

**The Effect of Corporate Governance, Risk and ESG  
towards Bank Performance: Does Fintech Matter?**

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## Abbreviations

BS	Basel Committees
CSR	Corporate Social Responsibility
EU	European Union
ESG	Environmental, Social and Governance
FSB	Financial Stability Board
GDP	Growth Domestic Product
GMM	Generalised Method of Moment
LDR	Loan-to-Deposit ratio
MENA	Middle East/ North Africa
NIM	Net Interest Margin
NPL	Non-Performing Loan
OIC	Organization Islamic Corporation
OLS	Ordinary Least Square
PCSE	Panel Corrected Standard Error Techniques
PLS-SEM	Partial Least Square- Structural Equation Modelling
ROA	Return on Asset
ROaA	Return on Average Asset
ROE	Return on Equity
ROaE	Return on Average Equity
SRI	Social Responsible Investing

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## **Author's declaration**

I confirm that this work is my own. Additionally, this work has not been submitted for another qualification. Further, Chapters 4, 5 and 6 were utilised to submit papers at peer-reviewed journal.

**Chapter 4** was used in Mokhtar, N. B. Ashraful, A. and Ogundele, B. (2022), “Corporate Governance and Bank Performance : Does Fintech Play Any Role”, 16th Bulletin of Monetary Economics and Banking (BMEB) International Call for Paper (ICFP)- 2022, Jakarta, Indonesia.

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## Abstract

This thesis examines how corporate governance, risk, and ESG affect bank performance and provides a novel theoretical framework for incorporating fintech into the relationship in the context of EU banks. The banking sector is transitioning to become increasingly digitised. Corporate governance, risk, and ESG management in banking are changing, and fintech involvement is currently popular on the market.

First, the study identifies a positive significant relationship between corporate governance and bank performance. It demonstrates how improved corporate governance can boost bank performance and how, in accordance with Agency Theory, improved governance will prevent the agency problem in banks. Additionally, the results suggested that fintech acts as a moderator to enhance the relationship. Second, the study find that bank risk negatively affects bank performance, suggesting that performance would decrease as risk rises. Furthermore, it was demonstrated that fintech has a moderating impact on the relationship between risk and bank performance. It demonstrates how fintech intervention helps banks improve risk management by minimising and controlling the risk, in line with the Consumer Theory's suggestion that an initiative like fintech or the enhancement of existing products and services, improvement of operations to minimise risk, improved performance in banks. Third, it has been discovered that ESG has a positive impact on bank performance, suggesting that implementing more robust ESG practises will improve bank performance. According to the Theory of Stakeholders, it is the obligation of a bank to add value for its stakeholders, and one way to do this is through ESG. Additionally, it was concluded that fintech mediates the link between ESG and bank performance. This indicates that banks with higher fintech engagement have better ESG results, which has indirectly boosted performance.

Secondary data for the analysis was gathered from a variety of sources, including Orbis Bank Focus, Refinitiv data stream, annual financial reports, the World Bank's Development Indicators, Worldwide Governance Indicators, and CrunchBase (CB). The analysis included both static and dynamic panel data approaches, including the fundamental Partial Least Square-Structural Equation Model (PLS SEM), the second generation of data analysis, and Ordinary Least Square (OLS) for robustness. This study will be useful to a wide range of stakeholders, including investors and managers, lenders, and policymakers in the EU region and around the world. It will also provide academicians and researchers with future research directions in the banking and fintech fields.

# Chapter 1

## Introduction

### 1.1 Overviews

The banking sector supports the entire economy (Jeucken and Bouma, 2017). Banks are used to distribute the nation's financial resources. Additionally, the banking industry serves as the economy's "heart" by pumping money into it. An increasingly competitive in the banking market may boost bank to enhance their performance by finding a better way to ensure that they could be in line with their market rival (Vives, 2019). To ensure this, banks must determine what is their factors that could give effect to their bank performance. The factors such as corporate governance, bank risk, and ESG practices are among the essential factor that hotly discussed by the industrial player in the banking and the researcher. As the globalisation has fuelled increased rivalry in the banking business (Yin, 2019), the rising diversity of client expectations and technological advances are projected to significantly impact the bank's management's ability to maintain and attract new customers and investors. The emergence of Fintech in the banking industry, on the other hand, has presented a challenge to the commercial banks (Wang et al., 2021). The emergence of challenger banks leveraging Fintech innovations like NuBank, Revolut, and Chime has influenced conventional commercial banks to act in line with their market competitors.

Banks in EU have embraced technologies that strengthen authentication and data security (EBF, 2020). NatWest, for instance, has provided biometric fingerprint credit cards, and Barclays provides finger vein reader technology to its business clients (IMF, 2020). Infrastructure in EU and an atmosphere that values innovation is favourable to the expansion of fintech services. In terms of internet coverage, as well as access to energy, the IMF (2020) study places EU ahead of the rest of the globe. Additionally, it boasts an entrepreneurial climate

that encourages innovation and technological advancement, with numerous EU, including the Netherlands, leading the 2020 Global Innovation Index. By making the most of these favourable conditions, the prospects for fintech throughout Europe, and more especially the EU region in this study, may be improved. That is why this study has selected the listed banks on the EU countries as our research object as they are supporting the social and economic development (Buallay, 2019). By facilitating financial transactions, the banking sector currently contributes significantly to the expansion and growth of the EU economy. Therefore, the EU has some interesting ground to cover in examining how bank factors affect performance and how fintech in this area has been used to improve their business while also assisting in educating the traditional banks that are slow to adopt fintech into their banking operations in the EU region.

Banks have varying effects on and interactions with corporate governance structures. Since many businesses have failed due to weak corporate governance (Arnaboldi and Rossinogli, 2015), including Northern Rock Bank, Lehman Brothers, Enron, and Exxon Mobil, this issue of stronger corporate governance in the sector has become crucial. Literature states that banking firms present unique challenges, making corporate governance for these institutions distinct from other non-financial firms (Bhatia and Gulati, 2021). Banks' corporate governance is of critical importance to both the banks and the financial regulators. According to conventional wisdom, good governance can support bank performance, while lousy governance can destabilise and destroy stability and soundness (Brogi and Lagasio, 2021). For instance, research by Ayadi (2019) discovered that internal controls and capital regulations complement each other and have a big impact on bank performance. It demonstrates how internal variables like corporate governance have a big impact on bank performance. Therefore, it is crucial for the researcher and other key players to ascertain the impact of bad corporate

governance and how to ensure that it can be improved in order for banks to operate successfully. In return for the study of the relationship between corporate governance and bank performance, this study is critical because it provides evidence of the relationship effect of corporate governance and bank performance as well as sheds light on the use of fintech in banking in the EU. Utilizing the chance of fintech will give the main player a solid notion in terms of enhancing their business in the market, in addition to concentrating on strengthening their corporate governance, risk, and ESG practises in the usual practises. The first way that a commercial bank can benefit from the potential provided by fintech is by employing it to manage their governance (Cheng and Qu, 2020). Artificial intelligence, machine learning, and blockchain technology could be used to improve governance (AlShamsi et al., 2021) . It is possible to prevent the board's abuses of power.

In addition, bank risk is critical for both banks and financial institutions. Traditional thinking holds that increasing risk generates a higher return, but it also puts banks in jeopardy (Vives, 2019). The market value of a company was shown to be most affected by bank-specific risk, such as credit risk, liquidity risk, operational risk, market risk, and solvency risk, according to theoretical research. For a variety of participants in the financial market, a better knowledge of bank risk is crucial (Haq and Heany, 2012). Bank risk assessment is critical for regulators, market supervisors, borrowers, shareholders, and bondholders. According to study by Sondakh et al. (2021) and other researchers, bank risk has a detrimental impact on bank performance. Therefore, it is crucial for the researcher to continue analysing the risk assessment and figuring out ways to lower the risk in order to prevent the bank from performing poorly. Thus, this study is important because it provides evidence on how bank risk can affect bank performance and then enlightens the value of using fintech to minimise risk that could threaten the bank's business in EU. Second, through innovation that lowers costs, improves customer experience,

and fosters trust, fintech can have an impact on the payment services solution (Barbu et al., 2021). Investment in fintech innovation to create tools that could save costs and improve payment convenience will benefit the bank and the customer in the long run. Third, artificial intelligence is used to analyse client payment data in order to detect and prevent fraudulent transactions, biometrics are used to improve authentication and convenience, and tokenization is used to increase the security of payment communication (Königstorfer and Thalmann, 2020). Customer data is a very valuable resource that can be "mined" for cheaply utilising machine learning and artificial intelligence (Alt et al., 2018). This presents chances for established financial organisations, like commercial banks, to cut expenses, offer novel services, and boost competitiveness. These potential efficiency improvements must, of course, be balanced against the risks of abuse and violation of customer privacy, necessitating rigorous cyber security and privacy precautions as well as control of data ownership and handling procedures. The efficacy of current consumer and investor protections may also be significantly impacted by these developments. In light of this, banks have recently started using fintech solutions (Alt et al., 2018).

In addition, environmental, social, and governance (ESG) issues have also recently become a major concern for individuals in a variety of businesses (Buallay, 2019). Climate change and other environmental concerns have made ESG practises more important for the key players in the industries. Theoretical research shows that the involvement of significant players in the environmental, social, and governance concerns has given stakeholders a different perspective (Atan et al., 2016). It has helped many corporations improve their public image while still running their operations. Recent studies, including Dalal & Thaker (2019), found that ESG practises have a very large impact on performance. This demonstrates that ESG could have an impact on bank performance (Buallay, 2019), and it is vital for business players to determine

whether these practises will have a material impact on their organisation and what steps can be taken to improve ESG practises in order to improve bank performance. As a result, this study is crucial in establishing the link between ESG and banking performance and in shedding light on how industry players can use fintech to improve ESG for better banking performance in the EU.

## **1.2 Motivations of the study**

The motivation for this study comes from mostly from the changing banking landscape, particularly after Fintech began to emerge in a variety of industries, including the financial industry. Meanwhile, there are a few motivations that have led to the conduct of this study. To begin, it is apparent that there is an abundance of research relevant to bank performance. However, this study believes that little research has been undertaken in relation to the interaction between governance, risk, and ESG, which would provide a distinct perspective. As a result, it has prompted the study's conduct. Second, while EU banking is usually regarded as one of the largest and most rapidly changing banking landscapes (EBF, 2020), there have been relatively few studies on this region to demonstrate that EU banks have distinct results on their bank performance. This factor contributed to the interest in the research. Third, the blooming of fintech is a very hot topic in many industries (Chen, 2020), including the financial sector; however, the scarcity of it due to its infancy has provided an excellent opportunity for this study to delve deeper into understanding the usage and role of fintech in improving the performance of banks in the EU. This is a very strong motive and a potential opportunity for this study to be undertaken, since the results will increase the body of literature on fintech in banking, as well as provide a fantastic possibility for future research in this field.



### **1.3 Purpose of the study**

What connection exists between corporate governance, bank risk and ESG in terms of bank performance? What potential interactions could fintech make to change those relationships?

The goal of this study is to provide an answer to these questions. In order to achieve the following goals, this study aims to:

- Analyse the impact of corporate governance on bank performance, and further examine if fintech has any moderating effects on the connection.
- Examine the effect of bank risk to bank performance, and further examine fintech has a moderating impact on the connection.
- Determine the impact of ESG on bank performance, and further examine whether fintech mediates the link.

### **1.4 Contributions of the study**

This study contributes empirical, theoretical, and methodological contributions to bank performance and fintech-related research and policymaking by exploring the relationship between corporate governance, risk, and ESG and bank performance, as well as how fintech intervenes in the interactions.

#### ***1.4.1 Empirical contribution***

The existing literature has examined the effect of corporate governance towards bank performance in different region context such as Japan (Ullah, 2016), GCC countries (Dalwai et al., 2015; Ajili and Bouri, 2018), United States (Bhagat and Bolton, 2016; Bhagat and Bolton, 2019), Nigeria (Onwuka et al., 2019), OIC countries (Aslam and Haron, 2020),

Romania (Benvenuto et al., 2021), MENA countries (Basar et al., 2021) and China market (Wang et al., 2021). As opposed to that, this study aimed to analyse the impact of corporate governance from a holistic viewpoint utilising a sample of all 28 EU nations to help us better understand the impact of corporate governance from this angle. Second, it is found that bank risk has been extensively studied in other areas, including Sondakh et al. (2021) using an Indonesian banking sample, Inegbedion et al. (2020) in a Nigerian banking sample, Fang et al. (2019): Tan (2016) in Chinese banking, and Bitar et al. (2016) for MENA countries. However, the outcome is ambiguous because it could vary for different Eurozone members. Thus, in the context of EU banks, this study contributes to completing the body of work on the relationship between bank risk and bank performance. Thirdly, ESG has been extensively studied in few scopes globally such as Shaikh (2022) and Al Hawaj and Buallay (2022), as well as by Aouadi and Marsat (2018), Minutolo et al. (2019), and Xie et al. (2019). However, as the outcomes for other EU could vary, the result is ambiguous. Thus, this study adds to the expanding body of evidence regarding how ESG factors affect bank performance in the context-specific sample of the EU commercial banks. Fourth, based on previous research in the literature review, this study is one of the first to investigate the influence of fintech in all three elements that affect bank performance. Banking industry fintech research is still restricted and sparse. There are numerous debates over the role of fintech in improving bank performance through internal variables. Thus, by carrying out this research, the empirical results of fintech's intervention in the relationship of corporate governance, bank risk, and ESG will shed light on the knowledge and understanding of fintech's essential role in the banking market.

### ***1.4.2 Theoretical contribution***

This thesis does not fit into a single theory because it focuses on multiple dimensions of variables like as corporate governance, risk, ESG, fintech, and bank performance. As a result, the analysis in this paper employs a number of theories, including Agency theory, consumer theory, and stakeholder theory. Although these hypotheses have been tested in a select regions, such as the United States and Asia, relatively few have been examined in the setting of the EU. As a result, by verifying these theories in the EU region, our study adds to prior research. The Agency theory is used to investigate the relationship between corporate governance and bank performance in this study. It has been discovered that almost all banks adhere strictly to governance in order to avoid any agency problems. The relationship between corporate governance and bank performance can be enhanced with the involvement of fintech, since fintech helps to provide better transparency disclosure, which helps to minimise the bank's agency problem. Additionally, by using the consumer theory, the connection between risk and bank performance is investigated. The impact of fintech on banks can be explained by the consumer theory, according to this hypothesis (Aaker and Keller, 1990).

The customer theory holds that brand-new services can displace current ones by fulfilling the same consumer needs, and examples include digital mobile banking, blockchain technology, and big data analytics (as defined by the fintech definition) (such as those provided by traditional commercial banks). This theory also explains how new or existing industrial firms might increase market rivalry by using new or better existing technologies to produce more accessible and cost-effective goods and services. The scope of the theory is applicable to our study, where the initiative of new fintech or enhancement of existing products and services, improvement of processes to reduce risk for enhanced bank performance.

Further, using the stakeholder theory, this study investigated the relationship between ESG and bank performance. According to stakeholder theory, corporate managers are accountable to a certain group of stakeholders (Freeman, 2015). According to this viewpoint, the goal of a corporation is to create value for its stakeholders. Involved parties, also known as stakeholders, are individuals who have the ability to influence the company directly or indirectly (Freeman, 2015). This means that banks must not only create revenue, but also be accountable to its stakeholders in terms of good environmental, social, and governance practises. Finally, this study contributes to the novel of new fintech theoretical. As far as we know, no previous study examined the role of fintech in the relationship between corporate governance, bank risk, and ESG and bank performance. As we all know, fintech is a popular topic in the industry right now (Haddad and Hornuf, 2018), but there has been very little study done on the function. As a result of proposing the new theoretical framework, this study brought a new body of fintech literature to this field of study.

### ***1.4.3 Methodological contribution***

The study broadens the breadth of the literature on corporate governance, risk, ESG, fintech, and bank performance by employing a second-generation method, Partial Least Square-Structural Equation Modelling (PLS-SEM). To the best of our knowledge, the PLS-SEM method has never been used in previous work (method contribution), which has exclusively used first-generation approaches such as GMM and OLS regression (Aslam and Haron, 2020; Boachie, 2021). This second-generation approach provides an alternative to covariance-based SEM (Wold, 1985; Chin et al., 2010; Hair et al., 2019), which is particularly useful when the data is not normally distributed (Monecke and Leisch, 2012; Hair et al., 2014). PLS-SEM with higher statistical power is useful for exploratory research that evaluates less formed or still

emerging theories (Hair et al., 2019; Ramli et al., 2019). For estimating the value of a mediator, PLS-SEM outperforms regression (Preacher & Hayes, 2004; Chin, 1998).

### **1.5 Structure of the thesis**

This thesis is organised as follows. Chapter 1 discusses the study's background, as well as the motives and contributions. Chapter 2 present the theory of the study including Agency Theory, Consumer Theory and Stakeholder Theory with the combinations on literature review of previous studies.. The methods chosen is described in depth in Chapter 3. The empirical findings are presented in Chapters 4 (the relationship of corporate governance and bank performance), Chapter 5 (the relationship of bank risk and bank performance), and Chapter 6 (the relationship of ESG and bank performance), and this research is concluded in Chapter 7.

### **1.6 Summary**

In this chapter, the context of the investigation has been established, and the goals and objectives of the study have been outlined. Along with that, it has described the study's objectives and prospective contributions. There has also been a description of the thesis' structure.

As stated above, the study is concerned with corporate governance, bank risk, ESG, and fintech in relation to bank performance in EU countries. Its focus is on the relationship between corporate governance, bank risk, and ESG and how Fintech might intervene in this relationship.

## **Chapter 2**

### **Literature Review**

#### **2.1 Overviews**

This chapter reviews the relevant literature review on corporate governance, bank risk, ESG and fintech in particular to the bank performance. In this chapter, theories that underpin the research questions are presented. First, agency theory is described, and then it is explained how agency theory explains the link between corporate governance and bank performance. Second, consumer theory is described, and then relating it to the risk and fintech towards bank performance. Third, stakeholder theory that applied into the ESG and bank performance.

This will serve as a foundation for the discussion and analysis of subsequent chapters. A review of empirical studies on the bank performance factors such as corporate governance, bank risk, ESG and few literatures on fintech would give the opportunity and help to identify the gaps in the existing body of knowledge. The chapter is structured as follows. Section 2.2 defining on the Agency Theory, Section 2.3 defining on the Consumer Theory, section 2.4 defining on Stakeholder Theory, Section 2.5 presents a meaning, definition and the relation of bank performance, corporate governance, bank risk, ESG and fintech from previous studies and finally Section 2.6 summarises the chapter.

#### **2.2 Agency Theory**

According to the Agency Theory, employees or supervisors in organisations can be self-interested (Jensen and Meckling, 1976). This theory prescribes that people or employees are held accountable in their tasks and responsibilities. Employees must constitute a good governance structure rather than just providing the need of shareholders, which maybe challenging the governance structure. Agency problem can be caused by information asymmetry where there is less information disclosure between shareholders and managers. For

the agency theory, shareholders' value is expected to fall when there is a conflict of interest between managers and owners of the firm. Efficient corporate governance is important especially for firms in developing countries, as it can enhance managerial quality and vibrancy as well as help with raising capital. That is why, to alleviate the agency problem, a strengthened corporate governance practice should be implemented. Transparency in monitoring and reporting can be achieved through innovation in the bank organisation, such as fintech. Using the innovation such as digital reporting and branch banking consolidation, for example, will help to obtain the financial report faster with more minor of human error. This will aid in more excellent governance and the avoidance of agency costs for improved performance. In their study, AlShamsi et al. (2021) highlighted how the use of fintech tools like blockchain could aid in organisation governance, including increasing transparency. It is now that blockchain has emerged as a technology that can enable or allow things that previously seemed impossible, like recording assets, allocating value, and most importantly registering and monitoring the footprint of electronic transactions without any central repository, i.e., decentralised. This provides transparency, integrity, and traceability of information and data on a consensus-based approach where trusted parties can validate an assertion ( AlShamsi, et al., 2021). This suggests that fintech tools like blockchain could improve governance in banks' transparency and bring a very useful integrity. Although there are other theories that discuss corporate governance, this study concludes that the Agency theory is the most appropriate theory to apply in the study of corporate governance and bank performance.

### **2.3 Consumer Theory**

The Consumer Theory can explain the effect of innovation like fintech on banks risk (Aaker and Keller, 1990). According to the theory, new services such as digital mobile banking, blockchain, and big data analytics (such as those given by the fintech definition) can replace existing services by matching the same consumer need (such as those provided by traditional

commercial banks). According to the consumer theory, new or current industrial players who use new or improved existing technology to deliver more accessible and cost-effective goods and services can promote market rivalry. The theory's scope is relevant to our narrative, where the initiative of new fintech or enhancement of existing products and services, improvement of operations to minimise risk for improved performance in banks. Therefore, in order to relate to the second factor of bank risk towards bank performance, this theory was chosen.

## **2.4 Stakeholder Theory**

Stakeholder theory proposes that managers of businesses have responsibility to a certain group of stakeholders (Freeman, 2015). According to this notion, a company's objective is to create value for its stakeholders. Involved parties, also known as stakeholders, are those who have the potential to directly or indirectly impact the company (Freeman, 2015). Internal and external stakeholders make up the two categories of stakeholders. The company's management, employees, and investors are examples of internal stakeholders. External stakeholders are those who are not part of the business, such as the neighbourhood in which it is located, its clients and suppliers, the government and non-governmental organisations, as well as investors and creditors. Stakeholders play a crucial role in ensuring the company's viability and performance (Freeman et al., 2010), and as a result, their impact on business operations is significant. The stakeholder theory is relevant to firms that promote efforts to help protect the environment, seek to improve social welfare and community relations, and often do adhere to value-maximising governance practices. As a result, this idea serves as the foundation for ESG practices and how investment in Fintech in the bank could give benefits in straightening the ESG. Through ESG practises and financial investments in fintech, the role of shareholders dictates how the business interacts with stakeholders. As a result, this theory was chosen to be discussed in relation to ESG and bank performance when discussing ESG.



## **2.5 Corporate Governance, Risk, ESG and Bank Performance**

### ***2.5.1 Corporate governance and bank performance***

Corporate governance is a strategy for taking charge of a business, promoting its success, and easing management's frustration over the abuse of corporate governance codes (Aslam et al., 2019; Aslam and Haron 2020). For many years, academics, lawmakers, and business leaders have been concerned about corporate governance in order to gain a competitive edge and attract more capital (Benvenuto et al., 2021). Risk must be reduced, value must be created, and public accountability must be enhanced (Rashid et al.,2020). This is due to the fact that for corporate governance to function properly, a set of rules and standards must be in place.

The correlation between corporate governance and bank performance has been the subject of a large number of studies. Insights into the outcome, however, are conflicting. Munisi and Randøy (2013) conducted a study in a Sub-Saharan African sample to look at the relationship between corporate governance and company performance. They discover that there is a strong correlation between governance and performance using the OLS approach. The analysis also shows that not all governance approaches are substantially connected with performance and that there is a negative correlation between governance and market valuation.

El-Chaarani (2014) reported conflicting results on corporate governance variables towards performance in her study for Lebanese banking, which focuses on numerous aspects to emphasise the impact of corporate governance on financial performance. The study concludes that insider ownership concentration has a beneficial impact on performance and is positively correlated with the proportion of directors on the board of directors in Lebanese banks. However, the size of the board has no bearing on performance. Additionally, CEO duality harms the performance of the bank. The empirical results, however, are contested because the sample size is small—40 banks from the Lebanon region make up the sample—and the model's

predictions may not be reliable. In their research, Zagorchev and Gao (2015) assess the impact of corporate governance on the level of excessive risk-taking and the performance of US financial institutions from 2002 to 2009. They discover that improved governance is favourably correlated with the performance of U.S. financial institutions and negatively correlated with excessive risk-taking using Tobit regression and conventional panel regression analysis.

Salim et al. (2016) used two-stage double-bootstrap data envelopment analysis to measure the relationship between corporate governance and efficiency of Australian banks between 1999 and 2013. The authors found that board size and committee meetings are the most efficient of the five corporate governance factors studied. They also found evidence of increased industry efficiency since the Principles of Good Corporate Governance were introduced in 2003. Also, Ullah (2016) investigated the implications of ownership structure and control transfers in the Japanese corporate market, which are mainly attributed to the government's liberalisation policies in the 1990s. According to the author, it is efficient to unwind cross-shareholding between banks and corporations and mutual transfers among non-financial institutions. Furthermore, private and foreign ownership transfer is consistently associated with high market value, implying that individual transfers increase inefficiency. Then Bhagat and Bolton (2019) extended their study from their previous research in 2008 by added additional 14 years of sample data to test the specification and power of director stock ownership as a measure of corporate governance. Various specifications, estimation techniques, and sub-samples showed that director stock ownership has positively related to future corporate performance in several out-of-sample periods (2002–2006, 2007–2009, 2010–2016).

Buallay (2019) in her study for MENA countries finds a mixed result on the corporate governance and performance while using the General Linear Modelling to analysing the result. The study indicates that Sharia'ah governance significantly influenced ROA and ROE.

However, corporate governance significantly influenced Tobin's Q. The study on the MENA region also been discovered by Basar (2021). According to the study, the governance index, which combines the four board attributes, is positively correlated with return on assets. The study examined the link between corporate governance structure and performance in the banking sector. A sample was chosen using the GMM. The model used data from 33 Turkish, Tunisian, Moroccan, and Lebanese banks listed in 2012-2017. Because the paper focuses on corporate governance, a "Board Characteristics Index" was created based on onboard leadership structure, member characteristics, and board committee structure. It showed the overall index's relationship to banking performance.

Haris et al. (2019) investigated the impact of corporate governance and director political connections on bank profitability in Pakistan. The study used data from 26 domestic banks from 2007 to 2016 and found that board independence and director compensation positively impact bank profitability. Aslam and Haron (2020) then continue to research corporate governance. They examined the mediating role of intellectual capital (IC) on the relationship between corporate governance mechanisms and Islamic banking performance. From 2008 to 2017, a panel of 129 Islamic banks from 29 OIC countries were studied. The unobserved endogeneity and heteroscedasticity problem was solved using the two-step system generalised method of moments . The empirical findings showed that corporate governance has a significant impact on intellectual capital. Meanwhile, Fiador and Sarpong-Kumankoma's study (2020) found that corporate governance matters in the banking sector and helps improve loan quality. The study used a panel-corrected standard errors estimation model with 11-year data from 2006 to 2016 showed the significant result of corporate governance and loan quality.

The impact of the corporate governance index on financial performance (ROA, general liquidity, capital adequacy, and size of the company expressed as total assets) was also studied

by Benvenuto (2021). Using survey data from 2007–2018, the study examined how corporate governance interacts with a homogeneous and heterogeneous banking system and found that corporate governance has a significant, positive, and long-lasting effect on profitability and capital adequacy in Romanian and Italian banking. Boachie (2021) found that ownership had a moderating effect on the relationship between corporate governance and financial performance in Ghanaian banks. The study used a panel dataset of 414 banks from 18 years and a sample of 23 banks. Audit independence, CEO duality, non-executive directors, and bank size all boosted performance.

From the many academic studies that have been gathered, this study can highlight a few key points in the review. First, none of the earlier studies have examined the relationship between corporate governance and bank performance in relation to EU banks, which might have produced different findings that would have supported earlier studies that suggested corporate governance could have an impact on bank performance. Second, it is evident from the previous study that the majority of scholars continue to employ the same conventional techniques, such as GMM, Data Envelopment Analysis (DEA), and OLS. As a result, using the second generation method to gather the data for this study would improve the outcome and increase knowledge of using other methods in this field. Third, it is criticised that previous studies did not look at other current trends and instead only tested the factors that were already in place in various regions. The current fintech factor will then be incorporated into the relationship in this study to gain a different perspective on the research and shed light on its potential future directions.

