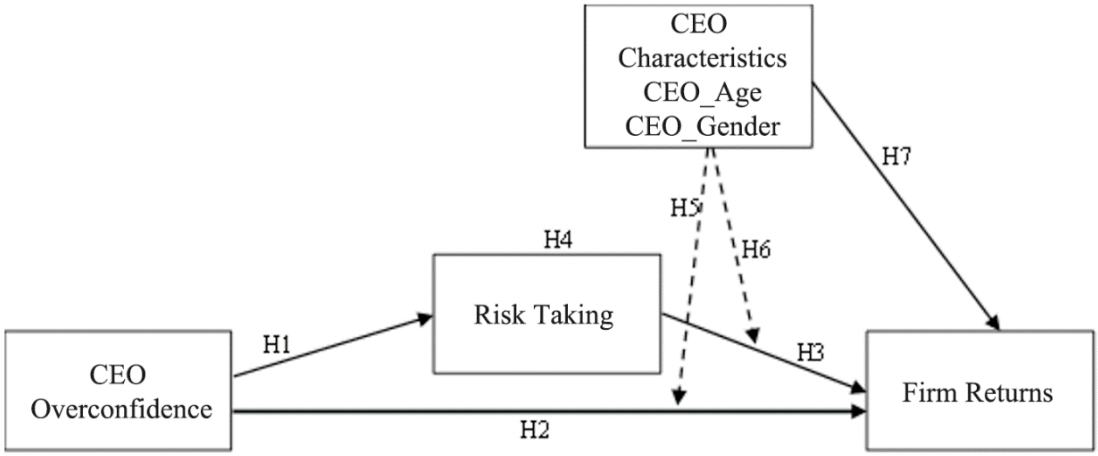

Figure 1.
Conceptual framework.

This framework hypothesizes that CEO overconfidence leads to increased risk-taking (H1), which enhances firm returns under effective governance (H3). The direct effect of overconfidence on firm returns is expected to be insignificant (H2), emphasizing mediation through risk behavior (H4). CEO age and gender moderate both stages of the behavioral chain, dampening or refining the impact of bias on organizational performance (H5–H7).

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3.4. Hypothesis Development

Building on the conceptual framework, the following hypotheses are developed:

H_1: *CEO overconfidence positively influences risk-taking*. Overconfident CEOs perceive higher probabilities of success and therefore initiate bolder, risk-laden strategies [5]. In digital banks, this manifests as aggressive expansion of unsecured lending and technological investments.

H_2: *CEO overconfidence has no significant direct effect on firm returns*. The net impact of overconfidence is conditional; while optimism can generate innovation, it can also trigger mispricing and volatility. The overall firm returns effect depends on the mediating influence of risk governance.

H_3: Risk-taking positively affects firm returns when undertaken within effective governance constraints. Consistent with the risk-return trade-off, higher controlled risk exposure enhances firm returns when accompanied by strong governance and market validation.

H_4: Risk-taking mediates the relationship between CEO overconfidence and firm returns. Risk behavior acts as the conduit translating psychological bias into financial outcomes.

H_{5a-b}: *CEO age and gender moderate the relationship between overconfidence and risk-taking*. Older and female CEOs, owing to greater caution and regulatory sensitivity, are expected to attenuate the magnitude of risk escalation induced by overconfidence.

H_{6a-b}: *CEO age and gender moderate the relationship between risk-taking and firm returns*. When risk behavior occurs under the stewardship of more experienced or female leaders, the outcome tends to be more sustainable, strengthening the risk–returns linkage.

H_7: *CEO characteristics directly influence firm returns*. Demographic composition of leadership affects strategic coherence and market perception, contributing to returns beyond psychological and behavioral pathways.

These hypotheses operationalize a behavioral governance model that transcends conventional financial metrics by embedding executive psychology and demographic moderation into the analysis of firm return creation.

4. Methodology

4.1. Research Design

This study adopts a quantitative explanatory design intended to test causal relationships between CEO overconfidence, risk-taking behavior, and firm returns in the context of Indonesia's digital banking sector. The design follows a positivist epistemological orientation, emphasizing objectivity, replicability, and empirical verification through numerical data and statistical modeling. Structural Equation Modeling (SEM) using LISREL 8.80 is used as a tool for simultaneous estimation of measurement and structural models. SEM is particularly suited to this research because it accounts for latent constructs such as overconfidence and risk-taking, phenomena that cannot be directly observed but can be inferred from multiple proxy indicators.

