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Algorithmic Overconfidence, Financial Literacy, and Decision Quality: Comparative Evidence from Morocco and France.

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Abstract:

The rapid diffusion of algorithmic financial technologies such as robo advisors, automated trading platforms and artificial intelligence applications raises a central question regarding their actual impact on investor rationality. While these tools are often perceived as enhancing objectivity and improving decision making, they may also introduce new behavioral vulnerabilities. This study examines the impact of algorithmic overconfidence, defined as excessive reliance on automated systems driven by an overestimation of their reliability and superiority, on the quality of financial decisions. It also investigates the explanatory and moderating role of financial literacy. A comparative research design is adopted, contrasting Morocco as an emerging market characterized by lower financial literacy and a developing regulatory framework, with France as a developed market marked by higher institutional and digital maturity. The empirical analysis is based on a questionnaire administered to 312 individual investors, including 158 Moroccan and 154 French participants. The relationships are tested using partial least squares structural equation modeling. The findings indicate that algorithmic overconfidence significantly reduces financial decision quality, while financial literacy exerts a positive direct effect and a protective moderating role. More precisely, the positive interaction effect shows that higher levels of financial literacy weaken the negative impact of algorithmic overconfidence on decision quality. The comparative analysis further reveals that the adverse effect of algorithmic overconfidence is more pronounced in Morocco, whereas the protective role of financial literacy is stronger in France. These results demonstrate that technological tools do not eliminate behavioral biases but rather reshape their intensity depending on the institutional context. The study contributes to the behavioral finance literature by integrating the technological dimension into the analysis of cognitive biases and by highlighting the central role of financial literacy as both an explanatory and protective mechanism. From a practical perspective, the findings emphasize the need to strengthen financial education in emerging markets and to promote greater transparency and critical awareness in the use of algorithmic financial systems in developed economies.

Keywords: Algorithmic Overconfidence; Financial Literacy; Behavioral Finance; Financial Decision Quality; Robo-Advisors; FinTech Adoption; Emerging vs. Developed Markets; Morocco-France Comparison.

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Introduction:

The rapid diffusion of algorithmic financial technologies, including robo-advisors, automated trading platforms, and artificial intelligence applications, represents a profound transformation in contemporary financial markets. These tools are commonly portrayed as mechanisms capable of enhancing market efficiency and improving decision-making processes through advanced computational power and perceived objectivity. By reducing informational frictions and standardizing investment strategies, they are often assumed to promote more rational financial behavior and facilitate broader access to financial markets. However, this optimistic perspective remains increasingly challenged within the behavioral finance literature. While algorithmic systems are designed to support rational decision-making, their growing integration into financial environments raises a fundamental question: to what extent does automation genuinely enhance investor rationality, and to what extent does it generate new behavioral vulnerabilities? Rather than eliminating cognitive biases, the use of algorithmic tools may reshape them, introducing new forms of distortion linked to excessive reliance on automated systems. Among these distortions, overconfidence remains one of the most persistent and detrimental biases affecting financial decisions. Traditionally defined as the tendency of individuals to overestimate their abilities and the accuracy of their judgments, overconfidence has been widely associated with excessive trading, underestimation of risk, and suboptimal portfolio allocation (Barber & Odean, 2001; Malmendier & Tate, 2005; Biais et al., 2005). In digital environments, this bias takes on a specific form referred to as algorithmic overconfidence, characterized by an excessive trust in automated recommendations and the perception of algorithms as inherently superior and error-free (Skitka et al., 1999; Dzindolet et al., 2003; Dietvorst et al., 2015). Empirical evidence suggests that individuals often grant disproportionate credibility to algorithmic predictions, even when confronted with clear evidence of error (Logg et al., 2019; Castelo et al., 2019). Consequently, automation may not only fail to correct human biases but may also encourage excessive cognitive delegation, weaken critical scrutiny, and ultimately deteriorate the quality of financial decisions.