### ***2.5.2 Bank risk and bank performance***

Bank risk is usually referred as the potential loss to a bank due to the occurrence of particular events. Key risks in banking include credit risk, interest rate risk, market risk, liquidity risk,

and operational risk. Bank risk must be carefully considered (Altunbas et al, 2010). A number of research on risk components and bank performance have been done in recent years. Sondakh et al. (2021) using an Indonesian banking sample investigate the impact of banking risk on regional development banks in Indonesia during the period of 2013–2015. Using multiple regression analysis, the study found that there is a substantial association between the independent variables and performance (ROA). The findings indicate that NPL, NIM, LDR all have a significant impact on ROA at the same time. NPLs are significant and negatively affect ROA, while NIM is significant and positively affects ROA, LDR is not significant and negatively influences ROA. Inegbedion et al. (2020) in their study for Nigerian banking using GMM found that findings show a substantial inverse association between ROaA and credit, leverage, and liquidity risks, and all of these relationships were significant. Rising credit risk will result in a decrease in a bank's investable funds and average assets. The study also finds that there is a significant positive relationship between ROaA and CAR. Efficiency, credit risk, diversity, and concentration ratio all have a strong negative impact on all performance measurements, according to Alfadli and Rjoub's (2020) study using Panel-corrected standard error analysis for GULF cooperation council countries. In their study for South Africa using pooled OLS, Munangi and Bongani (2020) discovered that the relationship between financial performance and credit risk, an indicator of bank risk, was adverse.

Hunjra et al. (2020) in their study for Pakistan, India, Bangladesh and Sri Lanka using GMM method finds that bank risk has significant mixed effect towards bank performance. Ul-Huq et al. (2020) found that an increasing non-performing loan ratio as credit risk results in the bank being underperforming and unstable in their study using the GMM method to a sample of emerging countries. According to Fang et al. (2019), cost efficiency has a greater favourable impact on profitability when banks take on more risk and are subject to more competition. This

finding was made in a study conducted in the China region. Tan's study from 2016 used the same sample of China's banking sector but a different GMM method; while their findings did not support any conclusive findings about the effects of competition and risk on bank profitability. Chen et al. (2018) used Fixed effect regression to conduct a study for 12 advanced economic countries and discovered that in a market-based financial system, liquidity risk has a negative influence on bank performance. In a study of MENA countries, Bitar (2016) discovered that meeting Basel capital standards increases bank risk protection while also increasing efficiency and profitability. For too-big-to-fail banks, banks in crisis, and banks in well-governed countries, capital requirements have a greater impact on bank performance. Kamran et al. (2016) used Panel data analysis to conduct a study in Pakistan and discovered a significant relationship between financial market development in the banking sector and financial performance as measured by key indicators. Haq and Heany (2012) discover evidence of a convex (U-shaped) relationship between bank capital and bank systematic risk and credit risk in their study for Europe using two-step system GMM analysis. While increased capitalization improves bank profitability, liquidity risk varies according to bank size. Terraza (2015) found no evidence of a link between increased efficiency and increased bank profitability using the same scope of Europe and method of GMM study. Ellul and Yerramilli (2013) suggest that a strong and independent risk management function can reduce tail risk exposures at banks in their study USA scope using Fixed effect analysis.

There are a few things that could be highlighted from the earlier studies. First, it is criticised that no prior study has used EU banks as a sample in its analysis. Since there is no one solution that works for everyone, different outcomes may be obtained from EU banks. Second, it only criticises the earlier study using traditional methods that have already been tried and tested by many academics, such as GMM, panel data, and OLS. Thus, carrying out a new study using a

different methodology could produce a variety of results and increase knowledge of the other method. Third, the criticism is that no previous researcher had used the bank risk index to demonstrate the impact of bank risk. As a result, this study also provided the risk index of bank risk effect towards bank performance using the second generation of SEM-PLS. Fourthly, it is criticised that no study has included the fintech factor as an extra variable to examine the relationship. Then, this study offers a better outcome by incorporating the most recent fintech factor in the financial sector, including banks in the EU.

### ***2.5.3 ESG and bank performance***

Environmental, Social and Governance (ESG) have become key indicators of management competence, risk management, and non-financial performance (Galbreath, 2013). Buallay et al. (2021) examines 882 banks from developed and developing countries covering 11 years after the 2008 financial crisis. Using pooling regression and instrumental variable GMM, the study finds that ESG weakens banks' performance in developed and developing countries. Ruan and Liu (2021) analysed samples of China's Shanghai and Shenzhen A-share listed companies using OLS regression using ESG rating data from 2015 to 2019. They discovered that corporate ESG initiatives has significant negative effect towards firm performance. Fahad and Busru (2021) looked at the impact of CSR disclosure using panel regressions for the final sample of 386 Indian companies listed, representing all of the major players in the capital market over a ten-year period from 2007–2016. The research reveals a pattern of a negative impact of CSR disclosure, as reflected by ESG, on Indian company profitability and firm value. In their study on Italian companies listed utilising Panel data analysis, Landi and Sciarelli (2019) discovered a negative and statistically significant impact of ESG in terms of market premium, while they were engaging in socially responsible investing. In their comparative study of rising nations Malaysia and Denmark as the standard of best practise, Atan et al. (2016)

found no correlation between ESG disclosure level and firm's financial success for the Top 100 largest companies listed in each Bursa Malaysia and Nasdaq.

The majority of research show that, nevertheless, ESG information disclosure, rating, and other activities have a greater favourable impact on business performance. In their study employing a sample of European banks operating in 21 countries between 2005 and 2017, Chiaramonte et al. (2021) discovered that the total ESG score, as well as its sub-pillars, reduces bank fragility during times of financial difficulty. The impact of environmental, social, and governance performance on the economic success of the Standard & Poor's 500 firms was assessed by Cek and Eyupoglu (2020). Using longitudinal data covering the years from 2010 to 2015, structural equation modelling and linear regression have been used to assess the overall and individual influence of environmental, social, and governance (ESG) performance on economic performance. The whole ESG approach and economic success were significantly correlated. They discovered a substantial correlation between economic performance and the entire ESG strategy. Alareeni & Hamdan (2020) examined if there are associations between corporate disclosure of environmental, social, and governance (ESG) and firms' operational (ROA), financial (ROE), and market performance (Tobin's Q), and whether these associations are favourable, unfavourable, or neutral. United States Standard and Poor 500 listed businesses from 2009 to 2018 are included in the study sample. ESG disclosure has been shown to have a favourable impact on a firm's performance metrics using panel regression analysis.

The importance of ESG materiality and its intensity in determining stock returns were examined by Consolandi et al. in 2020. The Sustainability Accounting Standards Board classifications of materiality were adopted, and using data from a sizable sample of U.S. companies represented in the Russell 3000 from January 2008 to July 2019, they discovered



that not only do ESG rating changes (ESG momentum) have a consistent impact on equity performance, but also that the market appears to favour companies that operate in sectors with a high level of concentration of ESG materiality. According to Chen & Yang (2020), financial markets have ESG momentum effects as a result of investors routinely exaggerating corporate ESG information. Investors react positively to positive news about companies with higher ESG scores but negatively to negative news about companies with lower ESG ratings. According to empirical findings, an ESG momentum strategy can produce significant short-term gains and long-term losses, supporting the overreaction theory. Through several measures of return on asset and Tobin's Q ratio, Dalal and Thaker (2019) investigated the impact of ESG issues on the profitability and firm value of Indian public limited enterprises. They discovered that high business ESG performance improves financial performance as measured by accounting and market-based indicators using random effect panel data regression analysis using the data for 65 Indian company listed in ESG database from 2015 to 2017.

In the context of emerging markets, Shakil et al. (2019) investigated the implications of banks' ESG performance on their financial performance. This study used the ESG performance data of 93 emerging market banks from 2015 to 2018 and used the generalised method of moments (GMM) technique for estimation purposes due to the dynamic nature of the data and to correct for endogeneity. They discovered a positive correlation between the environmental and social performance of emerging market banks and their financial performance. In their analysis of 467 Standard and Poor 500 companies from 2009 to 2015, Minutolo et al. (2019) showed that ESG scores have a positive impact on business performance as assessed by Tobin's Q and return on assets. Environmental, social, and governance (ESG) concerns and corporate market value were studied by Aouadi and Marsat (2018). Surprisingly, the primary finding demonstrates that ESG concerns are connected with higher business value using a unique

dataset of more than 4000 firms from 58 countries between 2002 and 2011. Using return on assets as a metric of profitability, Brogi and Lagasio (2019) looked into the relationship between environmental, social, and governance (ESG) disclosure and business success (ROA). The statistical model is performed on 17,358 observations and analyses the association of ROA and the three main dimensions of ESG score using the ESG score of a large sample of U.S. listed businesses based on data from 2000 to 2016. They discovered a strong link between ESG and profitability that was considerable and favourable.

In her study for the European banking sector, Buallay (2019) analysed 235 institutions over a ten-year period (2007–2016), yielding 2,350 observations. ESG disclosure serves as the independent variable, while the performance indicators (return on assets, return on equity, and Tobin's Q) serve as the dependent variables. The author found that ESG had a positive impact on performance. To find out whether businesses concerned with environmental, social, and governance (ESG) issues can still be successful and efficient, Xie et al. (2019) looked into the relationship between corporate sustainability and efficiency. They discovered that ESG disclosure has a positive association with corporate efficiency at the moderate disclosure level, as opposed to the high or low disclosure levels, by estimating corporate efficiency using data envelopment analysis (DEA) and looking into the nonlinear relationship between corporate efficiency and ESG disclosure. Following governance information disclosure are social and environmental information disclosure, which have the strongest positive relationships with corporate effectiveness. Ting et al. (2019) looked at how environmental, social, and governance (ESG) activities within businesses affected their financial performance. Additionally, it contrasts how corporate social performance initiatives affect valuation in both developed and emerging market enterprises. This study found that ESG activities have a significant beneficial impact on the firm performance using ESG ranking scores from the Thomson Reuters database

and a sample of 1317 emerging market firms and 3569 developed market firms. Fatemi et al. (2018) looked into how environmental, social, and governance (ESG) actions and their transparency affected firm value. They used data on ESG strengths and ESG concerns as compiled and reported by KLD Research and Analytics as proxies for a firm's ESG performance and used Bloomberg's ESG disclosure score (DISC) as an indicator of the extent of a firm's ESG disclosure using empirical analysis based on data for 1640 firm-year observations for publicly traded U.S. firms for the years 2006 to 2011. The research discovered that ESG firm value is increased by strengths and decreased by shortcomings. Yoon et al. (2018) investigated whether a company's corporate social responsibility (CSR) had a substantial impact on enhancing its market value in Korea, a rising market. In order to assess CSR performances and look into how they affect firm valuation, the study used environmental, social, and corporate governance (ESG) scores. From the findings, CSR policies have a favourable and considerable impact on a company's market.

Aouadi and Marsat (2018) explored the association between environmental, social, and governance (ESG) concerns and corporate market value. Using a unique dataset of over 4000 enterprises from 58 countries between 2002 and 2011, their primary analysis reveals that ESG concerns are connected with higher firm value. Velte (2017) focuses on environmental, social, and governance performance (ESGP) as a whole and divides it into components, evaluating their impact on financial performance (FINP). The study covers a sample of firms listed on the German Prime Standard from 2010 to 2014 with 412 firm-year observations. A correlation and regression analysis were performed to assess potential relationships between ESGP as determined by Thomson Reuters' Asset4 database and accounting and market-based FINP measures (Return on Assets (ROA) and Tobin's Q). The study discovered that ESGP has a positive effect on ROA but has no effect on Tobin's Q.

There are a few things from the earlier studies that could be highlighted in the review. First, it is criticised that earlier researchers did not test the variables using EU banks. We can see that earlier researchers only compared studies using a broad range of developed, developing, and emerging nations. Although Buallay (2019) used European banking in her research on ESG and bank performance, the study was only conducted from the years 2007 to 2016, which is now regarded as being out of date in terms of providing a valid data result. Thus, by focusing on data from 2010 to 2019, this study will advance knowledge and produce more accurate results. Second, it is criticised that prior researchers have used the same first-generation methodology repeatedly to obtain results. Without creativity in using alternative methods, the outcome might be identical to spinning a wheel. In order to provide better and more meaningful results, this study supports the use of other second generation methodologies, such as SEM-PLS. Third, despite the fact that there have been many studies on the relationship between ESG and bank performance, it is criticised that none of them have created a new theory about how fintech fits into the picture. As a result, it is novel for this study to create a new model by including fintech in the relationship between ESG and bank performance.

#### ***2.5.4 Fintech***

Fintech is a word often used to characterise a broad variety of financial technology applications, operating processes, and creative products at the forefront of financial innovation through technical methods. In general, fintech refers to technical solutions produced in numerous financial services domains, such as online banking and mobile payments, that are used by consumers on a daily basis. Alternative finance, crowdfunding, peer-to-peer lending, automated loans, Robo-advisors, and automated investment management are just a few of the financial technology innovations that are helping to fuel the increasing sector (Schueffel, 2016). By automating a wide range of financial processes, new digital technologies may provide innovative and more cost-effective solutions in various segments of the financial

sector. Fintech is able to increase the overall process efficiency of the financial business by expanding financial tradition limits and changing consumer spending behaviours thanks to advancements in information technology (Lee et al.,2021; Demertzis et al.,2018).

Fintech innovation will have an impact on customer support, product service, and risk management services, including online and physical channels, agents, financial advisers, and other third parties. Furthermore, fintech will have an impact on customer experience, which refers to the entirety of the client's interaction with the service provider. Moreover, fintech innovation will have an impact on the business economy, including income, expenses, and margins (Schueffel, 2016). The Financial Stability Board (2017) states that the term "Fintech" is frequently used to describe a wide range of financial technology applications, operational procedures, and innovative products at the forefront of financial innovation through technical approaches. Digital technologies, including the internet, mobile computing, and data analytics, are referred to as fintech when they facilitate, innovate, or disrupt financial services, according to Gimpel et al. (2018). Fintech, in general, refers to technological advancements made in a variety of financial services industries that are regularly used by customers. Examples include online banking and mobile payments.

There are a few things to be highlighted from the previous scholar's study of fintech specifically in the financial sector. First, because fintech is still in its infancy, it is criticised that previous research's findings are still insufficient to demonstrate that fintech plays a crucial role in businesses, including banks. In contrast to demonstrating how fintech has enhanced bank performance, the only conclusion offered by the current and previous scholars is more focused on the use of fintech in the business world. Therefore, it is essential to conduct research that will demonstrate that Fintech has improved the effect of performance, whether it is acting as a

moderator, mediator, or even having a direct impact on performance. Second, it is criticised that there are still few studies on fintech in many major regions, including the EU. The previous scholar's insufficient study yielded insufficient information about the fintech trend in the EU region, necessitating additional research to provide proof of this trend's existence. Although the European Banking Federation (EBF) has emphasised that EU has been embracing fintech at a rapid pace, this may not be the only evidence. In order to improve and broaden our understanding of the function of fintech in the industry, we must conduct a different study and gather reliable data.

## **2.6 Summary**

This chapter has described theories relevant to corporate governance, bank risk, ESG and fintech. Each of the chapter 4, 5, and 6 has been discussed on the result and hypotheses using relevant theory. Agency theory discussed on corporate governance, bank risk and fintech discussed in line with consumer theory and ESG has been discussed in line with the stakeholder theory.

Understanding the earlier conclusions about the elements of corporate governance, bank risk, and ESG will aid this study in identifying any gaps that the earlier study did not identify. Important gaps in the literature have been found by this review. First, the literature already in existence has looked at how corporate governance, bank risk, and ESG relate to bank performance. The empirical study has concentrated on comprehending the current theory of bank performance factor utilising various region-based approaches. Nevertheless, it is clear that little research has been conducted from the perspective of EU banks; as a result, this study complements research that has been conducted from this perspective to test the idea. Second, the research that has been published so far only discusses the relationship between the main corporate factors like the bank risk index and the ESG index and how they relate to bank

performance without considering which of the subindices contributes more to this relationship. In order to improve their key performance indicators, banks could adjust their strategy with the help of additional analysis. Third, the past work only used first-generation methods like GMM and OLS regression (Aslam and Haron, 2020; Boachie, 2021), and the PLS-SEM method has not yet been applied to that study. Fourth, this research has adopted a global perspective by looking at other unforeseen successes or indicators of the bank's accomplishments. Only conventional measures, such as ROA, ROE, and Tobin Q, were utilised in the earlier research to assess bank performance. However, in this study, efficiency, liquidity, and leverage were used to assess the bank's performance. Intangible benchmarks for measuring bank performance, such as profitability, liquidity, and leverage, are essential because they may pique investors' attention before they decide to invest in a bank. Fifth, it is clear from the previous study that no study has examined the contribution of fintech to the relationship between bank performance and the variables of corporate governance, bank risk, and ESG. The new interaction theory on fintech that was suggested in this study sheds light on the relationship between bank performance and other important factors including corporate governance, bank risk, and ESG. The policy makers in the industry will have a better knowledge of the importance of fintech thanks to this new fintech theory, which will lead to better ideas and a better strategy for investing more in fintech solutions to improve bank performance.

## **Chapter 3**

### **Methodology**

#### **3.1 Overviews**

This chapter is organised around four questions: first, what is the relationship between corporate governance and bank performance? Second, what is the relationship between bank risk and bank performance? Third, what is the relationship between ESG and bank performance? Finally, does the relationship change when fintech is introduced into each of the key factors? To answer these questions, a suitable method must be used. This chapter will explain how appropriate methods were chosen to answer these questions, as well as how the data was analysed. In a nutshell, this chapter explains why a particular research philosophy was chosen. It also justifies the use of quantitative research for this investigation. The study's research setting is also described, as are the data sources and quantitative tools used.

#### **3.2 Research approach and reasoning**

There are two types of research: empirical research and theoretical research. Empirical research promotes the creation of new ideas and/or thoughts based on data, whereas theoretical research promotes the discovery of new ideas from existing works through the application of theories and explanations. In other words, theoretical research focuses primarily on theory or concepts, whereas empirical research uses data to test the theory. These two approaches are distinct in terms of theory construction. They are, however, linked in the sense that empirical studies rely on theoretical studies. Many studies are now empirical, because results or evidence that contradict theory can contribute to a body of knowledge or aid in the development of a new theory. To address the research questions, this study primarily employs an empirical research strategy, though a theoretical approach is used to develop and operationalize the research objectives.



Another thing to consider is that researchers typically use one of two research methodologies, which can be broadly classified as either qualitative or quantitative. Quantitative research refers to the process of quantifying the data by applying statistical techniques. The result in quantitative data analysis express in the form of numbers that further interpreted and that propose solution in the particular problem (Bhatti and Sundaram, 2015). The data used in this study are quantitative. It involves utilising statistical methods to quantify data. Numbers are employed to convey the results of the quantitative data analysis, which are then analysed and used to provide a solution to the particular issue.

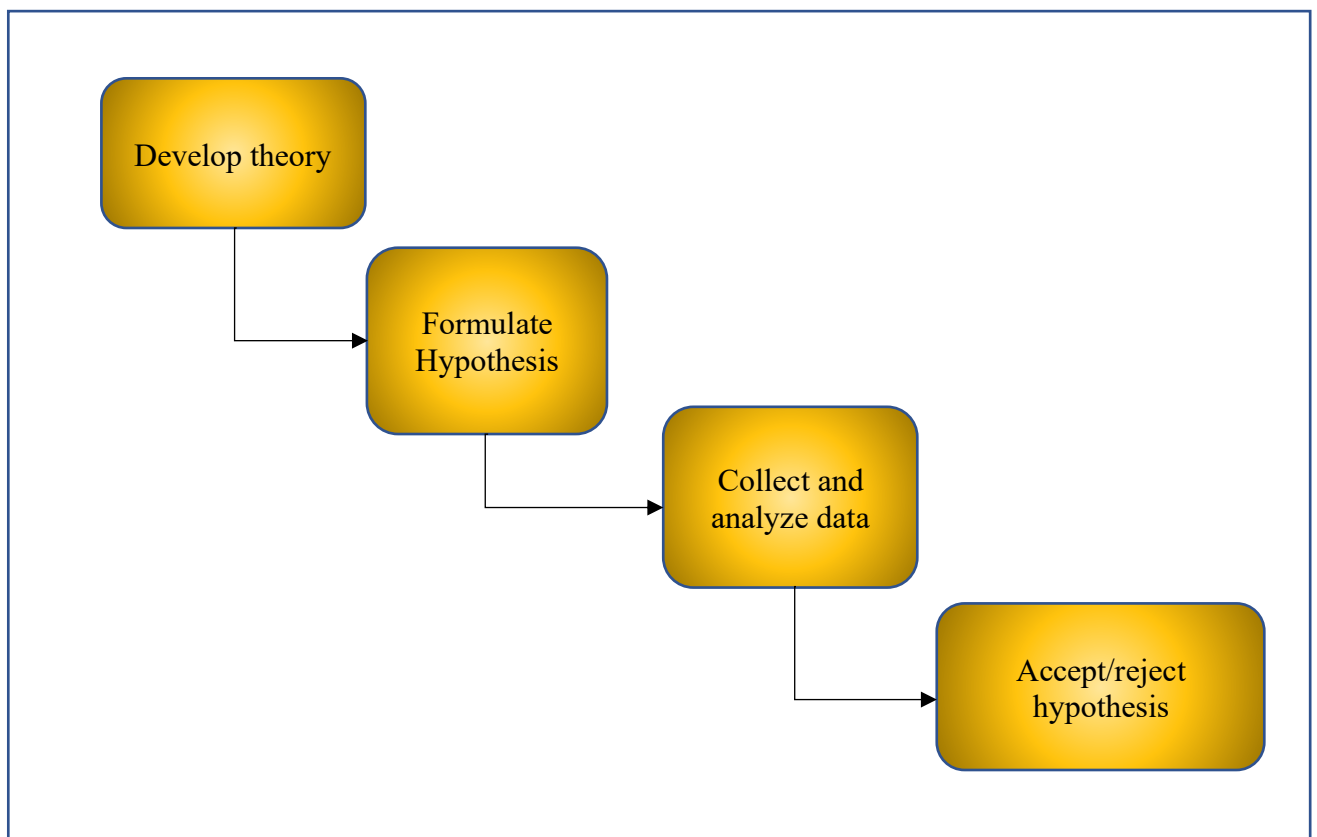
Meanwhile, in research, there are two sorts of reasoning: deductive reasoning and inductive reasoning. In this study, the researcher used deductive reasoning to develop theoretical ideas and test them in order to gather empirical data. Better governance, for example, leads to increased bank performance, according to corporate governance theory. The deductive procedure was used in this study by collecting data from secondary sources and developing empirical evidence based on theoretical propositions.

Table 3.1 Difference between Qualitative and Quantitative research methods

Qualitative Research Methods	Quantitative Research Methods
Action research	Surveys
Case study research	Laboratory experiment
Ethnography	Simulation
Grounded Theory	Mathematical modelling
Semiotic	Structured Equation Modelling
Discourse analysis	Statistical analysis
Hermeneutics	Econometrics

Source : Bhatti and Sundaram (2015:pg 16)

Figure 3.1 Deductive Reasoning



### **3.3 Research strategy and design**

The research philosophy is still another important factor that could have an impact on the structure and progress of the design of the research process. Positive, interpretivist, and critical research philosophies are the three categories identified by Bhatti and Sundaram (2015). A typical positivist strategy involves testing a theory in order to comprehend specific phenomena. Instead, an interpretivist approach is used to create a theory, and critical researchers hold that social reality is historically constituted as well as produced and reproduced by humans. Positivist approach was employed in this investigation. Positivist firmly believes in facts. In other words, this study could offer convincing proof of the impact of corporate governance, bank risk, ESG, and fintech on the performance of banks using numerical data and analysis. For this study, a positivist design was chosen for the following reasons:

1. When time and resources are scarce, the positivist paradigm is more cost-effective than the interpretive strategy. A positivist approach would be more appropriate for this study because of its constrained time frame.
2. The positivist approach seeks to compare data statistically (Bhatti and Sundaram, 2015), which adds to the thoroughness of this study's analysis.
3. While interpretive results are typically expressed qualitatively, positivist results are more likely to be expressed quantitatively (Bhatti and Sundaram, 2015). The positivist approach is more appropriate for this study because it uses quantitative methods and numerical data to answer its research questions.

### **3.4 Research setting**

The study spans the 28-country EU, which includes the United Kingdom, from 2010 to 2019. There are a few reasons why we chose EU banks as our sample. According to Kasman et al. (2010), the European banking system has undergone a profound reorganisation process that

included complete consolidation. Furthermore, the European Banking Federation (EBF) (EBF, 2020) stated that European banks have focused more on electronic payments, as well as online and mobile services. Furthermore, EU are leading the way when it comes to promoting sustainable development (Buallay, 2018). Additionally, the EU has seen some of the fastest growth in the fintech sector. CrunchBase data indicates that the EU is home to the largest fintech market in the world. However, we discovered a scarcity of research in using this excellent region in the study, which made us eager to select this region for our sample. The country is still included due to the UK's continuous support of the EU during that time and its official conclusion of Brexit in 2020. As a result, the UK was included in this study's examination of the EU. Because the banking systems of EU are complex, this study will help people understand the hypothesis when it is tested.

### **3.5 Data sources**

To meet the objectives of this study, secondary data were gathered from a variety of sources, including Orbis bank focus, company annual financial reports, the World Bank's Development Indicators, Worldwide Governance Indicators, and Crunchbase Insight. This study relied on secondary data for a variety of reasons. For starters, secondary data is typically more readily available and less expensive than primary data. Secondary data is more practical than primary data, which can be time consuming and expensive, because this study must be completed within a specific time frame. This secondary data is easily accessible via data platforms like Orbis Bankfocus, annual financial reports, and other external sources. Although there are few contrasts of secondary data that the research requires, such as unspecific measurement and non-direct measurement, this data can be used meaningfully in the research by using many variables and developing an index, for example.

To investigate firm-level corporate governance and bank performance, Orbis Bankfocus data and annual financial reports were used. In addition, we use Orbis Bankfocus to collect data on each bank's fintech investment and expenses. Annual report data was used to fill in missing values in the Orbis Bankfocus data. Orbis Bankfocus was used to collect additional information about firms, such as their years of operation, nature (local or multinational), country of origin, year of establishment, and so on. To fill gaps in the most recent data, annual data were collected from 2010 to 2019. Only banks with ten years of data were taken into account. Banks that had missing data for more than three years in a row were excluded from the analysis. In Chapter 4, the data is presented in detail.

Later on, we used Orbis Bankfocus to retrieve data for developing the variable of bank risk index, which includes credit, liquidity, operational, market, and solvency data that can be retrieved from Orbis Bankfocus, and we filled in the missing value through annual reporting. Meanwhile, macroeconomic variables such as GDP and inflation were calculated using World Bank Development Indicators. The sample period chosen was 2010-2019, and the details are provided in Chapter 5.

The ESG scoring index for the following ESG variable was primarily obtained from Refinitiv (previously Thompson Reuters), who offered solid and more trustworthy data for global organisation, including bank information and index scoring for analysis. Additionally, we used Orbis Bankfocus, our primary platform for bank data, to retrieve the profitability indicator for each bank. The ESG's sample period is from 2010 to 2019. Macroeconomic variables in the study, such as GDP and inflation, are also being calculated using data from the World Bank Development Indicator. Chapter 6 provides more information.

There are some points worth highlighting in the measurement of each variables. In the first place, the indicators of profitability, liquidity, and leverage have been used to gauge bank

performance in Chapter 4. It provided insightful information on corporate governance for 326 of the EU's commercial banks by using the developed Corporate Governance Index. Profitability and efficiency have been used in chapter 5 to gauge the performance of banks. This is because only 230 banks' worth of information were retrieved when measuring bank risk and performance. The chapter 6 uses profitability as the indicator to assess the performance of banks. We assess the performance of the banks using the ESG score index using a sample of 138 banks. Due to data limitations, each chapter that presented results was actually measured by a different bank's performance. As a result, we decided to use different performance indicators to produce better and more insightful results for each of the key drivers.

### **3.6 Sample and data analysis**

This study analyses commercial banks from across the EU. In the first research of corporate governance and bank performance, 326 commercial banks that provided corporate governance data in the Orbis bank focus were used. Because corporate governance is required of all banks, including commercial banks, more data on corporate governance has been collected. However, several banks had to be removed due to either missing annual reports or a lack of information on the bank's financial features. In the second research of the relationship between bank risk and bank performance, 230 commercial banks from the EU region were used. Due to limited and conflicting data regarding bank risk, such as the risk ratio of solvency, a few institutions were left out of the study. In the third experiment, 138 commercial banks from the EU region are also used in this investigation. Due to the inability to receive the ESG score from the Refinitiv platform, a few banks were left out of the study.