The methodological choice reflects the complexity of behavioral governance phenomena: overconfidence and risk-taking are intertwined psychological and strategic constructs that operate through interdependent pathways. By combining confirmatory factor analysis (CFA) for validity testing with path analysis for hypothesis verification, SEM provides a comprehensive model approach these multidimensional relationships. The design's explanatory nature also permits the identification of mediating (risk-taking) and moderating (CEO age and gender) mechanisms, aligning with the behavioral-agency framework articulated in the theoretical section.

4.2. Population and Sample

The population of this study comprises all banks operating under a digital banking license as recognized by the Otoritas Jasa Keuangan (OJK) as of December 2024. Indonesia's digital banking landscape remains relatively concentrated, with only a handful of fully licensed entities. Applying purposive sampling, the study selects seven digital banks with the largest total assets that meet three

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criteria: (1) continuous operation and availability of audited financial statements for 2018–2024; (2) disclosure of CEO identity and tenure; and (3) publicly accessible data on key performance indicators. Collectively, these banks represent over 85 percent of the total assets of the digital banking segment in Indonesia and embody diverse ownership structures, ranging from state-linked subsidiaries to private fintech-led ventures.

Given the seven-year observation window and seven banks, the balanced panel yields 196 firm-year observations. The unit of analysis is the CEO-year, acknowledging that executive characteristics and behavioral tendencies can vary across time even within the same institution. This longitudinal approach enhances the study's ability to capture the temporal evolution of behavioral effects, a feature often overlooked in cross-sectional designs.

4.3. Data Type and Sources

The research relies exclusively on secondary data, chosen for its reliability, accessibility, and ability to reflect real-world conditions unobstructed by survey bias. Data are sourced from multiple repositories to ensure triangulation and traceability, including publicly available annual reports and audited financial statements from the company's investor relations portals and OJK filings for the period 2018-2024.

The use of secondary data in this study enables replication and comparative benchmarking against similar regional studies while reducing common method variance. Furthermore, all firm-level variables were cross-verified with multiple sources to ensure data integrity, a critical requirement in behavioral finance research where subtle measurement errors can distort inference.

4.4. Operationalization of Variables

To translate conceptual constructs into measurable entities, this study employs well-established proxy indicators from behavioral finance and banking literature. Each variable is reflective (not formative), consistent with the assumption that the latent construct causes variation in its indicators rather than the reverse.

CEO Overconfidence (OC) is proxied through three behavioral signals: (1) the optimism gap between forecasted and realized earnings per share; (2) the CEO's retention ratio of vested stock options; and (3) the linguistic positivity index derived from sentiment analysis of Management Discussion & Analysis (MD&A) reports. These capture cognitive optimism, risk preference, and communication tone, dimensions widely recognized in the literature [5, 11, 18, 27].

Risk-Taking (RT) is operationalized through the Loan-to-Deposit Ratio (LDR), volatility of Return on Assets (σROA), and growth in unsecured or SME loans, capturing both balance-sheet exposure and earnings volatility [21].

Firm Returns (FR) are measured through Returns on Equity (ROE), Returns on Assets (ROA), and equity growth, representing accounting-based and equity-performance measures of firm returns.

CEO Characteristics (CC) are operationalized via AGE (continuous variable) and Gender (GEN) (dummy variable: male = 1, female = 0).

All indicators were standardized (z-scores) and winsorized at the 5th and 95th percentiles to mitigate outlier effects. This consistent scaling ensures comparability across banks and years, which is particularly important for multi-year SEM analysis.

4.5. Model Specification

The structural equation model is specified as a system of interrelated regressions connecting psychological, behavioral, and financial constructs:

$$RT = \beta_1 OC + \beta_2(OC \times AGE) + \beta_3(OC \times GEN) + \varepsilon_1$$

$$FR = \beta_4 RT + \beta_5 OC + \beta_6(RT \times AGE) + \beta_7(RT \times GEN) + \varepsilon_2$$

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The first equation models how CEO overconfidence and its demographic interactions influence risk-taking behavior. The second equation captures how risk-taking, along with CEO characteristics, drives firm returns. The mediating and moderating pathways together form the behavioral governance mechanism hypothesized in the conceptual framework.

