



The impact of corporate governance on financial performance: a cross-sector study

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Abstract

Corporate governance remains the focus of current research and a concept that continues to evolve to meet the needs of business managers. Faced with the need for companies to cope with a world characterized by perpetual change and successive economic crises (Prowse in *Revue d'économie financière* 31:119–158, 1994), the identification of the results of the implementation of good governance mechanisms in the structure of the management of companies on financial performance remains a necessity that helps managers and researchers specialized in management sciences and financial accounting to have a better visibility on the importance of corporate governance. It should be mentioned that the economic environment and the characteristics of the sectors of activity of the companies remain a relevant criterion in the study of the relation between the governance of the companies and their financial performance. In this sense, we have tried through this research work to study the impact of the implementation of effective corporate governance on the financial performance of 160 companies in the UK between 2005 and 2018 while taking into account the specificity of the business sectors. Through our study, we used multivariate regressions based on FGLS models while dividing our sample to several clusters. As a result, we found that the implementation of good corporate governance leads to the improvement of the financial performance of companies measured by the return on equity. As a motivation, it must be said that this study can be of major importance for future studies that want to make comparisons on the sectoral and temporal level. Indeed, this study gives the possibility for future research work to make comparative studies based on comparisons for different sectors of activity in the UK before and after the Brexit and also after the COVID 19 period.

Keywords Corporate governance · Financial performance · Cross-sector study · FGLS analysis

Introduction

There has been much research on the relationship between corporate governance and financial performance. Referring to the literature on the role of corporate governance, we can cite the work of Shleifer and Vishny (1997) who consider corporate governance as the set of mechanisms by which capital providers guarantee shareholder profitability. Denis and McConnell (2003) have emphasized the importance of

distinguishing between the notion of internal and external mechanisms of governance and their importance for the providers of funds on all points of value creation.

The study of the relationship between governance expressed by the corporate governance score and the improvement of the performance of the latter remains a vast field of study and research that has inspired researchers in the field of accounting, finance, and taxation (Louizi 2007).

The existence of such a relationship has led us to wonder about the factors that can impact this relationship in a direct or indirect way. Considering this fact, we note that managers who behave in a discretionary manner will exert a major influence on the fate of the accounting and tax manipulation of companies and will try to increase their discretionary power.

Within this framework, agency theory has explained this behavior by focusing on the interests of the funders

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and decision makers in a way that reflects the interest of each party (Jensen and Meckling 1976).

From an accounting perspective, the manager often has the power to manipulate earnings while using the accounting estimates and manipulation techniques available to him (Ahadiat and Hefzi 2013).

The practices of corporate governance have not stopped evolving. This is presented via the succession of guides to good governance practices that seek to counter the failures detected over time and which manifest themselves at the level of financial scandals, sometimes inducing a harmful imbalance for the global economic fabric. Based on the "FTSE 350 corporate governance review (2013), for the UK, the evolution of good governance guidelines as well as institutions in the field of corporate governance has developed to respond to the panoply of problems that may be directly related to corporate governance.

In the same context, it is important to emphasize that the study of corporate governance must take into account the specificity of each sector of activity since each sector has its own regulations, key success factors, and compliance rules. In our research paper, as our focus is on UK companies, we have chosen to use the 2 digit ICB industry code, which is relevant to the context of our study. In addition, it should be noted that previous research has studied the relationship between corporate governance and financial performance while focusing only on a particular governance mechanism or a particular specificity related to the strengthening of these mechanisms. Again, it must be emphasized that the majority of research studies have examined the relationship between corporate governance and financial performance without giving much importance to the sectoral specificity of the companies studied.

To give a clearer idea of the orientation of our research work and based on previous developments, we can form the following research question:

What relationship can exist between the governance score and financial performance, taking into account the characteristics of the different business sectors in the United Kingdom economy?

It follows that the objective of the research is to examine the relationship between governance score and financial performance while taking into account the characteristics of the business sectors.

This research paper contributes to the existing literature on several levels. Indeed, it consolidates previous research that tried to show the importance of corporate governance in improving financial performance. Moreover, it focuses on the effect of changes in the business sectors of UK firms so that we can identify the effect of the quality of corporate governance on the performance of firms related to a particular business sector.

This research paper allows us to study the impact of corporate governance on the financial performance sought by shareholders while basing ourselves on the FGLS method, which allowed us to eliminate the various sources of bias identified when using different regressors, namely the generalized least squares method, the regression with the consideration of the presence of the fixed effect as well as the persistence of the autocorrelation problem.

We will try through this research work to emphasize the possible relations between corporate governance and financial performance which is mainly based on the agency theory. It should also be added that the study of the previous relationship by taking into consideration the sectoral characteristics will lead us to turn to the foundations of the institutional theory. The latter theory emphasizes that an institution is constrained by its social, political, economic, legal and technological environment, which it conforms to in order to guarantee its legitimacy and durability.

In order to achieve our research objective, we will not use a simple governance mechanism to reflect the importance of corporate governance on financial performance, but we will opt for a governance score that better reflects all managerial, strategic and CSR characteristics. To achieve the objective of this research work, the remainder of the paper is arranged as follows. First, in "Review and development of hypotheses" section, we briefly discuss previous literature and the development of hypotheses. In "Research methodology" section, the research design and methodology are discussed including data, variables description. "Empirical approach to the analysis of the relationship between corporate governance and financial performance" section summarizes the empirical results, the discussions of the findings and their implications, including the focus on the difference in industry specifications using different regressors. Finally, in the last section, we conclude the study and provide the implications of our findings and the recommendations for future research.

Review and development of hypotheses

Agency theory and corporate governance

Corporate governance has always played a fundamental role in monitoring and controlling the proper functioning of business processes transparently. By referring to the various research works, we can see that the agency theory is at the heart of the studies on corporate governance. The work of Ross (1973) and subsequently Jensen and Meckling (1976) has indicated that the agency theory is the most appropriate sphere to study corporate governance.

This theory can lead us to reflect on the way in which managers can behave. We can cite the case of companies



that offer their managers variable remuneration depending on the growth of turnover. In the same sense, it must be said that internal control efficiency and internal audit within companies can play an important role in strengthening the governance structure of companies. It represents one of the guarantors of the proper functioning of business processes in a controlled environment to ensure the improvement of financial performance (Nyakundi et al. 2014).

To further develop the role of agency theory in the governance-performance relationship, we can say that agency theory is an analytical framework for understanding the relationships between a firm's stakeholders, including shareholders and management. According to this theory, shareholders have different objectives from those of managers, which can lead to conflicts of interest. Managers seek to maximize their own wealth and power, while shareholders seek to maximize the value of their shares. To align the interests of stakeholders and improve the financial performance of the firm, agency theory advocates the establishment of an effective governance system. Good corporate governance involves putting in place control and oversight mechanisms to ensure that management acts in the best interests of shareholders. This can include the appointment of an independent board of directors, executive compensation linked to company performance, financial transparency and disclosure of relevant information to shareholders. By establishing appropriate incentives and controls, corporate governance can help reduce conflicts of interest and improve the company's financial performance by increasing the value of the company and the return on investment for shareholders. The importance of corporate governance mechanism and its impact on the financial performance was studied by Yermack (1996), en plus Shleifer and Vishny (1997) reviewed the state of corporate governance research using a review of the existing literature. The authors concluded that agency theory is an important framework for understanding the relationship between corporate governance and financial performance, and that it can be used to develop effective governance mechanisms for firms.

Consider a publicly traded company whose shareholders are concerned with maximizing the value of their shares. The company's managers, on the other hand, may have different objectives, such as maximizing their own compensation or maintaining their power within the company. This divergence of interests can lead to strategic decisions that are not optimal for the company or its shareholders. In this case, agency theory suggests that strong corporate governance can help align stakeholder interests and improve the firm's financial performance. For example, the appointment of an independent and competent board of directors can help monitor the activities of executives and make strategic decisions in the interests of shareholders. Similarly, compensating

executives based on company performance can provide an incentive to work hard to increase the value of the company.

In summary, agency theory shows that corporate governance is essential for aligning stakeholder interests and improving the financial performance of the firm. By putting in place appropriate control and oversight mechanisms, corporate governance can help reduce conflicts of interest and improve shareholder value.

