

# “Financial flexibility and investment efficiency: The moderating role of board financial expertise”

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# FINANCIAL FLEXIBILITY AND INVESTMENT EFFICIENCY: THE MODERATING ROLE OF BOARD FINANCIAL EXPERTISE

## Abstract

The environment for enterprise external financing has deteriorated recently, especially in the wake of the COVID-19 outbreak, which has severely restricted enterprise external financing options. Therefore, it is essential to implement efficient financial methods to encourage business growth. This paper intends to investigate the moderating effect of board financial expertise on the relationship between flexibility and investment efficiency of listed companies in Egypt. This study includes moderator and control variables to produce an empirical model and findings that are more reliable based on 592 sample observations collected as annual secondary data from 2014 to 2021. Generalized least squares, logistic regression, and panel-corrected standard error were employed in the analysis. Results indicate that a higher board financial expert's ratio decreases investment efficiency and has a moderating effect on financial flexibility and investment efficiency. High proportions of flexibility affect investment efficiency. Robustness checks confirm the negative effect of board financial expertise on the relationship between flexibility and investment efficiency. In unpredictable times, financial flexibility can help firms meet capital needs and boost the effectiveness of their investment decisions. Therefore, to increase investment efficiency and support firm growth, firms should maintain their financial flexibility while tightening internal controls.

## Keywords

financial expertise, financial flexibility, investment efficiency, GLS, PCSE, logistic regression

## JEL Classification

G39, M41, G50

## INTRODUCTION

Financial flexibility refers to the inherent ability of an organization to get financial resources quickly to manage unanticipated situations at a minimal cost, foresee or benefit from unknown events, take advantage of worthwhile investment opportunities, and increase value (Gamba & Triantis 2008; Zhang et al., 2020; El-Ansary & Hamza, 2023). Financially flexible companies are more adept at enduring negative shocks and promptly financing investments when profitable possibilities arise. Firms may explore financial flexibility to reduce their exposure to shocks and increase corporate value, however, there is an argument that having financial flexibility may be expensive (Garmaise & Natividad, 2021; Mahmood et al., 2021).

Achieving investment efficiency necessitates the establishment of a harmonious equilibrium between over and under-investment, where overinvestment refers to making investments in projects that have low or negative net present value (NPV) and underinvestment refers to holding back investments even when profitable projects are available (Cariola et al., 2005; Biddle et al., 2009).

Investment efficiency is a common investment appraisal technique that refers to achieving the ideal investment and can be made by having enough ability to finance positive NPV investment, while at the same time, not giving up good investment opportunities due to limited financing (Nor et al., 2017). Investment efficiency is contingent upon the comprehensive evaluation of investment management costs, returns, and risks, taking into consideration the prevailing constraints faced by investors (Duho, 2021).

Financial flexibility plays a crucial role in confronting the funding needs in emerging economies (Arslan et al., 2014; Setianto & Kusumaputra, 2017; Islam et al., 2020; Raza et al., 2021). Accordingly, firms need to retain a certain amount of flexibility to avoid potential dangers to their sustainable development, respond to significant positive shocks to investment possibilities, and simultaneously strengthen their establishment of competitive advantages to produce a fair market environment. In other words, financially flexible firms can prevent situations that lead to excessive or insufficient investment (Arslan et al., 2014; Zhang et al., 2020). Financial flexibility is usually influenced by financing costs, anticipated cash inflows, and cash on hand (Ma & Jin, 2016). The positive value of financial flexibility is expected to be larger in countries that anticipate encountering more significant funding limitations and worse investor protection (Ferrando & Marchica, 2017).

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## 1. LITERATURE REVIEW AND HYPOTHESES

Most research on the economic implications of financial flexibility mainly focuses on investment ability and firm performance (Arslan et al., 2014; Ma & Jin, 2016; Marchica & Mura, 2010; Ferrando & Marchica, 2017; Mahmood et al., 2021; Hossain et al., 2023; Setianto & Kusumaputra, 2017), payout policy (Kumar & Vergara-Alert, 2020), enterprise risk-taking (Chang & Wu, 2021; Liu & Chang, 2020), capital structure (Pendar et al., 2019; Yanti et al., 2022), research & development investments (Han et al., 2021; Hao et al., 2022).

Investment efficiency has a lot of determinants whether financial or non-financial, however, financial flexibility is a means to achieve investment efficiency (Mahmood et al., 2021). Several scholars have examined the impact of financial flexibility on investment efficiency (Roychowdhury et al., 2019; Islam et al., 2020; Raza et al., 2021; Cherkasova & Kuzmin, 2018). Moreover, some of the literature moderates this relationship through economic policy uncertainty (Hao et al., 2022), financing constraints (Hao et al., 2022), or global financial crises (Bancel & Mittoo, 2011).