This dual-equation structure allows the study to decompose total effects into direct, indirect, and conditional components. Indirect effects (mediation) were validated through bootstrapped Sobel tests with 10,000 resamples, while moderation effects were verified using latent interaction modeling in LISREL. Model stability was further assessed through multi-group analyses across ownership types (state-affiliated vs. private) to examine structural invariance.

4.6. Goodness-of-Fit Assessment

Model adequacy was assessed through a combination of absolute, incremental, and parsimonious fit indicators to evaluate both statistical reliability and conceptual consistency. The estimated fit statistics ($\chi^2/df = 1.812$; GFI = 0.943; AGFI = 0.915; CFI = 0.967; RMSEA = 0.049; SRMR = 0.046) indicate a well-specified model, with all values falling within commonly accepted evaluation ranges [26], demonstrating both parsimony and explanatory precision.

Beyond numerical fit, construct reliability and validity were scrutinized through three complementary checks:

1. Internal consistency: All latent constructs demonstrated satisfactory internal consistency, with composite reliability values comfortably exceeding the recommended minimum threshold.
2. Convergent validity: Convergent validity was supported, as the proportion of variance captured by each construct exceeded the level typically regarded as adequate.
3. Discriminant validity: The square root of each construct's AVE exceeded its inter-construct correlations, satisfying the Fornell–Larcker criterion.

Together, these diagnostics confirm that the measurement model accurately captures the underlying behavioral constructs and that multicollinearity and specification errors are minimal. The strong model fit suggests that the relationships between psychological and financial dimensions are empirically stable and conceptually meaningful within Indonesia's digital banking environment.

4.7. Reliability, Validity, and Data Diagnostics

To reinforce empirical rigor, several diagnostic procedures were implemented.

Reliability and Construct Validity: Reliability diagnostics further confirm that the measurement items consistently represent their underlying constructs, as demonstrated by Cronbach's alpha coefficients for each latent variable (OC = 0.83, RT = 0.81, FR = 0.87). Factor loadings from confirmatory factor analysis (CFA) all exceeded 0.70 and were significant at $p < 0.001$, affirming indicator reliability.

Normality and Multicollinearity. Skewness and kurtosis values for all standardized indicators fell within ±1.5, supporting the assumption of multivariate normality required by LISREL's Maximum Likelihood estimation. Variance Inflation Factors (VIF) were below 3.0, suggesting an absence of multicollinearity among predictors.

Endogeneity and Robustness. To test for potential endogeneity between CEO overconfidence and risk-taking, a Durbin–Wu–Hausman test was conducted, confirming that the exogeneity assumption holds ($p > 0.10$). Additionally, alternative estimation using Partial Least Squares (SmartPLS 4.0) was performed as a robustness check; path directions and significance levels remained consistent across methods.

Model Predictive Power. The final model explains 51% of the variance in risk-taking ($R^2 = 0.51$) and 62% of the variance in firm returns ($R^2 = 0.62$), indicating substantial explanatory strength relative to comparable behavioral finance studies.

These diagnostics establish the empirical soundness of the measurement and structural models. The convergence of behavioral indicators and financial outcomes validates the proposed model as a robust

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analytical framework for behavioral governance, capable of distinguishing cognitive from strategic determinants of firm returns in digital financial institutions.

5. Empirical Results

5.1. Descriptive Statistics

Table 1 presents the summary statistics for all variables derived from 196 firm-year observations of Indonesia's seven digital banks during 2018–2024.

Table 1.
Descriptive statistics.

Variable	Mean	Std. Dev.	Min.	Max.
CEO Overconfidence (OC)	0.56	0.18	0.21	0.89
Risk-Taking (RT)	0.64	0.15	0.31	0.92
Firm Returns (FR)	1.37	0.42	0.74	2.41
CEO Age (years)	47.3	5.9	36	59
CEO Gender (1 = male)	0.86	0.35	0	1

The descriptive pattern offers an early insight into Indonesia's digital-bank leadership and performance structure. The average CEO age of 47 years reflects a relatively young cohort, suggesting managerial generations shaped by fintech innovation rather than traditional banking hierarchies. The dominance of male CEOs (86%) highlights gender imbalance in the sector, raising questions about cognitive-diversity gaps.

The mean firm return of 1.37 indicates moderate returns, typical for high-growth, technology-intensive institutions. The wide dispersion in risk-taking (LDR and σROA) demonstrates strategic heterogeneity across banks; some emphasize conservative balance-sheet management, while others pursue rapid loan growth through digital platforms. This heterogeneity provides fertile ground for analyzing how behavioral factors, especially CEO overconfidence, translate into differing risk and return outcomes.