Effect of governance score on performance

In studies that have introduced corporate governance as a main variable, two main areas have been examined. The first seeks to address governance from a shareholder and capital structure perspective, the second seeks to address the composition of boards of directors and the improvement of the quality of governance mechanisms to improve financial performance. Among the research that has emphasized the importance of capital structure, we can cite McConnell and Servaes (1990), Nesbitt (1994), Smith (1996), Del Guercio and Hawkins (1999), and Hartzell and Starks (2003), who found that the presence of institutional shareholders positively affects management behavior. Regarding the research that has dealt with the functioning of boards of directors, we can cite Brickley et al. (1994), Lee et al. (1999) who have emphasized the importance of independent or outside directors in improving the level of governance quality. In addition, Jensen (1993) has shown that dual directorships increase the discretion of the director so that the director can influence the financial outcome. For Dechow and Sloan (1991), the introduction of the CEO's age as a variable makes it possible to reflect the difference between executives and their behaviors throughout their career and especially in the last year of service. During the last two decades, institutional theory has contributed greatly to the understanding of the behavioral aspect and the explanation of the reaction of the different stakeholders toward corporate governance (Aguilera and Jackson 2003; Judge et al. 2008). It must be said that this theory has contributed enormously to the study of the interaction between the governance mechanism and the institutional framework in which any firm operates. Several studies tried to examine closely the main characteristics of corporate governance to show if there is a possible explanation of the relationship between corporate governance and fiscal management in a perspective of improving financial performance. While Armstrong et al. (2015) and Seidman and Stomberg (2017) found a significant relationship between the latter two variables, Blaylock (2016) did not find any relationship between these two concepts. Before proposing the research hypothesis of the first chapter, it was necessary to first list the results found by researchers who studied the relationship between corporate governance and



financial performance based on the governance index or score.

Indeed, La Porta et al. (2000) have shown that the value of firms is positively associated with minority shareholders' rights. In their research, they emphasized the role of compliance with good governance practices while focusing on the impact of external governance mechanisms such as the level of control of firms in the market.

Indeed, other research works, such as those of Guney et al. (2019), have shown that the quality of corporate governance measured by Data Stream's ESG ASSET 4 governance score presents a negative and significant association with financial performance for panel data for a sample of 10171 US companies between 2002 and 2014 classified into 10 industries. Indeed, these authors indicated that there are several studies that have given importance to the relationship between corporate governance and its financial performance and whose results of impact or association are mixed while taking into consideration the sectoral characteristics. Other research works have emphasized the importance of internal governance mechanisms while studying factors related to other aspects such as board structure, board function, executive properties of management, and the effect of compensation (Bhagat et al. 2008; Guney et al. (2019); Walsh and Seward 1990). In addition and while referring to the work of Guney Guney et al. (2019), we can say that several research works have tried to investigate the relationship between governance and the performance of companies that seeks to be consistent with the principles of good governance codes. They have used a governance index in particular; the G-INDEXTM of Gompers et al. (2003) which focused on the structure and characteristics within American companies to find in conclusion a positive and significant association between their governance index and the value of the companies, their level of profits, their growth in sales and their reduction in capital expenditure.

We also distinguish the E-INDEXTM index used by Bebchuk et al. (2006, 2002). According to Bebchuk et al. (2006), the E-INDEXTM derives from an index that consists of 6 attributes related to the IRRC provisions in the USA and that can allow academics to find meaningful results. In fact, these authors divided the Gompers et al. (2003) index into two indices: the E-INDEXTM, which is made up of six governance factors, and the O-INDEXTM, which is made up of the rest of the provisions or attributes used by Gompers et al. (2003). It should be remembered that this E-INDEXTM index includes six provisions, which are: the board of directors, limits on changes in shareholder regulations, poison pills, golden parachutes, the requirement of an absolute majority for mergers, and changes in the charter. As a result, they found that increases in the index level are monotonically associated with economically significant reductions in firm valuation and large negative abnormal returns over the period

1990–2003. Regarding the other 18 Investor Responsibility Research Center (IRRC) requirements that formed the O-INDEXTM, they do not correlate with reductions in firm valuation or with abnormal market returns. Ribando and Bonne (2010) tried to analyze the relationship between the ASSET4 ESG index of Data Stream and the performance of the company. Indeed, they used the information coefficient (IC) while trying to find possible relationships between ESG characteristics of firms between 2003 and 2009 and future returns. For these characteristics, they found positive and significant associations with all scores except for the corporate governance component. Jun Xie et al. (2019) found that board independence has a positive and significant association with financial performance as measured by (ROA). On the other hand, there is a negative and significant association between executive compensation, duality, number of audit committee meetings on the one hand, and financial performance on the other hand. Concerning the presence of women on boards of directors, it does not show a significant relationship with ROA. Finally, the control variable, which is research and development expenses, shows a positive and significant association with financial performance. We can notice that the literature on the subject has not ceased to emphasize the relationship between corporate governance and financial performance while missing the importance of the deconstruction of the relationship by taking into account the sectoral characteristics of the firms under study. For this reason, we can say that our work will present an added value to the previous literature because it gives a lot of importance to the sectoral characteristics. As we have seen, the literature on the relationship between corporate governance and financial performance can present mixed results. This leads us to propose the first research hypothesis, which is as follows:

H1 Corporate governance score has a positive and significant association with financial performance.

In our study, we will try to investigate this relationship taking into account the sectoral characteristics of the firms in the UK economy (ICB Code). In the same sense, it is important to underline the importance of taking into account the contribution of institutional theory which has been the basis of several research works on the relationship between corporate governance and financial performance. For example, we can cite the research work of Rachmawati et al. (2018) who examined the relationship between corporate governance and financial performance in different economic sectors in Indonesia, using institutional theory as a theoretical framework. The authors found that corporate governance had a positive impact on financial performance in all sectors studied, but that the impact was greater in more regulated sectors. In addition, Boubakri et al. (2019) examined the relationship between corporate governance, institutional



environment and financial performance of Russian firms. The authors found that corporate governance had a positive impact on financial performance. Qin et al. (2019) studied the relationship between corporate governance and financial performance of technology firms in the United States and China. These authors found that corporate governance had a positive impact on financial performance, but that the impact was greater in firms operating in stronger institutional environments. In addition, Muda et al. (2018) examined the relationship between corporate governance and firm financial performance in different economic sectors in Malaysia, using institutional theory as a theoretical framework. The authors found that corporate governance had a positive impact on financial performance in all the sectors studied, but the impact was greater in the more regulated sectors.

Research methodology

When studying the relationship between corporate governance and financial performance, we must always refer to certain theories that can guide us in establishing our research methodology in order to test our conceptual model. Referring to the governance literature, we can indicate that there is no single pioneering theoretical framework that can be considered as a foundation for governance research. Nevertheless, we can face a particular set of research currents gathered in a paradigm to explain the logic of the relationships in corporate governance. Thus, we can distinguish the research stream focusing on the contractual aspect of the relationship between agents, principals, and creditors. A such relationship can be detailed in the following part of this research paper.

Sample selection

As mentioned at the beginning of this paper, the targeted context is the United Kingdom. Given that we seek to identify the nature of the relationship between corporate governance and financial performance, we first selected all UK-listed companies for which governance characteristics are available from the ASSET4 database, a Thomson Reuters domain, which provides environmental, social, and governance (ESG) information. This initial selection attempts to capture an initial sample of panel data that corresponds to 349 companies that will remain active, between the period of 1998 and 2019, and we will limit ourselves to the period of 2005–2018, i.e., 14 years. This choice is justified by two reasons. The first is the choice of 2005 as the reference year, which corresponds to the year of adoption and application

Table 1 First step of the sample selection

Initial sample (ASSET4)	349
The banks	(10)
Companies specializing in financial services	(26)
Life insurance	(6)
Non-life insurance	(6)
Basic sample	301

Table 2 Second stage of sample selection

Basic sample	301
Company with a currency different from the £	(15)
Company not listed on the London Stock Exchange	(2)
Financial sector company according to ICB code	(2)
Final sample	282

of IFRS by the United Kingdom. The second is the elimination of the year 2019 which does not present complete information when we collected data. In order to obtain a homogeneous sample that allows us to achieve a consistent interpretation, we have eliminated banks and companies that provide financial services, as well as life and non-life insurance (Table 1).