In this context, financial literacy emerges as a central factor in understanding individual behavior in digitally mediated financial environments. Defined as the set of knowledge, skills, and competencies that enable individuals to make informed financial decisions (Lusardi & Mitchell, 2014), financial literacy plays a dual role. On the one hand, it directly improves decision quality by enhancing individuals' capacity to assess risk, interpret information, and align choices with financial objectives. On the other hand, it functions as a protective mechanism, reducing susceptibility to cognitive and emotional biases and fostering more critical engagement with algorithmic recommendations (Allgood & Walstad, 2016; Grohmann et al., 2018). However, the

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distribution of financial literacy remains uneven across countries, with significant disparities between developed and emerging economies (Demirgüç-Kunt et al., 2022), suggesting that the effects of algorithmic overconfidence may vary across institutional contexts. Against this backdrop, the present study aims to examine the impact of algorithmic overconfidence on the quality of financial decisions, while investigating the explanatory and moderating role of financial literacy within a comparative framework. More specifically, it seeks to determine whether financial literacy can mitigate the negative effects associated with excessive reliance on algorithmic systems, and how this relationship varies between an emerging market and a developed market.

In line with this objective, the central research question guiding this study can be formulated as follows: To what extent does algorithmic overconfidence influence the quality of financial decisions, and how can financial literacy moderate this effect within a comparative framework between an emerging market and a developed market?

To address this question, the study adopts a comparative approach focusing on Morocco and France, two contrasting contexts in terms of financial literacy, regulatory development, and technological maturity. Methodologically, the analysis is based on a sample of 312 individual investors, including 158 Moroccan and 154 French participants. The relationships between algorithmic overconfidence, financial literacy, and financial decision quality are examined using partial least squares structural equation modeling (PLS-SEM), allowing for the simultaneous estimation of direct, moderating, and comparative effects within a unified analytical framework.

This paper is structured as follows. The first section reviews the relevant literature on algorithmic overconfidence, financial literacy, and financial decision-making. The second section develops the conceptual framework and formulates the research hypotheses. The third section presents the research methodology, including data collection, measurement of variables, and analytical approach. The fourth section reports and discusses the empirical results. Finally, the paper concludes by highlighting the main theoretical contributions, managerial implications, and avenues for future research.

1. Literature Review:

1.1. Algorithmic overconfidence and financial decision quality:

Overconfidence is one of the most studied and most costly biases in behavioral finance. Pioneering work shows that it leads investors to overestimate their abilities, ignore certain risks, and engage in excessive or inefficient strategies (Barber & Odean, 2001; Malmendier & Tate, 2005). Laboratory and simulated market experiments confirm that this bias is robust and persistent, and translates into a measurable deterioration in financial performance (Biais, Hilton, Mazurier &

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Pouget, 2005). With the rise of digital technologies, this distortion has taken on a specific form: algorithmic overconfidence. Whereas classic overconfidence stems from overestimating one's own abilities, algorithmic overconfidence results from excessive cognitive delegation to an artificial agent. It falls within the broader framework of automation bias, defined as the tendency to follow automated recommendations uncritically, even when they are demonstrably erroneous (Skitka, Mosier & Burdick, 1999; Dzindolet et al., 2003). In the financial domain, this bias manifest as near-unconditional trust in decisions proposed by robo-advisors, algorithmic trading platforms, or predictive models. Recent research shows that users often grant greater credibility to algorithmic predictions than to human judgments, including in the face of documented errors (Dietvorst, Simmons & Massey, 2015; Logg, Minson & Moore, 2019). This phenomenon is reinforced by model opacity (the black-box effect) and by the prevailing perception that the growing complexity of financial markets exceeds human analytical capacities. Thus, automation does not abolish biases: it can correct them as much as amplify them, via trust miscalibration**,** reduced critical scrutiny, and risk underestimation that yield suboptimal strategies. Rahwan et al. (2019, Nature Human Behaviour) indeed emphasize that algorithmic systems, far from eliminating irrationality, introduce new behavioral vulnerabilities. Likewise, Dietvorst & Bharti (2020) confirm that individuals oscillate between algorithm aversion and algorithm appreciation, but tend in financial settings to favor the latter, at the risk of excessive cognitive dependence. The impact of this algorithmic overconfidence on the quality of financial decisions therefore appears ambivalent. On the one hand, algorithms can reduce the influence of emotions, standardize decisions, and improve investor discipline (Dhar & Stein, 2017). On the other hand, when confidence becomes disproportionate, they weaken cognitive engagement, foster underestimation of extreme risks, and generate strategies misaligned with individual objectives. As Jussupow, Spohrer & Heinzl (2020) remind us, the added value of AI systems depends less on their technical performance than on how individuals calibrate their trust and maintain critical vigilance.