5.2. Measurement Model Evaluation

The Confirmatory Factor Analysis (CFA) tested the reliability and validity of all latent constructs, CEO overconfidence, risk-taking, and firm returns, before estimating structural paths.

All standardized loadings exceed 0.70 and are significant at $p < 0.001$, confirming each indicator strongly reflects its intended latent construct. Cronbach's alpha and Composite Reliability values above 0.80 demonstrate internal consistency. The Average Variance Extracted (AVE) values range between 0.58 and 0.74, ensuring convergent validity.

Discriminant validity was further established via the Fornell–Larcker criterion: the square root of each construct's AVE exceeded its inter-construct correlations, implying conceptual distinction among behavioral and financial dimensions. These diagnostic results verify that the model measures what it intends to measure: overconfidence as a psychological bias, risk-taking as strategic behavior, and firm returns as the market outcome of both.

5.3. Structural Model Results

The structural equation model links CEO overconfidence, risk-taking, firm returns, and the moderating demographic variables.

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Table 2.
Structural model results.

Hypothesis	Path	β	t-Value	p-Value	Result
H1	OC → RT	0.690	7.842	< 0.001	Supported
H2	OC → FR	0.061	0.944	0.347	Not Supported
H3	RT → FR	0.422	5.107	< 0.001	Supported
H4	OC → RT → FR	Indirect β = 0.291	Sobel z = 1.678	0.093	Partially Supported
H5a	(OC×Age) → RT	−0.204	−3.126	0.002	Supported
H5b	(OC×Gender) → RT	−0.081	−1.501	0.133	Not Supported
H6a	(RT×Age) → FR	0.167	2.842	0.005	Supported
H6b	(RT×Gender) → FR	0.121	2.134	0.033	Supported
H7	CEO Characteristics → FR	0.315	3.764	< 0.001	Supported

Note: Bootstrapped 10 000 resamples; significance at $p < 0.05$.

The results provide empirical validation of the behavioral-governance model. CEO overconfidence significantly increases risk-taking (H1), confirming the psychological pathway from cognitive optimism to strategic boldness. However, overconfidence does not directly influence firm returns (H2), implying that markets and governance mechanisms partly neutralize raw managerial optimism. Risk-taking itself exerts a strong positive influence on firm returns (H3), supporting the argument that return creation in digital banks arises through calibrated risk assumption. The partial mediation in H4 suggests that while overconfidence stimulates risk, only part of this behavioral energy translates into returns; the rest may dissipate through inefficiency or regulatory correction.

5.4. Interpretation of Hypothesis Tests

The significant OC to RT path (β = 0.690) demonstrates that overconfident CEOs systematically perceive opportunities through an optimistic lens, leading to higher leverage and aggressive loan growth. This behavioral link resonates with prior findings that excessive self-belief can increase corporate exposure to volatility [5]. Yet, in digital banking, where innovation is critical, a degree of overconfidence may be functionally adaptive: it encourages experimentation with fintech partnerships and novel credit-scoring technologies.

The absence of a direct OC to FR relationship (H2) reveals the disciplining effect of governance and profitability. Shareholders, rating agencies, and regulators tend to discount managerial optimism unless accompanied by measurable risk-adjusted performance. Consequently, firm returns respond not to confidence itself but to its strategic expression through risk-taking (H3-H4).

The moderating results further nuance the behavioral narrative. Older CEOs significantly temper the influence of overconfidence on risk (H5a), reflecting cognitive maturity and historical awareness of banking crises. Female CEO leadership, though underrepresented, is associated with a stronger translation of risk-taking into firm returns, consistent with the positive moderation effect on the risk-taking–returns pathway (H6b), which may reflect differences in risk governance practices and decision processes rather than inherent capability differences. The direct significance of CEO characteristics (H7) reinforces that leadership demography is not merely contextual but structurally consequential for digital-bank returns. This study also reveals that, while both age and gender were theorized as moderators of overconfidence-induced risk-taking, empirical results indicate that experience (age) plays a more salient role than gender at the risk-formation stage.

5.5. Structural Behavioral Mechanism

The behavioral transmission chain is reflected as overconfidence energizes risk appetite, which enhances firm returns when balanced by demographic experience and gender-driven prudence. The R^2 values, 0.51 for risk-taking and 0.62 for firm returns, demonstrate that behavioral and demographic variables jointly explain a substantial portion of performance variance. These magnitudes surpass those typically observed in behavioral-finance models of corporate investment (average $R^2 \approx 0.40$),

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underscoring the explanatory power of behavioral governance in emerging-market financial institutions.

