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Does sustainability matter for Fintech firms? Evidence from United States firms

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Abstract

Purpose – This study aims to look at how financial technology (FinTech) companies adhere to sustainable standards in contrast to their counterparts. Following the validation of its new sustainability index, this study looks into the impact of sustainability on the stock performance of FinTech companies.

Design/methodology/approach – To efficiently test the hypotheses, sample has been collected from the Bloomberg of all FinTech and non-FinTech companies from the USA. The final sample comprises 1,712 company-year observations over the investigation period 2010–2019. The methodology entails ordinary least squares regressions and generalized panel methods of moments (GMM).

Findings – The results suggest that the developed sustainability index is a valid proxy for sustainability measures and directly relates to stock performance. Besides, the evidence indicates that non-FinTech companies display superior sustainability and stock performance compared to FinTech companies. The present results corroborate with stakeholder theory, which implies that quality sustainability performance will alleviate the agency issue and safeguard the shareholders' interest.

Research limitations/implications – Despite the fact that it presents the limitation of not considering other dimensions of financial performance, this research is important as it highlights the sustainability practices by the FinTech and non-FinTech companies, offering insights to researchers, policymakers, regulators, financial reports users, investors, environmental union, employees, clients and society.

Originality/value – This paper is novel because it is unique in evaluating the sustainability practices in FinTech and non-FinTech firms.

Keywords Sustainability, Environmental, Social, Climate change, GMM, Fintech, Governance

Paper type Research paper

1. Introduction

The advent of the fourth industrial revolution and its supporting technologies are rapidly developing and reshaping the global economy and markets. Particularly, big data, artificial

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intelligence (AI), machine learning (ML) and blockchain are shaping current and future business practices (Atayah and Alshater, 2021). Specifically, the financial sector has witnessed several shifts in the operating model over the past decade, such as introducing the automated teller machine (ATM) and online banking services. Financial services are currently affected by new issues, especially the increasing customer concerns for sustainability and respect for the environment in the goods and services they purchase and consume (Checa Vergada and Agudo, 2021). New managerial trends are primarily expressed in corporate social responsibility (CSR) and environmental, social and governance (ESG) factors. These shifts align with the United Nations Agenda for sustainable development goals (SDGs) to combat climate change.

The growing awareness of climate change and its impact on people well-being affect the nature of consumers' behavior, who become more demanding of ecological and environmentally friendly products for a more sustainable lifestyle (Checa Vergada and Agudo, 2021). Currently, setting "green marketing" campaigns and modernizing their technologies became a competitive advantage for firms to differentiate their products and brands from their competitors. These green marketing campaigns are helpful to consumers by letting them know the green proprieties of the products they are buying or using (Gräuler and Teuteberg, 2020). However, the competition for green-oriented might lead to unfair marketing tools, owned as "greenwashing" (Pimonenko *et al.*, 2020). Greenwashing has defined as a set of deceptive behaviors or practices that deliberately mislead consumers about the ecological activities of an organization, or the environmental benefits of a given product, which appear to be sustainable but are not (Checa Vergada and Agudo, 2021).

Nowadays, the concern for the environment affects both consumers and suppliers. Companies increasingly consider specific non-financial attributes in their investments, such as ESG criteria (Checa Vergada and Agudo, 2021).

The latter factors have inspired global financial institutions to develop, reshape and innovate financial services. Within the digital and technological context, the so-called "Fintech" must be highlighted. Fintech refers to the latest technologies used in innovative financial products and services, and it is considered to be one of the most important new markets and cutting-edge business models in recent times (Abdullahi *et al.*, 2021; Hamdan *et al.*, 2021). Even though the FinTech business model is still in its infancy stages, the exponential expansion of investment in this innovation indicates stakeholders' acceptance and trust in this business model (Chen *et al.*, 2021).

The revolution of Fintech firms has its origin in two theories. First, the shadow of consumer theory accommodates the FinTech services era, and it states that new services could successfully replace the old if they received the exact customers' demand level (Aeker and Keller, 1990). Second, disruptive innovation states that new market players have a meaningful chance to gain a market share if they introduce more convenient and cost-efficient services (Christensen *et al.*, 2006). These two theories present the FinTech firms' foundation to enter the markets, secure market share and compete with the old players (Phan *et al.*, 2020).

Simultaneously, the practices of sustainability and performance are gaining notable traction and significant growth in the interest of stakeholders at the national and international levels.

Mohammad and Wasiuzzaman (2021) documented that the low ESG disclosure raises concerns about the firms' idiosyncratic risks. Consistently, the investors need to build their decisions based on comprehensive reports, including financial and non-financial information such as ESG information. Other studies have documented that the ESG disclosure also has inevitable consequences on the firms' performance, reputation and financing cost (Boffo and Patalano, 2020). However, the literature related to the Fintech

innovations is still in its infancy stage (Puschmann *et al.*, 2020). The impact of Fintech innovation in the financial sector is still foggy and not entirely evaluated (Phan *et al.*, 2020).

This study examines the importance of sustainability measures for FinTech firms and their impact on their market value. More precisely, this study compares FinTech and non-FinTech firms listed in the USA; a total of 193 firms have been investigated from 2010 to 2019. Our results indicate that the FinTech firms follow fewer sustainability measures than non-Fintech firms, which eventually affect their market performance.

The rest of the paper is organized as follows. The theoretical background and hypotheses development are presented in Section 2. Section 3 describes the method, sample and data, and Section 4 discusses the findings of the empirical results. In Section 5, we conclude this study.