Finally, the effects of algorithmic overconfidence are deeply conditioned by the institutional and educational context. In emerging economies, where financial literacy remains low and regulation is still fragile, the risk of uncritical use of algorithms is amplified. Conversely, in developed economies, stricter regulatory oversight and higher levels of literacy limit such misuses (Arner, Barberis & Buckley, 2017; OECD, 2020). This asymmetry justifies a comparative approach between Morocco and France **to** assess how the institutional and cultural context shapes the intensity and consequences of this bias. Based on these observations, we posit that algorithmic overconfidence **is** expected to exert a negative effect on the quality of financial decisions, particularly in emerging markets characterized by limited regulation and low financial literacy.

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1.2. Financial literacy as determinant and protective mechanism:

Over the past two decades, financial literacy has become a central concept in the analysis of financial behavior. Defined as the ability to understand, analyze, and use financial information to make informed decisions, it combines cognitive (knowledge), behavioral (skills), and affective (self-confidence) dimensions (Lusardi & Mitchell, 2014, Journal of Economic Literature). The pioneering work of Chen & Volpe (1998, Financial Services Review) showed that individuals with low levels of literacy adopt riskier, less diversified, and often inefficient behaviors. Since then, a substantial empirical literature has confirmed that financial literacy is a key determinant of financial rationality (Hastings, Madrian & Skimmyhorn, 2013, Annual Review of Economics; Klapper, Lusardi & Panos, 2013, Journal of Banking & Finance). One of the major contributions of this literature is to demonstrate that financial literacy is not limited to a direct explanatory role; it also acts as a protective mechanism against behavioral biases. Lusardi & Mitchell (2011, Journal of Pension Economics & Finance) emphasize that individuals with higher literacy are less likely to succumb to simplifying heuristics and emotional distortions. Similarly, Van Rooij, Lusardi & Alessie (2011, Journal of Financial Economics) show that literacy is positively correlated with participation in financial markets but negatively associated with irrational speculative behaviors. In short, it promotes more efficient resource allocation and better risk management. In the context of financial technologies, this protective function becomes even more salient. Recent research indicates that investors with limited financial literacy tend to place blind trust in automated recommendations, whereas those with higher literacy maintain critical vigilance and the capacity to contextualize algorithmic suggestions (Allgood & Walstad, 2016, Journal of Economic Surveys; Grohmann, Klühs & Menkhoff, 2018, World Development). Put differently, literacy reduces the likelihood of excessive cognitive delegation and thus mitigates the risk associated with algorithmic overconfidence. Financial literacy therefore plays a dual role: (1) Direct determinant: it improves the intrinsic quality of financial decisions by strengthening analytical capacity and understanding of risk; (2) Protective moderator: it attenuates the negative effect of algorithmic overconfidence by encouraging a more critical and reasoned use of digital tools. However, the effects of literacy remain heterogeneous depending on the level of market development. In emerging economies, surveys by the World Bank (Demirgüç-Kunt et al., 2022, Global Findex) and the OECD (2020) confirm that literacy deficits increase vulnerability to biases and limit effective participation in financial markets. Conversely, in developed economies, literacy helps strengthen institutional trust and the sophistication of choices while limiting excessive dependence on automated systems (Arrondel, Debbich & Savignac, 2015, International Journal of Bank Marketing). Thus, financial literacy appears to be both an explanatory and normative pivot in the study of financial decision-

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making in the digital age. It not only determines performance levels but also conditions the magnitude of cognitive biases and the ways in which individuals interact with algorithms. These observations justify two hypotheses: Literacy exerts a positive direct effect on decision quality and it negatively moderates the relationship between algorithmic overconfidence and decision quality. At this stage, two dimensions emerge as central: algorithmic overconfidence, as a technological extension of a well-documented bias in behavioral finance, and financial literacy, whose explanatory and protective roles are now well established. To clarify existing contributions and highlight gaps in the literature, the following table provides a synthesis of the principal studies addressing these two themes.