This first elimination reduces our sample to 301 companies, obtained as follows:

When processing the panel data that make up our sample, we were obliged to eliminate observations relating to firms whose functional currency does not correspond to the currency of the context of the study, i.e., the pound sterling. These companies number is about 15. In preparing our data, we were obliged to remove the English companies that are not listed on the London Stock Exchange. The number of these companies is 2. We also eliminated 2 other companies that belong to sectors of activity that could cause outliers in our analysis (Financial services according to the ICB classification). This data processing allowed us to obtain a final sample of 282 companies that served as a basis for the study of the relationship between corporate governance and the financial performance of UK companies (Table 2). These steps are summarized in the following data processing table:

For a more in-depth study that aims to analyze the impact of governance on financial profitability, we also eliminated firms with missing observations and with a missing value or a very high age of establishment. They are 21 firms. This reduced the number of firms in the sample to 261 firms. We also eliminated 101 firms with outliers in the dependent variable so that the value varies between -100% and $+200\%$, which leads us to a final sample of 160 firms with better



Table 3 Third stage of sample selection

Final sample	282
Companies with missing observations and high age	(21)
Companies with abnormally low or high ROE	(101)
Final sample	160

homogeneity in the dependent variable (ROE). In fact, there is no hard and fast rule for determining an appropriate range for ROE. However, a range of -100% to $+200\%$ for ROE can be considered as less extreme for our study because we identified more extremum values. We can add that we have tried to refer to other previous works that have tried to present a homogeneous value of financial profitability ROE cite Masood and Ahmad (2012) who studied the determinants of capital structure of firms in the manufacturing sector in Pakistan. The authors used regression analysis to study the effect of various factors on the capital structure of firms. The authors also used a homogeneous value of ROE by eliminating ROE outliers to reduce the effect of extreme values on the results of the analysis. The results showed that firm size, tax rate, firm growth, and liquidity have a significant influence on the capital structure of firms in the manufacturing sector in Pakistan. We also refer to Almazari and Abuzayed (2016), who studied the relationship between corporate governance and capital structure in the Gulf Cooperation Council (GCC) countries. The authors used regression analysis to study the effect of corporate governance on firms' capital structure. The authors also used a homogeneous ROE value by eliminating ROE outliers to reduce the effect of extreme values on the results of the analysis (Table 3). The results showed that corporate governance has a significant effect on the capital structure of firms in the GCC countries.

In the processing of the data obtained at the level of the variables of the research model, we found some missing observations that could influence the results. To solve this problem, we have resorted to the literature to know how to treat them. In this framework and by reference to Florou and Galarniotis (2007), missing values (i.e., not disclosed) are treated as an absence of the variable at the study level and thus, the firms constituting the study sample are penalized in the evaluation of the variable studied. Indeed, the missing values were excluded from the analysis. We can add that in the field of corporate governance research, the variables do not present a remarkable change between the following years. For this reason, we preferred to replace the missing values by the weighted average of the existing variables in order not to reduce our sample of panel data further, which

remained cylindrical. This choice was made with reference to Rahman et al. (2016) and White et al. (2011).

Measures of variables

The study of the relationship between corporate governance and financial performance requires particular attention in the choice of variables of the model to be used. Indeed, we can refer to the work of Alodat et al. (2022a), who assessed the effect of the board of directors and the audit committee attributes and ownership structure on firm performance. They stated that better governance leads to better financial performance. Mansour et al. (2022) investigated the relationship between corporate governance quality, capital structure and firm performance for Jordanian non-financial firms listed on the Amman Stock Exchange from 2014 to 2019. The results show that good corporate governance practices have a positive impact on firm performance, and that capital structure can strengthen this relationship. The variables reported that summarizes our model are in the form of dependent variables reflecting the financial performance of firms and independent explanatory variables reflecting the quality of corporate governance as well as other control variables relating to the characteristics of UK firms and reflecting size, debt, and age. Our choice of variables was the result of several investigations of the prior research literature on the relationship between corporate governance and financial performance. Alodat et al. (2022a, 2022b) studied ESG disclosure in Jordanian industrial firms. ESG disclosure is low but improving due to stakeholder pressure. Board size and meetings have an impact on ESG performance, but other corporate governance mechanisms do not. The study provides recent evidence from the literature on disclosure in emerging markets. Other research has attempted to study the mediating role of sustainability disclosure in the relationship between corporate governance and firm performance (Alodat et al. 2022a, 2022b).

In this sense, we will try to detail the measures of the variables used in our research work starting with the dependent variable, the independent variable and then control variables.

Dependent variable

Previous studies used variables reflecting the financial performance while taking into account the effect of governance (Cornett et al. 2008). The latter used EBIT (earnings before interest and taxes) divided by total asset value to measure financial performance. Indeed, the use of EBIT or operating profits divided by total asset value has been used by a range of research studies (Eberhart et al. 2004; Denis and Denis 1995; Hotchkiss 1995; Huson et al. 2004; Cohen et al. 2005). Also, Cornett et al. (2008) provide another measure of performance



which is profitability, not subject to result management. This is the financial profitability with neutralization of the effect of discretionary accruals which is detailed as follows:

$$\text{Financial profitability with neutralization of discretionary accruals} = \frac{\text{Income before taxes}}{\text{total assets}} - \% \text{discretionary accruals}$$

While referring to the research on corporate finance, we can see that several researchers have adopted accounting and non-accounting evaluations to arrive at the quantification of this variable. In our study, we will measure the financial performance as follow (measure proposed by data stream):

$$\text{ROE} = \frac{(\text{net income} - \text{preferred dividend effect})}{\text{average of the value of ordinary shares for the last year and the current year}}$$

It reflects the variation of ROE that adjusts for the effect of preferred dividends. We have opted for the ROE because our objective is to measure the company's performance in terms of shareholder return, ROE measures the return on shareholder investment by comparing the company's net income to the value of its equity. It measures the company's ability to generate profits from the funds invested by shareholders. We will thus consider that this measure of the dependent variable is the most adequate for our analysis which remains adaptable.

Independent variable

Corporate governance practices have not stopped evolving. This is presented through the succession of good governance practice guides that seek to counter the failures detected over time and which manifest themselves in financial scandals, sometimes inducing a harmful imbalance in the global economic fabric. Based on the "FTSE 350 corporate governance review (2013)" elaborated by Grant Thornton (auditing and consulting firm), especially for the UK, the evolution of good governance guides, as well as institutions in the field of corporate governance, have developed to respond to the panoply of problems that may be directly related to corporate governance.

Zahra and Pearce (1989) have identified several studies that have attempted to investigate the effect of corporate governance characteristics on financial performance. We cite the research work of Zahra and Stanton (1988) who studied the relationship between the size of the board of directors and the financial performance of companies by measuring it based on the variable (ROE), the gross sales margin, the ratio of revenues net of capital, the earnings per share (EPS), and the log of revenues. Based on a sample of 100 Fortune, 500 companies in the USA between 1980 and 1983 found that board size and the ratio reflecting the proportion of

outsiders on boards are not associated with financial performance. Schmidt (1977), taking into account the US context, focused on the external affiliation of outsiders while measur-

ing financial performance by ROE in 156 industrial firms. Schmidt found no relationship between these two variables. Kesner (1987) studied the effect of the proportion of insiders at the board level and the percentage of equity held by board members while aiming to explain their effects on gross mar-

gin, (ROE), (ROA), earnings per share (EPS), stock price and (ROI). Based on a sample of 250 Fortune 500 companies across 27 industries, he found a positive association between the percentage of board members' ownership and the cited financial performance. In addition, Baysinger and Bulter (1985) studied the impact of outsiders on the financial profitability (ROE) of 266 companies between 1970 and 1980 and found that the presence of a significant number of outsiders on the board of directors improved their financial performance. Pearce (1983) studied the effect of directors' skills and attitudes on the financial performance of firms measured by several variables including (ROE). He found, based on the responses of 137 respondents in 8 banks, that there is a strong association between the attitude of directors and the financial performance of their company. Referring to the above, we can say that previous studies have tried to examine the relationship between the different governance mechanisms and financial performance while quantifying the latter by using different variables and financial ratios. Among these variables, it is important for us to focus on the financial profitability of shareholders, namely the ROE, which will be used as the dependent variable for our research. Regarding the variables that measure governance mechanisms, we can distinguish variables that were proposed by Cornett et al. (2008).

After having exposed these research works, we can see that previous research has used particular measures of governance mechanisms to reflect the quality of corporate governance we allow ourselves to indicate that in our research work we are going to use the governance score (CGVS: Corporate Governance Score) which encompasses a significant number of governance mechanisms, and this one manifests itself as the governance score that we have obtained from the database (Data Stream) for the companies that make a disclosure according to ASSET 4. The latter measures a company's governance systems and processes, ensuring that



its board members and executives act in the best interests of shareholders over the long term. It reflects a company's ability, through its use of best management practices, to direct and control its rights and responsibilities through the creation of incentives and control mechanisms to generate long-term value for shareholders. Its value is presented as a percentage so that it can be used to detect the effectiveness of companies in terms of governance. Based on the Thomson Reuters ESG Scores calculation guide (February 2019), we can see that the governance score we will use as an independent variable in our analysis plays an important role in determining the governance component of the ESG score.

Control variables

Control variables refer to the characteristics of UK firms and reflect size, leverage and age. The selection of variables is based on a review of some of the previous research literature on the relationship between corporate governance and financial performance.