2. Theoretical background and hypothesis

The supply and demand for innovative financing have evolved over the recent years. Financial institutions offer solutions for their customers in line with the new sustainability paradigm to promote the link between sustainability and economic and financial activities (Checa Vergada and Agudo, 2021).

The so-called "Fintech" comes within the digital and technological context. Fintech refers to the latest technologies used in innovative financial products and services, which are among the most important new markets in recent times (Zhang-Zhang *et al.*, 2020). It includes digital innovation and modern technology designed to improve, develop and automate financial services. Fintech is used to assist and support all stakeholders (firms, investors and customers) in managing their economic activities using specialized applications and software (Al Hammadi and Nobanee, 2019). More specifically, it includes new applications, processes, products and more financial services. Various independent service providers, often including at least one regulated bank or insurance business, provide these services largely or wholly through the internet at the same time. These services are mostly or entirely provided over the internet, "simultaneously by various independent service providers, typically including at least one licensed bank or insurance company" (Checa Vergada and Agudo, 2021). Some of the provided financial services may include investment advice (robot-advising), credit decisions, asset trading, digital currencies, automatic transactions, payment settling, crowdfunding, person-to-person transactions (*P2P*) and smartphone wallets (Kabulova and Stankevičiene, 2020).

In its report issued in 2019, the International Monetary Fund (IMF) emphasized the importance of financial markets sustainability. ESG issues, according to the IMF, can have a considerable impact on corporate profitability and jeopardize financial stability. The report also suggested that lawmakers work together to set consistent ESG performance and disclosure criteria to encourage transparency, accountability and the incorporation of environmental factors into investment and business decisions. The report also highlighted the necessity of building a holistic ESG theme to bridge emerging data gaps by optimizing ESG terminology and encouraging consistent corporate ESG reporting to make ESG data gathering and assessment more convenient for stakeholders (Al Sahaf and Al Tahoo, 2021). Finally, the IMF emphasized the importance of independent ESG data verifiers to monitor and check the transparency, consistency and authenticity of the disclosed ESG data. Although sustainable investment has increased in popularity in recent years, investors still have trouble-seeking reliable and comparable ESG data. The current obstacle is that various kinds of data are created at various intervals and for different purposes in different parts of the world. The Organization for Economic Co-operation and Development (OECD) recently called for global guidance, and the World Economic Forum (WEF) announced its agreement

with leading consulting companies to define universal ESG monitoring standards, all in line with these assumptions (Boffo and Patalano, 2020).

Nowadays, a new strand of research focuses on the relationship between the Fintech industry and sustainability and whether the trendy pattern of this industry is consistent with the main pillars of sustainability. In this regard, Moro-Visconti *et al.* (2020) find that the Fintech industry provides a solution for sustainable finance with microfinance and crowdfunding. FinTech is a crucial driver for financial inclusion, which is the foundation for long-term, balanced growth (Alberti and Belfanti, 2021; Grashof *et al.*, 2021; Kumar *et al.*, 2021; Maalouf *et al.*, 2021). While the previous studies have only focused on the relationship between ESG disclosures and firm performance, this research focuses on the relationship between sustainability and firms' performance in Fintech and non-Fintech firms.

The literature usually argues that Fintech firm's ESG practices are less than those of non-Fintech firms. One argues that Fintech firm is not mature enough regarding sustainability practices and disclosure. In this direction, many studies have demonstrated that the firm age positively impacts sustainability (Ahmed and Courtis, 1999; Aksu and Kosedag, 2006). Moreover, current evidence shows that cryptocurrencies, considered integral parts of the Fintech industry, have a huge negative impact on the environment through energy consumption and cryptocurrency mining (Puschmann *et al.*, 2020). Therefore, it is expected that Fintech industries involved in cryptocurrency mining will disclose less ESG information. Cumming and Schwienbacher (2018) found a U-shaped relationship between FinTech and ESG development in China, as Fintech constrains sustainable development when it is less than a critical value and promotes sustainable development once a threshold is exceeded. Following their premises, we develop the first hypothesis:

H1. *Ceteris paribus*, FinTech companies take less sustainability initiatives than their peers.

The impact of sustainability practises on the firm's financial performance has been subject to several investigations, sometimes contradictories (Grougiou *et al.*, 2014). The main dominant stream of research argues that a sustainable investment considers environmental, social and corporate governance (ESG) criteria to generate long-term competitive financial returns and positive societal impact (Freeman *et al.*, 2010). However, there is no consensus in the literature in terms of the existence of this impact and its direction (Perrini *et al.*, 2016). Several studies have hypothesized the positive effects of ESG disclosure on the firms' value and financial performance because of the close connection between a company's image and its social scores (Dimson, 2015; Eccleston *et al.*, 2015).

The relationship between ESG disclosure and firm performance is founded on sustainability theories, such as stakeholder, agency, legitimacy and signaling. In this regard, Sroufe *et al.* (2019) argue that firms engaged in ESG disclosures are associated with lower systemic and non-systematic risks because of lower possibility of litigation or adverse market reaction. Porter *et al.* (2019) argue that ESG disclosure indicates that the firm provides sustainable solutions to environmental and social issues, increasing its competitive advantage. Moreover, Lopez-De-silanes *et al.* (2020) found that firms with good ESG scores simply disclose more information. In line with the stakeholder theory, Alsayegh *et al.* (2020) demonstrate that ESG information disclosure to all stakeholders is essential in creating a competitive advantage to enhance corporate sustainability performance.