Cross-sectional and time series data were combined in this study to produce panel data, which provides more meaningful data, variability, and efficiency. Cross-sectional studies, also known as one-shot studies, are a method of gathering data only once in order to answer a research

question or solve a research problem. The analysis for this study used unbalanced panel data. The acquired data were examined using IBM SPSS statistics version 26.0 for the robustness test and Smart PLS version 3.2.7 for the primary analysis. Due to the PLS's capability to concurrently portray the link between all latent constructs and account for measurement errors in the structural model, it was chosen (Farooq and Markovic, 2016). SmartPLS is a software based on structural equation modelling (SEM) which uses the PLS method. It was developed by Ringle et al. (2015). PLS is a soft modelling method for SEM that makes no assumptions about the distribution of the data (Vinzi et al., 2010). SEM is a second-generation multivariate data analysis technique that is most frequently employed in social science research since it can evaluate additive and linear causal models that are theoretically supported (Haenlin and Kaplan, 2004). As a result, PLS-SEM is a good substitute in the following circumstances. (Bacon, 1999; Hwang et al., 2010; Wong, 2011):

1. Variable of sample size.
2. Applications have little available theory.
3. Predictive accuracy is paramount.
4. Correct model specification cannot be ensured

One of the well-known programmes for partial least squares structural equation modelling is called SmartPLS (PLS-SEM). The software has grown in popularity since its release in 2005, not only because academics and researchers can use it for free if the sample size is under 100, but also because of its user-friendly interface and sophisticated reporting capabilities.

### **3.7 Summary**

This chapter has explained the research methods used for this study, focusing on the research philosophy, data collection, and methodology selection. The study takes a positivist approach and employs quantitative methodology. Secondary data for the analysis were gathered from sources such as Orbis Bankfocus, annual financial reports, Refinitiv, the World Bank's Development Indicators, and Crunchbase Insight (CB). The main technique for data analysis is the Structural Equation Model with Partial Least Squares (SEM-PLS). Furthermore, OLS tests are used to assess data robustness.



## Chapter 4

### Corporate Governance and Bank Performance :Does fintech play any role?

#### 4.1 Overviews

Corporate governance mechanisms are influenced and interacted with differently by banks.

Literature states that banking firms present unique challenges, making corporate governance for these institutions distinct from other non-financial firms (Bhatia and Gulati, 2021).

According to Laeven (2013), the unique characteristics of banks imply that agency costs are likely to be higher in banks than in other businesses. Banks' corporate governance differs from non-financial organisations due to conflicts of interest between shareholders and debtholders, bank regulation, opacity, and the complexity of bank activities (Orazalin et al., 2016). Banks' corporate governance is of critical importance to both the banks and the financial regulators.

According to conventional perception, good governance can support bank performance, while lousy governance can destabilise and destroy stability and soundness (Brogi and Lagasio, 2021). Eugene Fama began investigating and conducting an in-depth study on the underlying distinctions between banks and non-financial enterprises in 1985. No other industry has been scrutinised as rigorously as banks and financial organisations in recent years (John et al., 2016).

There is plethora of research on corporate governance (Ullah, 2016; Dalwai et al., 2015; Ajili and Bouri, 2018; Bhagat and Bolton, 2016; Bhagat and Bolton, 2019; Onwuka et al., 2019; Aslam and Haron, 2020; Benvenuto et al., 2021; Basar et al., 2021; Wang et al., 2021). The findings however, resulted with mixed findings in different context. Furthermore, the majority of board effectiveness studies do not include the financial sector in their samples. As a result, we know very little about banking business governance efficacy (Adams and Mehran, 2012). Meanwhile, the banking business has grown in breadth in recent years, adapting to the changing nature of its environment (Chai et al., 2016). Globalisation has fuelled increased

rivalry in the banking business. The rising diversity of client expectations and technological advances are projected to significantly impact the bank's management's ability to maintain and attract new customers and investors. The results led to motivation for us to explore in-depth the governance in the banking industry using EU region perspective and this will broaden the understanding of the effect on corporate governance towards bank performance better.

In the meantime, fintech's influence on the banking and financial sector starts to be felt. The rise of financial innovation in the financial industry has resulted in new product and service development. As described by the Financial Stability Board (2017), fintech is a term commonly used to describe the broad range of financial technology applications, operating processes, and innovative products at the forefront of financial innovation, using technical means. In general, fintech refers to technological solutions developed in various financial services areas, such as online banking and mobile payments, that are used by consumers daily (Vives, 2017). Financial technology advancements further support the growing market, such as alternative finance, crowdfunding, peer-to-peer lending, automated loans, Robo-advisors, and automated investment management (Schueffel, 2016). In some sections of the financial sector, new digital technologies may deliver new and more cost-effective solutions by automating a wide range of financial tasks. The information technology enables fintech to improve the entire financial industry's process efficiency while expanding financial tradition boundaries and altering consumer spending habits (Lee et al.,2021; Demertzis et al.,2018). According to Schueffel (2016), activities involving the support of customers, product service and risk management functions, including online and physical channels, agents, financial advisors, and other third parties, will be affected by fintech innovation. In addition, fintech will influence customer experience, meaning the entirety of the customer's experience with the service provider. Also, fintech innovation will affect the business economy, i.e., income,

costs and margins. According to Lee et al. (2021), fintech's innovations improve banks' cost-effectiveness. This finding is also similar to the result from Wang et al. (2021). The study concluded that commercial banks could improve their traditional business model with the usage of fintech. The improvements including reducing operating costs for banks, improving service effectiveness, strengthening customer risk management capacity, and building an enhanced customer-oriented business model for their customers. The results suggested that the intervention of fintech has widely affected the entire banking landscape.

Based on understanding of previous comprehensive literature (Berger, 2003; Chai et al., 2016; Haddad and Hornuf, 2019; Phan et al., 2019; Lee et al., 2021; Liu et al., 2021; Wang et al., 2021), it is suggested that fintech has a positive and significant effect on performance in most organisations. fintech is undeniable that it is still debated as a part of banking that helps to improve bank performance. Simultaneously, it has become more involved in corporate governance in the industry in order to become more competitive in comparison to other major players. fintech development enables them to practise good governance by conducting more systematic and transparent transactions and becoming more advanced in providing services and financial products to their customers, attracting more potential customers and loyal customers to use the bank's services in the future. According to Ji and Tia (2021), the widespread use of blockchain in fintech, for example, helped reduce fraud and the risk of human error, thereby reducing the agency problem in corporate governance. Furthermore, the accountability and transparency of blockchain have a positive and significant impact on all aspects of business intelligence efficiency. Blockchain in fintech improves data storage and transformation security, provides decentralised and transparent network infrastructure, and significantly reduces operational costs (Sinha and Bathla, 2019). However, there is a scarcity of empirical evidence on how fintech can impact the relationship between corporate

governance and bank performance. To deal with the rising influence of financial innovation in the economy, policymakers must improve operating performance, provide more diverse financial services at lower costs, and improve industry competitiveness. These goals have far-reaching economic and policy implications, necessitating additional research into the effects of financial innovation on banks.

This study has several contributions. First, we investigate the relationship between corporate governance and bank performance for 326 commercial bank-year observations from 27 EU countries during 2010-2019. As far as our knowledge, the previous studies have focused on countries such as Lebanon (El-Chaarani, 2014), Japan (Ullah, 2016), GCC countries (Dalwai et al., 2015; Ajili and Bouri, 2018), United States (Zagorchev and Gao, 2015; Bhagat and Bolton, 2016; Bhagat and Bolton, 2019), Nigeria (Onwuka et al., 2019), OIC countries (Aslam and Haron, 2020), Romania (Benvenuto et al., 2021), MENA countries (Buallay, 2019; Basar et al., 2021) and China market (Wang et al., 2021). Few studies focus on the European bank context, namely Mateus and Belhaj (2016) and Ayadi (2019). These studies, however, only focusing on a small sample such as Belhaj and Mateus (2016) used 73 banks from 11 selected countries and Ayadi (2019) also used overall banks type in European banking. The author analysed the effects of governance mechanisms on the performance and risk-taking of banks from the Eurozone before and after the 2008 financial crisis. However, the author only studied a few Eurozone countries, namely France, Belgium, Germany, and Finland, between 2004 and 2009 and found that internal mechanisms and capital regulations complement and significantly impact bank performance. Nonetheless, the outcome is still ambiguous because the outcome may differ for other Eurozone countries. None of the current research used a large sample and specific characteristics of commercial banks in the scope of EU. Therefore, these studies are not sufficient to understand the relationship effect of corporate governance and bank

performance from the context of other regions like EU countries. Poor banking performance can lead to banking failure and crisis, negatively affecting economic growth (Ongore and Kusa, 2013). The statement shows that the banking sector in each country plays an essential role in economic circulation. Banking systems in Europe have undergone a profound reorganisation process in the European countries that included a complete consolidation. The bank system transformed through debt consolidation, restructuring and privatisation of governmental banks, abolition of domestic and external market entry restrictions, and the regulatory and supervisory framework development (Kasman et al., 2010). Moreover, data indicate that banks concentrated more on electronic payments and online and mobile services in the European Region in 2019, according to the European Banking Federation (EBF) (EBF, 2020). As a result, EU commercial banks made an excellent sample for our research. The paper has taken a holistic approach to fill the gap by examining the effect of corporate governance within the framework of commercial banks in EU. This study thus provides an essential insight into the significance of other vital factors such as fintech, particularly the performance of EU banks. This is due to the organisation's technological innovation significantly improving performance (Chai et al., 2016).

Second, this paper has contributed to the methodological portion by utilising a method from the second generation of data analysis, namely partial least square structural equation modelling or PLS-SEM. As far as we know, the method of PLS-SEM is not yet applied in the prior work, which only employed first-generation methods such as GMM and OLS regression (Aslam and Haron, 2020; Boachie, 2021). Third, by examining other unpredictable achievements or metrics of the bank's results, this research has taken a universal approach. In the previous studies, only the traditional methods are used to evaluate bank performance, for example, ROA, ROE and Tobin Q. However, profitability, liquidity, and leverage were taken to evaluate the bank's performance in this study. Profitability, liquidity and leverage are

unsung benchmarks towards bank performance, and they are vital because before investing in the bank, investors may be more interested in these measures. Fourthly, our research is unique because we study fintech as a moderating factor. Fintech is booming worldwide. According to our best information, there is new fintech research in many dimensions because of infancy. Research fails to investigate fintech's role as a moderator in understanding the relationship between corporate governance and bank performance. These gaps in the literature provide an excellent opportunity to review this link by adding more exciting hypotheses to our current research.

#### **4.2 Theory and hypothesis**

Despite several attempts to investigate the relationship between corporate governance and bank performance in banking firms, the evidence remains mixed (Bhatia and Gulati, 2021). Few studies were made by scholars internationally and in a different context. Munisi and Randy (2013) conducted a study in a Sub-Saharan African sample to look at the relationship between corporate governance and company performance. They discover that there is a strong correlation between governance and performance using the OLS approach. The analysis also shows that not all governance approaches are substantially connected with performance and that there is a negative correlation between governance and market valuation.

El-Chaarani (2014) reported conflicting results on corporate governance variables towards performance in her study for Lebanese banking, which focuses on numerous aspects to emphasise the impact of corporate governance on financial performance. The study concludes that insider ownership concentration has a beneficial impact on performance and is positively correlated with the proportion of directors on the board of directors in Lebanese banks. However, the size of the board has no bearing on performance. Additionally, CEO duality harms the performance of the bank. The empirical results, however, are contested because the

sample size is small—40 banks from the Lebanon region make up the sample—and the model's predictions may not be reliable.

In their research, Zagorchev and Gao (2015) assess the impact of corporate governance on the level of excessive risk-taking and the performance of US financial institutions from 2002 to 2009. They discover that improved governance is favourably correlated with the performance of U.S. financial institutions and negatively correlated with excessive risk-taking using Tobit regression and conventional panel regression analysis. Salim et al. (2016) used two-stage double-bootstrap data envelopment analysis to measure the relationship between corporate governance and efficiency of Australian banks between 1999 and 2013. The authors found that board size and committee meetings are the most efficient of the five corporate governance factors studied. They also found evidence of increased industry efficiency since the Principles of Good Corporate Governance were introduced in 2003. Also, Ullah (2016) investigated the implications of ownership structure and control transfers in the Japanese corporate market, which are mainly attributed to the government's liberalisation policies in the 1990s. According to the author, it is efficient to unwind cross-shareholding between banks and corporations and mutual transfers among non-financial institutions. Furthermore, private and foreign ownership transfer is consistently associated with high market value, implying that individual transfers increase inefficiency. Then Bhagat and Bolton (2019) extended their study from their previous research in 2008 by added additional 14 years of sample data to test the specification and power of director stock ownership as a measure of corporate governance. Various specifications, estimation techniques, and sub-samples showed that director stock ownership has positively related to future corporate performance in several out-of-sample periods (2002–2006, 2007–2009, 2010–2016).

Buallay (2019) in her study for MENA countries finds a mixed result on the corporate governance and performance while using the General Linear Modelling to analysing the result. The study indicates that Sharia'ah governance significantly influenced ROA and ROE. However, corporate governance significantly influenced Tobin's Q. The study on the MENA region also been discovered by Basar (2021). According to the study, the governance index, which combines the four board attributes, is positively correlated with return on assets. The study examined the link between corporate governance structure and performance in the banking sector. A sample was chosen using the GMM. The model used data from 33 Turkish, Tunisian, Moroccan, and Lebanese banks listed in 2012-2017. Because the paper focuses on corporate governance, a "Board Characteristics Index" was created based on onboard leadership structure, member characteristics, and board committee structure. It showed the overall index's relationship to banking performance. Haris et al. (2019) investigated the impact of corporate governance and director political connections on bank profitability in Pakistan. The study used data from 26 domestic banks from 2007 to 2016 and found that board independence and director compensation positively impact bank profitability. Aslam and Haron (2020) then continue to research corporate governance. They examined the mediating role of intellectual capital (IC) on the relationship between corporate governance mechanisms and Islamic banking performance. From 2008 to 2017, a panel of 129 Islamic banks from 29 OIC countries were studied. The unobserved endogeneity and heteroscedasticity problem was solved using the two-step system generalised method of moments. The empirical findings showed that corporate governance has a significant impact on intellectual capital. Meanwhile, Fiador and Sarpong-Kumankoma's study (2020) found that corporate governance matters in the banking sector and helps improve loan quality. The study used a panel-corrected standard errors estimation model with 11-year data from 2006 to 2016 showed the significant result of corporate governance and loan quality.



The impact of the corporate governance index on financial performance (ROA, general liquidity, capital adequacy, and size of the company expressed as total assets) was also studied by Benvenuto (2021). Using survey data from 2007–2018, the study examined how corporate governance interacts with a homogeneous and heterogeneous banking system and found that corporate governance has a significant, positive, and long-lasting effect on profitability and capital adequacy in Romanian and Italian banking. Boachie (2021) found that ownership had a moderating effect on the relationship between corporate governance and financial performance in Ghanaian banks. The study used a panel dataset of 414 banks from 18 years and a sample of 23 banks. Audit independence, CEO duality, non-executive directors, and bank size all boosted performance.

Therefore, based on the above analysis, we hypothesise that:

**Hypotheses 1:** *There is a positive relationship between corporate governance and bank performance.*

Corporate governance and bank performance may have a positive relationship, but fintech may enhance it. Moderating variables can change the effect (Bhatia and Gulati 2021). Frame et al. (2019) claim that technological advancements in banking have implications for fintech. Rising fintech has changed the banking business landscape, necessitating new solutions (Romanova et al., 2016). Regardless of bank size, financial technology and digitalisation investment has become a necessity in the banking industry. Also, few studies have been done on the rise of fintech in the industry (Haddad and Hornuf, 2019; Phan et al., 2019; Wang et al., 2021). Fintech is not yet a jargon term. Due to financial and technological collaboration, cryptocurrencies, blockchain, digital banking, artificial intelligence Robo-advisors, and many other new products and services have emerged. It takes organisational knowledge, abilities, and motivation to

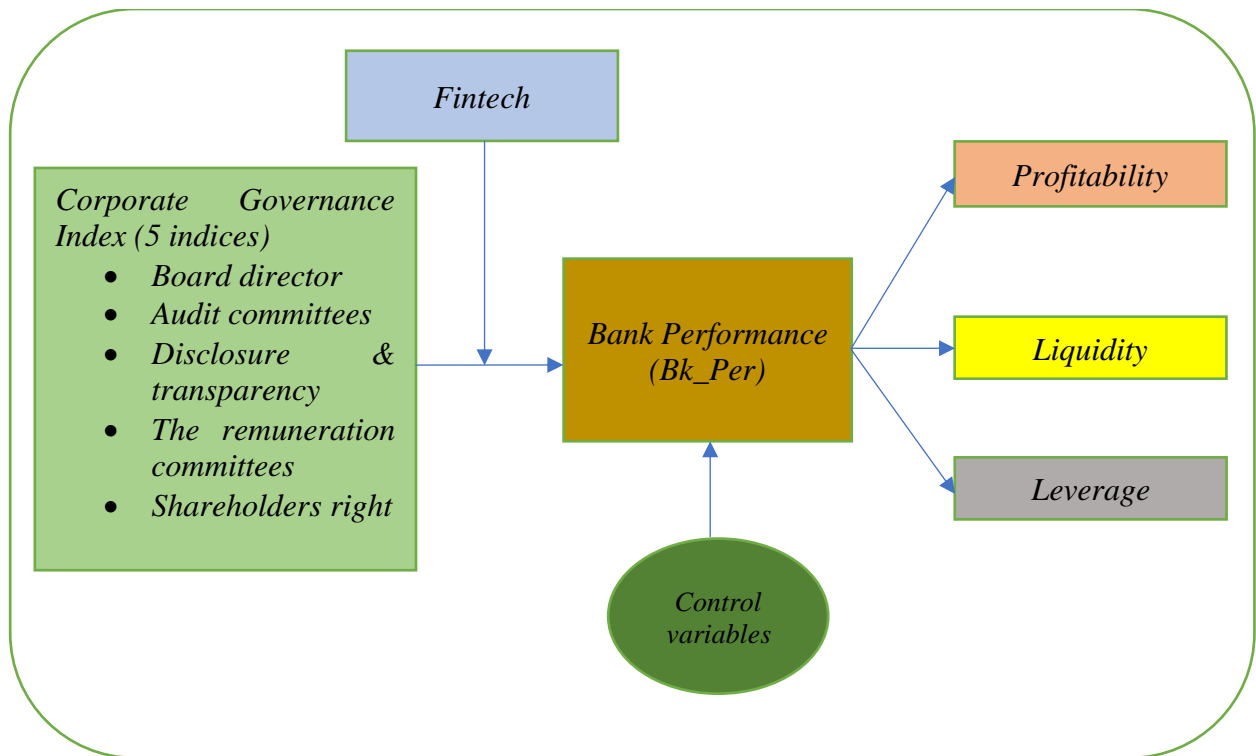
ensure that innovation activities serve market needs and organisational goals. Fintech is part of technological progress (Chen, 2016).

As a result, it's a financial industry innovation. Fintech is slowly changing people's lives and businesses (Chen, 2020). Recent research by Akhisar et al. (2015) shows that the ratio of branches to ATMs significantly impacts bank profitability in both developed and developing countries. According to Chai et al. (2016), technological innovation in the workplace improved performance. The fintech effect is still a new concept. Chen (2020) used DEA to analyse bank efficiency and regression to estimate performance. The periods were 2009-2014 and 2015-2018. The final result shows that commercial banks' efficiency improved with the help of the internet and technology between 2015 and 2018. Also, the study from Wang et al. (2021), in their investigation of the effect of Fintech on commercial banks in China banking, found that fintech's development leads to increased profitability and better management. Based on the preceding discussion, we can form the following hypotheses:

***Hypotheses 2:** Fintech positively moderates the relationship between corporate governance and banks performance.*

We propose that the intervention of fintech will have a different effect on the relationship between corporate governance and firm performance. This conceptual model can be explaining in *figure 4.1*.

Figure 4.1 Theoretical framework



## 4.3 Methodology

### 4.3.1 Data

The data collection techniques used in this study are documentation studies carried out by collecting secondary data from financial and annual reports published by commercial banks from 27 EU between 2010 and 2019. The EU banking industry has undergone a profound reorganisation, with complete consolidation. (Kasman et al., 2010). Moreover, data indicate that banks concentrated more on electronic payments and online and mobile services in the EU in 2019, according to the European Banking Federation (EBF, 2020). Therefore, using the platform of Orbis Bank Focus for 10-year annual reporting and bank data retrieving, we concentrated on commercial banking, one of EU's most significant segments of depository institutions. To that end, the analysis excludes bank holding companies, investment banks and securities houses, savings banks, real estate and mortgage banks, non-banking credit institutions, and other specialised governmental credit institutions. Meanwhile, other sources

for fintech adoption, such as news on bank investment in their business strategy, including digitalisation strategy, are sorted from the reading in Crunchbase (CB) and Chartered Banker. We include eight variables in the empirical study to analyse the determinants of commercial bank performance, three of which are dependent on measuring bank performance. In the research, three indicators are used to assess bank performance: Profitability (measured by net interest margin), Liquidity (liquid asset / total asset), and Leverage (total equity / total asset). The net interest margin is calculated as a percentage of total assets divided by net interest income. Because it focuses on profit earned from interest activities, net interest margin is an important indicator of bank profitability and growth. The liquidity ratio we use provides information about a bank's overall liquidity shock absorption capacity. Liquid assets include cash, balances with central and other banks, government debt securities and similar securities, and reverse repo trades. Given that market, liquidity is the same for all banks in the sample. The higher the share of liquid assets in total assets, the greater the capacity to absorb liquidity shock. Leverage is another way to measure a bank's performance. High leverage is optimal in a model with just enough frictions for banks to play a meaningful role in liquid-claim production (DeAngelo and Stulz, 2015). The ratio of total assets to equity is leverage (Adrian et al., 2010). Many studies have provided empirical evidence on the effects of financial leverage on corporate performance (Zhou et al., 2021; Basar et al., 2021) and evidence on corporate governance (Bhagat and Bolton, 2019; Doan and Nguyen, 2018). Corporate governance has not yet been tested to see if it affects commercial bank performance as measured by leverage. A company with perfect corporate governance is less likely to be leveraged and has higher financial performance, but this is not the case in the banking industry. The independent variable is the corporate governance index, consistent with previous research (Munisi et al., 2013; Bebchuk et al., 2009; Gompers et al., 2003; Basar et al., 2021). Corporate governance is a whole system (Bhagat and Bolton, 2008), and specific indicators cannot assess

its overall quality (Schweizer et al., 2017). As a result, a comprehensive CGI is better suited to measuring management quality. We use the measurement of fintech as a moderating variable, taking the percentage of commercial banks invested in financial innovation. Scholars are now studying fintech measurement in a variety of ways. One of the challenges that researchers have faced in measuring fintech is a lack of data. However, because we are focusing on the interaction of the other variables, we conclude that fintech is broadly defined. Any innovation, service upgrading, and product development in a bank are considered a part of fintech contribution. As a fintech indicator, we used commercial banks' expenses in fintech investment, digital transformation, including digital banking innovation, and investment in working with third-party fintech firms for outsourcing product and services. In addition, we include three control variables in the study: countries, bank growth, and bank size.

*Table 4.1 Definitions of variables*

<i>Variables</i>	<i>Definition</i>	<i>Sources</i>
<i>Corporate Governance index (CGi)</i>	<i>Corporate Governance Index (5 indices)</i> <ul style="list-style-type: none"> <li>• <i>Board director</i></li> <li>• <i>Audit committees</i></li> <li>• <i>Disclosure &amp; transparency</i></li> <li>• <i>The remuneration committees</i></li> <li>• <i>Shareholders right</i></li> </ul>	<i>Orbis Bank Focus</i>
<i>Profitability</i>	<i>Cost to income ratio</i>	<i>Orbis Bank Focus</i>
<i>Liquidity</i>	<i>The ratio of Liquidity Asset / Total Asset</i>	<i>Orbis Bank Focus</i>
<i>Leverage</i>	<i>The ratio of Total Equity / Total Asset</i>	<i>Orbis Bank Focus</i>
<i>Fintech (Fin)</i>	<i>The expenses and investment in Fintech including digital transformation, mobile banking, and internet banking</i>	<i>Orbis Bank Focus</i>
<i>Bank Size (BkSz)</i>	<i>Natural Log of Total Asset for Bank (in Million USD)</i>	<i>Orbis Bank Focus</i>
<i>Bank Growth (BkGro)</i>	<i>Percentage of growth in Total Asset</i>	<i>Orbis Bank Focus</i>
<i>Country (Coun_t)</i>	<i>0=Bank-based country, 1= Market-based country</i>	<i>Orbis Bank Focus</i>

### **4.3.2 Control variables**

#### **4.3.2.1 Bank size**

Corporate governance may be impacted by a bank's size. Larger banks may benefit from economies of scale and require "better" governance to handle their more complicated operations (Boachie, 2021). As a result, the size of the bank may have an impact on how corporate governance and bank performance are related. It is discovered that log of assets affects the bank's performance (Bhatt and Bhattacharya, 2015). The size of the bank is determined by the log of assets (Bhatt and Bhattacharya, 2015).

#### **4.3.2.2 Bank growth**

A bank that is expanding or growth-oriented denotes increased revenue from expanding operations (Garcia-Meca et al., 2015). However, a rise in deposit growth on its own does not always signify an increase in bank profits. Deposits must be able to be turned into profitable investments by banks. Giving loan preference to borrowers with lower credit quality is one way to accomplish this (Phan et al., 2020). Additionally, deposit growth can draw in new competitors and increase market competition. This may result in lower market profits for banks. Therefore, the impact of bank growth is unknown at the outset, theoretically speaking. There is conflicting empirical data at this time. For instance, Demirguc-Kunt and Huizinga (1999) found a negative correlation between performance and bank growth; Phan et al. (2020) found a positive correlation.

#### **4.3.2.3 Country**

Many economists contend that, especially in the early phases of economic development and in contexts with weak institutional frameworks, bank-based systems are more effective at identifying good investments, maximising savings, and exercising solid corporate governance. According to a study by Lee (2012), the banking industry was more significant in Germany, France, and Korea than the stock market in the U.S., the U.K., and Japan in terms of funding

economic growth. Additionally, a study by Antoniou et al. (2008) indicated that neither a bank's market- or bank-based approach toward performance has a substantial impact on performance. The lack of bank orientation as a variable makes more research on this subject necessary.

#### ***4.3.2.4 Growth domestic product (GDP)***

The gross domestic product (GDP), according to Demirgüç-Kunt and Huizinga, is the sum of all the goods and/or services generated inside a nation's borders within a given year. Better GDP will result in higher income for the general populace, which will raise savings rates and, in turn, increase bank deposits. The performance of the bank could benefit from a rise in GDP. In addition, Kiganda (2014) highlighted that an increase in GDP would improve the performance of the banking sector. There are three things that can affect how well banks perform. These are operating expenses, loan loss reduction, and net interest income. In periods of economic expansion, banks perform better, and the opposite is also true. Since people's incomes are rising, the country's GDP grows as well. They may want a bank loan for this in order to extend their business activities. As a result, there is a rise in the demand for bank loans, which benefits banks' operations. According to Ongore and Kusa (2013), there is a complicated relationship between GDP and bank performance. Their research showed that the GDP had a positive correlation with return on equity but a negative correlation with return on assets. The results of their study also showed that these linkages were not important. Further research on the connection between GDP and bank performance is necessary.