Table N°1: Summary of research on overconfidence and financial literacy

Theme	Authors & References	Context	Main findings	Identified gaps
Classical overconfidence	Barber & Odean (2001, QJE), Malmendier & Tate (2005, Journal of Finance), Biais et al. (2005, RES)	Developed markets (US, Europe)	Overestimation of skills, excessive trading, performance losses	Limited analyses in emerging markets
Automation bias	Skitka et al. (1999, IJHCS), Dzindolet et al. (2003, Human Factors)	Experimental (military, medical)	Blind acceptance of automated recommendations	Limited transferability to the financial domain
Algorithmic overconfidence	Dietvorst, Simmons & Massey (2015, Management Science), Logg, Minson & Moore (2019, OBHDP)	Digital decision-making environments	Excessive credibility granted to algorithms; persistence of trust despite errors	Recent concept; few empirical studies in finance
Financial literacy (direct role)	Volpe (1998, FSR), Lusardi & Mitchell (2014, JEL), Klapper, Lusardi & Panos (2013, JFE)	Global studies and national surveys	Literacy positively correlated with financial participation and rationality	Persistent disparities between developed and emerging countries

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Theme	Authors & References	Context	Main findings	Identified gaps
Financial literacy as protective mechanism	Lusardi & Mitchell (2011, JPEF), Van Rooij et al. (2011, JFE), Allgood & Walstad (2016, JES)	Various international contexts	Literacy reduces exposure to biases and speculative behaviors	Few studies linking literacy and technological biases
Emerging vs. developed context	Demirgüç-Kunt & Levine (2001, WBER), Arrondel, Debbich & Savignac (2015, IJBM)	Developed markets (Europe) vs. emerging market (Morocco)	Lower literacy in emerging economies; uneven technological adoption	Rare North–South comparisons on biases + FinTech

Source : ***Authors' elaboration***

This synthesis shows that, despite extensive work on overconfidence and financial literacy, their interplay remains underexplored particularly in the context of the ongoing digitalization of financial services. Accordingly, we adopt a comparative design contrasting emerging and developed markets, presented in the next section.

1.1. Emerging vs. developed markets: the case of Morocco and France:

The comparative literature on behavioral finance and FinTech adoption highlights pronounced heterogeneity between emerging and developed markets. This divergence **stems from** structural differences in financial literacy, institutional trust, regulatory oversight, and the maturity of digital infrastructures (La Porta, Lopez-de-Silanes, Shleifer & Vishny, 1998, *Journal of Political Economy*; Demirgüç-Kunt & Levine, 1999, World Bank Policy Research Working Paper No. 2143). In this study, Morocco and France provide a high-contrast pair along these dimensions, informing how such structural gaps may shape algorithmic overconfidence and financial decision quality.

• Financial literacy and decision behaviors:

In developed economies such as France, surveys by the OECD (2020) and the World Bank (Global Findex Database 2021; Demirgüç-Kunt et al., 2022) report significantly higher average levels of financial literacy. These competencies are associated with greater participation in financial markets, better portfolio diversification, and heightened critical scrutiny regarding automated recommendations (Arrondel, Debbich & Savignac, 2013, *Numeracy*). Conversely, in emerging economies such as Morocco, several studies document a persistent financial-literacy deficit,

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increasing investors' vulnerability to behavioral biases and distortions linked to algorithmic overconfidence (Chetioui, El Bouchikhi, Makhtari, Sahli & Lebdaoui, 2024; Zakarya, Bakkali & Ammi, 2025; OECD, 2020).

• Institutional trust and regulatory framework:

A further determinant is the level of institutional trust and the effectiveness of the regulatory framework. In developed markets, regulation of digital financial services is comparatively robust, governing the use of algorithms and imposing standards of transparency and investor protection (Arner, Barberis & Buckley, 2017). This oversight bolsters trust and curbs uncritical delegation to algorithms. In Morocco, although recent reforms have been undertaken notably the National Strategy for Financial Inclusion and the gradual modernization of the stock market FinTech regulation is still consolidating (World Bank, 2022). This situation sustains perceptions of uncertainty and may amplify cognitive distortions.

• Technological adoption and digital maturity:

The trajectory of financial technology (FinTech) adoption also differs across contexts. In France, the FinTech ecosystem benefits from a high degree of maturity, with the growing integration of artificial intelligence, blockchain, and robo-advisors into financial services (EY, 2022; Zetzsche, Buckley & Arner, 2020). This innovation intensity supports a more critical and gradual adoption among investors. In Morocco, although the momentum is positive driven by the rise of mobile payments and the expansion of digital platforms adoption remains constrained by access disparities and a still-limited uptake of algorithmic investment tools (World Bank, 2022; GSMA, 2022).