- LNTA: It is the total assets of the company; in our research work, we will use as recommended in the literature the Log of TA as a control variable for our research model.
- leverage = ((short-term debt and a current portion of long-term debt + long-term debt) / (total assets)).
- AGE: the age of the company

Empirical approach to the analysis of the relationship between corporate governance and financial performance

For the study of the relationship between corporate governance and financial performance, we have tried to respect the scientific approach that ensures a quality analysis of the data that have been initially collected. It is a matter of following a positivist epistemological posture according to a hypothetical-deductive approach. Indeed, when analyzing panel data, there is a very specific approach to follow and a set of econometric tests that will allow us to obtain the research model that leads us to the realization of the necessary predictions. First, when we use cylindrical panel data, we must verify the necessary conditions that give us the assurance of the reliability of the database studied. The verification of such conditions allows us to have the best unbiased predictor that ensures an efficient interpretation of the associations that may exist between the variables. Then, we must analyze the influence of the fixed effect and the random effect of the observations,

which will guide us toward the path of analysis to follow. It should be added that the results of the preliminary tests will give us a better idea of which regressor to use so that we can ensure that all sources of bias in the results are eliminated. Among these preliminary tests, we can mention the homoscedasticity test, the autocorrelation test, the multicollinearity test. In our research approach, we made sure to verify these preliminary tests in order to be able to move on to the analysis of associations via the execution of adequate regression models.

At this level, it should be noted that the estimation of panel data can be carried out through 3 possible estimators depending on the behavior of the data. In this respect, we mention 3 methods, which are the Pooled OLS regression (pooled OLS) which can lead us to the use of the GLS method which eliminates estimation bias problems. As an illustration, it is relevant to mention that the GLS method allows us to overcome the heteroscedasticity problem and the first-order autocorrelation problem. The second method is the fixed effect model (or within model): This model is characterized by the existence of a particular characteristic or behavior for a well-defined set of individuals or the firms in the sample. In our analysis, we are going to move directly toward an approach that targets the verification of the fixed effect while taking into consideration the specific characteristics related to each sector of activity (ICB industry code).

Finally, the third method is the random effect model. In this last case, the individuals under study can also be influenced by both factors at the same time (*i* and *t*).

In the context of the analysis of the association that may exist between the governance score and the financial performance of the company and while taking into account a significance level of 5% for the interpretation of the results, we will run the model based on the sample of UK companies that we have specified. This will allow us to verify the strength of the link between the endogenous and exogenous variable which is manifested through an approach that can test the existence of the fixed and random effects. The execution of the model via the command "xtreg" on STATA, which implements the method of generalized least squares (GLS: generalized least square), remains effective for the study of panel type databases. For a more refined analysis and in order to use a more accurate estimator, we will show

Table 4 Descriptive statistics of the 282 companies

Variable	Obs	Mean	Std. Dev	Min	Max
ROE	3948	-0.1643323	11.54527	-563.3157	72.0645
CGVS	3948	0.6703196	0.2345235	0.024	0.9801
LNTA	3948	14.03506	1.60258	5.308268	19.20148
Leverage	3948	0.2513059	0.2044684	0	1.9732
Age	3948	64.11018	62.88838	0	502



the results found by the execution of the GLS command which allows finding a better estimate allowing to reduce the bias effect caused by the presence of heteroscedasticity and the first-order autocorrelation. This is the Feasible GLS (FGLS) method. (Feasible Generalized Least Squares).

In our research work, we will first try to have a global vision of our research sample, which consists of 282 companies listed on the London Stock Exchange and which make disclosures according to ASSET 4 as already mentioned (Table 4). For this reason, we will expose the descriptive statistics that are manifested as follows:

These descriptive statistics tell us that the sample of 282 firms obtained displays numerous observations, namely 3948 observations.

Regarding the dependent variable, we note that the (ROE) shows a mean of -0.16 which reflects in a global but not precise way that all the companies studied operate in an unstable environment that can be considered unfavorable given the circumstances through which the United Kingdom is passing such as the effect of the repercussions of the global financial crisis of 2008 and the BREXIT. The dependent variable shows a maximum value of 72.06 which is considered an extremely high value in relation to the measure of financial profitability (ROE). The same remark can be made regarding the minimum value of the dependent variable, which is equal to 563.32. It should be noted that these outliers led us to reduce our sample. Concerning the independent variable (CGVS) which is the governance score proposed by Data Stream. This shows an average of 0.67, which indicates that all the companies in our sample give importance to governance and its mechanisms for creating value and improving financial profitability. This governance score has a maximum value of 0.98 and a minimum value of 0.02. These values indicate that there are two types of companies, those that give importance to governance and its mechanisms and those that do not. Moving on to the control variables, we can see that the variable (LNTA), which reflects the size of the company according to the current literature, has an average of 14.03. For the variable (LVERAGE), we have an average of 0.25, which indicates the level of indebtedness of the companies in the sample. Regarding the last control variable, which is the (AGE), it indicates that the average age of the companies studied is equal to

64 years. After presenting the descriptive statistics of our sample which is composed of 282 companies, we will try to start the study of the relationship between their governance score and their financial performance in order to know if we are able to confirm the hypothesis providing the existence of a positive and significant relationship between these variables.

For this reason, we will present our correlation matrix for the sample of 282 companies (Table 5).

This correlation matrix clearly shows that (CGVS) has a positive and significant correlation at the 5% level with (ROE). This supports the hypothesis of the existence of a relationship. Indeed, the analysis of the correlation remains insufficient to decide on such a relationship. For this reason, we will proceed to the analysis of the regressions necessary to provide a precise vision of the association between these two variables.

It should be noted that the outliers identified in the descriptive statistics forced us to reduce our sample to avoid problems of discordance and observations with outliers as explained in the approach to the selection of our final sample, which reflects the shift from the sample of 282 companies to the sample of 160 companies. In the rest of our analysis, we will limit ourselves to this sample of 160 firms to avoid being influenced by the high values of financial profitability. During our analysis, we will even try to perform robust regression to validate our results.

It must be said that in our analysis we have based ourselves on the book by William Greene (2011). Our research approach will be based on the identification of biases that can affect the quality and the level of convergence of the estimator to be used. Indeed, we will check the effect of the individuals studied which merit the use of an approach that takes into account the individual effect of each sector of activity for the analysis of the results. For the random effect and while basing ourselves on William Greene (2011), we can say that the most adequate estimator is the generalized least square as well as the quasi-generalized least square estimator (feasible) which presents a better level of correction of possible sources of bias (Table 6). Indeed, we will start by exposing the descriptive statistics of the 160 companies as follows:

Table 5 Correlation matrix of the 282 companies

	ROE	CGVS	LNTA	Lverage	Age
ROE	1.0000				
CGVS	0.0508*	1.0000			
LNTA	0.0270	0.4367*	1.0000		
Lverage	-0.0630*	-0.0540*	0.2549*	1.0000	
Age	0.0415*	0.2675*	0.2666*	-0.0112	1.0000

* significant at the 5% level



Table 6 Descriptive statistics of 160 companies for the study of governance and performance

Variable	Obs	Mean	Std. Dev	Min	Max
Roe	2240	0.1699846	0.2303871	-0.9244	1.9716
Cgvs	2240	0.6856706	0.219321	0.0247	0.9801
Lnta	2240	14.15234	1.559384	8.770128	19.20148
Lverage	2240	0.245043	0.1862903	0	1.0756
Age	2240	68.8875	61.83613	1	294

Table 7 List of study sectors by “ICB industry code”

ICB IND CODE	ICB name
10	Technology
15	Telecommunications
20	Health care
30	Financials
35	Real estate
40	Consumer discretionary
45	Consumer staples
50	Industrials
55	Basic materials
60	Energy
65	Utilities

Table 8 Correlation matrix of 160 companies for the study of the relationship between corporate governance and financial performance

	ROE	CGVS	LNTA	Leverage	Age
ROE	1.0000				
CGVS	0.0316	1.0000			
	0.1349				
LNTA	-0.0819*	0.4318*	1.0000		
	0.0001	0.0000			
Leverage	-0.0931*	-0.0264	0.3171*	1.0000	
	0.0000	0.2119	0.0000		
Age	0.0282	0.1930*	0.2520*	-0.0024	1.0000
	0.1814	0.0000	0.0000	0.9097	

* significant at the 5% level

The descriptive statistics mentioned above indicate that the value of the dependent variable which is financial profitability measured by (ROE) has an average of 16.9%, which could lead to an increase in results management. In the same framework, the governance score indicates that it varies between 2 and 98%, with an average of 68.5%. In fact, for

Table 10 : Heteroscedasticity test of 160 firms to study the relationship between corporate governance and financial performance

Breusch–Pagan/Cook–Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: residu
chi2(1) = 1353.22
Prob > chi2 = 0.0000

companies with a low governance score, we can say that the security of shareholders can be negatively affected. Regarding the control variables, we find that (LNTA) displays an average of 14.152. For the level of debt that is presented through (LEVERAGE), it shows that the companies in our sample display leverage equivalent to 24.5%, and the average age of the companies studied is equal to 68 (Table 7). In fact, we did not limit ourselves to the presentation of descriptive statistics according to the companies which are the object of our global sample only but also we used descriptive statistics by sector according to the criterion ICB industry which is summarized as follows:

Moving forward in our analysis of the results, we present the correlation matrix for our sample of 160 listed companies that are characterized by the disclosure of governance characteristics according to ASSET4 (Table 8).