#### ***4.3.2.5 Inflation***

According to Perry (1992), inflation is characterised as a steady rise in the general level of prices in an economy. People's savings and disposable personal income both decline as a result of inflation. As a result, the bank's amount of deposits declines. Moreover, Athanasoglou et al. (2008) stated that, as inflation rises, consumer demand for goods declines, which lowers the

need for bank loans. This can negatively impact the performance and earnings of the bank. Due to the fact that banks trade in nominal financial instruments, such as currency units, inflation is strongly correlated with bank health. For instance, when a bank extends a loan to a borrower, both parties agree on a specific amount that will be repaid in the future. The purchasing power of the money to be paid to the bank will, however, decline over time if the rate of inflation rises. Additionally, anticipated inflation also raises interest rates. People might therefore anticipate that banks will have to provide them higher interest rates on their deposits. As the cost of funding has grown, an increase in lending interest rates may also lead to a decline in bank loans. A borrower may decide not to apply for bank loans in the future because of this unfavourable circumstance.

*Table 4.2 Descriptive Data (Country)*

<i>Country</i>	<i>Frequency</i>	<i>Percent</i>	<i>Country</i>	<i>Frequency</i>	<i>Percent</i>
<i>Austria</i>	<i>38</i>	<i>11.7</i>	<i>Italy</i>	<i>20</i>	<i>6.1</i>
<i>Belgium</i>	<i>8</i>	<i>2.5</i>	<i>Latvia</i>	<i>5</i>	<i>1.5</i>
<i>Bulgaria</i>	<i>2</i>	<i>0.6</i>	<i>Lithuania</i>	<i>3</i>	<i>0.9</i>
<i>Croatia</i>	<i>4</i>	<i>1.2</i>	<i>Luxembourg</i>	<i>21</i>	<i>6.4</i>
<i>Cyprus</i>	<i>6</i>	<i>1.8</i>	<i>Netherlands</i>	<i>17</i>	<i>5.2</i>
<i>Czech Republic</i>	<i>11</i>	<i>3.4</i>	<i>Poland</i>	<i>15</i>	<i>4.6</i>
<i>Denmark</i>	<i>16</i>	<i>4.9</i>	<i>Portugal</i>	<i>7</i>	<i>2.1</i>
<i>Estonia</i>	<i>1</i>	<i>0.3</i>	<i>Romania</i>	<i>4</i>	<i>1.2</i>
<i>Finland</i>	<i>5</i>	<i>1.5</i>	<i>Slovakia</i>	<i>8</i>	<i>2.5</i>
<i>France</i>	<i>33</i>	<i>10.1</i>	<i>Slovenia</i>	<i>7</i>	<i>2.1</i>
<i>Germany</i>	<i>13</i>	<i>4.0</i>	<i>Spain</i>	<i>19</i>	<i>5.8</i>
<i>Greece</i>	<i>8</i>	<i>2.5</i>	<i>Sweden</i>	<i>5</i>	<i>1.5</i>
<i>Hungary</i>	<i>9</i>	<i>2.8</i>	<i>United Kingdom</i>	<i>34</i>	<i>10.4</i>
<i>Ireland</i>	<i>7</i>	<i>2.1</i>			
			<i>Total</i>	<i>326</i>	<i>100.0</i>

*Source: Authors' calculation 1*



Our descriptive data in *Table 4.2* show the percentage of each country that participated in our study. Until 2019, the EU will consist of 27 countries. However, we dropped one country, Malta, because there was insufficient data of commercial banks with the required data availability. According to the data, Austria has the highest commercial banks that has completed data of corporate governance, accounting for 11.41 percent of the total sample. United Kingdom came in second with 10.4 percent, followed by France with 10.1 percent. On the other hand, Estonia and Bulgaria have the lowest percentages at 0.3 percent and 0.6 percent.

*Table 4.3 Corporate Governance Index*

<i>N</i>	<i>STATEMENTS</i>	<i>AVERAGE</i>
	<b>SUB INDEX BOARD</b>	<b>96.45</b>
1	Chairperson of board and CEO are two different individuals	94.00
2	Chairperson is a non-executive director	93.00
3	Company indicates classes of directors	98.00
4	Non-executive directors make up at least two-thirds of the board	98.00
5	Company indicates the number of meetings held by the board	99.00
6	Board has a corporate governance committee	96.00
7	Board has a nominating committee	97.00
	<b>SUB INDEX AUDIT</b>	<b>90.06</b>
8	Company has an audit committee	100.00
9	Chairperson of the committee is a non-executive director	100.00
10	All members of the committee are non-executive directors	97.00
11	Chairperson of the board is not the chairman or a member of the audit committee	82.00
12	Company indicates the number of meetings held by the committee	100.00
	<b>SUBINDEX DISCLOSURE AND TRANSPARENCY</b>	<b>94.40</b>
13	Company use IFRS	100.00
14	Company discloses a composition of the remuneration committee	80.00
15	Company discloses a composition of the audit committee	63.00
16	Company discloses the total remuneration of each director	95.00
17	Company discloses remuneration of CEO	99.00
18	Company discloses work/professional qualifications of its senior officers	99.00
19	Company discloses the academic qualifications of its senior officers	98.00
20	Company discloses remuneration of the senior management team	99.00
21	Company discloses work/professional qualifications of directors	99.00
22	Company discloses academic qualifications of directors	99.00

23	Company discloses ages of directors	100.00
24	Company discloses the date on which each director was appointed	100.00
25	Company uses a "big four" audit firm as an external auditor	100.00
26	Company releases its annual reports within 3 months of year-end	100.00
27	Company reports stock prices and stock market performance	62.00
28	Company discloses share ownership	98.00
29	Company states its commitment to effective corporate governance	98.00
30	Company discloses a commentary on its financial results	99.00
31	Company discloses a summary of five-year financial trends	100.00
32	Company reports on CSR activities	99.00
	<b>SUB INDEX REMUNERATION</b>	<b>76.00</b>
33	Company has a remuneration committee	68.00
34	Chairperson of the committee is a non-executive director	67.00
35	All members of the committee are non-executive directors	69.00
36	Company indicates the number of meetings held by the committee	100.00
	<b>SUB INDEX SHARE</b>	<b>88.75</b>
37	Company uses the one-share-one-vote principle	68.00
38	Company elects all directors every year	100.00
39	Company indicates that it allows proxy voting	98.00
	<b>CGI_INDEX</b>	<b>89.13</b>

*Adapted from (Munisi & Randay, 2013)*

*Table 4.4 Correlations of subindices*

	<i>Bd_Index</i>	<i>Aud_Index</i>	<i>Dis_index</i>	<i>Rem_Index</i>	<i>Share_Index</i>	<i>CG_Index</i>
<i>Bd_Index</i>	1					
<i>Aud_Index</i>	.262**	1				
<i>Dis_index</i>	.122*	0.066	1			
<i>Rem_Index</i>	-0.011	-.466**	.198**	1		
<i>Share_Index</i>	.157**	0.092	.290**	.365**	1	
<i>CG_Index</i>	.375**	.137*	.458**	.687**	.799**	1

\*\* Correlation is significant at the 0.01 level (2-tailed).

\* Correlation is significant at the 0.05 level (2-tailed).

*Table 4.5 Summary of non-governance variables*

	<i>Minimum</i>	<i>Maximum</i>	<i>Mean</i>	<i>Std. Deviation</i>
<i>Profitability</i>	-0.003	0.075	0.019	0.011
<i>Liquidity</i>	0.033	0.951	0.536	0.195
<i>Leverage</i>	0.015	0.349	0.087	0.046
<i>BkSz</i>	76.000	242203.000	17928.094	39080.263
<i>BkGro</i>	-0.186	50.357	0.206	2.793
<i>Fin</i>	1.106	93.015	17.331	15.355
<i>Coun_t</i>	0.000	1.000	0.500	0.501

*Source: Authors' calculation 2*

*Table 4.3* illustrates how well each sub-index of "strong corporate governance practises" is followed. We create the Corporate Governance index by combining five subindices: Board director, Audit committee, disclosure and transparency, remuneration committee, and shareholders' rights. This is measured as a percentage of adherence to each corporate governance practice. We use each bank's annual financial reporting to determine whether each checklist statement is correct for the company. A yes equals one, and a no equals zero. The responses are added together to yield the CG index. (Bebchuk et al., 2019; Munisi & Rondoy, 2013; Basar et al., 2021). Overall, the mean corporate governance index score is 89.13% across all sub-indices (100% would imply full compliance). Based on the critical statements in *Table 4.3*, this shows that, on average, commercial banks in EU countries are approaching "perfection" in terms of what may be described as practical corporate governance standards. The sub-index for the board of directors has a mean of 96.45%. This means that, on average, the banks have implemented 96.45% of what we consider acceptable governance standards in terms of board membership and function. More than 94% of organisations, in particular, segregate the roles of chair of the board and CEO. *Table 4.3* further demonstrates that non-executive directors serve as chairmen in 93% of the companies. This shows that decision-

making (by management) and monitoring (by employees) are separated in commercial banks in the EU (by the board). Furthermore, our findings show that around 98% of commercial banks have boards with at least two-thirds non-executive directors. These characteristics of EU commercial banks' boards of directors imply that most boards have the independence required to supervise senior management adequately. In addition, corporate governance committees and/or nominating committees are present in 96% of banks. The audit committee sub-index has a mean value of 90.06%. More particular, we discovered that all banks have an audit committee and non-executive directors chair all audit committees. Furthermore, according to our research, 97% of corporations have audit committees made up entirely of non-executive directors.

The high scores for these corporate governance issues suggest that nearly all commercial banks in the EU know corporate solid governance processes linked to audit committee recruiting. The disclosure and transparency sub-index have a mean value of 94.40%. Many of the companies express their commitment to good corporate governance and provide further financial results commentary. This could be due to more stringent regulations requiring banks to disclose all reports following a series of mishaps and crises. The remuneration committee sub-index has a compliance rate of 76%. This number suggests that when it comes to remuneration practices, many banks have relatively strong corporate governance. Finally, the shareholders' rights sub-index has an average compliance rate of 88.75%. Only a few corporations do not state that they hold an annual board of director elections. This means that if the board, or an individual member, becomes incompetent or inefficient in carrying out their obligations, it is simple for shareholders to vote for a change in the entire board at once. Most commercial banks allow shareholders to be represented without having to attend meetings using proxies.

The pairwise correlation matrix for the overall corporate governance index and its sub-indices is shown in *Table 4.4*. It shows that the corporate governance index and all of its sub-indices have positive and substantial connections. This is expected because banks that perform well in one sub-index are more likely to perform well in others.

The summary statistics of the non-governance variables utilised in the analysis are presented in *Table 4.5*. The average bank size and bank growth of a commercial bank are 17928.094 and 0.206, respectively. This indicates that commercial banks in the EU have an average growth rate of 20.6%, indicating that they perform reasonably well. The average profitability is 1.9% and the average liquidity is 53.6%. This implies that the profitability and liquidity performance of commercial banks in EU as a whole is pretty good. Leverages, on the other hand, has a mean of 8.7%, the average fintech is 17.331, and the average country bank orientation is 0.500.

#### **4.4 Model**

The following model was developed to investigate the impact of country governance factors on the relationship between corporate governance and bank performance and the moderating role of fintech.

##### ***Model 1***

*Bank Performance (Bk\_Per) =*

$$\beta_0 + \beta_1 (CGindex) + \beta_2 (Fin) + \beta_3 (BkSz) + \beta_4 (BkGro) + \beta_5 (Coun\_t) + \varepsilon$$

##### ***Model 2***

*Bank Performance (Bk\_Per) =*

$$\beta_0 + \beta_1 (CGindex) + \beta_2 (Fin) + \beta_3 (BkSz) + \beta_4 (BkGro) + \beta_5 (Coun\_t) +$$

$$\beta_6 (CGIndex*Fin) + \varepsilon$$

## 4.5 Method

The study used the partial least squares (PLS) approach of SEM with the multilevel analysis function. This second generation of analysis provides an alternative to covariance-based SEM (Wold, 1985; Chin et al., 2010; Hair et al., 2019), which is particularly useful when data are not normally distributed (Monecke and Leisch, 2012; Hair et al., 2014). Higher statistical power in PLS-SEM is beneficial for exploratory research that examines less developed or still developing theory (Hair et al., 2019; Ramli et al., 2019). We chose this method after considering a few reasons and guidelines outlined by Hair et al. (2019):

First, PLS-SEM can be used, for example, when the analysis is concerned with theoretical framework testing from a prediction standpoint. Second, the structural model is complicated, containing many constructs, indicators, and/or model relationships. Third, by delving into established theories and their theoretical extensions, the research aims to add complexity to the equation (exploratory research for theory development). In addition, the path model includes a formatively measure construct. Fifth, financial ratios and other types of data artefacts are included in the study. Sixth, the research relies on secondary data because of measurement theory, which may lack comprehensive substantiation. Seventh, sample size is limited by a small population (e.g., business-to-business research), though PLS-SEM can handle large sample sizes as well. Eighth, issues with distribution, such as a lack of normalcy, are a source of worry. Finally, for the research's follow-up analysis, latent variable scores are required. We conclude from the summary that, given the circumstances, PLS-SEM is an appropriate method to use in our study. In addition, our research relies on secondary data gleaned from annual financial reporting, which includes financial ratios in most bank performance measures.

Meanwhile, a formatively measure construct is included in this research model. Furthermore, determining the moderating role of fintech, which can be precisely measured using PLS-SEM, is one of our primary objectives. This study follows the summary in procedures and metrics for analysing and reporting PLS-SEM results (Chin et al., 2010; Ramli et al., 2019; Hair et al., 2019). The summary guidelines are comprehensive in explaining the PLS-SEM results, and we adhere to the tips and rules of thumb as outlined. The first step in PLS-SEM evaluates the two constituents, measurement, and structural sub-models (Chin, 2010; Ramli et al., 2019), also known as structural model specification. The structural model that explains the relationship between exogenous and endogenous variables is evaluated in the second step (Ramli et al., 2019). The statistical significance of this structural model was determined using PLS-SEM. The third step is to estimate the model and evaluate the results. We defined our measurement as formative at this point and analysed the results. The bootstrap t-statistics (Ramli et al., 2019; Hair et al., 2017) were used in the final step to test whether fintech moderates the effect of corporate governance on bank performance. We also ran additional tests and robustness checks with OLS regression to see if our model is reliable in other methods.

#### **4.6 Results and discussion**

We utilised the SmartPLS 3 programme (Ringle et al., 2015) to analyse the data by selecting a weighting scheme (path); the maximum number of iterations on the PLS algorithm is 300. We employed a bias-corrected and accelerated (BCa) bootstrap with a sample size of 1000 and a significance level of 10% during the bootstrapping step (one-tailed). The value denotes the strength of the association between variables, whether direct or indirect. The bigger the route coefficient value, the more strongly the variables are related (Chin et al, 2010; Hair et al, 2019). Positive or negative signs on the route coefficient reflect the direction of the relationship between variables. Meanwhile, the *p-value* shows the results of hypothesis testing. With a *p*-

*value* of 0.1, the hypothesis is accepted. We include path coefficients beta to demonstrate the effect of the relationship, as well as t value results to compare with the critical value (Chin et al., 2010; Hair et al., 2019), *p-value* to check the construct's significance. In addition to the size of R<sup>2</sup>, the predictive sample reuse technique (Q<sup>2</sup>) can be effectively used as a predictive criterion (Chin 2010). Q<sup>2</sup> evaluates the predictive validity of a large complex model using PLS using a blindfolding procedure. We experimented with blindfolding at the default distance of 7 metres. Values greater than zero are significant (Hair et al. 2019). According to Chin et al. (2010), a value greater than 0 indicates that the exogenous construct has predictive relevance for the endogenous construct under consideration. If 0.02 represents minor relevance, 0.15 represents medium relevance, and above 0.35 represents enormous relevance. According to *table 6*, all of our values are greater than 0.35, indicating that the exogenous construct has good predictive relevance towards the endogenous variables.



Table 4.6 PLS-SEM results

<i>Variables</i>	<i>Model 1</i>			<i>Model 2</i>		
	<i>Profitability</i>	<i>Liquidity</i>	<i>Leverage</i>	<i>Profitabilit</i> <i>y</i>	<i>Liquidity</i>	<i>Leverage</i>
<i>CGIt-1</i>	0.211*** (0.000)	0.087* (0.095)	0.108 (0.117)	0.246*** (0.000)	0.091* (0.128)	0.125** (0.020)
<i>Board_index</i>	0.214*** (0.000)	0.012 (0.373)	0.751*** (0.000)	0.205** (0.008)	0.027 (0.303)	0.768*** (0.000)
<i>Audit_index</i>	0.934*** (0.001)	0.336* (0.086)	0.414*** (0.000)	0.933*** (0.001)	0.338* (0.083)	0.416*** (0.000)
<i>Disc_index</i>	0.025 (0.258)	0.012 (0.373)	0.751*** (0.000)	0.025 (0.257)	0.020 (0.208)	0.083** (0.026)
<i>Rem_index</i>	0.088 (0.213)	0.078 (0.114)	0.008 (0.411)	0.086 (0.218)	0.075 (0.125)	0.011 (0.377)
<i>Share_index</i>	0.054 (0.107)	0.012 (0.316)	0.131*** (0.000)	0.053 (0.113)	0.010 (0.347)	0.134*** (0.000)
<i>Fin</i>	0.086* (0.065)	0.068 (0.127)	0.032 (0.261)	0.120** (0.010)	0.030* (0.098)	0.048 (0.191)
<i>BkSz</i>	-0.245*** (0.000)	-0.172*** (0.000)	-0.298*** (0.000)	-0.244*** (0.001)	-0.298*** (0.001)	-0.172*** (0.000)
<i>BkGro</i>	-0.058 (0.182)	-0.049* (0.083)	-0.033 (0.277)	-0.053 (0.188)	-0.043 (0.116)	-0.031 (0.287)
<i>Coun_t</i>	-0.053 (0.142)	-0.084* (0.066)	0.017 (0.379)	-0.056 (0.125)	-0.087* (0.055)	0.015 (0.388)
<b><i>CGIt-1</i></b>				<b>0.144**</b>	<b>0.155**</b>	<b>0.069*</b>
<b><i>*Fin</i></b>				<b>(0.006)</b>	<b>(0.005)</b>	<b>(0.174)</b>
<i>Q<sup>2</sup></i>	0.539	0.843	0.719	0.536	0.831	0.692
<i>R<sup>2</sup></i>	0.590	0.898	0.738	0.590	0.898	0.738
<i>Adjusted R<sup>2</sup></i>	0.577	0.895	0.730	0.576	0.894	0.729
<i>Observations</i>	3260					

Standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Our R<sup>2</sup> shows a good predictive relevance whereby all the variables have more than 50% on explaining the relationship between the variables. Our primary finding is that corporate governance has a 21.1% positive effect on bank profitability. Corporate governance has an 8.7% positive effect on bank liquidity. Corporate governance has positive impact towards leverage with the percentage of 10.8% coefficient and vice versa. Meanwhile, control variable, bank size has a negative effect on profitability, with coefficients of 24.5 %. With a coefficient of 17.2 %, bank size also has a negative effect on liquidity. With a coefficient of 29.8%, bank size has a negative effect on leverage. The country bank orientation in our control variable has a 5.3% negative effect on bank profitability. With a value of 5.8%, bank growth has a negative effect on bank profitability. With a value of 4.9% bank growth has negative effect towards liquidity, and with coefficient of 3.3 % bank growth has a negative effect on bank leverage. The country's bank orientation towards profitability has a negative effect of 5.3%, towards liquidity has negative effect 8.4% and towards leverage 1.7% positive effect.

We also look at the relationship between each corporate governance subindex to see which ones have the biggest impact on bank performance. The most significant effect that improves bank performance is found to be audit subindices. The audit role has a significant impact on profitability (93.4%), liquidity (33.6%), and leverage (41.4%). Meanwhile, the board index and disclosure index both have a positive significant effect on leverage, with a path coefficient of 75.1%. For moderation testing, we discovered an intriguing result: Fintech interaction in corporate governance has a 14.4% positive effect on bank profitability, which is statistically significant at 0.05. Fintech has a 15.5% positive effect on corporate governance and liquidity, which is statistically significant at 0.05. Fintech's interaction with corporate governance and leverage has a 6.9% positive effect that is statistically significant at 0.1.

In summary of our main findings, we discovered:

Corporate governance has a positive impact on performance. This finding has supported the previous literature and findings by other studies such as (Munisi and Randøy, 2013; Salim et al., 2016; Bhagat and Bolton, 2019; Başar, 2021). It implies that improved corporate governance will lead to greater bank performance. As a result, we believe that improved corporate governance will have a positive impact on bank profitability. Corporate governance has a positive effect on bank liquidity. It implies that improved corporate governance will increase bank liquidity in a positive way and vice versa. As a result, we accept our hypothesis that improved corporate governance will increase bank liquidity. Corporate governance has a positive effect on leverage. It implies that if a bank practises better corporate governance, its leverage will increase and become more optimal. As a result, we accept our hypothesis that good corporate governance will boost bank leverage.

Fintech's moderating role was demonstrated to have significantly strengthened the relationship between corporate governance and bank performance in our fascinating findings on fintech's moderating role. Fintech helps to moderate the relationship between corporate governance and efficiency, implying that this interaction would boost profits. As a result, we believe fintech can aid in the management of the relationship between corporate governance and bank profitability. Fintech helps to moderate the relationship between corporate governance and liquidity, implying that this interaction will increase liquidity. As a result, we believe fintech can aid in the management of the relationship between corporate governance and bank liquidity. The relationship between fintech, corporate governance, and leverage is positive, implying that this relationship will increase leverage. As a result, we believe that fintech can aid in the moderation of the relationship between corporate governance and bank leverage. This supports previous studies on fintech (Berger, 2003; Chai et al., 2016; Haddad and Hornuf,

2019; Phan et al., 2019; Lee et al., 2021; Liu et al., 2021; Wang et al., 2021) that fintech has significant effects on performance in the most organisation including banks. With the intervention of fintech in commercial banks, it has minimised the risk of misallocating resources, better transparency in administration and reducing the cost of agency in banks. Thus, it has led to better bank performance.

#### 4.7 Robustness Test

We use OLS regression to test our model to ensure that it is stable. We used three variables to assess the relationship between corporate governance and bank performance, as well as whether the impact of fintech on the relationship is significant. After testing our theoretical model with OLS regression, we found that it is robust and produces significant results.

Table 4.7 OLS results

<i>Variables</i>	<i>Model 1</i>			<i>Model 2</i>		
	<i>Profitability</i>	<i>Liquidity</i>	<i>Leverage</i>	<i>Profitability</i>	<i>Liquidity</i>	<i>Leverage</i>
<i>CGIt-1</i>	0.211*** (0.023)	0.087* (0.004)	0.108* (0.001)	0.083* (0.030)	0.051 (0.005)	0.170* (0.001)
<i>Fin</i>	0.086 (0.004)	0.068 (0.001)	0.032 (0.000)	0.430* (0.122)	0.479** (0.002)	0.208* (0.005)
<i>BkSz</i>	-0.245*** (0.000)	-0.172*** (0.000)	-0.298*** (0.000)	-0.244*** (0.000)	-0.172** (0.000)	0.298*** (0.000)
<i>BkGro</i>	-0.058 (0.000)	-0.049 (0.000)	-0.033 (0.000)	-0.053 (0.000)	-0.043 (0.000)	-0.031 (0.000)
<i>Coun_t</i>	-0.053 (0.007)	-0.084 (0.001)	0.017 (0.000)	-0.056 (0.007)	-0.087 (0.001)	0.015 (0.000)
<b><i>CGIt-1</i></b> <b><i>*Fin</i></b>				0.143** (0.145)	0.147** (0.026)	0.021* (0.006)
<i>R<sup>2</sup></i>	0.553	0.8565	0.738	0.574	0.854	0.737
<i>Adjusted R<sup>2</sup></i>	0.539	0.851	0.730	0.573	0.853	0.734
<i>Observations</i>	3260					

Standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

#### **4.8 Summary**

This chapter examines the relationship effect between corporate governance and bank performance for a sample of 326 banks in 28 EU countries from 2010 to 2019 using the second-generation PLS-SEM method. To summarise our findings and conclusions, we concluded that good corporate governance improves bank performance. We discover that corporate governance has a significant impact on every indicator of commercial banks in the EU, including profitability, liquidity, and leverage. A proper corporate governance structure and practice help banks to be more profitable and competitive. But, most importantly, improved corporate governance will aid in lowering agency costs and mitigating risk. As a result, certain conditions must be met for better corporate governance to contribute to economic growth and development. The culture and mentality of good corporate governance must be maintained to raise awareness of the importance of proper governance and administration for each bank. This must be accomplished through various means, including training for all employees and the board, strengthening procedures and regulations, recognition, and more, to avoid misconduct and white-collar combat crime, which could be a silent tumour in the organisation. Furthermore, we discovered that fintech had moderated the relationship. It demonstrated that fintech could significantly improve the relationship between corporate governance and bank performance. This discovery is intriguing because it may shed light on traditional banks slow to improve their fintech and digitalisation. This finding adds to the bottom-line research by Frame et al. (2019) on fintech development in banking. In addition, research on the emergence and significance of fintech and digital IT in this era (Romanova and Kudinska, 2016; Haddad and Hornuf, 2019; Phan et al., 2019; Wang et al., 2021). The rate of change in Fintech, particularly in the banking sector, is mind-blowing. By seizing the opportunity of fintech, banks' performance can improve because customers who receive excellent service will continue to use the bank's services and products.

The findings of our study have significant practical and managerial ramifications. First and foremost, our findings support policymakers' efforts in developing policies to increase fintech innovation in the banking industry. For example, the EU established the European Banking Federation (EBF) to assist banks in Europe in 1960 and developed an Innovation and Cybersecurity hub for European Banks since 2009. Providing the financial sector with a regulatory framework that balances innovation and consumer protection while maintaining financial stability can contribute significantly to EU's ambition to be at the forefront of digital transformation. This contributes to the strengthening of bank regulatory frameworks while also improving banking performance by maximising their potential in digital innovation in fintech. Second, when formulating policies to encourage more fintech innovation in the banking landscape, policymakers may need to take cultural factors into consideration, as this study suggests that policymakers may need to provide more significant support to potential fintech development in cases where cultures are individualistic or long-term oriented. Third, to the extent that banking managers seek to improve the efficiency of their organisations, our research shows that implementing fintech is a viable means of achieving this goal. Finally, it is anticipated that this research will be helpful to businesses in evaluating cross-border investment decisions. Individualistic or long-term oriented societies, for example, may place restrictions on the potential benefits of investing in a particular country. The characteristics of those countries may hamper the availability of fintech, but with better governance and greater access to Fintech, the situation can be improved.

The limitation of this study is the inability to obtain consecutive data on financial reporting; additionally, many data from a few banks are not publicly disclosed, such as the proportion of independent board of directors, incentives, and salaries, and so on. As a result, the banks that cannot be found in Bank Focus, Osiris, or DataStream were eliminated from our analysis. The

inability to gather consistent statistics on fintech also one of the study's weaknesses. The advice given is that other variables not included in the study model should be considered so that not all information is revealed through the data collected and analysed. In addition, the study should be carried out in other places to examine if the theories are applicable in those areas. The concept of "one size fits all" is rarely accepted, but confirming it by expanding the analysis to other locations or industries could be a promising future research direction. Also, to be more comprehensive, it is necessary to finish the qualitative analysis rather than focusing solely on the quantitative study.

## Chapter 5

### **Bank Risk and Bank Performance : the moderating role of fintech**

#### **5.1 Overviews**

A bank's success can be influenced by a variety of internal and external factors. One of the essential issues that could have a substantial impact on the bank's soundness is bank hazards. Risk analysts and academics have identified a number of bank risks, as well as several arguments and solutions that have been widely employed to mitigate the risk. Banking institutions' risks, as well as systemic hazards, have expanded in tandem with the rapid expansion of financial market scale and financial innovation. Bank risks are becoming increasingly important in bank management. Banking has become dominant in the financial system (Sondakh et al., 2021). Banks have been controlled and monitored by Basel Committees in an effort to mitigate and improve risk management in the banking industry due to the industry's fragility and high risk. For both banks and financial institutions, bank risk is crucial. Poor risk management has contributed to the demise of numerous international banks in the past, including Bear Stern and Northern Rock Bank (Bebchuk et al., 2010). There are serious worries about how bank risk will impact performance because of the numerous economic downturns in the past brought on by inadequate risk management. Determining how risk can influence a business, which risks are the riskiest, and what can be done to mitigate risk before a danger or business failure occurs is vital, thus industrial practitioners and researchers must continue their studies in this area. According to conventional wisdom, taking on more risk results in a larger return, but it also puts banks at risk. Theoretical research revealed that bank-specific risk, such as credit risk, liquidity risk, operational risk, market risk, and solvency risk, had the biggest impact on a firm's market value.