• Behavioral implications:

These contextual differences directly shape the interaction between algorithmic overconfidence and financial literacy. In developed markets, robust regulation and heightened critical scrutiny attenuate the likelihood of irrational behavior and strengthen literacy's moderating role. By contrast, in emerging markets, a financial-literacy deficit combined with a transitioning regulatory framework heightens the risk of excessive reliance on algorithmic recommendations and the adoption of suboptimal strategies.

• Relevance of the Morocco-France comparative design:

The choice to contrast Morocco and France is therefore scientifically pertinent on several grounds. First, it illustrates two contrasting archetypes an emerging market and a developed market within a structured comparative design. Second, it elucidates how contextual factors (literacy, regulation, digital maturity) shape the magnitude and direction of biases. Third, it enriches a literature still centered on Western markets by bringing North Africa into the academic debate on behavioral finance and FinTech (Zetzsche et al., 2020; GSMA, 2022). In sum, the

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Morocco-France comparison is not merely a geographical juxtaposition but a scientific strategy aimed at showing how universal psychological dynamics cognitive biases and algorithmic overconfidence interact with differentiated institutional contexts and, in turn, shape the quality and rationality of financial decisions.

2. Conceptual framework and hypothesis formulation:

2.1. Theoretical logic:

The literature review highlights three central dynamics. First, algorithmic overconfidence is a technological extension of a well-documented bias in behavioral finance. Whereas classical overconfidence manifests as an overestimation of one's own abilities (Barber & Odean, 2001), algorithmic overconfidence results from excessive cognitive delegation to automated systems. Research shows that users often grant disproportionate credibility to algorithmic predictions, even after observing errors (Dietvorst, Simmons & Massey, 2015; Logg, Minson & Moore, 2019; Dietvorst & Bharti, 2020). Rahwan et al. (2019, *Nature Human Behaviour*) confirm that algorithmic technologies do not eliminate irrationality but introduce new behavioral vulnerabilities. Second, financial literacy emerges as a central determinant of decision rationality. Defined as the set of knowledge, skills, and attitudes that enable individuals to understand and use financial information effectively (Lusardi & Mitchell, 2014), it improves market participation (Van Rooij, Lusardi & Alessie, 2011) and contributes to more rational behavior (Hastings, Madrian & Skimmyhorn, 2013). More recently, Lusardi (2021, *Nature Reviews Psychology*) has shown that literacy also plays a normative role by reducing exposure to cognitive and emotional biases. It thus constitutes a protective mechanism against behavioral distortions. Third, institutional and technological contexts significantly modulate the intensity of these dynamics. In emerging markets, characterized by lower financial literacy and a regulatory framework still in the process of consolidation, the likelihood of excessive reliance on algorithms is heightened. Conversely, in developed markets, more robust regulation and higher financial maturity tend to attenuate these effects (Demirgüç-Kunt et al., 2022; Arner, Barberis & Buckley, 2017). These elements justify the construction of an integrative model articulating four main relationships.

- **Direct effect:** Algorithmic overconfidence has a negative direct effect on the quality of financial decisions.
- **Protective effect:** Financial literacy has a positive direct effect on the quality of financial decisions.
- **Moderating effect:** Financial literacy attenuates the negative effect of algorithmic overconfidence on the quality of financial decisions (interaction effect).

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- **Contextual differentiation:** The negative effect of algorithmic overconfidence on decision quality is stronger in Morocco than in France, whereas the protective effect of financial literacy both direct and moderating is more robust in France than in Morocco.

2.2. Latent variables :

Algorithmic overconfidence (AO): tendency to grant disproportionate trust to algorithmic recommendations, perceived as intrinsically superior and error-free (Dietvorst et al., 2015; Logg et al., 2019; Dietvorst & Bharti, 2020).

Financial literacy (FL): level of knowledge and skills that enables individuals to understand and use financial information effectively (Lusardi & Mitchell, 2014; Lusardi, 2021).

Financial decision quality (FDQ): the degree to which financial choices align with defined objectives, measured in terms of diversification, risk management, and intertemporal consistency (Van Rooij et al., 2011; Dhar & Stein, 2017).