Consistently, Boffo and Patalano (2020) argue that the firm's engagement in the ESG disclosure boosts its market value. Remarkably, the firms with a high ESG rating have a better reputation, building a trustful relationship with the customers, leading to a decrease in the operational risk and leveraging firms' ability to mitigate the operational risk

(Najaf *et al.*, 2021a, 2021b, 2021c, 2021d). Furthermore, lowering operational risks helps reduce the cost of capital, which contributes to a higher firm's value. This is consistent with the outcome of Semenova and Hassel (2013), which states that disclosing ESG information leverages the firms' brand and reputation, reduces capital costs and increases customer loyalty. Because incorporating ESG forges an accurate picture of the challenges and opportunities that a business can face, Mejia-Escobar *et al.* (2020) state that a company ultimately mitigates its risks and improves its efficiency in the long run. This practice affects consumers, lenders and market valuation.

Similarly, Eccles *et al.* (2014) find that the US corporations that voluntarily adopted sustainability practices have outperformed their counterparts over the long term, both in terms of the stock market and accounting performance. Dimson (2015) show that better management of environmental and social issues helps companies achieve better accounting performance. Sroufe *et al.* (2019) confirmed the positive relationships between the management of sustainability practices, social sustainability performance and firm financial performance. Recently, Albitar *et al.* (2020) demonstrated a significant positive relationship between ESG disclosure score and firm performance among a sample of 350 firms.

Resource orchestration theory generally suggests a positive relationship between ESG disclosure and value creation (Wong *et al.*, 2018). In fact, when the management strategically exploits the ESG disclosure, they get a competitive edge, leading to higher value creation (Chernev and Blair, 2015; Freudenreich *et al.*, 2020). In the same direction, the shareholder theory posits that the firm's engagement in ESG disclosure fulfils the requirements of stakeholders (environmental and social practices) and enhance value creation (Alshehhi *et al.*, 2018).

On the other hand, several other research claimed that sustainability had a detrimental influence on business performance. Their main justification is that the firm's investment in sustainability raises the cost, reducing its ability to compete in the market and consequently decreasing its income and market value (Jensen, 2002). Moreover, the stakeholder theory argues that the firm's main objective is to create value for all stakeholders who are usually expecting to maximize their capital (Freeman *et al.*, 2010). However, implementing ESG requirements creates conflict (Dranev *et al.*, 2019; Kolsi and Attayah, 2018). Consistently, several other studies have documented that despite green awards and efficiently disclosing ESG data several companies receive, they still face abnormal losses, affecting investors who become hesitant to invest in these firms.

Similarly, Di Giuli and Kostovetsky (2012) found no evidence that firms spending on ESG make additional profits because of increased sales. In contrast, they demonstrated that increases in firm ESG are associated with negative future stock and a decline in firm return on investment. However, these studies recommended the business trade-off between the ESG investment and disclosure and the expected cost to manage the firms' ESG activities and investments (Puschmann *et al.*, 2020). The trade-off theory suggests that the adoption of ESG disclosure can reduce the firm's focus on its traditional business plans, which results in lower profit and lower value creation (Wagner and Blom, 2011).

The previous research finding regarding the impact of ESG disclosure on market value is inconsistent and contradictory. However, none of the prior studies has discussed sustainability in the Fintech industry leading to market performance. To fill this gap, we propose the second hypothesis aiming to explore the impact of Fintech and non-Fintech firms' sustainability on a firm's stock market value:

H2. *Ceteris paribus*, the Fintech firms have less stock market value than counterparts.

3. Method, sample and data

3.1 Dependent variables

3.1.1 Sustainability index. We examine the Fintech and non-Fintech firms based on this study constructed sustainability index. At the same time, we look through the wide range of literature; these disclosure scores are related to the firm's market performance (Najaf *et al.*, 2021a). Using the CAPM and Fama-French model, we try to determine the relationship between the firm market performance and sustainability index to ensure the effectiveness of our sustainability index. Later, we compare the FinTech and non-FinTech firms based on market performance.

We construct a sustainability index using nine distinct elements: GRI criteria compliance, global reporting initiatives checked, verification type, business ethics policy, employee CSR training, women in management, independent audit committee chairperson, executive director with responsibility for CSR and CSR/sustainability committee. Our index is based on the above nine variables defined by SDGs 17 defined by United Nations (UN, 2020). Our sustainability index is based on three variables, each per category of "Environmental," "Social" and "Governance." We selected GRI criteria compliance, global reporting initiatives checked and verification type for "Environmental" criteria. Then, we gathered ethics policy, employee CSR training and women in management for "Social" criteria, whereas for "Governance," we selected independent audit committee chairperson, executive director with responsibility for CSR and CSR/sustainability committee [1].

We convert all nine sustainability factors into indicators by assigning a value of 1 if that indicator reinforces the sustainability and 0 otherwise. The sustainability index ranges from 0 to 9; higher scores represent higher quality sustainability adopted by the firm. The aggregate index is represented by equation (1).

$$\begin{aligned} \text{SIndex} = {} & \text{GRI Criteria Compliance} + \text{Global Reporting Initiatives Checked} \\ & + \text{Verification Type} + \text{Business Ethics Policy} + \text{Employee CSR Training} \\ & + \text{Women in Management} + \text{Independent Audit Committee Chairperson} \\ & + \text{Executive Director with Responsibility for CSR} + \text{CSR/Sustainability Committee} \end{aligned} \tag{1}$$

We assign equal weight to all nine factors on the assumption that as they play equally significant roles as sustainable mechanisms. The individual components of the index are defined in Table 1.