This correlation matrix indicates the absence of correlation at the 5% level between (ROE) and (CGVS). However, we can estimate that there is a correlation at the 15% level, which means that in 85% of the situations we distinguish a positive and significant correlation between the financial performance and the governance score. Despite a weak correlation, there is a possible link between the dependent and independent variables. Moreover, and concerning the control variables, we can notice the existence of a negative and significant correlation at the 5% level between (LEVERAGE) and (ROE) which reflects the negative effect of debt on English companies. Similarly, LNTA shows a negative and significant correlation with the financial

Table 9 OLS regression of 160 firms to study the association between corporate governance and financial performance

ROE	Coef	Std. Err	t	P> t	[95% Conf	Interval]
CGVS	0.0695751	0.0249628	2.79	0.005	.0206223	0.1185279
LNTA	-0.0150945	0.0037674	-4.01	0.000	-.0224825	-0.0077066
Leverage	-.0727749	0.0279328	-2.61	0.009	-.1275517	-0.017998
Age	0.000153	0.0000813	1.88	0.060	-6.47e-06	0.0003125
_cons	0.3431934	0.0456238	7.52	0.000	0.2537239	0.4326628
Source	SS	Df	MS		Number of obs	2240
Model	2.03173353	4	0.507933382		F(4, 2235)	9.72
Residual	116.810431	2235	0.052264175		Prob > F	0.0000
Total	118.842165	2239	0.053078234		R-squared	0.0171
					Adj R-squared	0.0153
					Root MSE	0.22861



Table 11 Autocorrelation test of 160 firms to study the relationship between corporate governance and financial performance

Wooldridge test for autocorrelation in panel data	
H0: no first-order autocorrelation	
<i>F</i> (1, 159)	17.261
Prob > <i>F</i>	0.0001

Table 12 Multicollinearity test for 160 companies to study the relationship between corporate governance and financial performance

Variable	VIF	1/VIF
LNTA	1.48	0.676340
CGVS	1.28	0.778756
Leverage	1.16	0.862068
Age	1.08	0.922828
Mean VIF	1.25	

performance of firms, which is explained by an unfavorable effect of the growth of the political visibility of firms in the UK. In order to unravel and further analyze such a relationship, it is necessary to conduct a correlation analysis by sector to identify those that may imply a correlation. Indeed, the present research work will be based essentially on the study of the relationship between governance and financial performance which has been widely studied by most researchers. Thus, OLS regression will allow us to approach this analysis as presented in Table 9:

Indeed, it remains clear that the OLS regression presents a positive and a significant association at the 5% level between the governance of firms and their financial performance, measured on the basis of the ROE. But at this level, we cannot admit such results for the analysis of the mentioned relationship due to the fact that the data we are analyzing is panel data that require the absence of heteroscedasticity and autocorrelation problems (Table 10). Thus, we can present the preliminary tests in question. We start with heteroscedasticity, which presents a remarkable problem in the data. This manifests itself through the Breusch–Pagan test, which is displayed as follows:

Table 13 GLS regression for the 160 firms to study the relationship between corporate governance and financial performance

ROE	Coef	Std. Err	<i>z</i>	<i>P</i> > <i>z</i>	[95% Conf	Interval]
CGVS	0.1326331	0.0297175	4.46	0.000	0.0743878	0.1908785
LNTA	-0.0327726	0.0062284	-5.26	0.000	-0.0449801	-0.0205652
Leverage	-0.1253454	0.0389433	-3.22	0.001	-0.2016729	-0.0490178
Age	0.0001128	0.0001921	0.59	0.557	-0.0002637	0.0004893
_cons	0.5657964	0.0820295	6.90	0.000	0.4050215	0.7265714
<i>R</i> -sq: within	0.0324	Wald chi2(4)	55.62			
Between	0.0160	Prob > chi2	0.0000			
Overall	0.0161					

This test is based on a null hypothesis predicting the equality of the variance of the residuals. However, as indicated, it follows that we will reject this hypothesis and accept the alternative hypothesis which reflects the existence of a heteroscedasticity problem (Table 11).

Still, within the framework of the reliability of the data quality, we used the Woodridge autocorrelation test which shows the following results:

This test includes a null hypothesis that considers the absence of an autocorrelation problem. However, we find that such a hypothesis can only be rejected. This indicates the presence of a first-order autocorrelation problem, which will be corrected.

We also tested the multicollinearity problem by computing the VIF (Table 12). We found that such a problem does not taint the processed data. The multicollinearity test is displayed as follows:

After checking the quality of the data, we proceed to the use of a second estimator namely, the GLS, which is an efficient and unbiased estimator of the parameters of the model with a lower variance. The use of such an estimator presents the following results:

Table 13 shows a *P* value < 5%. This means that the model is significant in its entirety. Furthermore, it remains clear that the governance score has a positive and significant relationship at the 5% level with financial profitability.

Regarding the control variables, we find that they also show a significant association with the dependent variable. For example, the debt ratio has a negative and significant association at the 5% level with financial performance. This is due to the fact that excessive debt can damage the financial performance of the firm. Regarding age, we find that it does not show a significant association with the dependent variable. These results can only reinforce the confirmation of the basic hypothesis predicting the existence of the positive and significant association between governance and financial performance.

An analysis of the GLS regression by sector for the study of the relationship between corporate governance and financial performance remains essential (Table 14). This



Table 14 Summary table of the GLS regression by sector for the study of the relationship between corporate governance and financial performance

ICB IND CODE	ICB name	Coef	P value	Association by GLS	Globally significant model
10	Technology	0.2155342	0.044	+ & sig	Yes
15	Telecommunications	0.3602275	0.062	+	Yes
20	Health Care	0.10679	0.264	+	No
30	Financials	NA	NA	NA	NA
35	Real Estate	0.0647609	0.235	+	Yes
40	Consumer Discretionary	0.229015	0.000	+ & sig	Yes
45	Consumer Staples	0.059291	0.260	+	No
50	Industrials	0.1653197	0.007	+ & sig	Yes
55	Basic Materials	-0.026218	0.815	-	No
60	Energy	0.1512735	0.473	+	No
65	Utilities	0.160153	0.331	+	No

Table 15 Hausmann test to decide whether there is a fixed or random effect

	Coefficients		$(b - B)$	sqrt(diag($V_b - V_B$))
	(b)	(B)		
	fe	re	Difference	S.E
CGVS	0.1878204	0.1326331	0.0551873	0.0164667
LNTA	-0.0399176	-0.0327726	-0.0071449	0.0086222
Leverage	-0.2136421	-0.1253454	-0.0882967	0.0254169
Age	-0.0036303	0.0001128	-0.0037431	0.001307

b = consistent under H_0 and H_a ; obtained from xtreg
 B = inconsistent under H_a , efficient under H_0 ; obtained from xtreg
 Test: H_0 : difference in coefficients not systematic
 $\chi^2(4) = (b - B)'[(V_b - V_B)^{-1}](b - B) = 29.09$
 Prob > $\chi^2 = 0.0000$

Table 16 Regression of the data with the inclusion of the fixed effect to study the relationship between corporate governance and financial performance

ROE	Coef	Std. Err	T	P > t	[95% Conf	Interval]
CGVS	0.1878204	0.0339747	5.53	0.000	0.1211923	0.2544486
LNTA	-0.0399176	0.0106365	-3.75	0.000	-0.0607768	-0.0190583
Leverage	-0.2136421	0.0465038	-4.59	0.000	-0.304841	-0.1224431
Age	-0.0036303	0.001321	-2.75	0.006	-0.006221	-0.0010396
_cons	0.9085602	0.1187743	7.65	0.000	0.6756311	1.141489
R-sq: within	0.0379		$F(4, 2076)$	20.47		
between	0.0001		Prob > F	0.0000		
overall	0.0002					

regression will be presented in this synthetic table, which is displayed as follows:

This table indicates that with the use of GLSs we obtain a positive and significant association at the 5% level between (ROE) and (CGVS) this is in line with the confirmation of our research hypothesis at the level of ICB10, 40, and 50 namely the technology sector, the sector of non-essential discretionary consumption and industrial (Table 15). To

determine whether the fixed or random effect is the effect that influences the research data, we referred to the Hausman test which indicates a P value = 0.0000 < 0.05, this leads us to reject the null hypothesis predicting the existence of the random effect. The last test is as follows:

To refine the quality of the analysis, we will, in the following, analyze the presence of the fixed effect which will allow us to reinforce the expected result (Table 16).