The impact of financial flexibility on investment ability and financial policy has witnessed a notable increase during the global financial crisis of 2007–2009. The existing literature focuses on the agency theory, which aims to address the conflict

of interest between management and shareholders. Financial flexibility seeks to mitigate management's risk aversion, enabling firms to adopt risk-taking in addition to analysis and selection of investment projects that have the potential to generate anticipated returns and future cash flows (Liu & Chang, 2020).

Several empirical studies demonstrated that there is a significant positive relationship between a firm's financial flexibility and its investment sensitivity. This relationship is particularly pronounced for firms that have employed conservative leverage strategies to get their desired level of financial flexibility (Marchica & Mura, 2010).

Yung et al. (2015) argued that the value of flexibility appears in the global crisis and supports the conservative strategy of low leverage for enterprises in emerging nations. Compared to rigid companies, financial flexibility can boost investments while decreasing suboptimal investments and improving investment efficiency.

Financial flexibility gives managers the chance to increase investment levels while also using funds for projects where profit margins are higher and risk is lower, thereby avoiding plans where risks are greater but returns are more cost-effective. This suggests that having more financial flexibility can improve both the firm's performance and investment strategy (Islam et al., 2020).

Financial flexibility is associated with higher investment expenditure and the implementation of effective and pragmatic investment plans, which aim to mitigate the occurrence of excess and underinvestment (Cherkasova & Kuzmin, 2018).

Ferrando and Marchica (2017) argued that firms with higher levels of financial flexibility can mitigate the adverse effects of liquidity shocks on their investment activities. Hence, financial flexibility contributes to increasing firm value through two distinct mechanisms (Mahmood et al., 2022). Firstly, financial flexibility operates by addressing the issue of underinvestment that arises when internal resources are inadequate or inaccessible. Firms that possess inadequate domestically generated capital are compelled to seek external sources of funding. Nevertheless, the presence of financial constraints might provide challenges for enterprises in terms of their ability to gain entry into the capital market. Secondly, financial flexibility operates by mitigating the impact of increased financial expenses and firm value (Mahmood et al., 2022).

The existing body of literature posits that financial flexibility has a positive impact on investment capacity and mitigates the influence of cash flow on investment activities. Firms with higher financial flexibility in Indonesia tend to maintain a higher cash reserve as a means of attaining and preserving their financial flexibility (Setianto & Kusumaputra, 2017). Therefore, firms often prioritize maintaining financial flexibility to mitigate the adverse effects of environmental unpredictability and financial constraints on their viability and prosperity for a long time.

The concept of financial flexibility encompasses both internal and external sources, and the impact of various resource origins on an organization's willingness to take risks may vary (Liu & Chang, 2020). The financial flexibility can mitigate the risks of under-investment or over-investment, thereby optimizing investment efficacy (Islam et al., 2020). Financial flexibility plays an important role in the existence of risks, financial shocks, and economic policy uncertainty. Hao et al. (2022) argued that economic policy uncertainty has a reverse impact on firm innovation. However, firms can proactively manage their flexible financial re-

serves to mitigate the adverse effects of policy uncertainty and achieve an adaptive outcome.

The literature posits that organizations with higher financial flexibility tend to allocate more resources towards investment expenditures and implement more efficient investment policies, thereby mitigating the risks associated with over- and under-investment. The presence of flexibility enables organizations to strategically allocate their resources toward projects that yield optimal results, particularly during periods of crisis (Cherkasova & Kuzmin, 2018).

De Jong et al. (2012) showed that companies that possess a greater amount of unused debt capacity tend to allocate more resources toward investments in subsequent years. Furthermore, financial flexibility pertains to the strategic planning and sustainable growth of businesses over an extended time. There is a growing worry among firm managers over financial flexibility. However, this may give birth to certain challenges like insufficient investment and inefficient allocation of funds (Zhang et al., 2020). According to the conservative leverage policy, firms aim to maintain a certain degree of financial flexibility to improve their capacity to enter the external market when positive shocks occur in their investment opportunity set (Marchica & Mura, 2010).

Financial flexibility is a key consideration for investors in the commercial real estate sector, particularly due to the capital-intensive nature and relative lack of liquidity in the underlying property market (Howton et al., 2018). The presence of financial frictions can impose constraints on organizations, limiting their ability to engage in activities that would enhance their value. The existence of these frictions gives birth to the importance of financial flexibility as a primary factor in a firm's capacity to promptly capitalize on investment opportunities. It is advantageous for high-tech companies to prioritize financial flexibility to enhance their ability to respond effectively (Han et al., 2021).