As we realized that improved understanding of bank risk is important for a range of financial market participants (Haq and Heany, 2012). Bank risk assessment is critical for regulators, market supervisors, borrowers, shareholders, and bondholders. Bank risk is also of great interest to borrowers who rely on banks for financing. Given the increasing levels of EU banking industry concentration that has happened since 1985, bank risk analysis is critical for the EU region (ECB, 2007). With the decrease in the number of EU banks and the increase in their size, it is critical that we better understand the risk factors that affect these institutions, as larger banks may become "too big to fail.". Rangkuti (2020) analysed the sample using panel data analysis and found that risk management has a positive direct impact on profitability. This implies that improved risk management will boost bank productivity. Therefore, research on bank risk indicators that have a significant impact on the bank is crucial in order to have good risk management. This research then aids management in developing an effective risk management strategy.

Numerous studies have been conducted worldwide and in particular regions, including those by Sondakh et al. (2021), Inegbedion et al. (2020), Fang et al. (2019), Tan (2016), Terraza (2015), Ellul & Yerramilli (2013). However, we find that the justification and outcomes are wildly inconsistent, despite the fact that the majority of studies use the same methodology, such as GMM and OLS. There is a paucity of prior research determining how overall bank risk affects bank performance, both within and outside of EU. The majority of European research from the past is out of date and contains outdated findings and data. This led us to conduct this study in order to comprehend the overall bank risk factor and its connection to bank performance specifically within the EU. In order to fill this knowledge gap and add to the body of knowledge about the relationship between bank risk and bank performance in the context of EU commercial banks, we decided to conduct a study.

Meanwhile, recent developments in the EU banking such as fintech, securitization growth, and changes in the style of servicing and new financial product innovations all have an impact on bank risk. According to the Financial Stability Board (2017), fintech is a word often used to characterise a broad variety of financial technology applications, operating processes, and creative products at the forefront of financial innovation through technical methods. In general, fintech refers to technical solutions produced in numerous financial services domains, such as online banking and mobile payments, that are used by consumers on a daily basis. Alternative finance, crowdfunding, peer-to-peer lending, automated loans, Robo-advisors, and automated investment management are just a few of the financial technology innovations that are helping to fuel the increasing sector (Schueffel, 2016). By automating a wide range of financial processes, new digital technologies may provide innovative and more cost-effective solutions in various segments of the financial sector.

Fintech is able to increase the overall process efficiency of the financial business by expanding financial tradition limits and changing consumer spending behaviours thanks to advancements in information technology (Lee et al., 2021; Demertzis et al., 2018). Fintech innovation will have an impact on customer support, product service, and risk management services, including online and physical channels, agents, financial advisers, and other third parties. Furthermore, fintech will have an impact on customer experience, which refers to the entirety of the client's interaction with the service provider. Furthermore, fintech innovation will have an impact on the business economy, including income, expenses, and margins (Schueffel, 2016). Based on our understanding of previous comprehensive literature fintech (Choubey and Sharma, 2021; Lee et al., 2021; Wang et al., 2021; Basyareh and Wadi, 2021; Cheng and Qu, 2020; Haddad and Hornuf, 2019; Phan et al., 2019), we find that fintech has a favourable and significant impact on performance in the majority of organisations including commercial bank.

With fintech intervention, might aid in improved management by reducing risks in bank operational activities. Using blockchain to improve the know your customer (KYC) procedure in credit applications, for example, will minimise fraud and data mismatches, both of which have a negative influence on credit risk. According to Ji and Tia (2021), widespread usage of blockchain in fintech, for example, has helped reduce fraud and the danger of human mistake, lowering operational risk in daily transactions. Blockchain in fintech improves data storage and transformation security, provides a decentralised and transparent network infrastructure, and significantly lowers operational costs (Sinha and Bathla, 2019). As a result, the openness and accountability of blockchain, which result from methodical management in fintech, have a good and significant impact on all elements of business intelligence efficiency. Banks can monitor and minimise their risks, allowing them to carry on with their normal operations. Investing in fintech, on the other hand, will make banks more competitive and systematic in risk management, leading to enhanced bank performance. By conducting more systematic and transparent transactions and becoming more advanced in providing services and financial products to their customers, fintech development allows them to reduce unwanted risk and mitigate risk for better prevention, attracting more potential customers and loyal customers to continue using the bank's services in the future.

However, there is a scarcity of empirical evidence on how fintech can influence the link between bank risk and performance. To deal with financial innovation's expanding influence in the economy, policymakers must improve operating performance, provide more diverse financial services at lower costs, and boost sector competitiveness. These goals have far-reaching economic and policy ramifications, prompting additional research into the impact of financial innovation on banks. In the context of commercial banks in the EU, this study examines a number of elements of bank accounts and finds risk diversifications, bank

performance, and fintech, taking a complete approach to reducing the gap. As a result, the importance of other critical issues such as fintech and bank performance in the EU is highlighted in this study. This is due to the organization's technical innovation, which has substantially improved performance (Chai et al., 2016). Moreover, our research is unusual in that it considers fintech as a moderator. Fintech is taking off all over the world. According to our best information, there is new fintech study in various dimensions due to its infancy. In studies, the significance of fintech as a moderator in determining the relationship between bank risks and bank performance has been disregarded. These gaps in the literature provide an excellent chance to re-examine this connection by bringing more fascinating possibilities into our current study.

This study contributes to a variety of areas. To begin, the study expects to contribute to a diverse sampling of regions. As far as we know, bank risk has been extensively studied in other regions such as Sondakh et al. (2021) and Rangkuti (2021) in Indonesia sample, Alfadli and Rjoub (2020) in GULF countries, Munangi and Bongani (2020) in South Africa study, Hunjra et al. (2020) and Ul-Huq et al. (2020) for emerging country, Inegbedion et al. (2020) in a Nigerian banking sample, Fang et al. (2019): Tan (2016) in Chinese banking, and Bitar et al. (2016) for MENA countries, Kamran et al. (2016) in Pakistan country, Terraza (2015) and Haq and Heany (2012) for Europe region, Ellul and Yerramili (2013) for USA market. Nonetheless, the result is equivocal because the results for other EU countries may differ. Moreover, the study on Europe region such from Terraza (2015) and Haq and Heany (2012) is obsolete data and need to be updated with recent study and evidence. In the scope of EU, none of the present studies used a large sample and specific characteristics of commercial banks. As a result, these studies are insufficient to comprehend the relationship between bank risk and bank performance in other locations, such as the EU region. Thus, utilising the most recent EU

sample, we were able to see new expectations and results from the relationship between bank risk and bank performance, contributing to new study discoveries in this field. Second, this research adds to the growing body of knowledge about fintech as a moderator in the relationship between bank risk and bank performance. Because fintech is still in its infancy, this study will contribute to a better understanding of its function in banking. Insights into financial institutions in particular, as well as the rest of the sector in general. Finally, this study contributed to the methodological section by employing a method from the second generation of data analysis, namely partial least square structural equation modelling, or PLS-SEM. To our knowledge, the PLS-SEM approach has never been employed in previous work, which has only used first-generation methods like GMM and OLS regression (Aslam and Haron, 2020; Boachie, 2021).

## **5.2 Theory and hypotheses**

The consumer theory can explain the effect of fintech on banks (Aaker and Keller, 1990). According to the customer theory, new services such as digital mobile banking, blockchain, and big data analytics (such as those given by the fintech definition) can replace existing services by matching the same consumer need (such as those provided by traditional commercial banks). According to the consumer theory, new or current industrial players who use new or improved existing technology to deliver more accessible and cost-effective goods and services can promote market rivalry. The theory's scope is relevant to our narrative, where the initiative of new Fintech or enhancement of existing products and services, improvement of operations to minimise risk for improved performance in banks.

New participants, regardless of who they are, create competition in the business. The use of new technology to do jobs more efficiently is a significant element of fintech (Brandl and Hornuf, 2017; Puschmann, 2017). Fintech has recently developed practical applications to

improve efficiency in financial services across a wide range of services, including (but not limited to): using blockchain to redesign the Know Your Customer (KYC) process in credit checking (Moyano and Ross, 2017), contactless and instant payments; asset management services; investment and financial service advice; and information and data management and storage (Phan et al., 2020). Banks, on the other hand, use outdated information technology systems and are viewed as being hesitant to adapt new technology (Brandl and Hornuf, 2017). To be more competitive and advanced, they must be open to embracing fintech opportunities. As a result, the major conclusion is that Fintech will be able to improve the process and mitigate risk in commercial banks by delivering lower-cost, more efficient services in the future.

Despite the rise of digital innovation and its perceived impact on the financial industry, the impact of digital innovation and fintech growth on the financial system is poorly understood, including how fintech could help commercial banks mitigate and lower risk in order to maintain stability and good performance. Exceptions include Cheng and Qu (2021), who investigate the impact of fintech on credit risk, Lee et al. (2021), who investigate the impact of Fintech on cost efficiency in Chinese commercial banks, Phan et al., 2020 and Wang et al., 2021, who investigate the impact of fintech on bank performance, Safiullin et al. (2020), who investigate the impact of fintech on operational risk in banks, Haddad and Hornuf (2018) investigate the determinants of the global fintech market, Brandl and Hornuf (2017) examine the change of the financial industry following digitalization, and Li et al. (2017) investigate how retail banks' share prices react to fintech.

### ***5.2.1 Bank risk and bank performance***

The current activity of banks has rapidly changed, bringing with it a slew of new risks in addition to the industry's gains and growth. The level of activity in banks has raised specific concerns, and the strategic focus of banks is protection against inherent risk through a variety

of approaches and measures for managing it. A number of research on risk components and bank performance have been done in recent years. Karamoy et al. (2021) using an Indonesian banking sample investigate the impact of banking risk on regional development banks in Indonesia during the period of 2013–2015. Using multiple regression analysis, the study found that there is a substantial association between the independent variables and performance (ROA). The findings indicate that NPL, NIM, LDR all have a significant impact on ROA at the same time. NPLs are significant and negatively affect ROA, while NIM is significant and positively affects ROA, LDR is not significant and negatively influences ROA. Inegbedion et al. (2020) in their study for Nigerian banking using GMM found that findings show a substantial inverse association between ROaA and credit, leverage, and liquidity risks, and all of these relationships were significant. Rising credit risk will result in a decrease in a bank's investable funds and average assets. The study also finds that there is a significant positive relationship between ROaA and CAR. Efficiency, credit risk, diversity, and concentration ratio all have a strong negative impact on all performance measurements, according to Alfadli and Rjoub's (2020) study using Panel-corrected standard error analysis for GULF cooperation council countries. In their study for South Africa using pooled OLS, Munangi and Bongani (2020) discovered that the relationship between financial performance and credit risk, an indicator of bank risk, was adverse. Hunjra et al. (2020) in their study for Pakistan, India, Bangladesh and Sri Lanka using GMM method finds that bank risk has significant mixed effect towards bank performance.

UI-Huq et al. (2020) found that an increasing non-performing loan ratio as credit risk results in the bank being underperforming and unstable in their study using the GMM method to a sample of emerging countries. According to Fang et al. (2019), cost efficiency has a greater favourable impact on profitability when banks take on more risk and are subject to more competition. This

finding was made in a study conducted in the China region. Tan's study from 2016 used the same sample of China's banking sector but a different GMM method; while their findings did not support any conclusive findings about the effects of competition and risk on bank profitability, it was found that taxes, overhead costs, labour productivity, and inflation all have an impact on Chinese bank profitability. Chen et al. (2018) used Fixed effect regression to conduct a study for 12 advanced economic countries and discovered that in a market-based financial system, liquidity risk has a negative influence on bank performance. In a study of MENA countries, Bitar (2016) discovered that meeting Basel capital standards increases bank risk protection while also increasing efficiency and profitability. For too-big-to-fail banks, banks in crisis, and banks in well-governed countries, capital requirements have a greater impact on bank performance. Kamran et al. (2016) used Panel data analysis to conduct a study in Pakistan and discovered a significant relationship between financial market development in the banking sector and financial performance as measured by key indicators. Haq and Heany (2012) discover evidence of a convex (U-shaped) relationship between bank capital and bank systematic risk and credit risk in their study for Europe using two-step system GMM analysis. While increased capitalization improves bank profitability, liquidity risk varies according to bank size. Terraza (2015) found no evidence of a link between increased efficiency and increased bank profitability using the same scope of Europe and method of GMM study. Ellul and Yerramilli (2013) suggest that a strong and independent risk management function can reduce tail risk exposures at banks in their study USA scope using Fixed effect analysis. According to the previous literature, the majority of the results conclude that bank risk has a negative impact. As a result, we assume:

**Hypotheses 1:** *Bank risk has a negative effect towards bank performance*



### ***5.2.2 Fintech and bank performance***

The word "fintech," which is an abbreviation for "financial technology," refers to businesses or representatives of businesses that integrate financial services with current, innovative technologies (Dorfleitner and Hornuf, 2017). It is impossible to create a narrow definition of "fintech" that encompasses all of the entities normally connected with the word. According to the Financial Stability Board (2017), fintech is a phrase that is often used to characterise a wide range of financial technology applications, operating methods, and new products that are at the forefront of financial innovation through the use of technological means. Fintech, in general, refers to technical solutions produced in various financial services domains, such as online banking and mobile payments, that are used on a daily basis by consumers. Financial technology innovations such as alternative finance, crowdfunding, and peer-to-peer lending, as well as automated loans, robo-advisors, and automated investment management, all contribute to the growth industry. By automating a wide range of financial processes, new digital technologies may provide innovative and more cost-effective solutions in various segments of the financial sector. Fintech can use information technology to help improve the overall efficiency of the financial industry's processes, while also expanding financial tradition limits and changing consumer spending behaviours (Lee et al.,2021; Demertzis et al.,2018).

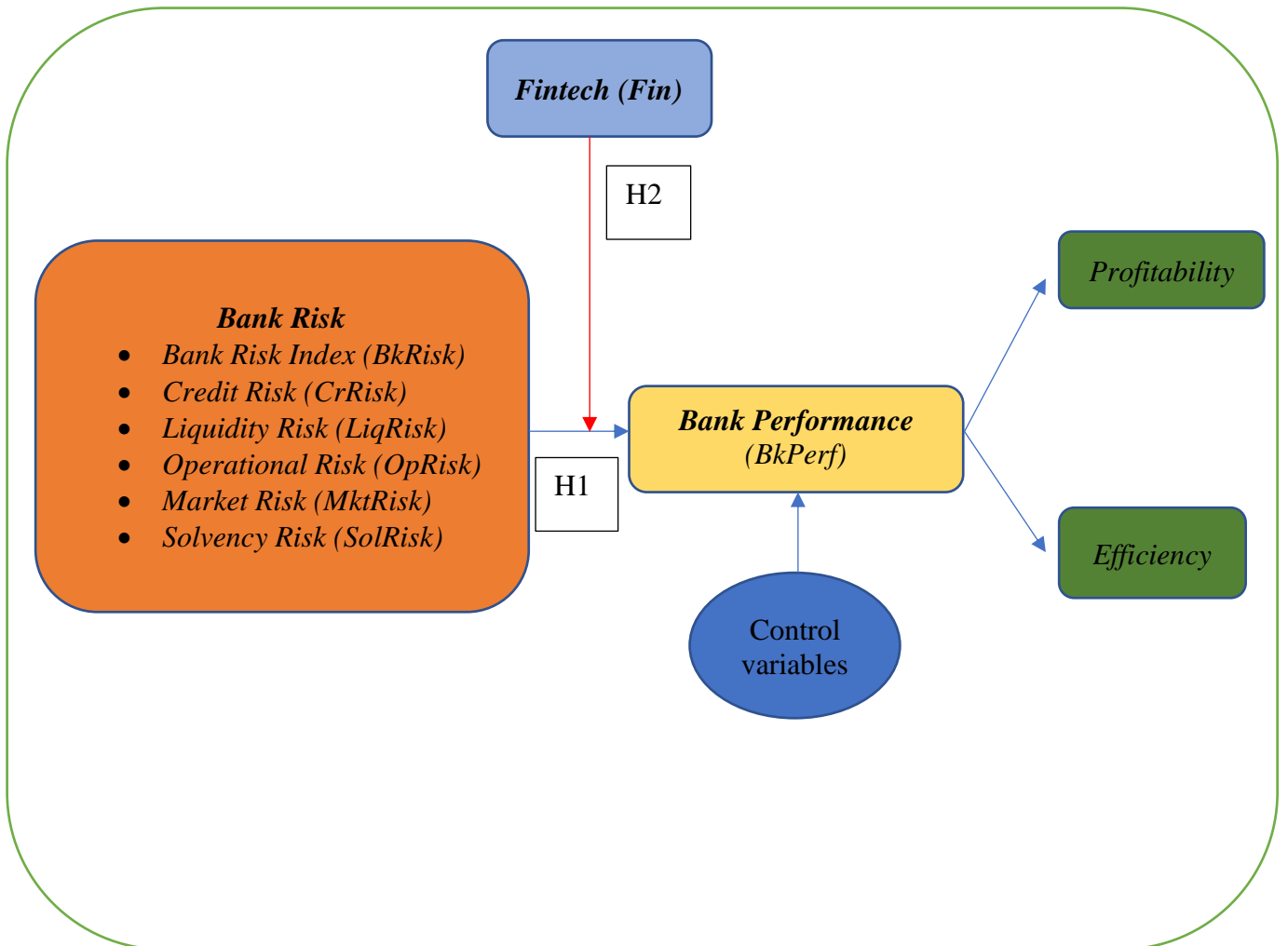
This study examined the use of financial technology in risk management in banks. According to theoretical studies, the purposes for which fintech are developed are diverse, and the new market demands necessitated the call to a series of activities as a result of the development of banking activity, and the novelty of these measures has brought, in addition to the anticipated benefits, a number of risks. Financial technology adoption, the growth of the intermediation process, and macroeconomic events all contribute to the introduction of new hazards in the banking sector. Financial institutions today have a plethora of chances and possibilities for

enhanced operational processes in order to boost performance, thanks to the emergence of fintech. Previous research for academics has found that fintech has an impact on the economic cycle, growth, and bank performance, as well as facilitating improved competitiveness among industry competitors. Fintech is gradually invading people's lives and changing business paradigms (Chen, 2020). According to Choubey and Sharma (2021), they investigated the influence of fintech on artificial intelligence in decreasing the cost in banking and discovered that fintech involvement in making automation process using artificial intelligence and robotics has greatly reduced the cost. In their fintech study, Lee et al (2021) discovered that fintech has a dual effect on bank efficiency and increases the use of technology in banks. Wang et al. (2021) discovered a positive and significant influence of fintech on bank performance in their study on fintech. In their study, Basyareh and Wadi (2021) discovered that fintech had a beneficial effect on bank performance in the Jordanian banking sector. Cheng and Qu (2020) discover that bank fintech considerably reduces bank risk in Chinese commercial banks. (Haddad and Hornuf, 2019; Phan et al., 2019) in their study found that that fintech has significant effects on performance in the most organisation including banks. With the intervention of fintech in commercial banks, it has minimised the risk of misallocating resources, better transparency in administration and reducing the cost of agency in banks.

According to the findings and investigations, the majority of research papers dealing with the direct relationship between financial innovation and bank performance have yielded conflicting results (Zouari-Hadiji, 2021). The debate about the positive and negative effects of Fintech on bank risk and bank performance remains unresolved. As a result, we propose a new hypothesis:

**Hypotheses 2:** *Fintech positively moderates the bank risk and bank performance*

Figure 5.1 Theoretical Framework



## 5.3 Methodology

### 5.3.1 Data

Documentation studies were performed to collect secondary data from financial and annual reports provided by commercial banks in 28 EU for a period of ten years between 2010 and 2019. The banking industry in the EU has experienced a major transformation, with complete consolidation (Kasman et al., 2010). Furthermore, data show that commercial banks in the EU focused more on fintech innovations and digital transformation in 2019, including electronic payments, online and mobile services, according to the European Banking Federation (EBF, 2020). As a result, we focused on commercial banking, one of EU's most important areas of depository institutions. To that aim, bank holding companies, investment banks and securities houses, savings banks, real estate and mortgage banks, non-banking credit institutions, and other specialised governmental credit organisations are excluded from the analysis. Meanwhile, additional data from Crunchbase (CB) and Chartered Banker is filtered to include fintech phase acceptance, bank investment in their business strategy, and digitalization strategy.

We include several variables in the empirical study to analyse the determinants of commercial bank performance, five of them which are risk indicators to form the main independent on measuring bank risk, namely *credit risk* measured by Non-performing loan (NPL), *liquidity risk* measured by ratio of banks total loan and advances to total deposits, *operational risk* measured by Cost to Income Ratio (CIR), *market risk* measured by Net interest margin (NIM) and *solvency risk* measured by Capital Adequacy Ratio (CAR). Meanwhile, two indicators are used to assess bank performance: Profitability (*Return on Asset*) and Efficiency (*Return on Equity*). We add on several control variables on bank level namely *bank size*, *bank growth*. Also, we added few macros level control namely, *Bank Orientation*, *Growth Domestic Product*

(GDP), and *Inflation*, each country. All these measures can explain better for the effect of other variables in the bank performance.

Fintech measurement is now being studied in a variety of approaches by academics. One of the difficulties that scholars have encountered in measuring fintech is the lack of readily available data and measurement. Fintech is a broad term. As a result, we believe that every bank innovation, service enhancement, or product creation is included in the fintech concept and perspective. In this study, we used commercial banks' expenses in fintech investment, digital transformation, including digital banking innovation, and investment to work with third-party fintech firms for outsourcing product and services to measure fintech. In summary, the annual report of each of the banks is checked to ensure that bank subsidiaries are not also included as separate entities in our final data set to reduce the impact of double counting.

*Table 5.1 Definition of variables*

<b><i>Variables</i></b>	<b><i>Definition</i></b>	<b><i>Type of Data</i></b>	<b><i>Sources</i></b>
<i>Efficiency</i>	Return on Equity	Ratio of return in equity for bank annual financial report	Orbis Bank Focus
<i>Profitability</i>	Return on Asset	Ratio on Return in Asset for bank annual financial report	Orbis Bank Focus
<i>Bank Risk (BkRisk)</i>	<ul style="list-style-type: none"> <li>• Bank risk index (5 indices)</li> <li>• Credit Risk (<i>CrRisk</i>)</li> <li>• Liquidity Risk (<i>LiqRisk</i>)</li> <li>• Operational Risk (<i>OpRisk</i>)</li> <li>• Market Risk (<i>MktRisk</i>)</li> <li>• Solvency Risk (<i>SolRisk</i>)</li> </ul>	<ul style="list-style-type: none"> <li>○ Non-Performing loan</li> <li>○ Total loan to total deposit</li> <li>○ Cost to income</li> <li>○ Net interest margin</li> <li>○ Capital adequacy</li> </ul>	Orbis Bank Focus

<i>Fintech (Fin)</i>	The expenses in fintech investment, digital transformation, including digital banking innovation, and investment to collaboration with third-party fintech firms.		Orbis Bank Focus
<i>Bank Size (BkSz)</i>	Natural Log of Total Asset for Bank	Total Asset ( <i>Log in Million USD</i> )	Orbis Bank Focus
<i>Bank Growth (BkGro)</i>	Growth in Total Asset	Percentage growth in total asset for bank	Orbis Bank Focus
<i>Growth Domestic Product (GDP)</i>	Percentage of annual GDP growth	GDP growth % (annual)	World Bank Indicator
<i>Inflation (Inf)</i>	Percentage of annual inflation	Inflation % (consumer price index)	World Bank Indicator

### 5.3.2 Control variables

#### 5.3.2.1 Bank size

Bank risk may all be impacted by a bank's size. Although the literature on the likely relationship between bank size and bank risk is contradictory, EU banks are now on average larger. Therefore, the size of the bank will have an impact on how well it performs in relation to bank risk (Laeven et al.,2015). Large banks may be less susceptible to idiosyncratic risk because they have greater internal diversification than small banks (Lee et al., 2020). Because of regulatory safeguards, bigger banks might become "too big to fail" (Saunders et al.,1990). This could increase large banks' incentives to engage in riskier business ventures, especially those

that don't generate interest (Demsetz and Strahan, 1997). Size and bank systematic risk are positively correlated, with large banks possibly being more sensitive to broad market fluctuations than small banks (Lee et al.,2020). It is discovered that log of assets affects the bank's performance (Bhatt and Bhattacharya, 2015). The size of the bank is determined by the log of assets (Bhatt and Bhattacharya, 2015).

### ***5.3.2.2 Bank growth***

A bank that is expanding or growth-oriented denotes increased revenue from expanding operations (Garcia-Meca et al., 2015). However, a rise in deposit growth on its own does not always signify an increase in bank profits. Deposits must be able to be turned into profitable investments by banks. Giving loan preference to borrowers with lower credit quality is one way to accomplish this (Phan et al., 2020). Additionally, deposit growth can draw in new competitors and increase market competition. This may result in lower market profits for banks. Therefore, the impact of bank growth is unknown at the outset, theoretically speaking. There is conflicting empirical data at this time. For instance, Demirguc-Kunt and Huizinga (1999) found a negative correlation between performance and bank growth; Phan et al. (2020) found a positive correlation.

### ***5.3.2.3 Bank orientation***

Many economists contend that, especially in the early phases of economic development and in contexts with weak institutional frameworks, bank-based systems are more effective at identifying good investments, maximising savings, and managing better risk. According to a study by Lee (2012), the banking industry was more significant in Germany, France, and Korea than the stock market in the U.S., the U.K., and Japan in terms of funding economic growth. Additionally, a study by Antoniou et al. (2008) indicated that neither a bank's market- or bank-

based approach toward performance has a substantial impact on performance. The lack of bank orientation as a variable makes more research on this subject necessary.

#### ***5.3.2.4 Inflation***

According to Perry (1992), inflation is characterised as a steady rise in the general level of prices in an economy. People's savings and disposable personal income both decline as a result of inflation. As a result, the bank's amount of deposits declines. Moreover, Athanasoglou et al. (2008) stated that, as inflation rises, consumer demand for goods declines, which lowers the need for bank loans. This can negatively impact the performance and earnings of the bank. Due to the fact that banks trade in nominal financial instruments, such as currency units, inflation is strongly correlated with bank health. For instance, when a bank extends a loan to a borrower, both parties agree on a specific amount that will be repaid in the future. The purchasing power of the money to be paid to the bank will, however, decline over time if the rate of inflation rises. Additionally, anticipated inflation also raises interest rates. People might therefore anticipate that banks will have to provide them higher interest rates on their deposits. As the cost of funding has grown, an increase in lending interest rates may also lead to a decline in bank loans. A borrower may decide not to apply for bank loans in the future because of this unfavourable circumstance.

#### ***5.3.2.5 Growth domestic product (GDP)***

The gross domestic product (GDP), according to Demirgüç-Kunt and Huizinga (1999) is the sum of all the goods and/or services generated inside a nation's borders within a given year. Better GDP will result in higher income for the general populace, which will raise savings rates and, in turn, increase bank deposits. The performance of the bank could benefit from a rise in GDP. In addition, Kiganda (2014) highlighted that an increase in GDP would improve the performance of the banking sector. There are three things that can affect how well banks



perform. These are operating expenses, loan loss reduction, and net interest income. In periods of economic expansion, banks perform better, and the opposite is also true. Since people's incomes are rising, the country's GDP grows as well. They may want a bank loan for this in order to extend their business activities. As a result, there is a rise in the demand for bank loans, which benefits banks' operations. According to Ongore and Kusa (2013) there is a complicated relationship between GDP and bank performance. Their research showed that the GDP had a positive correlation with return on equity but a negative correlation with return on assets. The results of their study also showed that these linkages were not important. Further research on the connection between GDP and bank performance is necessary.