5.6. Robustness Checks

A suite of robustness analyses confirmed that the results are statistically stable and conceptually consistent across alternative specifications.

Alternative estimation: Re-estimating the model with Partial Least Squares–SEM (SmartPLS 4.0) yielded coefficient directions and significance levels nearly identical to LISREL results, confirming model robustness across covariance- and variance-based frameworks.

Multicollinearity and endogeneity: All VIFs were below 3.0, eliminating multicollinearity concerns. A Durbin–Wu–Hausman test showed no significant endogeneity between OC and RT ($p > 0.10$), suggesting that managerial optimism is an exogenous psychological trait rather than a reaction to firm performance.

Model invariance: Multi-group tests comparing state-linked vs. private digital banks revealed no significant structural differences ($\Delta\chi^2 = 1.87$, $p = 0.27$), indicating that behavioral effects transcend ownership structures.

Temporal stability: Year-by-year rolling regressions confirmed that path coefficients remained directionally consistent, demonstrating that behavioral governance dynamics persisted despite macroeconomic shocks such as COVID-19 or interest rate volatility.

Collectively, these tests reinforce the internal validity of the findings and their external relevance to various institutional contexts within Indonesia's financial ecosystem.

5.7. Summary of Empirical Findings

The empirical analysis provides strong support for the proposed behavioral-governance model.

Behavioral bias as catalyst: CEO overconfidence acts as a psychological catalyst that energizes strategic risk-taking.

Risk-Taking as returns driver: Firm returns rise not from optimism itself but from well-governed risk behavior that channels optimism into productive innovation.

Demographics as behavioral governors: Age and gender act as natural governance filters - experience restrains excess, and gender diversity enhances calibration.

Behavioral governance framework validated: The model explains over 60% of firm-returns variance, demonstrating that psychological and demographic variables, when integrated with governance theory, yield substantial predictive capacity.

Implications for digital-bank evolution: Indonesian digital banks thrive when behavioral exuberance is counterbalanced by demographic prudence and institutional oversight, providing a blueprint for sustainable fintech-driven finance across emerging markets.

In summary, the results reveal a nuanced behavioral ecosystem in which leadership cognition, demographic diversity, and governance structures jointly determine risk and return outcomes. Overconfidence may ignite innovation, but only disciplined behavioral governance ensures that innovation translates into enduring firm returns.

6. Discussion

6.1. Behavioral Governance and Executive Bias

The empirical results confirm that corporate outcomes are not solely the product of institutional frameworks but are profoundly shaped by executive cognition and behavioral orientation. This supports [8] proposition that governance effectiveness depends not on formal existence but on behavioral enactment, the internalization of accountability, integrity, efficiency, and transparency in executive decision-making. In Indonesia's digital banking sector, where technological disruption, regulatory

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fluidity, and financial innovation intersect, behavioral governance emerges as the most decisive layer of control.

CEO overconfidence energizes strategic ambition and technological experimentation, a critical trait in industries characterized by rapid digital transformation. On the other hand, it can distort managerial perception, leading to excessive risk exposure and the erosion of prudential safeguards. The challenge is therefore not to suppress overconfidence but to institutionalize behavioral counterweights, through independent boards, data-driven risk monitoring, and diversity at the top, to channel overconfidence into disciplined innovation.

The Indonesian case exemplifies an important nuance in behavioral governance: optimism and bias are not inherently destructive when embedded within robust governance ecosystems. The insignificant direct path from overconfidence to firm returns (H2) illustrates this "behavioral buffering effect," which reflects that institutional oversight mechanisms effectively absorb the excesses of executive self-belief.

6.2. Risk-Taking as a Behavioral Transmission Mechanism

The study's evidence that risk-taking mediates the relationship between CEO overconfidence and firm returns (H4) provides empirical grounding for a behavioral transmission mechanism. Overconfident CEOs do not directly create or destroy returns; they do so through the channel of risk behavior, by determining how aggressively the firm deploys resources, pursues credit growth, or invests in technology.