Indeed, the regression of the data taking into account the existence of a fixed effect is as follows:

It remains clear that taking the fixed effect into consideration can only confirm the previous results regarding the association between the governance score and financial performance at the 5% level.

In order to analyze this association by sector, we performed the sectoral GLS regression, taking into account the presence of the fixed effect. In fact, based on the results obtained we can say that we found a positive and significant relationship at the 5% level between corporate governance and financial performance in the ICB 15 40 50 and 60 sectors. However, it should be noted that the association found

Table 17 Summary table of the sectoral GLs regression with the fixed effect taken into account

ICB IND CODE	ICB name	Coef	P value	Association with FE	Globally significant model
10	Technology	0.1812102	0.112	+	Yes
15	Telecommunications	0.4559933	0.040	+ & sig	No
20	Health Care	0.0477244	0.675	+	No
30	Financials	NA	NA	NA	NA
35	Real Estate	0.1729416	0.101	+	Yes
40	Consumer Discretionary	0.2294146	0.000	+ & sig	Yes
45	Consumer Staples	0.0889826	0.120	+	No
50	Industrials	0.2031276	0.004	+ & sig	Yes
55	Basic Materials	0.148905	0.230	+	Yes
60	Energy	0.4660237	0.022	+ & sig	Yes
65	Utilities	0.1073196	0.518	+	No

Table 18 Regression of 160 firms with the presence of the fixed effect, with correction for autocorrelation to study the relationship between governance and financial performance

ROE	Coef	Std. Err	t	P> t	[95% Conf Interval]
CGVS	0.1916551	0.03714	5.16	0.000	0.1188161 0.2644941
LNTA	-0.0136638	0.0130739	-1.05	0.296	-0.0393044 0.0119767
Leverage	-0.3043237	0.051028	-5.96	0.000	-0.4044001 -0.2042474
Age	-0.0056333	0.0016334	-3.45	0.001	-0.0088367 -0.0024299
_cons	0.694147	0.1183525	5.87	0.000	0.4620338 0.9262602
R-sq: Within=0.0370			F(4,1916)=18.40		
Between=0.0012			Prob>F=0.0000		
Overall=0.0001					

Table 19 Summary table of sectoral regressions with the presence of the fixed effect, with correction for autocorrelation for the study of the relationship between governance and financial performance

ICB IND CODE	ICB name	Coef	P value	Association with FE AR1	Globally significant model
10	Technology	0.1331525	0.093	+	Yes
15	Telecommunications	0.6871515	0.016	+ & sig	No
20	Health Care	0.1678458	0.121	+	No
30	Financials	NA	NA	NA	NA
35	Real Estate	0.3241455	0.010	+ & sig	Yes
40	Consumer Discretionary	0.1743539	0.007	+ & sig	Yes
45	Consumer Staples	0.1021243	0.159	+	No
50	Industrials	0.1918444	0.011	+ & sig	Yes
55	Basic Materials	0.1871969	0.113	+	Yes
60	Energy	0.4356504	0.135	+	Yes
65	Utilities	0.1448372	0.404	+	No



in ICB 15 will not be taken into account because the model is not significant in its entirety for the companies in this last sector (Table 17). To summarize our results, we can present the table of results found, by sector according to the regressor that takes into account the fixed effect which is presented as follows:

In the following, we will try to take into account the autocorrelation problem identified by the fact that the fixed effect estimator is consistent (Table 18). Indeed, the regression in the presence of a fixed-effect by correcting the effect of autocorrelation can be presented as follows:

Taking into account the correction of the first-order, autocorrelation leads us to the same finding, which predicts the existence of a positive and significant association at the 5% level between governance and financial performance. An analysis by sector based on the sectoral regression with the presence of the fixed effect, with correction of the autocorrelation for the study of the relationship between governance and the financial performance of the company remains adequate to detail our results. This regression is presented in Table 19. This analysis by sector, with the correction of the autocorrelation problem of order 1, indicates that we have a positive and significant

association at the 5% level between the two main variables studied at the level of ICB35, 40, and 50. It is true that we had found a significant relationship at the level of ICB 15, but such an association will not be taken into account because Fisher test for this sector indicates that there is no overall significance of the model.

To summarize these results, we present the following table, which presents the fixed effect regression correcting for the effect of the first-order autoregressive autocorrelation.

Still, in the context of supporting the confirmation of our initial hypothesis, we will, in the following, try to develop our analysis by seeking the resolution of the problem of heteroscedasticity and autocorrelation that have been detected. It must be said that the econometric tools of "STATA" have made it possible to find solutions to such problems by using the Feasible Generalized Least Squares (FGLS) method which can make the GLS estimation feasible by correcting the autocorrelation and heteroscedasticity problem (Table 20). The use of such a regressor gives us the following results:

Table 20 FGLS regression of the entire sample to study the relationship between governance and financial performance

ROE	Coef	Std. Err	z	P> z	[95% Conf	Interval]
CGVS	0.2966842	0.1049067	2.83	0.005	0.091071	0.5022975
LNTA	-0.0234933	0.021399	-1.10	0.272	-0.0654345	0.0184479
Leverage	-0.1087691	0.0950651	-1.14	0.253	-0.2950933	0.0775551
Age	-0.0008685	0.0009103	-0.95	0.340	-0.0026527	0.0009158
_cons	0.3634439	0.2833834	1.28	0.200	-0.1919773	0.918865
Estimated covariances = 12,880			Wald chi2(4) = 14.24			
Estimated autocorrelations = 1			Prob > chi2 = 0.0066			
Estimated coefficients = 5						

Table 21 Summary table of the FGLS regression by sector for the study of the relationship between corporate governance and financial performance

ICB IND CODE	ICB name	Coef	P value	Association with FGLS	Globally significant model
10	Technology	0.1499412	0.000	+ & sig	Yes
15	Telecommunications	0.1274849	0.334	+	Yes
20	Health Care	0.2372147	0.000	+ & sig	Yes
30	Financials	NA	NA	NA	NA
35	Real Estate	0.0301446	0.200	+	Yes
40	Consumer Discretionary	0.180493	0.000	+ & sig	Yes
45	Consumer Staples	0.075521	0.000	+ & sig	Yes
50	Industrials	0.1297632	0.005	+ & sig	Yes
55	Basic Materials	0.1112845	0.000	+ & sig	Yes
60	Energy	0.2777256	0.060	+	No
65	Utilities	0.0837993	0.381	+	No



$$ROE_{it} = \alpha_0 + \alpha_1 CGVS_{it} + \alpha_2 LNTA_{it} + \alpha_3 LEVERAGE_{it} + \alpha_4 AGE_{it} + \varepsilon_{it}$$

By analyzing this FGLS regression, we can see that this model is generally significant in its entirety because the P value $< 5\%$. Thus, there is at least one explanatory variable that can analyze the variable to be explained.

The results found indicate that we have a positive and significant association at the 5% level for the 160 firms in our study. In addition, to identify the effect of sectors of activity, we propose the FGLS regression by sector for the study of the relationship between corporate governance and financial performance which is presented in Table 21. The results obtained can be summarized as follow:

These results indicate that when correcting for the statistical problems identified, we were able to obtain in almost all the sectors of activity studied a positive and significant association at the 5% level between the governance index and financial performance in fact for ICB 10,20,40,45,50 and 55, we were able to obtain a very significant association at the 5% level. It must be said that with the correction of inconsistencies, we can confirm our H1 hypothesis in almost all sectors of activity. This leads us to emphasize

the importance of governance in improving the financial performance of firms.

To further summarize our results, we can present the following summary table that analyzes, by sector and by regressor used, the type of association between governance and financial performance (Table 22).

As part of the validation of our results, we used robust regression to ensure that our results remained free of bias.

Indeed, we performed robustness checks on the overall sample of 160 companies as well as by sector of activity studied (Table 23).

For the overall sample we found these results:

The results obtained after the verification of the robustness of our model validate the results obtained previously indicating the fact that corporate governance presents a positive and significant association with financial performance which further confirms our research hypothesis (Table 24).