Setianto and Kusumaputra (2017) argued that firms operating in emerging economies can get greater advantages by adhering to a conservative debt policy. These firms can effectively leverage

their untapped loan capacity to secure the necessary funding for future investment projects. In Asia, the literature argued that financial flexibility is associated positively with investment efficiency (Cherkasova & Kuzmin, 2018). The researchers argued that organizations with higher financial flexibility exhibited higher levels of new investment compared to firms with lower financial flexibility. Moreover, these financially flexible firms have shown the capacity to maintain high levels of efficiency even during the financial crisis, owing to their ability to absorb adverse economic shocks.

Corporate governance mechanisms have positively contributed to firm performance by mitigating potentially inefficient investment levels either overinvestment or underinvestment (Nor et al., 2017). Firms should improve their internal control systems and strengthen their governance to reduce agency costs (Hao et al., 2022). Moreover, recent research has sought to establish that the quality of reporting has an impact on investment efficiency through its role in enabling access to external resources. Firms with a higher level of reporting quality give shareholders more control over managers, which lessens their incentives to make excessive investments (Roychowdhury et al., 2019). Moreover, the focus on outside financial expertise is intended to increase oversight of the firm financial actions. Investors need to possess knowledge regarding the robustness of corporate governance to enhance the quality of accounting (García-Sánchez et al., 2017).

The Board of Directors (BODs) plays a vital role in establishing effective corporate governance and assessing the impact of excellent corporate governance practices, such as board financial knowledge, on a company's ability to attain the optimal investment level. Therefore, BODs assume a crucial role in monitoring and guiding enterprises investment decisions (Naheed et al., 2022). A primary concern of the board is monitoring and advising management on critical firm-specific financing and investment decisions. However, since the passage of Sarbanes-Oxley and other regulatory reforms mandating firms to increase outside financial expertise. Those firms with an internal financial expert on their board are associated with decreases in leverage and faster adjustments toward their

target debt ratio following shocks. Thus, these firms exhibit fewer financial constraints and greater financial flexibility to create value for shareholders.

Egypt is an emerging economy with a limited set of governance mechanisms like board governance which suffers from the weakness of board independence (Hariprasad, 2016). Moreover, it is worth noting that the Egyptian government does not exercise rigorous oversight over the governance system. This lack of monitoring contributes to a significant information asymmetry, ultimately leading to a decrease in investment efficiency. Furthermore, the functions of the audit committee are usually regarded to be governance tools aimed at addressing agency issues by incorporating individuals with expertise in finance, accounting, and economics into the committee. This inclusion is expected to strengthen the board's oversight function, enabling it to identify and address accounting and risk-related concerns. Moreover, companies that exhibit higher cash flow and lower financial constraints can readily acquire financial resources, hence facilitating their ability to pursue growth and investment abilities. This, in turn, enhances their capacity to make effective investment decisions (Raza et al., 2021; Naheed et al., 2022).

More specifically, if a director is independent and has expertise in accounting, auditing, taxation, and finance, we classify them as a "financial expert" within the context of an audit committee. Top managers having expertise in finance ensure that business resources are allocated effectively and assist in minimizing any deviations from the investment level required by firm fundamentals (Li et al., 2021; Li et al., 2023). Audit committee financial expert has tightened this definition via regulators and the need for at least two financial experts (Chen & Komol, 2018).

Unique traits of financial experts may influence organizational strategies and practices. Several empirical studies have found that organizations with higher financial expertise have better management and investment capabilities as well as the ability to implement organizational strategies more successfully, which enhances corporate policy (Jelic et al., 2019; Li et al., 2021).

According to the findings of Hellmann and Puri (2002), it is posited that developing enterprises have the potential to derive advantages from the financial expertise offered by venture capitalists through the implementation of stock option programs, the establishment of human resource policies, and the appointment of a vice president of sales and marketing. These experienced individuals play a crucial role in enhancing the professionalization of these organizations. Additionally, Jelic et al. (2019) argued that executive directors with prior expertise in the financial industry demonstrate higher effectiveness in implementing cost-reduction strategies and conducting financial oversight. As a result, these individuals contribute to the improved firm profitability.

Custódio and Metzger (2014) provide evidence supporting the notion that CEOs who possess prior expertise in the field of professional finance exhibit higher levels of financial literacy and engage in more proactive management of investment activities.

The significance of financial knowledge in the decision-making process of organizations has been emphasized in light of the financial crisis of 2018 and the accounting inaccuracies observed during the past two decades (Kalelkar & Khan, 2016). Recent studies show that hiring of CEOs with financial experience is increasing, which is not surprising (Custódio & Metzger, 2014). All top managers' financial expertise should be taken into account while developing company policy. In reality, firms can incorporate flexibility aspects into their investment strategies to help them make wise financial decisions (Islam et al., 2020). Moreover, the tax benefit associated with acquiring debt contributes to the enhanced financial flexibility and effectiveness of financial professionals. The investment choice is significantly influenced by financial flexibility, while the increase in the policy uncertainty index negatively impacts company efficiency (Howton et al., 2018; Hao et al., 2022).