Institutional context (IC): operationalized as an emerging market (Morocco) versus a developed market (France), capturing regulation, technological maturity, and institutional trust (Arner et al., 2017; Demirgüç-Kunt et al., 2022).

2.3. Research hypotheses :

H1. Algorithmic overconfidence is expected to have a negative direct effect on FDQ. (Dietvorst et al., 2015; Logg et al., 2019; Barber & Odean, 2001; Rahwan et al., 2019)

H2. Financial literacy is expected to have a positive direct effect on FDQ. (Lusardi & Mitchell, 2014; Hastings et al., 2013; Van Rooij et al., 2011; Lusardi, 2022)

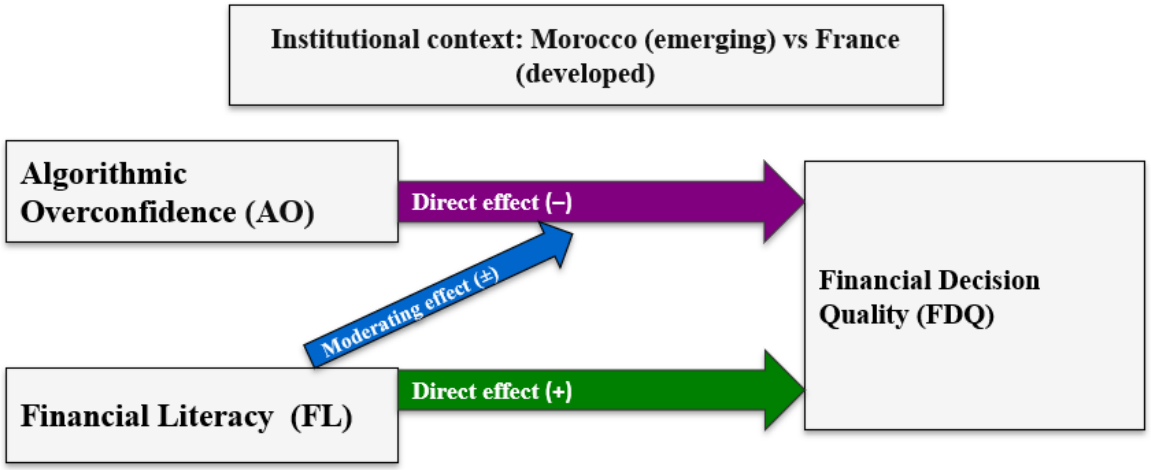
H3. Financial literacy is expected to attenuate the negative effect of algorithmic overconfidence on **FDQ**, thereby reducing its adverse impact. (Lusardi & Mitchell, 2011; Allgood & Walstad, 2016; Grohmann et al., 2018)

H4. The strength of these relationships is expected to vary across institutional contexts: the negative effect of algorithmic overconfidence on financial decision quality is stronger in Morocco than in France, whereas the positive direct and moderating effects of financial literacy are stronger in France than in Morocco (Demirgüç-Kunt et al., 2022; Arner et al., 2017; Arrondel et al., 2013).

2.4. Conceptual model (schematic):

The conceptual scheme integrates the four hypothesized relationships. Algorithmic overconfidence (AO) is posited to reduce financial decision quality (FDQ) (H1), whereas financial literacy (FL) is expected to improve FDQ (H2). In addition, FL attenuates the negative AO→FDQ relationship (H3). Finally, the institutional context (IC) operationalized as Morocco (emerging market) versus France (developed market) conditions these paths, such that effects differ in magnitude across the two groups (H4).

Figure N°1: Conceptual framework (AO, FL, FDQ, IC)



Source: ***Authors' elaboration***

Financial literacy performs a dual function in the conceptual framework. First, it exerts a direct effect on financial decision quality **(**FDQ**)** by strengthening investors' ability to understand products, assess risks, and make rational choices. This positive relationship is well documented in the empirical literature (Lusardi & Mitchell, 2014; Van Rooij, Lusardi & Alessie, 2011). Second, financial literacy plays a moderating role in the relationship between algorithmic overconfidence and FDQ. Individuals with higher levels of financial knowledge and skills are less likely to delegate their judgment uncritically to automated systems while maintaining critical scrutiny of algorithmic recommendations. This mechanism helps attenuate the adverse impact of algorithmic overconfidence on decision quality, thereby functioning as a protective**,** moderating mechanism against behavioral biases (Allgood & Walstad, 2016; Grohmann, Klühs & Menkhoff, 2018). Taken together, these two dimensions position financial literacy both as a direct determinant and as a safeguarding mechanism, underscoring its pivotal role in explaining and improving decision behavior in the era of financial technologies. Institutional context (Morocco vs France) is operationalized via multi-group analysis, after establishing partial measurement invariance using MICOM (Measurement Invariance of Composites).