3.1.2 Tock value. Following the prior literature, we use stock returns for the performance measurements (Najaf *et al.*, 2021d). It is the stock return above the risk-free rate.

3.2 Independent variable

Basically, we are looking for the difference between the Fintech- and non-Fintech firms in terms of market performance. To differentiate the Fintech firms from counterparts, we create a dummy variable, where the value of "1" is assigned to Fintech firms and "0" otherwise. The practice of assigning dummy variables to the two different groups within the data set is not new. The seminal works of Atayah *et al.* (2021a) and Najaf *et al.* (2021a, 2021b, 2021c, 2021d) allocated dichotomous values to the Fintech and non-Fintech firms.

3.3 Control variables

3.3.1 Firm-level control. In our regression analysis, we include additional factors that influence the observable firm-specific features in line with previous research and theory. A 1% winorization threshold is applied to the firm-level variables at the tails of our sample distribution. While doing our research, we kept track of any unusual gains or losses

(Dayanandan and Sra, 2018). The leverage, on the other hand, was the ratio of total debt to total assets for the companies. Leverage was kept under control to prevent it from increasing sustainability policies and plans for companies (Ali *et al.*, 2020). Naturally, when a company expands and develops, it becomes older and becomes more substantial. As a result, sustainability strategies evolve as a company matures (Dickinson, 2011; Tran and Le, 2020). In addition, because the data set was a company-specific panel data set, cross sections could be created at the firm level. As a final point, shareholders believed that companies audited

Category	Indicator	Definition
Environment	GRI criteria compliance	Indicates whether the company has used the global reporting initiative (GRI) framework for guidance in its public reporting, to varying degrees of compliance. This field is part of the environmental, social and governance (ESG) group of fields
	Global reporting initiatives checked	Indicates whether the company's application level or G4 general standard disclosures for "Materiality matters" was checked by the GRI. This field is part of the ESG group of fields
	Verification type	Indicates whether the company's environmental policies and data were subject to an independent assessment for the reporting period. This field is part of the ESG group of fields
Social	Business ethics policy	Indicates whether the company has established ethical guidelines and/or a compliance policy for its non-management/executive employees in the conduct of company business. "N" indicates the company has not explicitly disclosed this policy in its most recent annual or company responsibility reports. This field is part of the ESG group of fields When accessing historical data using Excel API, field will return a "1" – Yes or "0" – No
	Employee CSR training	Training spending per capita calculated as dollars spent on training per company employee. To compare companies around the world, this ratio should be converted to a common currency. Ratio is calculated based on data items disclosed in company filings. Calculated as follows: Employee training cost/number of employees
	Women in management	Percentage of women employed in senior management positions at the company. This field is part of the ESG group of fields
Governance	Independent audit committee chairperson	Indicates whether the chairperson of company's audit committee is independent. Independence is defined according to the company's own criteria. Field is part of the ESG group of fields When accessing historical data using Excel API, field will return a "1" – Yes or "0" – No
	Executive director with responsibility for CSR	Indicates whether there is an executive director on the board with responsibility for corporate social responsibility (CSR)/sustainability. This field will not return "Y" if there is a non-executive director on the board with responsibility for health and safety only. Where the company has a two-tier board, this field refers to the supervisory board. Field is part of the ESG group of fields When accessing historical data using Excel API, field will return a "1" – Yes or "0" – No
	CSR/sustainability committee	Indicates whether the company has a corporate social responsibility (CSR)/sustainability (or equivalent) committee that reports directly to the board. The field returns true if one of the committee's responsibilities explicitly includes oversights of CSR/sustainability/health and safety/energy efficiency activities

Table 1.
Definition of sustainability index indicators

by the best-ranked audit firms had stronger strategies for cutting EFs (Hassan Omer *et al.*, 2020). After all, shareholders' perceptions of good governance might better influence sustainability policies if they believed in the Big 4 audit companies' claims of good governance.

3.3.2 Country-level control. The variables we use are all at the national level. CPI is a measure of inflation that is published annually by the World Economic Forum (WEF). According to Beck *et al.* (2008), the CPI impacts a country's economic climate, which in turn impacts a company's long-term sustainability strategy. Another country-level control we include is gross domestic product (GDP) growth, because GDP may affect stock market performance (Najaf and Chin, 2021; Najaf *et al.*, 2021a, 2021b, 2021d).

3.3.3 Fixed-effect control. We use a sample of Fintech and non-Fintech companies in the USA, which necessitates the introduction of year dummies to account for any unobserved time-variant effects. In addition, we have control over the membership of sub-industries inside the Fintech sector. Many variables that may have an impact on a company's performance cluster according to industry. Included in these variables are product market concentration and the degree of regulation (Ali *et al.*, 2014; Ahmad and Hussain, 2001). A set of dummies representing Bloomberg categories serves as a proxy for industry participation. The Global Industry Classification Standard (GIS) is used to identify the business sectors (GICS). In addition to the GICS main sector, we also gathered information on the sub-sectors.

The annual dummies are also controlled for because of financial performance may fluctuate over time as a result of macroeconomic circumstances changing (Dickinson, 2011). Regardless of their environmental impact, businesses may suffer exceptional losses during recessionary times. For ten years of data, we built nine dummies (2010–2019).