To effectively preserve flexibility and ensure sufficient financial resources, firms must possess a certain level of financial expertise (Hao et al., 2022). This expertise plays a crucial role in mitigating the adverse impacts of uncertainty, capitalizing on opportunities, enhancing innovation efficiency,

and ultimately strengthening competitive advantage (Aljuneidi et al., 2023). Therefore, firms have an incentive to reduce economic uncertainty and financial constraints through board financial expertise, whether for financial flexibility or investment efficiency.

According to our predictions, there is solid evidence that financing and investment decisions are strongly correlated, and this correlation is even stronger when board financial expertise is available. Although many studies show that financial flexibility is a crucial factor in how organizations make decisions, there is little empirical data on how to obtain financial flexibility. There are no studies that have looked at how a firm's financial flexibility and the board's financial expertise affect its investment efficiency in Africa, particularly Egypt. The applicability of findings from the USA, Brazil, the UK, and Asia to the Egyptian environment may be limited by various institutional factors, including market characteristics, corporate profitability, the level of investment in Egyptian enterprises, and the sophistication of financial markets. Making strategic investment decisions aimed at maximizing shareholder value requires an awareness of the elements that influence investment efficiency because it demands that capital investments be restricted to profitable projects.

Also, we believe that board financial competence will help resolve disputes between debt and equity, making it easier for businesses to obtain debt financing and prevent underinvestment. This paper focuses on the governance role of audit committees in safeguarding corporate resources. The paper hypothesizes that directors with backgrounds in finance, accounting, management, law, and banking will be better able to raise capital for their companies and increase firm investment.

This paper aims to analyze the moderating effect of board financial expertise on the relationship between financial flexibility and investment efficiency. The hypotheses are formulated as follows:

- $H_1$ : *Financial flexibility promotes firm investment efficiency.*
- $H_2$ : *Director financial expertise enhances firm investment efficiency.*

$H_3$ : *The board’s financial expertise hurts the relationship between financial flexibility and investment efficiency.*

## 2. METHODOLOGY

The sample includes 58 Egyptian firms that were listed on the EGX100 between 2014 and 2021, a total of 464 observations. The financial industry was excluded from the sample due to its unique characteristics that set it apart from other industries. This study employs financial reports and statements to do panel data analysis utilizing OLS and GMM. The best time frame for the EGX100 is between the period 2014–2021 due to the Egyptian stock market being stable during the entire period.

Table 1 displays the various sectors included in the EGX100 sample, except for the financial sectors. The real estate industry represents the biggest proportion of the sample, comprising 29.31% of the total. Subsequently, the food industry, accounting for approximately 17.24% of the sample, is observed. The primary sector of resources constitutes 8.62% of the sample, but both the shipping and construction sectors individually represent 6.90% each. The paper industry constitutes the least significant segment within the sample, accounting for a mere 1.72% of the total. The sample consists of three sectors: trade, media, and industrial, each accounting for 3.45% of the total.

**Table 1.** Industries pertinent to the sample

Sector	FRE	%
Basic Resources	80	13.51
Building Materials	56	9.46
Contracting & Construction Engineering	16	2.70
Education Services	8	1.35
Energy	16	2.70
Food, Beverages, and Tobacco	104	17.57
Health Care	24	4.05
IT, Media & Communication Services	16	2.70
Industrial Goods, Services, and Automobiles	24	4.05
Paper & Packing	16	2.70
Real Estate	120	20.27
Shipping & Transportation Services	32	5.41
Textile and Durables	32	5.41
Trade & Distributors	16	2.70
Travel & Leisure	32	5.41
Total	592	100.00

This paper explores the moderating effect of board financial expertise on the relationship between financial flexibility and investment efficiency in Egyptian firms using PCSE and GLS. The proposed model is as follows:

$$EFF_{i,t} = \alpha_0 + \alpha_1 FF_{i,t} + \alpha_2 BFEX_{i,t} + \alpha_3 FF_{i,t} \cdot BFEX_{i,t} + \sum_k^{\beta} controls_{i,t} + \varepsilon_{i,t}. \tag{1}$$

$$EFF_{i,t} = \alpha_0 + \alpha_1 FF_{i,t} + \alpha_2 BFEX_{i,t} + \alpha_3 FF_{i,t} \cdot BFEX_{i,t} + \alpha_4 FS_{i,t} + \alpha_5 ROA_{i,t} + \alpha_6 FA_{i,t} + \varepsilon_{i,t}. \tag{2}$$