*Table 5.2 Descriptive Data (Country)*

<b>COUNTRY</b>					
	<i>Frequency</i>	<i>Percent</i>		<i>Frequency</i>	<i>Percent</i>
<i>Austria</i>	9	3.9	<i>Italy</i>	19	8.3
<i>Belgium</i>	9	3.9	<i>Latvia</i>	5	2.2
<i>Bulgaria</i>	1	0.4	<i>Lithuania</i>	3	1.3
<i>Croatia</i>	3	1.3	<i>Luxembourg</i>	9	3.9
<i>Cyprus</i>	3	1.3	<i>Malta</i>	2	0.9
<i>Czech Republic</i>	11	4.8	<i>Netherlands</i>	14	6.1
<i>Denmark</i>	10	4.3	<i>Poland</i>	12	5.2
<i>Estonia</i>	2	0.9	<i>Portugal</i>	6	2.6
<i>Finland</i>	6	2.6	<i>Romania</i>	3	1.3
<i>France</i>	17	7.4	<i>Slovakia</i>	5	2.2
<i>Germany</i>	10	4.3	<i>Slovenia</i>	6	2.6
<i>Greece</i>	4	1.7	<i>Spain</i>	14	6.1
<i>Hungary</i>	8	3.5	<i>Sweden</i>	4	1.7
<i>Ireland</i>	6	2.6	<i>United Kingdom</i>	29	12.6
<b>Total Banks</b>				<b>230</b>	<b>100</b>

*Table 5.3 Descriptive data variables*

<i>Variables</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Mean</i>	<i>Std Deviation</i>
<i>Profitability</i>	-2.467	4.862	0.431	0.913
<i>Efficiency</i>	-22.379	34.556	4.188	9.764
<i>BkRisk</i>	12.640	72.240	29.464	11.225
<i>CrRisk</i>	0.005	40.801	7.976	8.550
<i>LiqRisk</i>	0.101	64.578	6.445	12.411
<i>OpRisk</i>	26.644	87.749	60.949	12.424
<i>MktRisk</i>	0.054	12.934	2.0267	1.386
<i>SolRisk</i>	1.035	57.127	13.753	5.436
<i>Fin</i>	1.106	90.669	21.653	16.012
<i>BkSz</i>	116.014	242202.993	21242.298	42619.491
<i>BkGro</i>	-18.599	47.523	3.207	7.434
<i>GDP</i>	0.267	6.286	2.034	1.133
<i>Inf</i>	0.505	2.792	1.463	0.459
<b>Total</b>	<b>2300</b>			
<b>Observations</b>				

Our descriptive data in *Table 5.2* show the percentage of each country that participated in our study. Until 2019, the EU will consist of 28 countries. According to the data that available for bank risk variables, United Kingdom has the highest commercial banks, accounting for 12.6 % of the total sample. Italy came in second with 8.3%, followed by France with 7.4%. On the other hand, Bulgaria has the lowest percentages at 0.4%.

## 5.4 Model

The following model was developed to investigate the impact of bank risk towards bank performance and the moderating role of Fintech.

### *Model 1*

*Bank Performance (BkPerf) =*

$$\beta_0 + \beta_1(BkRiskIndex) + \beta_2 (Fin) + \beta_3 (BkSize) + \beta_4(BkGro) + \beta_5(GDP) + \beta_6(Inf) + \varepsilon$$

### *Model 2*

*Bank Performance (BkPerf) =*

$$\beta_0 + \beta_1(BkRiskIndex) + \beta_2 (Fin) + \beta_3 (BkSize) + \beta_4(BkGro) + \beta_5(GDP) + \beta_6(INF) + \beta_7(BkRiskindex * Fin) + \varepsilon$$

## 5.5 Method

The partial least squares (PLS) approach of SEM combined with the multilevel analysis function was used in this investigation. This second generation of analysis offers an alternative to SEM based on covariance (Wold, 1985; Chin et al., 2010; Hair et al., 2019). This is especially beneficial when data isn't dispersed evenly (Monecke and Leisch, 2012; Hair et al., 2014). PLS-SEM (partial least squares structural equation modelling) is a method that is often used by academics in marketing and other fields in their empirical assessments (Hair et al., 2012; Rasoolimanesh and Ali, 2018; Nitzl, 2016). The development of multivariate analysis techniques has altered the empirical validation of theoretical concepts in social science and business research. In this setting, structural equation modelling (SEM) has emerged as an effective approach for estimating conceptual models that connect two or more latent constructs (Akhter et al., 2017). We chose this method after considering a few reasons and guidelines outlined by Hair et al. (2019):

First, PLS-SEM can be used, for example, when the analysis is concerned with theoretical framework testing from a prediction standpoint. Second, the structural model is complicated, containing many constructs, indicators, and/or model relationships. Third, by delving into established theories and their theoretical extensions, the research aims to add complexity to the equation (exploratory research for theory development). Fourth, the path model includes a formatively measure construct. Fifth, financial ratios and other types of data artefacts are included in the study. Sixth, the research relies on secondary data because of measurement theory, which may lack comprehensive substantiation. Seventh, sample size is limited by a small population (e.g., business-to-business research), though PLS-SEM can handle large sample sizes as well. Eighth, issues with distribution, such as a lack of normalcy, are a source of worry. Finally, for the research's follow-up analysis, latent variable scores are required.

Based on the summary, given the conditions, PLS-SEM is an appropriate method to utilise in our investigation. Furthermore, our research is based on secondary data derived from yearly financial reporting, which contains financial ratios in the majority of bank performance metrics. Meanwhile, this study methodology includes reflective and formative measure constructs. Furthermore, one of our key goals is to determine the moderating role of Fintech, which can be carefully measured using PLS-SEM. This study follows the summary in procedures and metrics for analysing and reporting PLS-SEM results (Chin et al., 2010; Ramli et al., 2019; Hair et al., 2019). The summary instructions provide a thorough explanation of the PLS-SEM results, and we follow the advice and rules of thumb as indicated. The two constituents, measurement, and structural sub-models are evaluated in the first stage of PLS-SEM. (Chin, 2010; Ramli et al., 2019), also known as structural model specification. In the second stage, the structural model that describes the link between exogenous and endogenous variables is

assessed (Ramli et al., 2019). PLS-SEM was used to determine the statistical significance of this structural model. The model is estimated and the results are evaluated in the third stage. At this point, we designated our measurement as formative and analysed the results. The bootstrap t-statistics (Ramli et al., 2019; Hair et al., 2017) were used in the final step to test whether Fintech moderates the effect of bank risk on bank performance. We also used OLS regression to run additional tests and robustness checks to verify if our model is reliable in different techniques.

## **5.6 Results and discussion**

We used the SmartPLS 3 programme (Ringle et al., 2015) to analyse the data by selecting a weighting scheme (path); the PLS algorithm has a maximum of 300 iterations. During the bootstrapping stage (one-tailed), we used a bias-corrected and accelerated (BCa) bootstrap with a sample size of 1000 and a significance threshold of 10%. The strength of the link between variables, whether direct or indirect, is represented by the value. The greater the route coefficient value, the stronger the relationship between the variables (Chin et al, 2010; Hair et al, 2019). Positive or negative signs on the route coefficient reflect the direction of the relationship between variables. Meanwhile, the *p-value* shows the results of hypothesis testing. With a *p-value* of 0.1, the hypothesis is accepted. We include path coefficients beta to demonstrate the effect of the relationship (Chin et al., 2010; Hair et al., 2019), *p-value* to check the construct's significance. We also experimented with blindfolding  $Q^2$  at the default distance of 7 metres. Values greater than zero are significant (Hair et al. 2019). According to Chin et al. (2010), a value greater than 0 indicates that the exogenous construct has predictive relevance for the endogenous construct under consideration. If 0.02 represents small relevance, 0.15 represents medium relevance, and 0.35 represents large relevance.

Table 5.4 PLS-SEM results

VARIABLES	Model A		Model B	
	Profitability	Efficiency	Profitability	Efficiency
<b>BkRiskIndex</b> $t-1$	-0.624*** (0.129)	-0.676*** (0.064)	-0.619*** (0.117))	-0.672*** (0.061)
<b>CrRisk</b>	-0.467*** (0.125)	-0.620*** (0.071)	-0.491** (0.112)	-0.634*** (0.070)
<b>LiqRisk</b>	-0.002* (0.066)	-0.164** (0.087)	-0.002 (0.080)	-0.172** (0.099)
<b>OpRisk</b>	-0.217*** (0.066)	-0.194*** (0.070)	-0.023*** (0.066)	-0.195*** (0.073)
<b>MktRisk</b>	-0.467*** (0.096)	-0.350*** (0.063)	-0.454*** (0.104)	-0.336*** (0.067)
<b>SolRisk</b>	-0.204** (0.073)	-0.102** (0.055)	-0.139** (0.080)	-0.059 (0.060)
<b>Fin</b>	0.007 (0.023)	0.034** (0.026)	-0.101** (0.071)	-0.080* (0.053)
<b>BkSz</b>	-0.062** (0.028)	0.007 (0.035)	-0.063** (0.028)	0.023 (0.032)
<b>BkGro</b>	0.042 (0.082)	0.146** (0.068)	0.014 (0.085)	0.125** (0.085)
<b>GDP</b>	0.025 (0.051)	0.039 (0.049)	0.049 (0.063)	0.053 (0.053)
<b>Inf</b>	0.007 (0.082)	-0.111* (0.058)	0.021 (0.081)	-0.096* (0.056)
<b>BkRisk*Fin</b>			0.104* (0.105)	0.057* (0.062)
<b>CrRisk*Fin</b>			0.329** (0.052)	0.627** (0.375)
<b>LiqRisk*Fin</b>			0.123 (0.242)	0.206* (0.243)
<b>OpRisk*Fin</b>			0.012*** (0.181)	0.115* (0.259)
<b>MktRisk*Fin</b>			0.048* (0.289)	0.217 (0.389)
<b>SolRisk*Fin</b>			0.058* (0.202)	0.051 (0.229)
<b>R<sup>2</sup></b>	0.437	0.517	0.443	0.537
<b>R<sup>2</sup> adj</b>	0.411	0.495	0.404	0.505
<b>Q<sup>2</sup></b>	0.357	0.438	0.383	0.436
<b>Total Observations</b>	2300			
***Sig at 0.001 (1-tailed)	**Sig at 0.05 (1-tailed)	*Sig at 0.1 (1-tailed)		

Our  $R^2$  indicates that our model is highly predictive. To check the construct's relevance, we use path coefficients beta to see the relationship effect, standard deviation, and p-value. In Model A, we discovered that bank risk had a 0.624 effect on profitability. In this case, the route coefficient is heading to the left. It reveals that bank risk has a negative impact on profitability, meaning that every 10% increase in bank risk reduces profit by 62.4%, and vice versa. At 0.001, the p-value is significant. Bank efficiency is 0.676 in Model A, with the route coefficient pointing left. It reveals that raising bank risk by 10% reduces bank efficiency by 67.6%.

We could conclude that all of the subindices of risk analysis have different results since we also performed the subindices of risk analysis. Credit risk and market risk are the most significant subindices that affect profitability, with a negative effect of 0.467 for both indices and highly significant at 0.001. Operational risk has a negative effect of 0.217, solvency risk has a negative effect of 0.204, and liquidity risk has a negative effect of 0.002. As a result, each subindex can be said to have a significant effect on bank profitability. Bank risk has a detrimental impact on profitability and efficiency, which serve as a baseline for measuring bank performance. This finding has supported the previous literature and findings by other studies by Sondakh et al. (2021), Inegbedion et al. (2020), Chen et al. (2018) that concluded and suggested bank risk has negative effect towards performance. It suggests that increasing bank risk lowers bank performance. As a result, we believe that lowering bank risk will improve bank performance. Thus, we accept our hypothesis that rising bank risk reduces bank performance and vice versa. The risk subindices, on the other hand, have a considerable effect on efficiency. The most impacted subindices are credit risk (62% negative effect on efficiency), market risk (35% negative effect), operational risk (19.4% negative effect), liquidity risk (16.4% negative effect), and solvency risk (10.2% negative effect).

We also get results from additional control variables. Bank size has a negative effect on bank performance and is statistically significant at 0.05, which means that the larger the bank, the lower the profitability. This could be because the bank's expenses, operating costs, and administration are increasing before the business generates more revenue. Bank growth has a positive effect on profitability with a coefficient of 4.2%, which means that the greater a bank yields their bank growth, the more profitable they become. GDP indicates an insignificant value outcome, with a 10% rise in GDP enhancing profitability by 2.5%. The same is true for inflation, with a 10% increase in inflation increasing profitability by 7%. Bank size, on the other hand, has the reverse effect on efficiency, with a positive 10% increase in bank size enhancing efficiency by 0.7%. Bank growth has a favourable influence on efficiency, with a 14.6% increase in efficiency for every ten percent increase in growth. GDP has a 3.9% positive influence on efficiency, although it is minor. Finally, inflation has a negative influence on efficiency, with a value of 11.1%.

We discovered that fintech has a 0.7% influence on profitability and a 3.4% effect on efficiency. Our fascinating findings on fintech's moderating impact revealed that fintech had greatly changed the link between bank risk and bank performance. Fintech alters the relationship between bank risk and performance. First, we examine the bank risk index in terms of profitability. The path coefficient value is positive 0.104, with a statistically significant p-value of 0.1. This means that every 10% increase in fintech interaction in the relationship increases profitability by 10.4%. Second, the value path coefficient moderation towards efficiency is positive 0.057 with a statistically significant p-value of 0.1. This means that every 10% increase in fintech contact in the relationship increases efficiency by 5.7%. We can also say that the total subindices have an influence when there is interaction with fintech. Credit risk has a significant value of 32.9% towards profitability with 0.05 p value and 62.7% towards



efficiency with 0.05 p value. As a result, we accept our hypothesis that fintech moderates the relationship between bank risk and bank performance. The new findings have broadened the knowledge for fintech study and complement the previous findings in fintech study including Choubey and Sharma (2021), Lee et al. (2021), Cheng and Qu (2020), and Haddad and Hornuf (2019).

## 5.7 Robustness Test

Table 5.5 OLS results

VARIABLES	MODEL 1		MODEL 2	
	Profitability	Efficiency	Profitability	Efficiency
<b>BkRiskIndex</b>	-0.198** (0.005)	-0.466*** (0.055)	-0.183** (0.006)	-0.456*** (0.067)
<b>CrRisk</b>	-0.460*** (0.006)	-0.616*** (0.073)	-0.213** (0.011)	-0.484*** (0.123)
<b>LiqRisk</b>	-0.004 (0.007)	-0.168*** (0.074)	-0.010 (0.010)	-0.130* (0.119)
<b>MktRisk</b>	-0.463*** (0.035)	-0.347*** (0.395)	-0.445*** (0.052)	-0.371** (0.604)
<b>OpRisk</b>	-0.209*** (0.030)	-0.185*** (0.339)	-0.140* (0.047)	-0.151* (0.538)
<b>SolRisk</b>	-0.197*** (0.075)	-0.098* (0.846)	-0.361*** (0.125)	-0.223** (1.447)
<b>Fin</b>	-0.148* (0.003)	-0.111** (0.037)	-0.110* (0.007)	-0.085* (0.076)
<b>Bksize</b>	-0.055 (0.000)	0.028 (0.000)	-0.066 (0.000)	0.020 (0.000)
<b>BkGro</b>	0.043 (0.005)	0.145** (0.060)	0.017 (0.005)	0.127** (0.061)
<b>GDP</b>	0.040 (0.038)	0.048 (0.433)	0.054 (0.039)	0.060 (0.447)
<b>Inflation</b>	0.040 (0.120)	-0.090 (1.361)	0.042 (0.118)	-0.087 (1.362)
<b>BkRiskIndex*Fin</b>			0.046** (0.001)	0.031** (0.002)
<b>CrRisk*Fin</b>			0.385*** (0.000)	0.200** (0.005)
<b>LiqRisk*Fin</b>			0.032 (0.000)	0.061 (0.000)
<b>MktRisk*Fin</b>			0.030* (0.002)	0.052* (0.027)
<b>OpRisk*Fin</b>			0.296* (0.000)	0.168* (0.002)
<b>SolRisk*Fin</b>			0.467* (0.001)	0.358** (0.006)
<b>R<sup>2</sup></b>	0.443	0.519	0.484	0.537
<b>R<sup>2</sup> adjusted</b>	0.415	0.495	0.445	0.502
<b>Total Observations</b>	2300			

\*\*\*Sig at 0.001 (1-tailed) \*\*Sig at 0.05 (1-tailed) \*Sig at 0.1 (1-tailed)

To ensure that our model is stable, we use OLS regression to analyse it. Two variables, profitability and efficiency, are used to assess the relationship between bank risk and bank performance. Overall, we discovered that three of the five bank risk indicators had a statistically significant negative influence on bank performance, suggesting that the robustness of our primary findings is validated by further tests.

The moderating influence of fintech on bank performance is the most important finding. It shows that the interaction of fintech into bank risk and profitability has positive significant effect of 4.6%, while the interaction of fintech into bank risk and efficiency has significant effect of 3.1%. Additional analysis for subindices also has shown an intriguing result where fintech has the most significant moderating effect on credit risk, significant with our first primary findings, with path coefficients of 38.5% and 20.0%, respectively, for profitability and efficiency. This finding demonstrates that, even when risks are examined independently, the engagement of fintech into the relationship has resulted in a better result in terms of enhancing bank performance. This has demonstrated that the use of fintech in reducing risk, such as by using algorithms to evaluate credit scoring and biometrics to prevent fraud, has helped to achieve the goal of fintech in reducing risk in the bank and enhancing bank performance (Huang et al., 2020) In conclusion, after evaluating our theoretical model with OLS regression, we established that it is resilient and produces meaningful results.

## 5.8 Summary

This chapter examines the relationship effect between bank risk and bank performance for a sample of 230 banks in 28 EU countries from 2010 to 2019 using the second-generation PLS-SEM method. Our empirical findings discover that bank risk has a significant detrimental impact on bank performance. The outcome for additional analysis indicates that market risk and credit risk have the greatest bearing on profitability. Additionally, we discovered that fintech dramatically modifies the association between bank performance and risk. It shows how fintech participation helps banks enhance risk management by lowering and controlling risks, ultimately boosting investor and customer trust. The bank will suffer if appropriate risk management is not implemented. Therefore, this study has significant implications for managers and policy makers in the EU banks by understanding the impact of bank risk towards bank performance and identifying which risk has the riskiest effect on performance. This will help them to mitigate the bank risk and make appropriate policy to perform better risk management. Fintech's intervention, on the other hand, has a substantial impact on helping banks reduce risk and so improve bank performance. In order to increase their business' competitiveness in the market and prepare for the impending shift to more digitalization banking system, policymakers and industry participants in the EU, particularly commercial banks, should think about implementing the use of fintech. They can do this by investing more in R&D for fintech solutions and working with outside fintech companies, for example. Therefore, in order to develop a novel strategy for minimising risk, banks in the EU region, both policymakers and industry players, must be willing to change.

This study has a few drawbacks. First, the data for this study originated from EU banks, specifically commercial banks, where fintech and innovation are thriving, limiting the significance of the findings to recently founded virtual banks or other types of banks like mortgage banks, investment banks, and Islamic banks. Second, the information came from

studies conducted between 2010 and 2019—previous to the pandemic that significantly altered the banking industry and the subsequent boom in the fintech industry. It is therefore advised to carry out additional research by examining the relationship between risk and bank performance in both the pre- and post-pandemic eras and how fintech has modified it. Future research should concentrate on fintech and its effects on challenger banks, shadow banks, and start-ups, which are all experiencing increased competition globally. The study's scope could also be expanded by increasing the sample size.

## Chapter 6

### Mediating the role of fintech into the relationship between ESG and bank performance

#### 6.1 Overviews

Environmental, social, and governance concerns have recently risen to the top of people's worries in various businesses. ESG practises have elevated to a priority for the major players in the industries due to climate change and other environmental changes. Even the financial industry is affected by this. A survey in 2013 from United Global Compact found that nearly 93% of CEOs viewed ESG policies as crucial to their company's success (Khan, 2022). The EU, intends to make ESG reporting more stringent starting in 2021 with a "non-financial reporting requirement." It demonstrates that the EU region has begun to seriously consider the use of ESG. Theoretical research demonstrates that the involvement of important participants in the environmental, social and governance challenges has given stakeholders a different perspective. It has aided numerous corporations in enhancing their public image while continuing to operate their businesses (Houston and Shan, 2022). It is evident in the shares of all of these companies that they rose to the top when they were able to expand and maintain their ESG as a component of their operations. However, there are many divergent opinions and arguments over how ESG affects bank performance (Buallay, 2019).

Few studies have been done on the ESG from a global viewpoint, including those by Shaikh (2022) and Al Hawaj and Buallay (2022), as well as by Aouadi and Marsat (2018), Minutolo et al. (2019), and Xie et al. (2019). Numerous studies have been undertaken in countries' perspectives, including those by Buallay et al. (2020) and Ruan and Liu (2021) in China's market-based, Ting et al. (2019) and Buallay et al. (2021) in studies of developed and

developing countries, Garcia et al. (2017) in emerging market research, Fahad and Busru (2021), Buallay et al. (2020) for OIC member's Islamic bank. Studies on the US market have been carried out by a select group of academics, including Alareeni and Hamdan (2020), Consolandi et al. (2020), Brogi and Lagasio (2019), and Fatemi et al. (2018). While, Garcia et al. (2017), conducted research on the BRICS nations (Brazil, Russia, India, China and South Africa). Looking at the studies on ESG that have been done in other countries, some examples include Chen and Yang (2020) in the Taiwan market, Yoon et al. (2018) in the Korea market, Dalal and Thaker (2019) in the India market, Atan et al. (2018) and Atan et al. (2016) in the Malaysian market, and Lokuwaduge and Heenetigala (2017) in the market for Australia. In the meantime, there are studies in the European market based on Landi and Sciarelli (2019) in the Italian market and Velte (2017) in the German market, as well as Buallay (2019) and Chiaramonte et al. (2021), who are undertaking research especially using European data. There are studies on the banking industry from Miralles-Quirós et al. (2019), and Birindelli et al. (2019). (2018). Additionally, Buallay (2019) used European banks to conduct the study.

On the other side, the role of fintech in Banking 4.0 has generated a lot of heated discussion across various businesses, including the banking sector. In many businesses' shift into the new era of industry employing technology, the role of fintech has soared and blossomed. Fintech is still in its infancy, but little study has been done on the performance of related industries including start-up, venture capital, and cryptocurrencies. The current environmental concerns have led to a number of new advancements in technology and financial management. In the context of the digital revolution, fintech has emerged as an alternative to traditional financial institutions. The Financial Stability Board (2017) states that the term "fintech" is frequently used to describe a wide range of financial technology applications, operational procedures, and innovative products at the forefront of financial innovation through technical approaches.

Digital technologies, including the internet, mobile computing, and data analytics, are referred to as fintech when they facilitate, innovate, or disrupt financial services, according to Gimpel et al. (2018). Fintech, in general, refers to technological advancements made in a variety of financial services industries that are regularly used by customers. Examples include online banking and mobile payments. Fintech is able to improve the overall process effectiveness of the financial industry by extending the boundaries of financial tradition and altering consumer spending habits to reflect information technology improvements (Lee et al., 2021; Demertzis et al., 2018). The business economy will be impacted by fintech innovation, including revenue, costs, and profit margins (Schueffel, 2016). Based on our understanding of previous comprehensive literature fintech (Zhao et al., 2022; Cho and Chen, 2021; Chueca Vergara and Ferruz Agudo, 2021; Chang et al., 2021; Choubey and Sharma, 2021; Lee et al., 2021; Wang et al., 2021; Basyareh and Wadi, 2021; Cheng and Qu, 2020; Haddad and Hornuf, 2019; Phan et al., 2019), we find that fintech has a favourable and significant impact on performance in the majority of organisations. It is crucially necessary to determine how fintech impacts the relationship between the ESG and bank performance.

Relevant studies are still lacking, though. The use of fintech could help to mitigate the environmental problems associated with paper waste in normal bank operations (Chueca Vergara and Ferruz Agudo, 2021) For instance, by applying for a loan online, less paper can be used since no hard copies of the required documents are required. Using big data and artificial intelligence, all of the records might be safely kept (Chen et al, 2021). Blockchain, for instance, can be used to methodically organise the file. Fintech could potentially improve the social impact of banking. Better technology will make work easier and less stressful for employees, as well as aid to eliminate human mistake. It will also help to make work routines more systematic. This will result in content employees who have better peace of mind at work.



More fintech experts are required as the field is explored more. Fintech will reduce the amount of human capital needed for some banking tasks, but it will also create more new job opportunities because there will be a greater need for fintech specialists. The hopes of banks around the world have grown as a result of technological improvements in terms of attaining a significant position in global finance (Cho and Chen, 2021).

Using blockchain to improve the know your customer (KYC) procedure in credit applications, for example, will minimise fraud and data mismatches, which help for better bank governance. According to Ji and Tia (2021), widespread usage of blockchain in fintech, for example, has helped reduce fraud and the danger of human mistake, lowering operational risk in daily transactions. Blockchain in fintech improves data storage and transformation security, provides a decentralised and transparent network infrastructure, and significantly lowers operational costs (Sinha and Bathla, 2019). As a result, the openness and accountability of blockchain, which result from methodical management in fintech, have a good and significant impact on all elements of business intelligence efficiency. Banks can monitor and minimise their risks, allowing them to carry on with their normal operations. Investing in fintech, on the other hand, will make banks more competitive and systematic in practising their ESG, leading to enhanced bank performance (Chiaromonte et al., 2021). To deal with financial innovation's expanding influence in the economy, policymakers must improve operating performance, provide more diverse financial services at lower costs, and boost sector competitiveness. These goals have far-reaching economic and policy ramifications, prompting additional research into the impact of financial innovation on banks.

From prior studies on ESG and its impact on bank performance as well as information about fintech in the banking sector, we may infer the following: First, there is a dearth of research on ESG and its effects on particular bank performance in the banking industry. We stated that

prior research, such as Buallay (2019), which used a banking sample from countries in Europe specifically for her study, had produced conflicting findings. Additionally, none of the current research used a sizable sample or particular commercial bank characteristics. These studies therefore fall short of understanding the connection between ESG and bank performance in other regions, such as the EU region. Second, based on our research, the majority of earlier studies merely served to broaden the body of knowledge about environmental, social, and governance factors and bank performance by using various regional samples. None of them had tried out fintech or included it in the current study. We are motivated to perform a new study in order to improve our grasp of the existing literature, add to the body of knowledge, and explore new literature in the field of fintech research as a result of this gap in the literature. We fill this gap by doing fresh research on the effects of ESG in the banking sector using commercial banks from the EU. Our study's inclusion of fintech to see if it has any observable effects on this connection, is its most intriguing feature.

This study contributes to a variety of areas. To begin, the study expects to contribute to a diverse sampling of regions. As far as we know, ESG has been extensively studied in other regions. Nonetheless, the result is equivocal because the results for other EU countries may differ. Thus, utilising the most recent EU sample, we were able to see new expectations and results from the relationship between ESG and bank performance, contributing to new study discoveries in this field. Second, this research adds to the growing body of knowledge about Fintech as a mediator in the relationship between ESG and bank performance. Because fintech is still in its infancy, this study will contribute to a better understanding of its function in banking. Insights into financial institutions in particular, as well as the rest of the sector in general. Finally, this study contributed to the methodological section by employing a method from the second generation of data analysis, namely partial least square structural equation

modelling, or PLS-SEM. To our knowledge, the PLS-SEM approach has never been employed in previous work (method contribution), which has only used first-generation methods like GMM and OLS regression (Aslam and Haron, 2020; Boachie, 2021).

## **6.2 Theory and hypotheses**

Stakeholder theory proposes that managers of businesses have responsibility to a certain group of stakeholders (Freeman, 2015). According to this notion, a company's objective is to create value for its stakeholders. Involved parties, also known as stakeholders, are those who have the potential to directly or indirectly impact the company (Freeman, 2015). Internal and external stakeholders make up the two categories of stakeholders. The company's management, employees, and investors are examples of internal stakeholders. External stakeholders are those who are not part of the business, such as the neighbourhood in which it is located, its clients and suppliers, the government and non-governmental organisations, as well as investors and creditors. Stakeholders play a crucial role in ensuring the company's viability and performance (Freeman et al., 2010), and as a result, their impact on business operations is significant. As a result, this idea serves as the foundation for fintech investment and ESG practises. Through ESG practises and financial investments in fintech, the role of shareholders dictates how the business interacts with stakeholders. As a result, the performance of banks will be greatly impacted by this study on Fintech investments and ESG standards.