3.4 Sample and data

To obtain a representative sample of Fintech institutions, we select the institutions from the constituents of the well-known KBW Nasdaq Financial Technology Index (KFTX). We choose KFTX because it is the first official FinTech index recognized by the prior literature (Li *et al.*, 2020). The constituents of KFTX include both Fintech institutions and cross-business institutions. A total number of 48 Fintech institutions are listed in the KFTX. The sustainability and financial information data are gathered from the Bloomberg database. Also, we use the five factors Fama French factors (2×3) and risk-free rate (Rf) data from the Kenneth R. French online library. The list of Fintech firms is available in Appendix 2. We gather the Fintech-listed firms' data from the USA as the most aged listed Fintech Index is only available in the USA. We gather the Fintech firms' data using the guidelines provided by prior studies (Najaf *et al.*, 2021a, 2021b, 2021c, 2021d). We prefer KFTX over Standard Industrial Classification (SIC) coding; the reason is that KFTX is the only available index for the Fintech-listed firms and SIC does not have specific coding for Fintech firms.

Later, we select the matching sample of non-FinTech firms while using the Bloomberg "relative valuation (RV)" function, which is a technique of valuing businesses by comparing the value of one company to the value of its rivals. Instead of using future free cash flow estimates discounted to the present value, relative valuation methods use historical free cash flow data to evaluate a company's intrinsic value (Alshurafat *et al.*, 2021; Sisaye, 2021). Investors may use relative valuation models, which are similar to absolute value models, to determine if a company's stock is a worthwhile investment. The most logical multiple to use in real estate is a price-to-cash flow, whereas in retail, price-to-sales should be used to establish a company's relative value (Investopedia, 2020). This process yields 145 non-FinTech firms matched on the industry, EPS review, ownership and credit rating. We use annual data for all the variables because the governance structure does not change

frequently, but it evolves gradually over the years. Our total sample consists of 193 listed firms from 2010 until 2019. Firms with missing sustainability structure data are excluded from the sample. Hence, this study includes a total of 1,712 annual observations (firm-years).

The study provides the sample distribution in Table 2, which shows the total number of firms belonging to a particular period. It also shows the average sum of each sustainability component separately. The sustainability performance is neither monthly nor quarterly, rather yearly and it does not change suddenly, rather evolves slowly and steadily. Hence, this Table shows the sum trend of sustainability performance over the years from 2010 to 2019. The number of firms falling in a year remains between 150 and 188. We find an increasing trend among all nine sustainability factors, including the sustainability index, from 2010 until 2019. In other words, we find US-listed firms of our sample have strengthened the sustainability measure, which is good news for humanity as US firms are more environment friendly, social and have better governance as compared to ten years before.

4. Findings and discussions

4.1 Empirical results

4.1.1 Univariate tests. Table 3 presents the correlation matrix investigating the direct relationships between the independent and control variables, with both Spearman (upper diagonal) and Pearson (lower diagonal) coefficients provided. The largest correlations are found between *stock value* and *GDP* (0.6410, $p < 0.05$), *stock value* and *Sindex* (0.4980, $p < 0.05$). Because we run separate regression models for *Sindex* and *stock value*, correlation among the focused independent variables does not matter. Apart from that, the correlations are below 0.5 among the control variables; it, therefore, appears that multicollinearity is not a concern in our models (Dharmasiri *et al.*, 2021). Thus, no multicollinearity issues are apparent in Table 3. Moreover, the study considers variance inflation factor measure to address multicollinearity across the regression analysis.

4.1.2 Test of hypothesis – FinTech sustainability initiatives. We winsorize the sample observation at the 1st and 99th percentiles to remove the extreme outliers. The mean of studied dependent variables, i.e. Fintech firms' stock value and Sindex are 3.36 and 1.40, respectively. In contrast, the same variables for the non-FinTech firms hold a mean of 3.53 and 2.24. To this end, Table 4 tests the mean and median difference of the variables coming from two different categories, i.e. FinTech firms and non-FinTech firms. The mean and median of stock value and sustainability index from FinTech firms are significantly lower than those of non-FinTech firms, offering an initial idea that supports our hypothesis to proceed with further grinding. It implies that FinTech firms stay behind the non-FinTech firms in terms of stock market value and sustainability index. Thus, this supports our hypothesis of a low level of sustainability and performance by the FinTech firms. Our results are supported by resource orchestration theory, which suggests a positive relationship between ESG disclosure and value creation (Wong *et al.*, 2018).

4.1.3 Test of hypothesis – impact of sustainability on Fintech firms and firms' stock value. After applying the univariate tests (such as comparing means and medians), the results disclose that the FinTech firms are weaker than non-FinTech firms in terms of sustainability and market performance. Now we examine the stock return and sustainability difference between FinTech and non-FinTech firms using the regression analyses. Following the earlier studies and theory, we specify other variables in our regression analyses that control for the effect of the observable firm- and country-specific characteristics (Atayah *et al.*, 2021b; Najaf and Najaf, 2021; Yiwei *et al.*, 2021).