Investment inefficiency (EFF) is measured by the difference between the actual and expected investments (Biddle et al., 2009; Shen et al., 2015; Cao et al., 2018; Ghazali et al., 2023; Lin et al., 2023) as shown in equation (3).

$$EFF_{i,t} = \alpha_0 + \alpha_1 TQ_{i,t-1} + \alpha_2 CFO_{i,t-1} + \alpha_3 LEV_{i,t-1} + \alpha_4 RET_{i,t-1} + \alpha_5 FS_{i,t-1} + \alpha_6 FA_{i,t-1} + \alpha_7 EFF_{i,t-1} + \mu Industry\ fixed\ effect + \Omega Year\ fixed\ effect + \varepsilon_{i,t}. \tag{3}$$

The investment efficiency (EFF) is determined by the discrepancy between actual and anticipated investment amounts (Wang et al., 2020; Zhou & Zhao, 2022; Ma et al., 2023).  $TQ_{i,t-1}$  represents a proxy for growth potential, which is calculated by dividing the market value of assets to book value of total assets.

Cash flow ( $CF_{i,t-1}$ ) is quantified as the net operating cash flows divided by the total assets (Banerjee et al., 2023). Leverage ratio ( $LEV_{i,t-1}$ ) is calculated by dividing the total loans to total assets.  $RET_{i,t-1}$  represents the yearly stock return of the preceding year (Sun et al., 2022). Firm size ( $FS_{i,t-1}$ ) is measured by the log of total assets. Firm age ( $FA_{i,t-1}$ ) is measured by the number of years it has been listed. In addition to serving as controls, industry and year-fixed effects are also included in the analysis (Cohen & Li, 2020). The symbol  $\varepsilon_{i,t}$  represents the residuals of equation (3) (Ma et al., 2023).

Financial flexibility (FF) is the independent variable, which is measured by calculating the financial

leverage of each company is calculated as the aggregate of long-term and short-term liabilities divided by the total assets. Subsequently, the financial leverage of the company is adjusted by deducting the average financial leverage of the industry, dividing it by the standard deviation of the industry's financial leverage, and ultimately multiplying the result by a negative one (Guo et al., 2020).

The moderation in this study is referred to as board financial expertise (BFEX). BFEX is quantified by calculating the proportion of financial experts serving on the board, thereby serving as an indicator of the level of financial literacy (Ali et al., 2022; Naheed et al., 2022). A financial expert is an individual who possesses a strong educational foundation in accounting, finance, and economics, typically holding a bachelor's or master's degree in these fields. In addition, they may have pursued professional education, such as becoming a chartered accountant, or have experience as a professor specializing in finance, accounting, auditing, tax, management, or economics. Furthermore, they may have expertise as a professional investor (Khan et al., 2022; Naheed et al., 2022).

Control variables are  $FS_{i,t}$  is the firm size measured by the natural log of total assets;  $ROA_{i,t}$  is

derived by dividing net income by total assets;  $FA_{i,t}$  is a firm age measured by the number of listing years; Industry and year-fixed effects are also controls;  $\varepsilon_{i,t}$  is the residuals of equation 2 (Ghazali et al., 2023).

### 3. EMPIRICAL RESULTS

This section includes descriptive analysis, correlation matrix, conducting diagnostics tests, multivariate analysis, and robustness check.

#### 3.1. Descriptive analysis

The descriptive summary of the variables for the 74 Egyptian enterprises included in EGX100 is presented in Table 3.

**Table 3.** Descriptive statistics

VAR	Obs	Mean	SD	Min	Ma	Skew	Kurt
EFF	592	.020	.237	−.409	.621	.286	2.252
FF	592	−.026	1.3	−1.959	1.91	−.013	1.728
BEXP	592	.10	.111	0	.5	.695	2.376
FS	592	9.273	.595	8.37	10.22	.036	1.878
ROA	592	.109	.08	.017	.262	.668	2.201
FA	592	3.320	.508	2.56	4.11	.115	1.759

**Table 2.** Measurements of variables

VAR	P. Sig	Proxies			References
		Name	Abbrev	Measure	
Dependent Variable	Investment Efficiency		Efficiency	EFF	The discrepancy between actual and anticipated investment amounts (Biddle et al. 2009; Shen et al. 2015; Cao et al. 2018; Ghazali et al., 2023)
Independent Variable	Financial flexibility	+/-	Flexibility	FE	The industry's average financial leverage is deducted from the company's financial leverage, divided by the standard deviation of the industry's financial leverage, and finally multiplied by minus 1 (Guo et al., 2020)
Moderator Variable	Board Financial Expertise	−	Financial Expertise	BFE	Financial expert's ratio on the board. A financial expert is a person who has a bachelor's, or master's degree in accounting, finance, and economics and has a financial background. (Khan et al., 2022; Naheed et al., 2022)
Control Variables	Firm Size	+/-	Firm size	FS	Log of total assets (Rashed, et al., 2018; Naheed et al., 2022; Shehata and Rashed, 2021; Abdel-Wanis & Rashed, 2023; Khalil and rashed, 2023; Samir et al. 2023)
	Return on Assets	+	Return on assets	ROA	Net income scaled by total assets (Abdel-Wanis & Rashed, 2023)
	Firm Age	+	Firm Age	FA	the number of listing years (Abdel-Wanis & Rashed, 2023)