### ***6.2.1 ESG and bank performance***

ESG investment is already substantial and continuing to increase (Khan, 2022). There is a lengthy and extensive body of literature on the connection between ESG activities and corporate performance. There mixed result of negative and positive related to ESG. Buallay et al. (2021) examines 882 banks from developed and developing countries covering 11 years after the 2008 financial crisis. Using pooling regression and instrumental variable GMM, the

study finds that ESG weakens banks' performance in developed and developing countries. Ruan and Liu (2021) analysed samples of China's Shanghai and Shenzhen A-share listed companies using OLS regression using ESG rating data from 2015 to 2019. They discover that corporate ESG initiatives has significant negative effect towards firm performance. Fahad and Busru (2021) looked at the impact of CSR disclosure using panel regressions for the final sample of 386 Indian companies listed on the BSE 500 index, representing all of the major players in the capital market over a ten-year period from 2007–2016. The research reveals a pattern of a negative impact of CSR disclosure, as reflected by ESG, on Indian company profitability and firm value. In their study on Italian companies listed utilising Panel data analysis, Landi and Sciarelli (2019) discovered a negative and statistically significant impact of ESG in terms of market premium, while they were engaging in socially responsible investing (SRI). In their comparative study of rising nations Malaysia and Denmark as the standard of best practise, Atan et al. (2016) found no correlation between ESG disclosure level and firm's financial success for the Top 100 largest companies listed in each Bursa Malaysia and Nasdaq.

The majority of research show that, nevertheless, ESG information disclosure, rating, and other activities have a greater favourable impact on business performance. In their study employing a sample of European banks operating in 21 countries between 2005 and 2017, Chiaramonte et al. (2021) discovered that the total ESG score, as well as its sub-pillars, reduces bank fragility during times of financial difficulty. The impact of environmental, social, and governance performance on the economic success of the Standard & Poor's 500 firms was assessed by Cek and Eyupoglu (2020). Using longitudinal data covering the years from 2010 to 2015, structural equation modelling and linear regression have been used to assess the overall and individual influence of environmental, social, and governance (ESG) performance on economic performance. The whole ESG approach and economic success were significantly correlated.

They discovered a substantial correlation between economic performance and the entire ESG strategy. Alareeni and Hamdan (2020) examined if there are associations between corporate disclosure of environmental, social, and governance (ESG) and firms' operational (ROA), financial (ROE), and market performance (Tobin's Q), and whether these associations are favourable, unfavourable, or neutral. US S&P 500 listed businesses from 2009 to 2018 are included in the study sample. ESG disclosure has been shown to have a favourable impact on a firm's performance metrics using panel regression analysis. The importance of ESG materiality and its intensity in determining stock returns were examined by Consolandi et al. in 2020. The Sustainability Accounting Standards Board (SASB) classifications of materiality were adopted, and using data from a sizable sample of U.S. companies represented in the Russell 3000 from January 2008 to July 2019, they discovered that not only do ESG rating changes (ESG momentum) have a consistent impact on equity performance, but also that the market appears to favour companies that operate in sectors with a high level of concentration of ESG materiality.

According to Chen and Yang (2020), financial markets have ESG momentum effects as a result of investors routinely exaggerating corporate ESG information. Investors react positively to positive news about companies with higher ESG scores but negatively to negative news about companies with lower ESG ratings. According to empirical findings, an ESG momentum strategy can produce significant short-term gains and long-term losses, supporting the overreaction theory. Through several measures of return on asset and Tobin's Q ratio, Dalal and Thaker (2019) investigated the impact of ESG issues on the profitability and firm value of Indian public limited enterprises. They discovered that high business ESG performance improves financial performance as measured by accounting and market-based indicators using random effect panel data regression analysis from 65 Indian companies in the ESG database. In the context of emerging markets, Shakil et al. (2019) investigated the implications of banks'

ESG performance on their financial performance. This study used the ESG performance data of 93 emerging market banks from 2015 to 2018 and used the generalised method of moments (GMM) technique for estimation purposes due to the dynamic nature of the data and to correct for endogeneity. They discovered a positive correlation between the environmental and social performance of emerging market banks and their financial performance. In their analysis of 467 S&P 500 companies from 2009 to 2015, Minutolo et al. (2019) showed that ESG scores have a positive impact on business performance as assessed by Tobin's Q and return on assets.

Environmental, social, and governance (ESG) concerns and corporate market value were studied by Aouadi and Marsat (2018). Surprisingly, the primary finding demonstrates that ESG concerns are connected with higher business value using a unique dataset of more than 4000 firms from 58 countries between 2002 and 2011. Using return on assets as a metric of profitability, Brogi and Lagasio (2019) looked into the relationship between environmental, social, and governance (ESG) disclosure and business success (ROA). The statistical model is performed on 17,358 observations and analyses the association of ROA and the three main dimensions of ESG score using the ESG score of a large sample of U.S. listed businesses data from 2000 to 2016. They discovered a strong link between ESG and profitability that was considerable and favourable. In her study for the European banking sector, Buallay (2019) analysed 235 institutions over a ten-year period (2007–2016), yielding 2,350 observations. ESG disclosure serves as the independent variable, while the performance indicators (return on assets, return on equity, and Tobin's Q) serve as the dependent variables. The author found that ESG had a positive impact on performance. To find out whether businesses concerned with environmental, social, and governance (ESG) issues can still be successful and efficient, Xie et al. (2019) looked into the relationship between corporate sustainability and efficiency. They discovered that ESG disclosure has a positive association with corporate efficiency at the

moderate disclosure level, as opposed to the high or low disclosure levels, by estimating corporate efficiency using data envelopment analysis (DEA) and looking into the nonlinear relationship between corporate efficiency and ESG disclosure. Following governance information disclosure are social and environmental information disclosure, which have the strongest positive relationships with corporate effectiveness.

Ting et al. (2019) looked at how environmental, social, and governance (ESG) activities within businesses affected their financial performance. Additionally, it contrasts how corporate social performance initiatives affect valuation in both developed and emerging market enterprises. This study found that ESG activities have a significant beneficial impact on the firm performance using ESG ranking scores from the Thomson Reuters database and a sample of 1317 emerging market firms and 3569 developed market firms. Fatemi et al. (2018) looked into how environmental, social, and governance (ESG) actions and their transparency affected firm value. They used data on ESG strengths and ESG concerns as compiled and reported by KLD Research and Analytics as proxies for a firm's ESG performance and used Bloomberg's ESG disclosure score (DISC) as an indicator of the extent of a firm's ESG disclosure using empirical analysis based on data for 1640 firm-year observations for publicly traded U.S. firms for the years 2006 to 2011. The research discovered that ESG firm value is increased by strengths and decreased by shortcomings. Yoon et al. (2018) investigated whether a company's corporate social responsibility (CSR) had a substantial impact on enhancing its market value in Korea, a rising market. In order to assess CSR performances and look into how they affect firm valuation, the study used environmental, social, and corporate governance (ESG) scores. From the findings, CSR policies have a favourable and considerable impact on a company's market.

Aouadi and Marsat (2018) explored the association between environmental, social, and governance (ESG) concerns and corporate market value. Using a unique dataset of over 4000 enterprises from 58 countries between 2002 and 2011, their primary analysis reveals that ESG concerns are connected with higher firm value. Velte (2017) focuses on environmental, social, and governance performance (ESGP) as a whole and divides it into components, evaluating their impact on financial performance (FINP). The study covers a sample of firms listed on the German Prime Standard from 2010 to 2014 with 412 firm-year observations. A correlation and regression analysis was performed to assess potential relationships between ESG as determined by Thomson Reuters' Asset4 database and accounting and market-based FINP measures (Return on Assets (ROA) and Tobin's Q). The study discovered that ESGP has a positive effect on ROA but has no effect on Tobin's Q. Although the outcomes on ESG towards firm performance vary, we feel that the good influence outweighs the negative effect. As a result, we assume:

**Hypothesis 1:** *There is positive effect of ESG towards bank performance.*

### **6.2.2 Fintech and bank performance**

Zhao et al. (2022) used patent data and a fintech development index to assess the influence of financial technology innovation on Chinese bank performance, and discovered that fintech innovation reduces bank profitability and asset quality. In their study of fintech in Chinese banking using the system-GMM model, Cho and Chen (2021) discovered that the greater the banks' proportion of mobile device transactions and the volume of third-party payment transactions, the higher the cost productivity growth rate. It shows that fintech has some effect into the productivity.

### **6.2.3 Fintech and ESG**

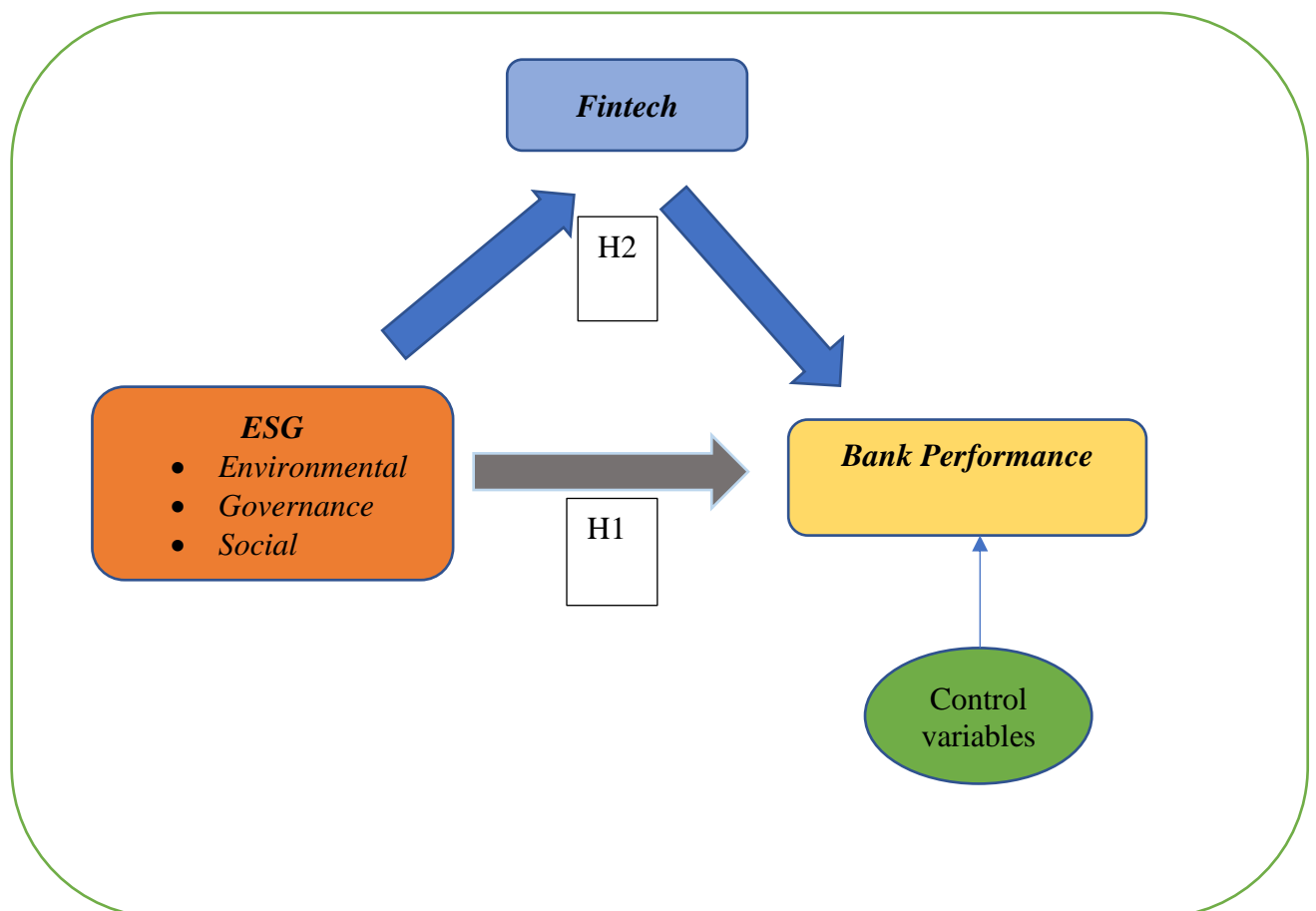
Chueca Vergara and Ferruz Agudo (2021) conducted a study using a literature review and case study approach to examine the relationship between fintech and ESG, from both a theoretical



and descriptive standpoint. The findings suggest that ESG and fintech have many similarities, and that fintech can make financial organisations more environmental overall by supporting green financing. Chang et al. (2021) use data envelopment analysis (DEA) and panel data analysis to investigate the interacting effects of digital finance and environmental, social responsibility, and corporate governance (ESG) performance on corporate financing efficiency. The empirical findings show that higher ESG performance and digital finance improve corporate financing efficiency at the 1% significance level, and that digital finance mitigates the positive marginal effect of ESG performance on corporate financing efficiency. In conclusion, we discovered conflicting results regarding how Fintech affects ESG and bank performance. Our novel hypothesis on the mediating role of fintech in the relationship between ESG and bank performance are as follows:

**Hypothesis 2:** *Fintech mediates the relationship between ESG and bank performance.*

Figure 6.1 Theoretical Framework



## **6.3 Methodology**

### **6.3.1 Data**

Secondary data was collected from financial and annual reports published by commercial banks in 28 EU during a ten-year period between 2010 and 2019. The European countries are the leading countries when it comes to advocating better ESG development (Buallay, 2018). We selected the listed commercial banks on the EU countries as our research object as they are supporting the social and economic development which has the same asset base that will be easy to make comparison. Presently, banking sector plays an important root for development and growth of the EU economy by facilitating the financial transactions. Furthermore, data show that commercial banks in the EU focused more on fintech innovations and digital transformation in 2019, including electronic payments, online and mobile services, according to the European Banking Federation (EBF, 2020). As a result, we focused on commercial banking, one of EU's most important areas of depository institutions. We incorporate a number of variables in the empirical study to analyse the factors that influence commercial bank performance, three of which are ESG score ratings as indicators to construct the major independent on assessing ESG: Environmental score, Governance score, and Social score. The results came from Refinitiv's database (previously known as Thomson Reuters data). In the meanwhile, we utilise profitability, namely Return on Asset (ROA), as the indicator to assess the success of the bank (Brogi and Lagasio, 2019). We choose return on assets (ROA) as our benchmark because this statistic shows how profitable a business is in comparison to its total assets. Management, analysts, and investors can assess a company's ROA to see if its resources are being used profitably. On a bank level, we also include two control factors, such as bank size and bank growth. Additionally, we included two macroeconomic level controls, including GDP growth and inflation for each nation. The impact of other variables on bank performance can be better understood by all these metrics.

Fintech measurement is now being studied in a variety of approaches by academics. One of the difficulties that scholars have encountered in measuring fintech is the lack of readily available data and measurement. Fintech is a broad term. As a result, we believe that every bank innovation, service enhancement, or product creation is included in the fintech concept and perspective. In this study, we used commercial banks' expenses in fintech investment, digital transformation, including digital banking innovation, and investment to work with third-party fintech firms for outsourcing product and services to measure fintech. In summary, the annual report of each of the banks is checked to ensure that bank subsidiaries are not also included as separate entities in our final data set to reduce the impact of double counting.

*Table 6.1 Definition of variables*

<b>Variables</b>	<b>Definition</b>	<b>Type of Data</b>	<b>Sources</b>
<i>Bk performance</i>	<i>Profitability</i>	<i>Return on Asset (ROA)</i>	<i>Orbis Bank Focus</i>
<i>ESG Index (ESGIndex)</i>	<ul style="list-style-type: none"> <li>• <i>Environmental Score (Env_score)</i></li> <li>• <i>Governance Score (Env_Score)</i></li> <li>• <i>Social Score (Soc_Score)</i></li> </ul>	<i>Scores/Rating for each of banks that published in the database</i>	<i>Refinitiv</i>
<i>Fintech (Fin)</i>	<i>The expenses in fintech investment, digital transformation, including digital banking innovation, and investment to collaboration with third-party fintech firms.</i>	<i>Annual Financial Report</i>	<i>Orbis Bank Focus</i>
<i>Bank Size (BkSz)</i>	<i>Natural Log of Total Asset for Bank</i>	<i>Total Asset (Log in Million USD)</i>	<i>Orbis Bank Focus</i>

<i>Bank Growth (BkGro)</i>	<i>Growth in Total Asset</i>	<i>Percentage growth in total asset for bank</i>	<i>Orbis Bank Focus</i>
<i>Growth Domestic Product (GDP)</i>	<i>Percentage of annual GDP growth</i>	<i>GDP growth % (annual)</i>	<i>World Bank Indicator</i>
<i>Inflation (Inf)</i>	<i>Percentage of annual inflation</i>	<i>Inflation % (consumer price index)</i>	<i>World Bank Indicator</i>

### **6.3.2 Control variables**

#### **6.3.2.1 Bank size**

ESG may all be impacted by a bank's size. Compared to small size banks, large size banks typically engage in ESG more. According to research by Birindelli et al. (2018), a bank's size has a significant impact on its practises regarding ESG and financial performance. It is discovered that log of assets affects the bank's performance (Bhatt and Bhattacharya, 2015). The size of the bank is determined by the log of assets (Bhatt and Bhattacharya, 2015).

#### **6.3.2.2 Bank growth**

A bank that is expanding or growth-oriented denotes increased revenue from expanding operations (Garcia-Meca et al., 2015). However, a rise in deposit growth on its own does not always signify an increase in bank profits. Deposits must be able to be turned into profitable investments by banks. Giving loan preference to borrowers with lower credit quality is one way to accomplish this (Phan et al., 2020). Additionally, deposit growth can draw in new competitors and increase market competition. This may result in lower market profits for banks. Therefore, the impact of bank growth is unknown at the outset, theoretically speaking. There is conflicting empirical data at this time. For instance, Demirguc-Kunt and Huizinga (1999) found a negative correlation between performance and bank growth; Phan et al. (2020) found a positive correlation.

### **6.3.2.3 Inflation**

According to Perry (1992), inflation is characterised as a steady rise in the general level of prices in an economy. People's savings and disposable personal income both decline as a result of inflation. As a result, the bank's amount of deposits declines. Moreover, Athanasoglou et al. (2008) stated that, as inflation rises, consumer demand for goods declines, which lowers the need for bank loans. This can negatively impact the performance and earnings of the bank. Due to the fact that banks trade in nominal financial instruments, such as currency units, inflation is strongly correlated with bank health. For instance, when a bank extends a loan to a borrower, both parties agree on a specific amount that will be repaid in the future. The purchasing power of the money to be paid to the bank will, however, decline over time if the rate of inflation rises. Additionally, anticipated inflation also raises interest rates. People might therefore anticipate that banks will have to provide them higher interest rates on their deposits. As the cost of funding has grown, an increase in lending interest rates may also lead to a decline in bank loans. A borrower may decide not to apply for bank loans in the future because of this unfavourable circumstance.

### **6.3.2.4 GDP**

The gross domestic product (GDP), according to Demirgüç-Kunt and Huizinga (1999) is the sum of all the goods and/or services generated inside a nation's borders within a given year. Better GDP will result in higher income for the general populace, which will raise savings rates and, in turn, increase bank deposits. The performance of the bank could benefit from a rise in GDP. In addition, Kiganda (2014) highlighted that an increase in GDP would improve the performance of the banking sector. There are three things that can affect how well banks perform. These are operating expenses, loan loss reduction, and net interest income. In periods of economic expansion, banks perform better, and the opposite is also true. Since people's incomes are rising, the country's GDP grows as well. They may want a bank loan for this in

order to extend their business activities. As a result, there is a rise in the demand for bank loans, which benefits banks' operations. According to Ongore and Kusa (2013) there is a complicated relationship between GDP and bank performance. Their research showed that the GDP had a positive correlation with return on equity but a negative correlation with return on assets. The results of their study also showed that these linkages were not important. Further research on the connection between GDP and bank performance is necessary.

*Table 6.2 Descriptive data (Country)*

<b>COUNTRY</b>					
	<b>Frequency</b>	<b>Percent</b>		<b>Frequency</b>	<b>Percent</b>
<i>Austria</i>	<i>12</i>	<i>8.7</i>	<i>Italy</i>	<i>12</i>	<i>8.7</i>
<i>Belgium</i>	<i>5</i>	<i>3.6</i>	<i>Latvia</i>	<i>1</i>	<i>0.7</i>
<i>Bulgaria</i>	<i>6</i>	<i>4.3</i>	<i>Lithuania</i>	<i>1</i>	<i>0.7</i>
<i>Croatia</i>	<i>2</i>	<i>1.4</i>	<i>Luxembourg</i>	<i>8</i>	<i>5.8</i>
<i>Cyprus</i>	<i>0</i>	<i>0.0</i>	<i>Malta</i>	<i>1</i>	<i>0.7</i>
<i>Czech Republic</i>	<i>1</i>	<i>0.7</i>	<i>Netherlands</i>	<i>5</i>	<i>3.6</i>
<i>Denmark</i>	<i>10</i>	<i>7.2</i>	<i>Poland</i>	<i>3</i>	<i>2.2</i>
<i>Estonia</i>	<i>1</i>	<i>0.7</i>	<i>Portugal</i>	<i>7</i>	<i>5.1</i>
<i>Finland</i>	<i>2</i>	<i>1.4</i>	<i>Romania</i>	<i>4</i>	<i>2.9</i>
<i>France</i>	<i>9</i>	<i>6.5</i>	<i>Slovakia</i>	<i>0</i>	<i>0.0</i>
<i>Germany</i>	<i>10</i>	<i>7.2</i>	<i>Slovenia</i>	<i>1</i>	<i>0.7</i>
<i>Greece</i>	<i>4</i>	<i>2.9</i>	<i>Spain</i>	<i>10</i>	<i>7.2</i>
<i>Hungary</i>	<i>4</i>	<i>2.9</i>	<i>Sweden</i>	<i>4</i>	<i>2.9</i>
<i>Ireland</i>	<i>4</i>	<i>2.9</i>	<i>United Kingdom</i>	<i>11</i>	<i>8.0</i>
<b>Total Banks</b>				<b>138</b>	<b>100</b>

Table 6.3 Descriptive data variables

	Minimum	Maximum	Mean	Std. Deviation
<b>BkPerf</b>	-0.952	5.779	0.684	0.738
<b>ESGIndex</b>	28.640	83.160	68.468	10.439
<b>Env_score</b>	23.140	94.990	70.774	15.785
<b>Gov_score</b>	25.660	82.370	59.720	13.058
<b>Soc_score</b>	18.550	96.110	74.909	14.445
<b>Fin</b>	1.432	9326.179	632.406	1440.624
<b>BkSz</b>	1014.274	1644059.490	262888.191	408460.835
<b>BkGro</b>	-7.075	35.332	4.635	6.080
<b>GDP</b>	0.267	6.286	1.914	1.135
<b>Inf</b>	0.551	2.792	1.489	0.466
<b>Valid N (listwise)</b>	1380			

Table 6.4 Correlation ESG Index

		<b>ESGIndex</b>	<b>Env_score</b>	<b>Gov_score</b>	<b>Soc_score</b>
<b>ESGIndex</b>	<i>Pearson</i>	1	.742**	.653**	.767**
	<i>Correlation</i>				
	<i>Sig. (1-tailed)</i>		.000	.000	.000
<b>Env_score</b>	<i>Pearson</i>		1	.184*	.349**
	<i>Correlation</i>				
	<i>Sig. (1-tailed)</i>			.015	.000
<b>Gov_score</b>	<i>Pearson</i>			1	.311**
	<i>Correlation</i>				
	<i>Sig. (1-tailed)</i>				.000
<b>Soc_score</b>	<i>Pearson</i>				1
	<i>Correlation</i>				
	<i>Sig. (1-tailed)</i>				

\*\* . Correlation is significant at the 0.01 level (1-tailed). \* . Correlation is significant at the 0.05 level (1-tailed).

Our descriptive data in *Table 6.2* show the percentage of each country that participated in our study. Until 2019, the EU will consist of 28 countries. However, there are 2 countries that has no consistent data on ESG and fintech namely Cyprus and Slovakia, thus we dropped these two countries in our analysis. According to the data, Austria and Italy has the highest bank with ESG scoring published in the Refinitiv with 8.7% commercial banks as their ESG score for Austria and Italy, followed by United Kingdom 8.0%.

Our descriptive data in *Table 6.3* shows the descriptive result on variables. As can be seen that bank. Profitability has minimum of -.0952 and maximum of 5.779. it is a normal for certain bank that having negative in their ROA as it could be the proses of earning the profit after certain condition of instability. Meanwhile the ESG index show the minimum of 28.60 and maximum score of 83.61.

*Table 6.4* denoted the result of correlation among ESG indexes whereby all the three pillars of ESG namely Environmental, Social and Governance has positively and significant relation with the ESG index. Thus, we could say that our ESG index are reliable to be measure and analyse.

#### **6.4 Model**

The following model was developed to investigate the impact of ESG towards bank performance and the mediating role of Fintech.

$$\begin{aligned}
 \text{Bank Performance (BkPerf)} = & \\
 & \beta_0 + \beta_1(\text{ESGIndex}) + \beta_2 (\text{Fin}) + \beta_3 (\text{BkSize}) + \beta_4(\text{BkGro}) + \\
 & \beta_5(\text{GDP}) + \beta_6(\text{Inf}) + \varepsilon
 \end{aligned}$$



## **6.5 Method**

The data for our result is run through SmartPLS 3.0. This study utilised the SEM partial least squares (PLS) method along with the multilevel analysis function. SEM based on covariance can be replaced with this second generation PLS-SEM technique (Wold, 1985; Chin et al., 2010; Hair et al., 2019). This is especially beneficial when data isn't dispersed evenly (Monecke and Leisch, 2012; Hair et al., 2014). PLS-SEM can be used to properly measure the mediating role of Fintech as part of this study's methodology. In its most basic form, mediation describes how or how a dependent variable (Y) is impacted by an independent variable (X) through an intermediary variable, called a mediator (M) (Baron and Kenny, 1986). The most extensively used method for testing mediation has been regression analysis, which has been proposed by a number of researchers such as MacKinnon et al. (2002) and Wood et al. (2008). PLS-SEM is superior to the regression technique for determining a mediator's value (Preacher & Hayes, 2004; Chin ,1998). Our model was further tested further and subjected to robustness checks using OLS regression to see if it held up across various methodologies.

## 6.6 Results and discussion

Table 6.5 PLS-SEM results

<i>Variables</i>	<i>BkPerf</i>	
	<i>Model A</i>	<i>Model B</i>
<i>ESGIndex</i> $t-1$	0.869*** (0.027)	0.869*** (0.027)
<i>Env_score</i>	0.689*** (0.046)	0.689*** (0.046)
<i>Gov_score</i>	0.779*** (0.066)	0.779*** (0.066)
<i>Soc_score</i>	0.379*** (0.090)	0.379*** (0.090)
<i>BkSz</i>	0.182*** (0.042)	0.182*** (0.042)
<i>BkGro</i>	0.005 (0.045)	0.005 (0.045)
<i>GDP</i>	0.055* (0.038)	0.055* (0.038)
<i>Inf</i>	-0.052* (0.035)	-0.052* (0.035)
<i>Fin</i>	0.035 (0.040)	0.185*** (0.042)
<i>Fin&gt;ESGIndex</i>		0.213*** (0.049)
<i>Fin&gt;Env_score</i>		0.235*** (0.047)
<i>Fin&gt;Gov_score</i>		0.254*** (0.056)
<i>Fin&gt;Soc_score</i>		0.053* (0.061)
<i>R<sup>2</sup></i>	0.830	
<i>R<sup>2</sup> adj</i>	0.822	
<i>Q<sup>2</sup></i>	0.789	
<i>Total Observations</i>	1380	

\*\*\*Sig at 0.001 (1-tailed) \*\*Sig at 0.05 (1-tailed) \*Sig at 0.1 (1-tailed)

The outcome of PLS-SEM is shown in *Table 6.5*. The ESG index from Model A exhibits a positive influence with a 0.869 highly significant p value. It means that increasing ESG by 10% will result in an increase in bank profitability of 86.9%, and vice versa. This result has provided support for earlier research by Chiaramonte et al. (2021), Alareeni and Hamdan (2020), Dalal and Thaker (2019), Shakil et al. (2019), Minutolo et al. (2019), Brogi and Lagasio (2019), Buallay (2019), Ting et al. (2019), and Velte (2017). Our hypothesis that ESG has a significant, positive impact on bank performance is thus accepted.