Table 2.
Sample distribution of sustainability components and sustainability index

Year	No. of firms	GRI criteria compliance	Global reporting initiatives checked	Verification type	Business ethics policy	Employee CSR training	Women in management	Independent audit committee chairperson	Executive director with responsibility for CSR	CSR committee	Sust. index
2010	150	30	3	13	31	4	16	144	0	12	253
2011	156	36	2	12	35	4	16	150	0	18	273
2012	160	41	3	13	39	5	17	157	1	21	297
2013	163	45	3	19	44	5	20	163	1	23	323
2014	173	46	2	25	45	5	27	170	1	25	346
2015	176	51	2	31	53	5	30	175	1	30	378
2016	179	60	4	33	56	4	32	178	1	33	401
2017	182	62	7	37	62	7	36	180	1	40	432
2018	188	63	9	39	61	9	64	187	2	55	488
2019	185	30	10	20	31	9	25	183	2	62	371
Total	1,712	464	45	242	457	57	283	1,687	10	319	3,562

This section adopts a model to test whether FinTech firms experience better performance and if FinTech firms follow sustainable practices. Hence, the results in Table 5 (Models 1 and 2) show that FinTech firms compared to non-Fintech firms neither gain better performance nor have better sustainable practices. Alternatively, these findings imply that FinTech firms are confronting lower negative stock returns, as reflected in Model 2. In comparison, FinTech firm discloses fewer sustainability practices compared to non-FinTech firms. This implies that FinTech firms are far away from positive stock return as well as far behind non-FinTech firms in light of sustainability. These findings might be explained by the fact that Fintech is still relatively new and hence unable to provide a good stock return. Furthermore, ESG disclosure does get attention; perhaps, Fintech is neither involved in negative externalities nor concerned with ESG. Finally, the findings might be spurious, but the consistency of the results across methodologies and proxy variants eliminates this possibility. These results are oppositive with the seminal works of Najaf *et al.* (2021d, 2021c), which suggest that Fintech firms have a better value at risk (VaR) and sustainability than non-Fintech firms.

4.1.4 Robustness test. This section shows the impact of sustainability on the performance using the CAPM, Fama-French three- and five-factor models. The study, in particular, strives to explore whether the effect of sustainability on performance decays out with the presence of CAPM, three and five factors in the models (Table 6). The results interestingly show that both stock value and sustainability index have a negative impact on

Variables	Code	1	2	3	4	5	6	7	8
Stock value	1		*0.4508**	*0.1287**	*0.1377**	*0.1104**	*−0.0402*	*−0.6410**	*−0.1644**
Sindex	2	0.4980*		*0.0633**	*0.0773**	*0.1474**	*0.0091*	*−0.1319**	*0.0583**
Firm age	3	0.2067*	0.1044*		*0.0388*	*−0.0399*	*−0.0899**	*0.0432*	*0.01*
Audit dummy	4	0.1363*	0.0927*	0.0006		*−0.045*	*0.0282*	*0.0155*	*0.0071*
Leverage	5	0.2398*	0.2133*	−0.0148	−0.037		*−0.018*	*0.0199*	*0.0001*
Loss dummy	6	−0.0707*	0.0129	−0.1196*	0.0278	0.0082		*−0.0641**	*−0.0244*
GDP	7	−0.5657*	−0.1451*	−0.0121	0.0152	−0.0551*	−0.0662*		*−0.1489**
CPI	8	−0.2517*	0.0335	0.0132	0.0082	0.0066	−0.0193	−0.0500*	

Note: *Significance at the 0.01%, 0.05% and 0.10% level

Table 3.
Correlation matrix

Categories	Variables	Fintech firm = 1 (n = 434) Mean	Fintech firm = 1 (n = 434) Median	Non-Fintech firms = 0 (n = 1,278) Mean	Non-Fintech firms = 0 (n = 1,278) Median	t-test Diff. between means	Mann–Whitney Diff. between medians
Dependent variables	Stock value	3.36	2.96	3.53	3.53	(−0.17)***	(−0.57)***
	Sustainability index	1.40	1.24	2.31	2.24	(10.49)***	(0.19)***
Firm control variables	Firm age (No.)	22.48	16	31.16	22	(−8.68)***	(−6.00)***
	Big 4 (No.)	1	1	0.99	1	(0.01)*	(0.004)*
	Leverage (ratio)	5.60	2.58	5.70	3.15	(−0.10)***	(−0.57)***
	Loss dummy (No.)	0	0	0.02	0.01	(−0.02)*	(−0.01)*

Notes: This Table presents the non-parametric tests (t-test and Mann–Whitney); *, ** and ***statistical significance at the 10%, 5% and 1% levels, respectively

Table 4.
Differences in dependent variable mean and median between Fintech and non-Fintech firms (n = 1,712)

Fintech firm's structure. We can observe the explanatory power of the model also substantially increased. Overall, the findings suggest that sustainability plays a significant role in positively explaining the firm's performance even after capturing the effect of the firm-specific controls.

4.2 Control for endogeneity test – generalized panel methods of moments model

To address the same research question, the study used the generalized panel methods of moments (GMM) developed by Arellano and Bond (1991) and Arellano and Bover (1995). Hence, we test the dynamic system GMM model in Model (1) and (2) of Table 7 by including the lag-dependent variable in the model, which potentially corrects endogeneity issues and also provides more consistent estimates of the parameters. Broadly, the GMM can address the endogeneity issue. The endogeneity of several right-hand-side variables causes trouble in multivariate analysis. Therefore, we apply the two-step GMM model by Blundell and Bond (1998) to address endogeneity.

The results are reported in Table 7 (Models 1 and 2), which are consistent with the baseline estimations. Moreover, the diagnostic tests show the absence of autocorrelation as well as the justification of the instrumental variables. Overall, the study can conclude that stock returns and Sindex are less for the FinTech firms than non-FinTech firms. These results corroborate our baseline regression analyses.