Table 3 shows that the average value of investment efficiency (EF) often has a positive distribution, with a range spanning from -0.409 to 0.621. During the duration of the study, the mean value of financial flexibility (FF) is calculated to be -0.026. During the study period, the enterprises exhibited instability in both EF and FE as seen by the decreasing standard deviation.

The study period reveals that the mean value of board financial experts (BEXP) is 0.10. Firms can be differentiated based on the stability of BEXP, which is indicated by a higher standard deviation of 0.111. The mean values for the financial strength (FS), return on assets (ROA), and fair value (FV) variables, after controlling for other factors, are 9.273, 0.109, and 3.320, respectively. In the Egyptian market, it can be shown that all control variables remain constant and identical, indicating a consistent state of firms during the period from 2014 to 2021.

### 3.2. Correlation matrix

Table 4 illustrates the correlation matrix for each study variable. The findings pertain to the positive link between financial flexibility and investment efficiency ( $r = 0.122$ ), but there is no correlation between board financial expertise and investment efficiency. Moreover, investment efficiency shows a positive association with both FA and ROA, but not with FS. The variance inflation factors (VIF) for all variables in the study are less than 10 so, the presence of multicollinearity is not evident.

**Table 4.** Correlation matrix

VAR	(1)	(2)	(3)	(4)	(5)	(6)	VIF
(1) EFF	1.00						
(2) FF	.122* (.003)	1.00					1.19
(3) BEXP	.049 (.237)	-.084* (.041)	1.00				1.01
(4) FS	-.079 (.053)	-.288* (.000)	.097* (.019)	1.00			1.15
(5) FA	.194* (.000)	.200* (.000)	-.016 (.699)	-.257* (.000)	1.00		1.12
(6) ROA	.260* (.000)	.285* (.000)	.064 (.120)	-.067 (.102)	.200* (.000)	1.00	1.13

Note: \*  $p < 0.05$ .

### 3.3. Diagnostics check

Diagnostics check includes conducting heteroscedasticity, autocorrelation, omitted variables, and unit root tests.

**Table 5.** Diagnostics check

Diagnostics check		Coe.
Hetero	chi2(1)	8.06
	Prob > chi2	.004
Autocorrelation	Durbin Watson (28.592)	1.57
Omitted	F (3, 561)	10.21
	Prob > F	.00
Unit-Root	Adjusted t	-25.34
	Prob	.000

According to Table 5, there is a heteroscedasticity because the Chi2 value for EFF is 8.06 and the probability value is less than 0.05. The Durbin-Watson value of 1.572 provides proof that there is no autocorrelation. Given that the probability value is below the threshold of 0.05 and the f-value for the variable EFF is 10.21, there arises a legitimate concern regarding the presence of omitted variables. The presence of a stationary time series can be inferred from the observation that the probability value is below the significance level of 0.05, indicating a rejection of the null hypothesis of non-stationarity. Additionally, the unit root test for the variable EFF yields a value of -25.34, further supporting the conclusion of stationary.

### 3.4. Multivariate analysis

Table 6 shows regression analysis using two different regressions (PCSE and GLS) to explore the moderating effect of financial expertise on the relationship between financial flexibility and investment efficiency in Egyptian firms within the period between 2014–2021.

Table 6 shows that both financial flexibility (FF) and board financial experts (BEXP) explain 59% of investment efficiency across 592 observations within the period between 2014–2021. Results indicated that there is a positive impact of financial flexibility (FF) on investment efficiency (EFF) at the 5% level using panel corrected standard error (PCSE) and at the 1% level using generalized least square (GLS). Board financial experts (BEXP) hurt investment efficiency (EFF) in both PCSE and GLS

models. Also, there is a negative influence of BEXP on the link between FF and EFF at the 1% level in both models. According to control variables, there is a positive impact of FS, FA, and ROA on EFF in both PCSE and GLS models.