3. Methodology:

3.1. Research design:

This study adopts a comparative design to analyze the mechanisms through which algorithmic overconfidence influences the quality of financial decisions, and the extent to which financial literacy plays a protective role across differentiated institutional contexts. Two contrasting environments are examined:

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- **Morocco**, an emerging market characterized by a persistent financial-literacy deficit, a regulatory framework in the process of consolidation, and still uneven adoption of financial technologies;
- **France**, a developed market with a high level of financial maturity, a consolidated regulatory framework, and an advanced FinTech ecosystem.

This choice is guided by:

1. **Theoretical relevance:** cognitive biases display a degree of universality, but their intensity varies with institutions and financial maturity (Demirgüç-Kunt et al., 2022; Arner et al., 2017).
2. **Empirical originality:** there are few North–South comparative studies that simultaneously examine algorithmic overconfidence, literacy, and decision quality.
3. **Practical interest:** the comparison enables differentiated recommendations for investors and regulators according to the market's level of maturity.

The conceptual model was tested empirically using a sample of Moroccan and French individual investors. Data were collected via a standardized questionnaire based on internationally validated scales. The analysis was conducted using PLS-SEM modeling (Hair et al., 2019).

3.2. Population and sample:

The target population consists of individual investors active in Morocco and France. Three inclusion criteria were applied: residence, age ≥ 18, and at least one investment decision in the past 24 months. Data collection was conducted through professional networks (LinkedIn, investor associations), institutional conduits (universities, FinTech incubators), and industry partners (digital platforms, financial intermediaries). In total, 312 valid responses were obtained: 158 in Morocco and 154 in France. This sample size satisfies minimum PLS-SEM requirements (>10 observations per parameter; Hair et al., 2019). Moroccan respondents exhibit, on average, lower financial literacy, less digital familiarity, and greater vulnerability to behavioral biases. French respondents display higher financial literacy, stronger technology adoption, and a more mature digital investment environment.

3.3. Measurement of variables:

All latent variables were measured using **7point Likert-type items,** translated and back-translated (Brislin,1970).

- **Algorithmic overconfidence (AO):** Adapted from Barber & Odean (2001) and enriched by Dietvorst et al. (2015) and Logg et al. (2019). Three dimensions: overestimation of reliability, perceived algorithmic superiority, and persistence of trust following error.

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- **Financial literacy (FL):** Following Lusardi and Mitchell (2014), this construct was operationalized through self-reported items capturing respondents' perceived financial knowledge, understanding of financial concepts, and financially informed behaviors.
- **Financial decision quality (FDQ):** Assessed through self-reported indicators reflecting diversification practices, risk-return evaluation, consistency with financial goals, and perceived decision satisfaction (Statman, 2014).
- **Control variables:** Age, gender, income, education, investment experience, digital familiarity, and country.

3.4. Analytical method:

The analysis proceeded in four steps:

1. Measurement model validation (Cronbach's α and CR > 0.70; AVE > 0.50; Fornell-Larcker criterion; HTMT < 0.85 with 5,000 bootstrap resamples).
2. Structural model evaluation (β coefficients, R^2, f^2, Q^2; two-tailed bootstrapping with 5,000 resamples).
3. Multi-group analysis (MGA) comparing Morocco vs. France, after verifying partial measurement invariance through MICOM (Henseler et al., 2016).
4. Robustness checks (common method bias, sensitivity analyses).

All analyses were conducted in SmartPLS 4.0. In the structural model, FDQ is modeled as the sole endogenous construct; AO and FL are exogenous predictors. Control variables (age, gender, income, education, investment experience, digital familiarity, and country) were included as covariates affecting FDQ but not modeled as predictors of AO.