In addition, we performed robustness checks on the detailed results by sector and obtained the following results:

The results of the robustness checks lead us to validate the previous results obtained mainly in the ICB40 (Consumer Discretionary) and ICB50 (Industrials) sectors.

Table 22 Summary table of the different regressors in the sector study of the relationship between corporate governance and financial performance

ICB IND CODE	ICB name	Association avec MCG	Association avec effet fixe FE	Association avec effet fixe FE AR1	Association avec FGLS
10	Technology	+ & sig	+	+	+ & sig
15	Telecommunications	+	+ & sig	+ & sig	+
20	Health Care	+	+	+	+ & sig
30	Financials	NA	NA	NA	NA
35	Real Estate	+	+	+ & sig	+
40	Consumer Discretionary	+ & sig	+ & sig	+ & sig	+ & sig
45	Consumer Staples	+	+	+	+ & sig
50	Industrials	+ & sig	+ & sig	+ & sig	+ & sig
55	Basic Materials	-	+	+	+ & sig
60	Energy	+	+ & sig	+	+
65	Utilities	+	+	+	+

Table 23 Robust regression for the global sample of 160 companies

ROE	Coef	Std. Err	Z	$P > z $	[95% Conf	Interval]
CGVS	0.1326331	0.0347034	3.82	0.000	0.0646156	0.2006507
LNTA	-0.0327726	0.0101727	-3.22	0.001	-0.0527108	-0.0128344
Leverage	-0.1253454	0.0748006	-1.68	0.094	-0.2719518	0.021261
Age	0.0001128	0.0001761	0.64	0.522	-0.0002324	0.000458
_cons	0.5657964	0.1339279	4.22	0.000	0.3033026	0.8282902
R -sq: within = 0.0324					Number of obs = 2240	
Between = 0.0160					Number of groups = 160	
Overall = 0.0161					Obs per group: min = 14	
Wald chi2(4) = 21.75					avg = 14.0	
Prob > chi2 = 0.0002					max = 14	



Table 24 Robust regression by sector

ROE	Coef	Std.Err	z	P> z	[95%	Conf.Interval]
icbcode = 10						
Cgvs	0.2155342	0.1152058	1.87	0.061	-0.0102651	0.4413334
Lnta	-0.1334019	0.1180915	-1.13	0.259	-0.364857	0.0980532
Leverage	-0.0608078	0.1196745	-0.51	0.611	-0.2953656	0.1737499
Age	0.006701	0.0043164	1.55	0.121	-0.0017589	0.015161
_cons	1.573155	1.380659	1.14	0.255	-1.132886	4.279197
R-sq: within = 0.1393				Number of obs = 126		
between = 0.3438				Number of groups = 9		
overall = 0.2873				Obs per group: min = 14		
Wald chi2(4) = 18.91				avg = 14.0		
corr(u_i, X) = 0 (assumed)				max = 14		
(Std. Err. adjusted for 9 clusters in id)				Prob > chi2 = 0.0008		
icbcode = 15						
Cgvs	0.3602275	0.3051295	1.18	0.238	-0.2378153	0.9582703
Lnta	-0.0970114	0.0548379	-1.77	0.077	-0.2044917	0.0104688
Leverage	-0.2208968	0.1446089	-1.53	0.127	-0.504325	0.0625314
Age	0.0067016	0.0009817	6.83	0.000	0.0047775	0.0086258
_cons	1.241752	0.5433501	2.29	0.022	0.1768058	2.306699
R-sq: within = 0.1143				Number of obs = 42		
between = 0.9986				Number of groups = 3		
overall = 0.3730				Obs per group: min = 14		
Wald chi2(2) =				avg = 14.0		
corr(u_i, X) = 0 (assumed)				max = 14		
(Std. Err. adjusted for 3 clusters in id)				Prob > chi2 =		
icbcode = 20						
Cgvs	0.10679	0.1267952	0.84	0.400	-0.1417241	0.3553041
Lnta	0.0172711	0.0304159	0.57	0.570	-0.042343	0.0768852
Leverage	-0.1800574	0.0635073	-2.84	0.005	-0.3045294	-0.0555855
Age	-0.0016286	0.002467	-0.66	0.509	-0.0064639	0.0032067
_cons	-0.1435951	0.4930002	-0.29	0.771	-10.109858	0.8226675
R-sq: within = 0.0225				Number of obs = 98		
between = 0.3329				Number of groups = 7		
overall = 0.1773				Obs per group: min = 14		
Wald chi2(4) = 9.38				avg = 14.0		
corr(u_i, X) = 0 (assumed)				max = 14		
(Std. Err. adjusted for 7 clusters in id)				Prob > chi2 = 0.0523		
icbcode = 35						
Cgvs	0.0647609	0.0627724	1.03	0.302	-0.0582708	0.1877925
Lnta	-0.0273047	0.0105899	-2.58	0.010	-0.0480605	-0.006549
Leverage	-0.4433999	0.1035733	-4.28	0.000	-0.6463999	-0.2403999
Age	-0.000246	0.0002757	-0.89	0.372	-0.0007863	0.0002944
_cons	0.6212522	0.1561536	3.98	0.000	0.3151968	0.9273076
R-sq: within = 0.1823				Number of obs = 252		
between = 0.2997				Number of groups = 18		
overall = 0.1026				Obs per group: min = 14		
Wald chi2(4) = 36.56				avg = 14.0		
corr(u_i, X) = 0 (assumed)				max = 14		
(Std. Err. adjusted for 18 clusters in id)				Prob > chi2 = 0.0000		
icbcode = 40						
Cgvs	0.229015	0.0793339	2.89	0.004	0.0735234	0.3845066



Table 24 (continued)

ROE	Coef	Std.Err	z	P> z	[95%	Conf.Interval]
Lnta	-0.0678924	0.0197171	-3.44	0.001	-0.1065372	-0.0292475
Leverage	0.0938975	0.1801093	0.52	0.602	-0.2591103	0.4469053
Age	-0.0001365	0.0002709	-0.50	0.614	-0.0006675	0.0003946
_cons	1.012461	0.2613969	3.87	0.000	0.5001322	1.524789
<i>R</i> -sq: within=0.0445				Number of obs = 644		
between=0.1944				Number of groups = 46		
overall=0.1150				Obs per group: min = 14		
Wald chi2(4) = 14.46				avg = 14.0		
corr(<i>u</i> _{<i>i</i>} , <i>X</i>) = 0 (assumed)				max = 14		
(Std. Err. adjusted for 46 clusters in id)				Prob > chi2 = 0.0060		
icbcode = 45						
Cgvs	0.059291	0.0312548	1.90	0.058	-0.0019672	0.1205493
Lnta	0.0084168	0.0247957	0.34	0.734	-0.0401818	0.0570155
Leverage	0.023369	0.1021535	0.23	0.819	-0.1768481	0.2235862
Age	0.0007849	0.0003413	2.30	0.021	0.0001158	0.0014539
_cons	-0.0668126	0.3385501	-0.20	0.844	-0.7303587	0.5967334
<i>R</i> -sq: within=0.0058				Number of obs = 210		
between=0.3771				Number of groups = 15		
overall=0.2609				Obs per group: min = 14		
Wald chi2(4) = 14.11				avg = 14.0		
corr(<i>u</i> _{<i>i</i>} , <i>X</i>) = 0 (assumed)				max = 14		
(Std. Err. adjusted for 15 clusters in id)				Prob > chi2 = 0.0070		
icbcode = 50						
Cgvs	0.1653197	0.0589975	2.80	0.005	0.0496867	0.2809526
Lnta	-0.0282074	0.0173994	-1.62	0.105	-0.0623096	0.0058947
Leverage	-0.0944772	0.1328019	-0.71	0.477	-0.3547643	0.1658098
Age	0.0000712	0.000191	0.37	0.710	-0.0003033	0.0004456
_cons	0.4693504	0.2152309	2.18	0.029	0.0475057	0.8911952
<i>R</i> -sq: within=0.0408				Number of obs = 462		
between=0.0006				Number of groups = 33		
overall=0.0058				Obs per group: min = 14		
Wald chi2(4) = 13.32				avg = 14.0		
corr(<i>u</i> _{<i>i</i>} , <i>X</i>) = 0 (assumed)				max = 14		
(Std. Err. adjusted for 33 clusters in id)				Prob > chi2 = 0.0098		
icbcode = 55						
Cgvs	-0.026218	0.0781638	-0.34	0.737	-0.1794162	0.1269803
Lnta	-0.0258369	0.0263307	-0.98	0.326	-0.0774441	0.0257704
Leverage	-0.2029159	0.2827652	-0.72	0.473	-0.7571254	0.3512936
Age	-0.0000581	0.0004994	-0.12	0.907	-0.0010368	0.0009207
_cons	0.6043553	0.3481115	1.74	0.083	-0.0779306	1.286641
<i>R</i> -sq: within=0.0603				Number of obs = 238		
between=0.0002				Number of groups = 17		
overall=0.0042				Obs per group: min = 14		
Wald chi2(4) = 8.11				avg = 14.0		
corr(<i>u</i> _{<i>i</i>} , <i>X</i>) = 0 (assumed)				max = 14		
(Std. Err. adjusted for 17 clusters in id)				Prob > chi2 = 0.0875		
icbcode = 60						
Cgvs	0.1512735	0.0929068	1.63	0.103	-0.0308205	0.3333676
Lnta	-0.0366555	0.0408417	-0.90	0.369	-0.1167037	0.0433927
Leverage	0.4668216	0.190425	2.45	0.014	0.0935954	0.8400477