This finding is consistent with prior literature [6, 18, 21], but its contextual significance in digital banking is profound. Digital banks rely heavily on technological infrastructure and algorithmic lending models that magnify both efficiency and uncertainty. Overconfident CEOs tend to overtrust these models, assuming that digitalization automatically mitigates risk. Consequently, they expand credit portfolios faster than risk analytics can adapt, exposing their institutions to latent credit fragility.

The result validates the premise of productive risk-taking, where calculated exposure generates competitive advantage, technological learning, and market share expansion. The partial mediation indicates that behavioral energy must be disciplined through governance to convert optimism into returns. Without institutional controls, this behavioral energy can manifest as return-destructive exuberance, replicating the excesses of early fintech bubbles.

6.3. The Moderating Role of CEO Demographics

The moderating effects of CEO age and gender introduce a critical human-capital dimension to behavioral governance. The negative moderation of age on the overconfidence–risk-taking relationship (H5a) indicates that experience, cognitive maturity, and memory of past crises act as behavioral governors. Older CEOs, having navigated prior economic cycles, exhibit contextual awareness and skepticism toward over-optimistic forecasts. They are more likely to demand stress testing, maintain liquidity buffers, and defer risky innovations until proven sustainable.

Conversely, the positive moderating role of gender on the risk-taking-firm returns relationship (H6b) highlights the governance value of diversity. Female CEOs, though underrepresented, tend to demonstrate higher ethical sensitivity and risk calibration, transforming risk-taking into stable, long-term firm returns. Notably, gender does not significantly moderate the overconfidence-risk-taking relationship (H5b), suggesting that demographic effects are more salient in shaping the performance consequences of risk than in shaping risk formation itself. This aligns with Faccio et al. [24] and Palvia et al. [25] who found that female-led financial institutions display lower default probabilities and superior compliance cultures.

Together, these findings position demographic diversity as a behavioral stabilizer in corporate governance. It complements structural oversight mechanisms by embedding prudence, ethical balance, and perspective variety into strategic decision-making. For emerging economies like Indonesia, where board composition often mirrors homogenous leadership archetypes, fostering demographic diversity may be one of the most effective behavioral-governance reforms available.

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6.4. Comparative Insights with Classical Corporate Failures

Comparing the behavioral dynamics observed in Indonesian digital banks with the classical corporate collapse of Enron reveals an instructive historical contrast. As reference Mardjono [8] and Boyd [16] argued, this firm possessed governance structures in form but not in substance, its leaders weaponized complexity and information asymmetry to obscure reality, eroding integrity and accountability.

The digital banking sector operates within a different but equally perilous frontier: algorithmic opacity. Where Enron's obfuscation arose from structured financial instruments, digital banks face a subtler threat, blind faith in data models and artificial intelligence. Overconfident CEOs may assume that algorithmic precision eliminates human error, thereby underestimating new types of systemic risk. The essence of the threat is identical to Enron's: trust in control systems substitutes for human judgment.

However, Indonesian digital banks exhibit early signs of learning from history. Stronger regulatory supervision by OJK, mandatory board-independent directors, and fintech partnership disclosures create an environment that rewards transparency. Behavioral bias still exists, but the system's governance architecture mitigates catastrophic spillover. Thus, the evolution from structural to behavioral governance maturity represents Indonesia's contribution to the global governance discourse.

6.5. Theoretical Contributions

This research advances corporate-governance and behavioral-finance literature in several key respects.

First, it develops an integrated behavioral-governance model that unifies the psychological perspective of the *Upper Echelons Theory* with the institutional logic of *Agency Theory*. By demonstrating that cognitive biases manifest as measurable firm outcomes through risk-taking, it offers a behavioral micro-foundation for agency conflicts.

Second, the study expands the geographical and institutional boundaries of behavioral-finance inquiry. Most prior works have examined mature Western markets where governance mechanisms are stable and institutional trust is high. The Indonesian digital banking ecosystem, by contrast, represents a dynamic emerging context where formal governance coexists with rapid technological disruption. The validation of behavioral governance effects in this setting provides a new empirical reference for Southeast Asia and other emerging economies.

Third, it conceptualizes CEO demographics as governance capital, a form of human diversification that reduces cognitive herding at the top. Age and gender are not mere controls but also serve as behavioral moderators influencing how optimism is converted into strategic action. This insight suggests that leadership composition can serve as a non-financial risk-management instrument, complementing quantitative oversight systems.

In sum, the study contributes to a paradigm shift from structural to behavioral governance, highlighting that the sustainability of digital banks rests not merely on compliance frameworks but on the psychological integrity and demographic balance of those who lead them.