5. Conclusion

Using a panel of 1,712 company-years observations from 2010 to 2019, this study contributes to understanding how FinTech firms experience the stock performance with the

Variables	Sindex Model 1	Stock return Model 2
Fin	−0.549*** [−17.256]	−0.818*** [−11.818]
Firm age	0.004*** [7.380]	0.003 [1.563]
Big 4	0.804*** [8.972]	0.689*** [5.437]
Leverage	0.017*** [5.541]	0.052*** [6.597]
Loss dummy	−0.544*** [−5.870]	−0.042 [−0.175]
Gross domestic product	−12.043*** [−29.440]	−3.702*** [−3.932]
Consumer price index	−0.278*** [−14.260]	0.095* [1.822]
Constant	16.412*** [29.972]	5.380*** [4.038]
Year effect	Yes	Yes
Ind. effect	Yes	Yes
SE cluster	Firm	Firm
Observations	1,712	1,712
R^2 value	68.15%	11.49%

Notes: $Sindex_{it} = \alpha + \beta_i Fin_{it} + \sum_{i=1}^{6} Controls_{it} + \delta 1 Year_j + \delta 2 Industry_i + \varepsilon_{it}$ (Model 1) $Stock\ retrun_{it} = \alpha + \beta_i Fin_{it} + \sum_{i=1}^{6} Controls_{it} + \delta 1 Year_j + \delta 2 Industry_i + \varepsilon_{it}$ (Model 2) where *Sindex* represents an equally weighted index and a combination of all ESG scores. We use Stock return = (stock value$_t$/stock value$_{t-1}$) − 1 as the proxy for performance; $Controls_{it}$ is the list of firm- (firm age, auditor, financial leverage, loss dummy) and country- (GDP and CPI) level control variables; and ε_{it} is a white-noise error term. Also, we control for the unknown fixed effect of $industry_i$ and $year_j$. We prefer to cluster on firm-level rather than industry level as some of the industries in our sample have an uneven number of firms. The definition of all variables is provided in Appendix 1. ***, ** and *statistical significance at the 1%, 5% and 10% levels, respectively

Table 5. Analysis of Sindex and performance of the FinTech – main hypotheses

variation of sustainable performance. To estimate the model, in addition to ordinary least square, the GMM is used to capture endogeneity and heterogeneity issues. The study examined the impact of sustainability and market performance of both FinTech and Non-FinTech firms, as regarding sustainability practices have been a severe concern among investors before they jump to investment decisions. The results suggest a negative relationship between sustainability practices and market performance with Fintech firms. It is also revealed that investors are sensitive toward sustainable practices and the trend to invest more in their counterparts (in our case, non-Fintech firms) with better sustainability. The findings are robust across the model and methods variations, and these findings are also consistent with the grounding theories that backed our hypothesis.

There are several implications of these findings. In the first place, sustainability practices are increasingly being seen through the lens of the sustainability model. Hence, it should be a priority for facilitating a high and sustainable financial system. Second, this study indicates that the shareholders can benefit from investing in firms with better sustainability measures. For future studies, we would suggest looking into the value at risk and Fintech firms' performance. Furthermore, we would suggest future studies to look into additional dimensions related to the financial performance, such as ROA, profit and others. Finally, this study could be extended by measuring the impact of sustainability orientation on consumer behavior, such as purchasing behavior and loyalty.

	Dependent variable: R_rf_{it}		
	CAPM	Three factors	Five factors
Variables	Model 1	Model 2	Model 3
MKT_rf	0.001 [0.592]	−0.009*** [−3.912]	−0.014*** [−6.183]
SMB		0.029*** [9.852]	0.053*** [12.603]
HML		0.019*** [9.930]	0.032*** [11.830]
RMW			−0.007 [−1.539]
CMA			−0.047*** [−9.732]
		2.947***	
Sindex	0.282*** [24.028]	0.275*** [24.786]	0.279*** [25.553]
Constant	2.579*** [55.476]	2.789*** [59.345]	2.947*** [56.869]
Year effect	Yes	Yes	Yes
Ind. effect	Yes	Yes	Yes
SE cluster	Firm	Firm	Firm
Observations	1,712	1,712	1,712
R^2 value	20.35%	32.21%	35.09%

Notes: We use the following three models:

$$R\_rf_{it} = \alpha + \beta_1 MKT\_rf_t + \beta_2 \sum_{j=1}^{9} Sindex_{it} + \varepsilon_{it}. \quad (1)$$

$$R\_rf_{it} = \alpha + \beta_i MKT\_rf_t + sSML_t + hBML_t + \beta_2 \sum_{j=1}^{9} Sindex_{it} + \varepsilon_{it} \quad (2)$$

$$R\_rf_{it} = \alpha + \beta_i MKT\_rf_t + sSML_t + hBML_t + rRMW_t + cCMA_t + \beta_2 \sum_{j=1}^{9} Sindex_{it} + \varepsilon_{it}. \quad (3)$$

where R_rf_{it} is the stock return in excess of risk-free rate; MKT_rf_t is return of value-weighted portfolio of all US (NYSE, AMEX, and NASDAQ) listed stocks minus risk-free rate; SML means small minus big portfolio returns of US market; BML implies high minus low book value stock of US market; RMW is robust minus weak portfolio returns; CMA is conservative minus aggressive portfolio return; and Sindex is an equally weighted index and a combination of all ESG scores as defined in Table 1. Beneath each estimator, the values in the parentheses are *t*-values, the clustered robust *t*-statistic are reported at the firm level. The variance inflation factors (VIF) are well below the tolerance level; *, ** and ***statistical significance at the 1%, 5% and 10% levels, respectively