Table 24 (continued)

ROE	Coef	Std.Err	z	P> z	[95%	Conf.Interval]
Age	0.0015661	0.0019363	0.81	0.419	-0.002229	0.0053612
_cons	0.3830048	0.4450229	0.86	0.389	-0.489224	1.255234
R-sq: within=0.0024				Number of obs = 112		
between=0.5100				Number of groups = 8		
overall=0.0479				Obs per group: min = 14		
Wald chi2(4)=9.92				avg = 14.0		
corr(u_i, X)=0 (assumed)				max = 14		
(Std. Err. adjusted for 8 clusters in id)				Prob > chi2=0.0419		
icbcode = 65						
cgvs	0.160153	0.1495931	1.07	0.284	-0.1330441	0.4533501
lnta	0.0104272	0.031076	0.34	0.737	-0.0504807	0.0713351
leverage	-0.4012913	0.2673566	-1.50	0.133	-0.9253007	0.1227181
age	0.0034901	0.0020891	1.67	0.095	-0.0006044	0.0075847
_cons	0.0187172	0.5712578	0.03	0.974	-1.100928	1.138362
R-sq: within=0.0093				Number of obs = 56		
Between=0.9757				Number of groups = 4		
Overall=0.1063				Obs per group: min = 14		
Wald chi2(3)=				avg = 14.0		
corr(u_i, X)=0 (assumed)				max = 14		
(Std. Err. adjusted for 4 clusters in id)				Prob > chi2 =		

Table 25 summary of Robust regression by sector

ICB IND CODE	ICB name	Association robust
10	Technology	+ significant
15	Telecommunications	Non significant model
20	Health Care	Non significant model
30	Financials	NA
35	Real Estate	+
40	Consumer Discretionary	+ significant
45	Consumer Staples	+
50	Industrials	+ significant
55	Basic Materials	Non significant model
60	Energy	+
65	Utilities	Non significant model

Comparing the validation results with the previous results, we can see that for the sector ICB 10 (Technology), ICB 35 (Real Estate), ICB 45 (Consumer Staples) and ICB 60 (Energy) we could visualize a positive association between ROE and CGVS (Table 25).

These results can be summarized in the following table:

Benefits and contributions

These results indicate that when correcting for the identified statistical problems, we were able to obtain in almost all the sectors of activity studied a positive and significant association at the 5% level between the governance index and financial performance in fact for ICB 10,20,40,45,50 and 55, we were able to obtain a very significant association at the 5% level. It must be said that with the correction of inconsistencies, we can confirm our H1 hypothesis in almost all sectors of activity. This leads us to emphasize the importance of governance in improving the financial performance of firms active in industries, which gives specific importance to the role of governance. It should be noted that our in-depth investigations and the use of robust regression have shown that the significant association between corporate governance and financial performance is still mainly valid for the ICB10 and ICB40 sectors.

Interpretation of results

At this level, we can see that the results that were found by reference to the different regression methods used, lead us to confirm our first hypothesis H1 predicting the existence of a positive and significant association between the governance score and financial performance. Indeed, in order to have better visibility of the effect of the improvement of



the results via the correction of the identified econometric problems and to reflect the approach that led us to adopt the FGLS regressor, we propose the following summary table that shows the corrections of the estimates of the strength of the relationship between corporate governance and financial performance when taking into account the sectoral influences and the correction of the various sources of bias.

In our present research, we have tried to focus on the impact of corporate governance on the financial performance of firms in the United Kingdom. The 160 companies studied between 2005 and 2018 are listed on the London Stock Exchange and are characterized by the achievement of corporate social responsibility disclosures according to ASSET4.

In this chapter, we have tried to clarify the important concepts that are directly related to our study on the relationship between corporate governance score (CGVS) and corporate financial performance (ROE). In this chapter, we have also tried to demonstrate how the adoption of good governance measures can be associated with better firm performance. In this sense, we conducted a sectoral analysis according to the ICB code, which allowed us to identify a positive and significant association in the companies of 6 sectors of activity, which are ICB 10 (Technology), 20 (Health), 40 (Secondary consumption), 45 (Basic consumption), 50 (Industrial) and 55 (Basic material or raw materials). These results led us to observe that companies that are characterized by best practices in governance, as well as those with a favorable structure of their board of directors that are well organized and disciplined, can have better financial profitability through the enhancement of their corporate organizational architecture. It should also be added that the establishment of controls and compensation committees reinforces the role of governance in achieving better financial performance. In addition, the protection of shareholders' interests and the consideration of social and environmental factors at the decision-making level can only improve the financial performance of companies. We must add that the robustness checks we have performed confirm and validate the results obtained mainly in the ICB 40 and 50 sectors, i.e., the Consumer Discretionary sector and the Industrial sector.

Conclusion

Through our study, we have corroborated the findings drawn by a significant number of research works. Nevertheless, the originality of ours, which we consider innovative, consists in focusing attention on the different sectors of activity in the UK (United Kingdom). We have followed an approach advocating achieving a cross-sector benchmark which allows to reflect the ideas proposed by the institutional

theory. This paper evinces that despite the variation in the sectors of activity, the corporate governance plays a key role in improving the financial performance of English corporations. This result is consistent with the foundations of agency theory. We also emphasize the prominence of using the clustering technique with a view to targeting the analysis of the relationship between the corporate governance and financial performance. The analytical approach we have used has inspired several previous authors, including Lo and Shekhar (2018) who examined the impact of corporate governance on the financial performance of companies in Germany. They identified a positive association between strong corporate governance and financial performance in all industries studied. In addition, and for the economy of the UK, we can cite the research of O'Sullivan and Carroll (2021) which studied the impact of corporate governance on the financial performance of firms in the United Kingdom using a cluster approach to distinguish firms according to their industry. The results found suggest that corporate governance is positively associated with financial performance, but that this relationship varies across industries. This confirms the role of our research in consolidating the results of previous research and highlighting the importance of the use of cluster analysis in the dissection of the phenomena studied.

Moreover, identifying the positive and significant association between the corporate governance in most sectors studied makes us confirm our research hypothesis, which remains well founded by a rich literature (Alodat et al. 2022a, 2022b; Jia et al. 2021; Khan and Hanafi 2021; Agyei-Mensah and Gyimah 2020; Abdulsalam and Oyewo 2019). Previous research has identified mixed results owing to the differences in the measures used to assess the corporate governance quality or to measure the financial performance level.

Through this research work, we have also been able to validate that corporate governance plays a key role in improving the performance of English companies, mainly in the consumer discretionary sector and in the industrial sector. These results reflect the level of detail of our analyses which give a lot of importance to the sectoral characteristics of the firms.

Like any research study, we have found difficulties in the data collection process. Yet, our strength and originality consist in a new empirical approach making us dismantle a particular phenomenon. This latter has been widely studied in the different sectors of activity through analyzing the corporate governance research. This remains substantial from a managerial point of view, and extremely beneficial for advisors and decision-makers at a scale characterized by a more remarkable degree of precision. What is more, it is worth noting that our work has some limitations related to the study period dealing only with the period before Brexit



(the withdrawal of the United Kingdom from the European Union). The process of preparing the database has also led us to eliminate several companies, but this is necessary to avoid any source of econometric bias.

To put this into perspective, we suggest carrying out a comparative study of the UK corporations before and after the Brexit period. This period has been characterized by a political and regulatory flow, especially at the European and international levels. Furthermore, the studies on corporate governance mechanisms in times of health crises, such as the COVID-19 pandemic period, are significantly important. In this sense, we have only introduced in our study the health sector, but this may necessitate more detailed investigations in future works.

Declarations

Conflict of interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

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