**Table 6.** Regression analysis with PCSE & GLS

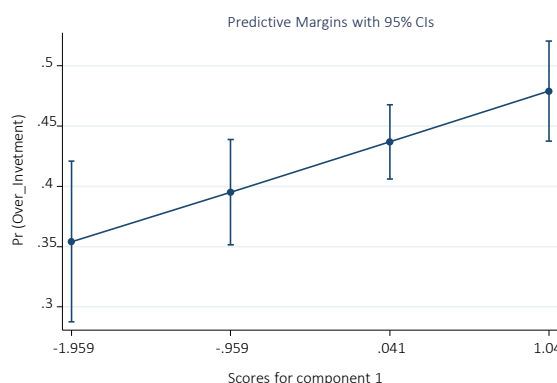
Variable	PCSE		GLS	
FF	.0110*	.0192**	.0110*	.0192**
BEXP	-.1328*	-.1875**	-.13285*	-.1875**
FF*BEXP		-.8155*		-.8155*
FS	.0396***	.0378***	.03963**	.0378**
ROA	.2171**	.2154**	.21713*	.2154*
FA	.0322*	.0268	.03227*	.0268
Cons	-.2636	-.2212	-.4794**	-.4369**
N	592	592	592	592
R <sup>2</sup>	.590	.593		
chi <sup>2</sup>	3118.89	7091.75	852.20	864.71
Prob > chi <sup>2</sup>	.00	.00	.00	.00

Note: \* p < 0.05; \*\* p < 0.01; \*\*\* p < 0.001.

Table 7 provides a detailed description of the methodology employed to assess the resilience of the financial flexibility (FF) impact. This involves substituting a binary variable for FF, whereby a value of 1 is assigned if FF exceeds the median value, and 0 otherwise.

**Table 7.** Financial flexibility effect with PCSE and GLS

Variable	PCSE		GLS	
FF_Dum	.020***			.020**
BEXP	-.312***	-.196*	-.196*	-.3126***
FF* BEXP	-.781*			-.781*
Low_FF		-.043**		
High_FF			.043**	
FF_Dum* BEXP		-.193**	-.193**	
FS	.035***	.040***	.040***	.035**
FA	.023	.024	.024	.023



Variable	PCSE			GLS
ROA	.181*	.1790*	.179*	.181*
Cons	-.182	-.399**	-.443**	-.387*
N	592	592	592	592
R2	.597	.600	.600	
Chi2	126.45	195.00	195.00	878.03
Prob > Chi2	.000	.000	.000	.000

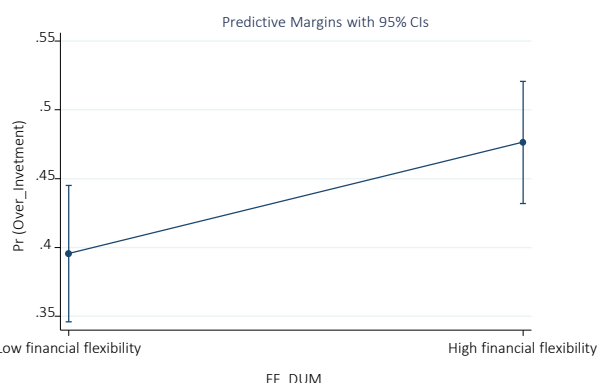
Table 7 shows the same results regarding a positive impact of FF on EFF at 1% level in PCSE and GLS models when higher financial flexibility, while there is a negative impact of FF on EFF when lower financial flexibility in addition to a negative impact of BEXP on EFF in both models. Results support a negative influence of BEXP on the link between FF and EFF at the 5% level in both models. Results are consistent with control variables in Table 6, showing that both FA and ROA have a positive impact on EFF but there is no impact of firm age (FA) on EFF in both PCSE and GLS models.

Figure 1 indicates that high financial flexibility leads to an increase in over-investment, while low financial flexibility causes a decrease in overinvestment

### 3.5. Robustness test

Table 8 shows the robustness test demonstrating the impact of FF & BEXP on over-under investment by substituting a dummy variable for EFF value, if EFF is a positive residual taking 1, and otherwise 0.

Results in Table 8 show that there is a positive influence of financial flexibility on over-investment when financial flexibility is high. Also, there is a



**Figure 1.** Association between financial flexibility and over-investment

**Table 8.** Robustness test by using logistics regression

VAR	Logistics regression			
	Model (1)		Model (2)	
	Coef	Odds	Coef	Odds
FF			.291**	1.338
FF_DUM	.559*	1.750		
BEXP	-3.187*	0.041	-4.754**	.020
FF_DUM* BEXP	-2.979*	0.051		
FF*BEXP			-6.517*	0.013
FS	-.386	.679	-.418	.658
FA	.526*	1.692	.411*	1.537
ROA	-.529	.589	-.647	.523
_cons		1.644		2.271
N		331		261
chi2		282.88		283.55
Prob > chi2		.000		.000
Log-likelihood		-264.75		-264.41
Pseudo R2		.348		.349

Note: \*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$ .

negative influence of BEXP on over-investment at 1% level, while there is a negative influence of BEXP on the link between flexibility and over-investment. Table 8 shows that both FS and ROA have no significant effect on over-investment, while there is a positive influence of FA on over-investment at the 5% level.