4. Results and discussion:

4.1. Measurement model assessment:

All constructs exhibit satisfactory reliability (Cronbach's α between 0.79 and 0.91; composite reliability, CR, between 0.84 and 0.93) and convergent validity (AVE > 0.55). Discriminant validity is confirmed (HTMT < 0.85).

4.2. Structural model assessment:

The coefficient of determination indicates solid explanatory power for the endogenous construct: R^2(FDQ) = 0.46.

The hypotheses are tested as follows:

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Table* N°2 : *Hypothesis test results - Effects of AO, FL, and their interaction on FDQ

Hypothesis	Tested relation	β	t-value	p-value	Outcome
H1	AO → FDQ (-)	-0.28	4.12	0.000	Supported
H2	FL → FDQ (+)	0.33	5.07	0.000	Supported
H3	AO × FL → FDQ (interaction)	0.17	2.84	0.005	Supported

Source: ***Authors' elaboration***

These results indicate that algorithmic overconfidence (AO) significantly impairs financial decision quality (FDQ). In contrast, financial literacy (FL) appears to play a protective role by mitigating this negative effect. More specifically, the positive AO × FL interaction coefficient suggests that the adverse impact of AO on FDQ becomes less pronounced as the level of financial literacy increases.

4.3. Multi-group analysis (Morocco vs. France):

Morocco: AO's negative effect is stronger ($\beta = -0.34$; $p < 0.001$), while FL's positive effect is present but more limited ($\beta = 0.27$).

France: AO remains significant but weaker ($\beta = -0.21$; $p < 0.01$), whereas FL exerts a stronger positive effect ($\beta = 0.38$). The moderating role of FL is confirmed in both countries and is more robust in France, where average financial literacy is higher.

4.4. Integrated Discussion:

Three major contributions emerge. Theoretically, the study confirms the deleterious role of algorithmic overconfidence, situating it within the literature on technology-related biases (Dietvorst et al., 2015; Logg et al., 2019), and clarifies the protective function of financial literacy, thereby enriching behavioral finance through an integrated techno-behavioral perspective. Empirically, the North-South comparison shows that institutional and financial maturity modulate the intensity of biases: Morocco illustrates the heightened vulnerability of emerging markets, whereas France illustrates that even in a digitally mature environment, algorithmic overconfidence remains present, although its negative impact appears less pronounced than in Morocco. Practically, regulators and financial actors should develop targeted interventions: in Morocco, strengthen financial education to contain algorithmic overconfidence, in France, enhance algorithmic transparency and raise awareness of the limits of automation. Overall, the study shows that algorithmic overconfidence is an emerging bias whose effects vary with institutional maturity, and that financial literacy operates both as an explanatory factor and as a protective mechanism, thereby opening avenues for further research on the interplay between individual competencies, financial technologies, and institutional contexts across emerging and developed markets.

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Conclusion

This study demonstrates that algorithmic overconfidence undermines financial decision quality, particularly in emerging-market settings. The comparison between Morocco and France shows that, although this bias appears across contexts, its intensity and consequences vary according to institutional maturity, regulatory conditions, and the level of financial literacy. In this regard, the findings highlight the pivotal role of financial literacy, which operates both as a direct determinant of better financial decision quality and as a moderating mechanism capable of attenuating the harmful effect of excessive reliance on algorithmic tools. These findings carry several important implications. From a theoretical perspective, the study contributes to the behavioral finance literature by integrating the technological dimension into the analysis of cognitive biases and by emphasizing the protective role of financial literacy in digitally mediated decision environments. From a managerial standpoint, the results suggest that financial institutions should move beyond purely technical innovation and develop more transparent algorithmic systems, while also incorporating educational features that help investors better understand the scope and limits of automated recommendations. From a regulatory perspective, the study supports the need for stronger policies aimed at enhancing algorithmic transparency and expanding financial education initiatives in order to reduce the behavioral risks associated with the growing digitalization of financial services. Overall, this research underlines the importance of balancing technological innovation with investor preparedness. The integration of algorithmic tools into financial decision-making cannot be considered beneficial in itself; its effectiveness depends on the extent to which users remain capable of exercising informed judgment and critical scrutiny. In this sense, the development of digital finance must be accompanied by educational and regulatory mechanisms that ensure more thoughtful, responsible, and resilient use of financial technologies.

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