7. Conclusion

7.1. Summary of Findings

This study empirically confirms that behavioral governance, the interplay between executive cognition, risk orientation, and demographic diversity, plays a central role in determining firm returns in Indonesia's digital banking sector. Overconfidence, while statistically linked to greater risk-taking, exerts no direct effect on firm returns. Instead, its influence flows through the behavioral conduit of risk-taking, affirming that optimism becomes economically meaningful only when transformed into strategic, well-governed actions.

Risk-taking, when balanced by robust governance mechanisms, positively influences firm returns, signifying that controlled experimentation and measured financial exposure underpin successful digital

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transformation. CEO characteristics further modulate these dynamics: older executives temper impulsive risk behavior, while female CEO leadership strengthens the effectiveness with which risk-taking is translated into sustainable firm returns. Collectively, these behavioral and demographic dimensions explain more than 60 percent of firm-returns variance, an impressive explanatory power by behavioral-finance standards.

7.2. Theoretical Implications

The findings expand theoretical understanding on multiple fronts. From the Agency Theory perspective, they reveal that behavioral bias constitutes a *hidden agency cost*: when CEOs are overly optimistic, their decisions deviate from shareholder risk preferences even in the absence of overt opportunism [27, 28]. Effective governance, therefore, requires not only incentive alignment but behavioral calibration, the ability to detect and manage cognitive distortions within leadership ranks.

From the Upper Echelons Theory viewpoint, the evidence strengthens the argument that observable demographic attributes reflect underlying psychological schemas. The moderating role of age and gender empirically supports the notion that who the CEO is crucially shapes how the firm behaves. Thus, this research operationalizes UET in a modern, digital-finance setting, transforming it from a descriptive framework into a predictive behavioral model.

Conceptually, this study positions behavioral governance as a third dimension of corporate governance, complementing structural (rules and institutions) and procedural (transparency and disclosure) dimensions. It asserts that without behavioral integrity, even the most sophisticated regulatory frameworks remain fragile.

7.3. Managerial and Policy Implications

The implications for boards, regulators, and investors are multifaceted and highly actionable.

For Boards of Commissioners and nomination committees: Behavioral governance metrics, such as CEO sentiment scores, decision-bias audits, or overconfidence indices, should be integrated into leadership evaluation systems. Boards must act as *behavioral moderators*, ensuring that executive optimism is tempered by analytical rigor. Succession planning should explicitly consider cognitive diversity and demographic balance, moving beyond traditional financial credentials to include psychological and ethical competencies.

For regulator (OJK): Regulatory oversight should evolve toward behavioral supervision, complementing prudential ratios with assessments of managerial bias and decision culture. Fit-and-proper tests can include psychometric screening for overconfidence and ethical reasoning. Encouraging greater female and age-diverse representation in top management can serve as a structural lever to reduce systemic behavioral risk.

For investors and analysts: Investors should interpret firm returns not only through balance sheet performance but also through leadership psychology. Early-warning indicators, such as persistent earnings optimism, CEO stock retention behavior, or overly positive corporate tone, can reveal underlying governance fragility. Integrating behavioral metrics into environmental, social, and governance (ESG) analytics would enhance predictive accuracy in digital-finance return models.

7.4. Limitations and Future Research

Despite its contributions, this study acknowledges several limitations that open avenues for future research. First, the analysis is confined to seven Indonesian digital banks, limiting generalizability across all emerging economies. Expanding to cross-country panels, such as ASEAN or South Asian fintech markets, would enhance comparative robustness.

Second, behavioral constructs like overconfidence were inferred from secondary proxies such as textual tone, published financial results, option retention, and forecast bias. Future research could incorporate primary data through executive surveys, experimental designs, or psychometric testing to refine construct validity.

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Third, the temporal scope (2018–2024) captures only the formative years of Indonesia's digital banking transformation. As the sector matures, longitudinal studies could assess how learning, regulatory adaptation, and technological stabilization reshape behavioral dynamics.

Ultimately, this study demonstrates that the sustainability of digital banking lies not in technology alone but in the psychology of its leaders. Behavioral governance, anchored in integrity, diversity, and prudence, is the unseen infrastructure that supports financial innovation. As Indonesia and other emerging economies continue their digital-finance journeys, embedding behavioral awareness into governance design will be indispensable for achieving both growth and resilience in an increasingly uncertain world.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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