With regard to the control variables, we discover that bank size has a favourable impact on bank profitability, with a 0.182 path coefficient and being statistically significant. It demonstrates that a 10% increase in bank size will result in an approximately 18.2% rise in bank profitability. Positive path coefficient for bank growth is 0.005, however the p value is not statistically significant. Bank profitability is positively impacted by GDP by 0.055 with a p value of 0.1. It demonstrates that every 10% increase in bank growth will result in a 5.5% rise in performance. On the other hand, inflation has a detrimental impact on the performance of banks, with a 10% increase in inflation lowering profitability to 5% and vice versa. The fintech variable in model A improves bank performance by 3.5%, but this effect is not statistically significant. This demonstrates that the performance of banks is not directly impacted by Fintech.

We discovered exciting results in the model B when we conducted the mediating impact to see the direct and direct effect of Fintech towards ESG and bank performance. While fintech doesn't directly affect bank performance, we find that it has a significant impact on improving ESG performance, which will indirectly boost bank performance. The outcome demonstrates that the mediating effect has a significant p value less than 0.001 positive 0.213 path

coefficient. It means that the indirect boost in bank performance due to Fintech's mediating influence will reach 21.3%. Thus, we accept our second hypotheses that Fintech mediates the relationship between ESG and bank performance.

For each score, we also conducted extra study to determine which score index had the most significant impact on ESG and which score had a favourable impact when fintech mediated the relationship between ESG and bank performance. First, the Environmental Score in the first Model A has a substantial positive influence of 0.689 path coefficient towards ESG. This implies that with a 10% increase in the Environmental score, bank performance will also climb by 68.9%, and vice versa. Meanwhile, on model B, the mediating impact of fintech into the relationship has indirectly improved bank performance to the 23.5 percent for environmental score. Second, with a 0.779 path coefficient and 0.001 p value, the governance score exhibits a substantial beneficial influence. According to the data, bank performance will rise by 77.9 % for every 1% improvement in governance score. Furthermore, the mediating role of fintech in the relationship between governance score and bank performance has indirectly improved it by 25.4%. Third, the social score positively affects bank performance, with a positive path coefficient of 0.379 positive significant value. It demonstrates that every 10% growth in social score will result in a 37.0% increase in bank performance, and vice versa. On the other hand, the model B saw a positive effect of 5.3 % as a result of the mediating role that fintech had in the interaction. Overall, we discover that the governance score has the biggest impact on how well a bank performs, with the environmental and social scores coming in second and third.

## 6.7 Robustness test

We carry out robustness analysis in SPSS using another method, OLS regression, to make sure our model is reliable. There are procedures that must be followed when doing an SPSS-based mediation analysis to guarantee a reliable outcome. Using bivariate regression, we first calculate the overall effect between X and Y. Using bivariate regression, we then evaluate the direct effect between X and M. Then, we evaluate the direct effect between M and Y using multiple regression with X and M as predictors and Y as the dependent variable. Finally, we estimate and test indirect effect for statistical significance. We measure the value using the Sobel Test and the standard error (SE) and beta coefficient results.

Figure 6.2 Robustness Test

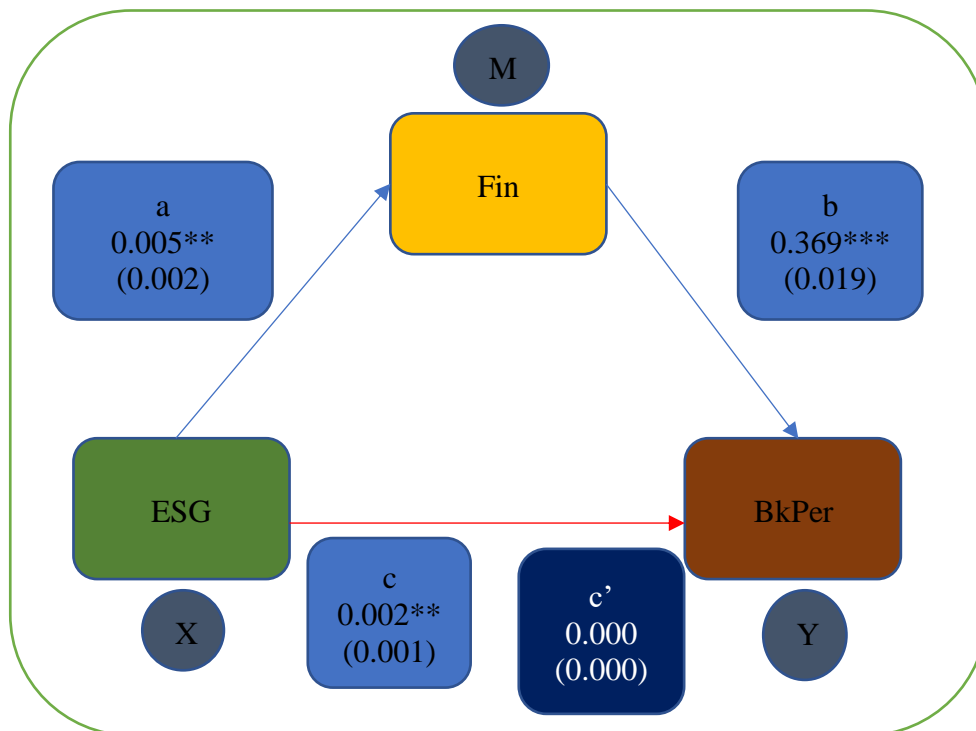


Table 7.6 Sobel Test

Sobel Test(z-score)	T/Statistic	Standard Error (SE)	P-Value
	2.480	0.001	0.013

According to a robustness test employing the rule of thumbs, the relationship is full mediation when there is a positive route coefficient, significant values for a, b, and c, but an insignificant p value for c'. Fintech strengthens the relationship between bank performance and ESG performance, which improves bank performance, even though there is no direct correlation between the two. We also meet the necessary criterion of  $-/+ 1.96$  when using the Sobel test, which has a value of 2.475. This outcome validated our key findings from the PLS-SEM approach and demonstrated the robustness of the model.

## **6.8 Summary**

This chapter examine the relationship between ESG and bank performance and how fintech mediates the relationship further. The study provides implications to consumers, investors, managers and policymakers. Firstly, consumers have to be more aware of ESG initiatives of banks and they should support those banks to do more. Banks that offer more fintech solutions to customers, such as easing the difficulty of conducting financial transactions, will draw more customers and potential users. Secondly, investors can use the and the ESG rating as an indicator for the volume of CSR activities, which have a negative impact on corporate performance. Thirdly, managers need to take ESG and fintech more seriously and spend the money on them sensibly after conducting thorough study, rather than just to reach the required limit. Additionally, managers must take the appropriate steps to inform the public about the bank's ESG practises and how it uses fintech to its advantage going forward. Finally, authorities need to place more attention on promoting ESG practises to reach the country's ultimate consumers who live in rural locations. They also need to raise their understanding of ESG practises and how employing fintech solutions may help them. In terms of theoretical ramifications. The study aims to add to the corpus of research on the connection between ESG and bank performance in the context of EU commercial banks. Only the influence of fintech on performance, or the relationship between fintech and performance, was studied in the prior

study. There hasn't been any research done to determine the indirect impact of those variables. So, by carrying out this research, we fill the gaps. The empirical findings indicated that ESG has a favourable, significant impact, which supports earlier studies in this area. ESG practises improve bank performance, highlighting Friedman's (1970) claim that a company's social responsibility is to raise its profit. Fintech's roles are the most intriguing findings. Our proposed model for how fintech mediates the relationship between ESG and bank performance demonstrates this. Our empirical findings reveal that fintech has a negative/no influence on performance, but there is a favourable association between fintech and ESG, and by improving ESG performance, bank performance has improved. This indicates that fintech indirectly contributes to enhancing bank performance. These recent discoveries have helped to advance the fields of fintech and ESG.

This study has a few limitations. First, the study primarily focuses on commercial banks in the EU countries while ignoring the other region. Using diverse samples from different regions to run the model in the future research could help researchers better grasp the relationship. Second, Refinitiv's competitive policy prevents them from disclosing the specific formula used to determine the ESG score. Considering that there are no established methods for determining sustainability. This could provide a starting point for future study to determine whether the conclusions of the association between ESG and business performance are biased toward the choice of the rating agency. Additionally, the impact of each of the ESG pillars on other indicators like leverage and efficiency can be thoroughly studied in future fintech studies.

## **Chapter 7**

### **Summary and Conclusion**

#### **7.1 Overviews**

Bank performance is a benchmark to the stakeholders in valuing a bank. Thus, there is need for in depth research into the key drivers or determinants that contributing to the better bank performance. Corporate governance, bank risk and ESG are the key drivers to consider when examining the benchmark of bank performance. As Bhagat and Bolton (2019) contend that corporate governance has significant impact towards bank performance. It means that corporate governance is the factor that cannot be neglected. A lousy governance in the bank could lead to a bad performance. Bank risk on the second driver also has significant impact towards bank performance. It is responsibility for the managers and employees to ensure that risk can be mitigating. The findings proven that a higher bank risk will lead to the low bank performance. ESG as a sustainability has significant effect nowadays towards bank performance. Instead of building better reputation of the bank, ESG proven helping bank to reduce the cost of operation and thus increasing the bank performance. Meanwhile, the intervention of fintech is undeniable anymore. The intervention of fintech in strengthening the relationship between corporate governance and bank risk helped bank to perform better and the interaction of fintech in increasing ESG performance indirectly helped to improved better bank achievement.

#### **7.2 Summary of research methods**

This thesis is empirical in nature and has followed a positivist approach. Quantitative methods were adopted to analyse the sample data. The sample data were collected from secondary sources. The dataset used capture the available data from recent period. Bank-level data were collected mainly from Orbis Bank Focus database, ESG rating were collected from Refinitiv DataStream, while macroeconomic data and additional data of fintech were collected from World Bank's World Development Indicator database, CrunchBase (CB). The World Bank's



Worldwide Governance Indicators provided two indicators provided which encapsulate different aspect of macroeconomic variables inflation and Growth Domestic Product (GDP). PLS-SEM estimation was mainly used for data analysis, whereas the OLS regression was used to ensure the robustness of the model.

### **7.3 Summary of findings**

Empirical analysis in chapter four attempts to conclusively investigate the relationship of corporate governance and bank performance. By utilising the governance index to measure the corporate governance of each bank, it reveals that there is positive significant relationship between corporate governance and bank performance. It is mean that a better governance in a bank will help bank to perform better. This is due to the transparency in operation and management will reduce the fraud issue and so on. It demonstrates how improved corporate governance can boost bank performance and how, in accordance with Agency Theory, improved governance will prevent the agency problem in banks. Meanwhile, the intervention of fintech has modified the relationship. It is reveals that fintech has positive moderate the relationship in increasing the bank performance. Therefore, this study contributes to the debate on whether corporate governance has impacted the bank performance and the importance of fintech in strengthening the effect between them. This will be helpful to the policy maker and fintech investor to establish how fintech can enhance better corporate governance and bank performance.

Chapter five examine the relationship between bank risk and bank performance and finds that the bank risk has negative effect towards bank performance. Thus, to ensure that bank can sustain their performance, it is a need for the management to lower the risk. Fintech is found moderate the relationship. It demonstrates how fintech intervention helps banks improve risk management by minimising and controlling the risk, in line with the Consumer Theory's

suggestion that an initiative like fintech or the enhancement of existing products and services, improvement of operations to minimise risk, improved performance in banks. This chapter also finds the additional analysis result showing that credit risk index has the most influential risk that could affect the bank performance. Therefore, this study contributes to the debate on whether which of the risk has the most influential towards bank performance. Also, this study suggested that the fintech is playing important role in minimising the bank risk and it gives a better understanding to the industrial player in making decision to invest in fintech.

Chapter six analyses the relationship between ESG and bank performance. This chapter substantiate that ESG is highly associated to bank performance. A better ESG for a bank will increase a better performance. According to the Theory of Stakeholders, it is the obligation of a bank to add value for its stakeholders, and one way to do this is through ESG. Additionally, it was concluded that fintech mediates the link between ESG and bank performance. This indicates that banks with higher fintech engagement have better ESG results, which has indirectly boosted performance. This study also performed additional analysis to determine which of the index has the most influential towards bank performance and shows that the governance has the most influential on it. This study will be helpful to the policymaker and various stakeholders in improving their ESG practices and also to invest more in fintech.

#### **7.4 Contributions of the study**

The paper has taken a holistic approach to fill this gap by examining various aspects of bank accounts and identifying the index of corporate governance, bank performance and fintech within the framework of commercial banks in EU. This study thus provides an essential insight into the significance of other vital factors such as fintech, particularly the performance of EU banks. This is due to the organisation's technological innovation significantly improving performance (Chai et al., 2016).

Thus, utilising the most recent EU sample, we were able to see new expectations and results from the relationship between corporate governance, bank risk, ESG and bank performance, contributing to new study discoveries in this field. Second, this research adds to the growing body of knowledge about fintech as a moderator in the relationship between corporate governance, bank risk, ESG and bank performance. Because fintech is still in its infancy, this study will contribute to a better understanding of its function in banking. Insights into financial institutions in particular, as well as the rest of the sector in general. Finally, this study contributed to the methodological section by employing a method from the second generation of data analysis, namely partial least square structural equation modelling, or PLS-SEM. To our knowledge, the PLS-SEM approach has never been employed in previous work , which has only used first-generation methods like GMM and OLS regression (Aslam and Haron, 2020; Boachie, 2021).

### **7.5 Implications of the study**

The following are the study's implications. First, this research looked on the relationship between corporate governance and bank performance in the EU commercial banks. Although the findings underscore the relevance of corporate governance to bank performance, they also imply that policymakers and industry players should focus on fintech intervention in boosting bank performance. Second, while it has been established that bank risk has a substantial impact on performance, it is recommended that policymakers and business stakeholders also pay attention to the specific risks that have a greater impact. Third, when focused on bank risk, they should also take into account how fintech might help improve performance by lowering risk. Fourth, even though the results show that ESG has a major impact on bank performance, additional study suggests that industry players and policy makers should focus on which of the ESG's sub-pillars has the greatest impact so they can plan and develop a stronger business strategy. Fifth, the findings advise industrial players and policy makers to think about

implementing fintech to help them improve their ESG in the workplace because it has been demonstrated that doing so will improve performance. Last but not least, this conclusion has a significant implication on the industry participant and the policy maker in the real banking sector, specifically in the EU. Even though the EU is an advanced country in terms of banking, there are still few commercial banks adopting fintech because they are not very aware of the importance role. As a result, this study would have significant implications for policy makers and industrial players regarding adopting fintech as a part of their business strategies rather than focusing only on the existing key drivers of corporate governance, bank risk, and ESG in their bank performance.

#### **7.6 Limitations of the study**

The following are the research limitations of this study. The first limitation of this study is the impossibility to get continuous data on financial reporting. In addition, numerous data from a few banks, such as the percentage of independent board of directors, incentives, and wages in corporate governance, are not publicly available. There are restrictions on how frequently data may be obtained and gathered for risk indices in financial reporting in bank risk analysis as well. As a result, the banks that are not listed in Orbis Bank Focus or whose annual financial reporting contains insufficient information were disregarded from our research. Second, the study's data comes from commercial banks in EU nations, where fintech and innovation are thriving, restricting the applicability of the findings to recently established virtual banks or other types of banks like mortgage banks, Islamic banks, ethical banks, and so on. Third, the analysis neglects the other region in favour of concentrating solely on commercial banks in the EU member states. Fourth, it is against Refinitiv's competitive policy to provide the precise algorithm used to calculate the ESG score. Taking into account that there are no recognised techniques for determining sustainability. Fifth, there is currently no standardised way to measure fintech indicators for the banking sector. The Financial Stability Board (FSB) and

Basel Committees (BS) both use the word "fintech" extensively, hence the study is limited and constrained by its usage of the established fintech indicator in a comprehensive manner. Last but not least, the study has been impacted in some way by the data collection time constraints, particularly during the pandemic scenario.

### **7.7 Areas for future research**

There are few recommendations for future research in this area. First, it is suggested that other variables not included in the study model be taken into account so that not all information is exposed through the data collected and analysed. Second, the research should be conducted in other locations to see if the theories are applicable in those areas. In future studies, using various samples from different places to run the model could help researchers better understand the relationship. Although the notion of "one size fits all" is rarely accepted, proving it by spreading the analysis to other places or industries could be a potential future research direction. Third, the sample size might be raised to broaden the focus of the inquiry. Fourth, due to restrictions placed on its competitive policy, Refinitiv is banned from disclosing the exact formula used to determine the ESG score. because there are no established methods for determining sustainability. This could be a starting point for more investigation into whether the choice of the rating agency affects the conclusions of the relationship between ESG and business performance. Sixth, given how competitive start-ups and shadow banks are expanding globally, future research should concentrate on fintech and its effects on these institutions. Seventh, future studies may look into creating a standardised fintech indicator for the banking industry. The fintech index or indicator should include all fintech terminology in the banking industry rather than just fintech investments and costs.

**Appendix 1: List European Union (EU) Countries as at 2019**

<i>Country</i>	
<i>Austria</i>	<i>Italy</i>
<i>Belgium</i>	<i>Latvia</i>
<i>Bulgaria</i>	<i>Lithuania</i>
<i>Croatia</i>	<i>Luxembourg</i>
<i>Cyprus</i>	<i>Malta</i>
<i>Czech Republic</i>	<i>Netherlands</i>
<i>Denmark</i>	<i>Poland</i>
<i>Estonia</i>	<i>Portugal</i>
<i>Finland</i>	<i>Romania</i>
<i>France</i>	<i>Slovakia</i>
<i>Germany</i>	<i>Slovenia</i>
<i>Greece</i>	<i>Spain</i>
<i>Hungary</i>	<i>Sweden</i>
<i>Ireland</i>	<i>United Kingdom</i>
<b><i>Total</i></b>	<b><i>28</i></b>

**Appendix 2: Summary of Literature Findings for Corporate Governance, Risk, ESG, Fintech and Bank Performance**

<b>Authors</b>	<b>Country/Market</b>	<b>Methods</b>	<b>Findings</b>
El-Chaarani (2014)	Lebanese	Multivariate regression analysis	The proportion of directors in the board is positively and significant. Board size is not related to the performance. CEO duality affects negatively the bank performance. Positive impact of insider ownership concentration on the return of Lebanese banks.
Zagorchev & Gao (2015)	USA	Tobit regression and standard panel regression	better governance is negatively related to excessive risk-taking and positively related to the performance of U.S. financial institutions.
Salim et al. (2016)	Australia	DEA method	Positive relationship of corporate governance and performance.
Buallay (2019)	MENA	General Linear Model (GLM)	The findings deduced from the empirical results demonstrate that Sharia'ah governance significantly influenced ROA and ROE. However, corporate governance significantly influenced TQ.

Bhagat & Bolton (2019)	USA	GMM	Positive relationship of director ownership in corporate governance to the performance
Haris et al. (2019)	Pakistan	GMM	Board independence and director composition in corporate governance is highly positive effect to profitability.
Aslam & Haron (2020)	OIC countries	2SYS-GMM	Corporate governance has significant positive impact on intellectual capital.
Fiador & Sarpong-Kumakoma (2020)	Ghana	Panel-corrected standard error PCSE	There is significant relation between corporate governance and loan quality
Basar et al. (2021)	Turkish, Tunisian, Moroccan and Lebanese	GMM	Overall index in corporate governance has significant effect towards bank performance (ROA, general liquidity, capital adequacy, and size)
Benvenuto (2021)	Romanian and Italian Banking	Primary data analysis	Corporate governance has a significant positive, long-lasting effect on profitability and capital adequacy.
Boachie (2021)	Ghanaian Banking	Panel analysis	Audit independence, CEO duality, non-executive directors, and bank size all boosted performance.



<b>Authors</b>	<b>Country/Market</b>	<b>Methods</b>	<b>Findings</b>
Sondakh et al. (2021)	Indonesia	Multiple regression analysis	NPLs are significant and negatively affect ROA, NIM is significant and positively affects ROA, LDR is not significant and negatively influences ROA.
Rangkuti (2021)	Indonesia	Fixed effect panel data analysis	Risk management has a positive direct impact on profitability. Risk management has a positive indirect impact on performance with as mediation variable. Profitability has a positive direct impact on profitability.
Inegbedion et al. (2020)	Nigeria	GMM	There is substantial inverse association between ROaA and credit, leverage, and liquidity risks, and all of these were significant. Rising credit risk will result in a decrease in a bank's investable funds and average assets.  There is a significant positive relationship between ROaA and CAR.
Alfadli & Rjoub (2020).	GULF cooperation council countries	PCSE	Efficiency, credit risk, diversity, and concentration ratio all have a strong negative impact on all performance measurements.

Munangi & Bongani (2020).	South African	Pooled OLS, fixed effect and random effect analysis	Credit risk as the indicator for bank risk was negatively related to financial performance.
Hunjra et al. (2020).	Pakistan, India, Bangladesh and Sri Lanka	GMM	All three risk have a substantial impact on financial success. The Z-score has a favourable impact on bank performance, whereas the NPLs ratio has a negative impact on bank financial performance. Liquidity risk evaluations demonstrate that the current and loan-to-deposit (LTD) ratios have a positive and negative impact on financial performance, respectively. While operational risk has a beneficial impact on financial performance.
Ul-Huq et al. (2020)	Emerging countries	GMM	The key findings for emerging economies are as follows: (a) an increasing non-performing loan ratio as credit risk causes the bank to be underperforming and unstable.
Fang et al. (2019)	China	Seemingly Unrelated Regression	Competition in the Chinese banking markets (deposit market, loan market, and non-interest income market) has increased

			from 2003 to 2005, as well as from 2014 to 2017. This study find that cost efficiency has a bigger positive impact on profitability when banks take on more risk and face more competition.
Chen et al. (2018)	12 advanced economic countries	Fixed effect regression	In a market-based financial system, liquidity risk has a negative influence on bank performance.
Tan (2016)	China	GMM	The findings do not support any significant conclusions about the effects of competition and risk on bank profitability, but it is discovered that taxation, overhead costs, labour productivity, and inflation all have an impact on Chinese bank profitability.
Bitar (2016)	MENA	OLS regression	The study's findings imply that meeting Basel capital standards increases bank risk protection while also increasing efficiency and profitability. Capital requirements have a greater impact on bank performance for too-big-to-fail banks, banks in crisis, and banks in well-governed countries.

Kamran et al. (2016).	Pakistan	Panel data analysis	There is a significant association between financial market development in the banking sector and financial performance as measured by key indicators.
Terraza (2015)	Europe	fixed effect regression and GMM	the study finds no actual evidence of a link between increased efficiency and increased bank profitability. While higher capitalization levels boost bank profitability, liquidity risk varies by bank size.
Ellul & Yerramilli (2013)	USA	Fixed effect analysis	Overall, these results suggest that a strong and independent risk management function can curtail tail risk exposures at banks.
Haq & Heany (2012)	Europe	two-step system GMM	The analysis discovers evidence of a convex (U-shaped) relationship between bank capital and bank systematic risk and credit risk.

<b>Authors</b>	<b>Country/Market</b>	<b>Methods</b>	<b>Findings</b>
Buallay et al. (2021)	Developed and developing country	GMM	ESG weakens bank's performance
Ruan & Liu (2021)	China (Shanghai and Shenzen)	OLS Regression	ESG has negative relation effect towards firm performance.
Fahad & Busru (2021)	India	Panel Regression	There is negative impact of CSR disclosure reflected by ESG on profitability and firm value
Landi & Sciarelli (2019)	Italy	Panel data analysis	There is negative and significant of ESG impact in terms of market premium
Atan et al. (2016)	Malaysia Denmark	Comparative study	There is no correlation between ESG disclosure level and firm's financial success
Chiaramonte et al. (2021)	European 21 countries	GMM	Total ESG score including the sub pillars, reduces bank fragility during times of financial difficulty.
Cek & Eyupoglu (2020)	U.S S&P 500	SEM and linear regression	The whole ESG approach and economic success were significantly correlated. There is substantial correlation between economic performance and the entire ESG strategy

Alareeni & Hamdan (2020)	U.S S&P 500	Panel Regression	ESG disclosure has been shown to have favourable impact on a firm's performance metrics.
Consoladi et al. (2020)	USA Russell 3000	Panel regression	Not only do ESG rating changes (ESG momentum) have a consistent impact on equity performance, but also that
Chen & Yang (2020)	Taiwan	Panel data analysis	Financial market has ESG momentum effect that affect positively the firm performance.
Dalal & Thaker (2019)	India	Random Effect panel data	High business ESG performance improves financial performance ROA and Tobin's Q
Shakil et al. (2019)	Emerging countries	GMM	Positive relation between environmental and social performance to their financial performance.
Minutolo et al. (2019)	US S&P 500	Quartile analysis	ESG scores have a positive impact on business performance ROA and Tobin's Q
Aouadi & Marsat (2018)	58 countries	Correlation and Regression analysis	ESG concerns are connected with higher business value.
Brogi & Lagasio (2019)	USA	Multiple regression analysis	There is strong link between ESG and profitability.

Buallay (2019)	Europe	Pooled data analysis	Positive impact of ESG towards performance
Xie et al. (2018)	74 countries	Data Envelopment Analysis (DEA)	ESG has strong correlation with corporate efficiency
Ting et al. (2019)	Developed and Emerging market	Panel regression	There is significant beneficial impact of ESG towards firms' performance
Fatemi et al. (2018)	USA	Two-stage least squares (2SLS) model	ESG firms value is increased by strengths and decreased by shortcomings
Yoon et al. (2018)	Korea	Ohlson's valuation model	ESG score as CSR policy has favourable impact to the firm's performance
Velte (2017)	German	Correlation and Regression analysis	ESG has positive relation to ROA but no relation to Tobin's Q

<b>Authors</b>	<b>Country/Market</b>	<b>Methods</b>	<b>Findings</b>
Haddad & Hornuf (2019)	107 countries	Panel data analysis	Countries witness more fintech start-up formations when the economy is well-developed and venture capital is readily available.
Phan et al. (2019)	Indonesia	GMM	The growth of FinTech firms negatively influences bank performance. The main conclusion that FinTech negatively predicts bank performance holds.
Wang et al. (2021)	China	DIF-GMM and SYS-GMM	Fintech's development leads to increased profitability and better management
Akhisar et al. (2015)	Developed and developing countries	Dynamic Panel Data	ATM in term of technology in financial significantly impact bank profitability
Chai et al. (2016)	Malaysia	Regression analysis	Technological innovation improved performance
Chen (2020)	China	Data Envelopment Analysis (DEA)	Bank's efficiency improved with the help of internet and technology
Cheng & Qu (2021)	China	Regression	We find that bank FinTech significantly reduces credit risk in Chinese commercial banks, and further analyses show that the negative effects of bank



			FinTech on credit risk are relatively weak among large banks, state-owned banks, and listed banks.
Lee et al. (2021)	China	Stochastic Metafrontier method	State-owned Commercial Banks are less cost-efficient and operate under inferior technology compared to joint stock commercial banks and Commercial Banks
Safiullin et al. (2020)	Russia	Regression	Fintech has potential to reduce the operational risks of credit organizations.  The functional capabilities of blockchain technologies are also identified that help minimizing operational risks in the banking sector.
Li et al. (2017)	USA	Panel data regression	Positive relationship exists between the growth in FinTech funding or deals and the contemporaneous stock returns of incumbent retail banks
Chueca-Vergara & Ferruz-Agundo (2021)	Europe	Fundamental & descriptive LR review	ESG and fintech have many similarities. Fintech can make financial organization more sustainable overall by supporting green financing

Chang et al. (2021)	Shanghai	Data Envelopment Analysis (DEA)	Higher ESG performance and digital finance improve corporate financing efficiency.
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