## 4. DISCUSSION

This paper fills the gap by exploring the moderating effect of board financial expertise on the relationship between financial flexibility and investment efficiency in Egyptian firms. The results show that board financial expertise reduces investment efficiency. This paper affirms the idea that financial experts have essential abilities and collaborate to encourage more effective investment. This study emphasizes the value of the knowledge and expertise gained through prior finance-related jobs in enhancing firm investment efficiency since board financial experts support the effective use of corporate resources. The findings of this study align with the notion that the presence of untapped reserves of borrowing capacity, which provide financial flexibility, is a crucial component that has been overlooked in capital structure theory (Marchica & Mura, 2010). Firms can raise outside capital and make investments when a growth opportunity occurs, despite a worsening macroeconomic outlook in addition these firms had built

up spare debt capacity by a prudent leverage policy for several years before the crisis (Ferrando & Marchica, 2017). As a result, financial flexibility boosts a firm's investment capabilities and leads to improved investment despite market frictions restricting possible growth prospects (Raza et al., 2021 & Ferrando & Marchica, 2017).

Firms are faced with several opportunities and challenges when the business environment is unpredictable. In the face of investment decisions, financial flexibility can greatly stimulate firms to make risk-taking decisions and dare to take risks (Liu & Chang, 2020). Financial flexibility can invest much more after a time of spare debt capacity in addition long-term performance assessments demonstrate that enterprises financially flexible invest more wisely, which ultimately provides remarkable results (Marchica & Mura, 2010).

Maintaining low debt ratios paired with strong internal equity in the presence of growth prospects leads to a proportionate increase in the number of investments, as firms spend more on new positive-NPV projects. Egyptian enterprises with financially flexible capital structures had higher levels of new investment than companies with financially rigid capital structures

Firms should only appoint financial professionals for the complete management team to account for all pertinent elements during the recruitment pro-

cess. One of the many considerations the organization should weigh when recruiting managers is financial expertise.

Financial experts support the management team in conducting accurate investment appraisals, giving financial knowledge and practical skills, bringing fresh ideas, and contributing to the development of top management strategy, all of which boost the efficacy of corporate investment. A mismatch between available cash and investment opportunities could result in investing inefficiently. For instance, corporations could decide on positive NPV initi-

atives because of a shortage of financial resources. Therefore, it is anticipated that the favorable influence of financial expert managers will be more visible in enterprises with limited access to finance.

Board financial expertise may be more valuable and hence have a bigger effect on lowering investment efficiency. Board financial expertise encourages overall investment efficiency. The findings demonstrate that board financial experts greatly minimize overinvestment but do not underinvest. Board financial expertise is essential for decreasing investment efficiency.

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## CONCLUSION

This paper aims to explore the moderating effect of board financial flexibility on the relationship between financial flexibility and investment efficiency based on 592 firm-year observations in 74 Egyptian listed firms using PCSE and GLS models. The findings indicate that a majority of the firms exhibit a higher degree of financial flexibility. Firms that exhibit financial flexibility are more likely to enhance their investment efficiency. The presence of financial flexibility can serve as a means to mitigate financial distress in the event of adverse shocks, while also enabling firms to allocate funds in real time towards advantageous investment abilities. This study offers a critical theoretical and practical contribution. Depending on mitigating agency problems, board financial expertise plays a vital link between financial flexibility and investment efficiency by using monitoring and advisory roles as moderator variables.

Financially flexible firms are positioned to mitigate the underinvestment problem enhance a firm's investment ability and lead to better investment despite market frictions hampering possible growth opportunities. The present results have pertinent implications for how firms proactively manage the sustainability of their operations by financial and accounting expertise has a significant effect on the optimization of finance and investment decisions. Finally; this study can be improved for a future examination that ought to be directed to recognize the moderating effect of economic policy uncertainty on the relationship between financial flexibility and research and development investment.

## AUTHOR CONTRIBUTIONS

Conceptualization: Mohamed Rezk Omara.  
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 Investigation: Mohamed Rezk Omara.  
 Methodology: Mohamed Rezk Omara.  
 Project administration: Ahmed Rashed.  
 Resources: Ahmed Rashed.  
 Software: Ahmed Rashed.  
 Supervision: Ahmed Rashed.  
 Validation: Mohamed Rezk Omara.  
 Visualization: Mohamed Rezk Omara.  
 Writing – original draft: Ahmed Rashed.  
 Writing – review & editing: Ahmed Rashed.

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