Table 6.
Robustness test

Variables	Stock return Model 1	Environment Model 2
l.Stock return	0.687*** [0.02]	
l.Sindex		0.650*** [0.07]
Fin	−0.127*** [0.05]	−1.264*** [0.27]
Firm age	0.001 [0.00]	0.010*** [0.00]
Big 4	0.253*** [0.09]	0.065 [0.10]
Leverage	0.002 [0.00]	0.026 [0.02]
Loss dummy	−0.098 [0.10]	0.657 [0.57]
Gross domestic product	0.347 [0.41]	0.683 [0.67]
Consumer price index	−0.060***	0.104*** [0.02]
Constant	−3.511 [5.50]	−8.608 [8.96]
Year effect	Yes	Yes
Ind. effect	Yes	Yes
Observations	1517	906
Wald χ^2	(280.79)***	(313.82)***
No. of instruments	161	49
No. of groups	188	188
Arellano–Bond: AR(1)	0.000	0.000
Arellano–Bond: AR(2)	0.323	0.187
Sargan test (p value)	0.000	0.081

Notes: $Stock\ return_{it} = \alpha + \beta_i Stock\ return_{it-1} + \beta_i Fin_{it} + \sum_{i=1}^{6} Controls_{it} + \delta 1 Year_j + \delta 2 Industry_i + \varepsilon_{it}$ (Model 1)

$Sindex_{it} = \alpha + \beta_i Sindex_{it-1} + \beta_i Fin_{it} + \sum_{i=1}^{6} Controls_{it} + \delta 1 Year_j + \delta 2 Industry_i + \varepsilon_{it}$ (Model 2)

where Stock return = (stock value$_t$/stock value$_{t-1}$) − 1 as the proxy for performance; $Sindex_{it}$ presents social index as defined in Table 1. $Controls_{it}$ is the list of firm- (firm age, auditor, financial leverage, loss dummy) and country- (GDP and CPI) level control variables; and ε_{it} is a white-noise error term. Also, we control for the unknown fixed effect of $industry_i$ and $year_j$. We prefer to cluster on firm level rather than industry level as some of the industries in our sample have uneven number of firms. The definition of all variables is provided in Appendix 1. ***, ** and * denote statistical significance at the 1%, 5%, and 10% levels, respectively

Table 7. Control for endogeneity (system GMM)

Note

1. The full definitions of all nine variables are available in Table 1.

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Appendix 1

Variable	Definition	Relevant studies
Focused independent variable		
Fin	This is a dichotomous variable, where "1" indicates FinTech firms and "0" indicates counterparts' firms	Najaf *et al.* (2020)
Dependent variables		
Stock return	It is the stock return in excess of risk-free rate. Stock return= (stock valuet/l.stock value$_t$)−1	Najaf *et al.* (2021b)
Sindex	This is a continuous variable, which is a combination of all environmental, governance and social indicators as defined in Table 1	This study
Firm-level control variables		
Firm age	Numeric variable representing the size of the firm as measured by the logarithm of total assets	Dickinson (2011)
Leverage	Total debt/total assets	Ali *et al.* (2020); Faccio *et al.* (2011)
Big 4	Dummy variable equal to 1 if the company is audited by "Big 4" audit firm otherwise "0"	Hassan Omer *et al.* (2020)
Loss dummy	Dummy variable equal to 1 if the company faces a financial loss during the financial year (t), otherwise "0"	Altarawneh *et al.* (2020)
Country-level control variables		
Consumer price index (CPI)	The annual rate of inflation of each country reported by World Economic Forum	Beck *et al.* (2008)
Gross domestic product (GDP)	The annual rate of GDP growth of each country, given by Oxford Economics and World Bank WDI. It is calculated as a natural log of GDP	Najaf and Chin (2021)
Fixed-effect controls		
Year	1 (0) for observations from year t and 0 for other observations	Dickinson (2011)
Industry	1 (0) if during year t, company i operating in industry j and 0 otherwise	Ali *et al.* (2014)

Table A1.
Variables' summary

Appendix 2

Table A2.
List of FinTech firms

S. no.	Bloomberg ticker	Name
1	ACIW US Equity	ACI WORLDWIDE INC
2	ADS US Equity	ALLIANCE DATA SYSTEMS CORP
3	AXP US Equity	AMERICAN EXPRESS CO
4	AX US Equity	AXOS FINANCIAL INC
5	BKI US Equity	BLACK KNIGHT INC
6	EPAY US Equity	BOTTOMLINE TECHNOLOGIES (DE)
7	BR US Equity	BROADRIDGE FINANCIAL SOLUTIO
8	CATM US Equity	CARDTRONICS PLC – A
9	CBOE US Equity	CBOE GLOBAL MARKETS INC
10	CME US Equity	CME GROUP INC
11	CLGX US Equity	CORELOGIC INC
12	CSGP US Equity	COSTAR GROUP INC
13	ENV US Equity	ENVESTNET INC
14	EFX US Equity	EQUIFAX INC
15	EEFT US Equity	EURONET WORLDWIDE INC
16	EVTC US Equity	EVERTEC INC
17	FDS US Equity	FACTSET RESEARCH SYSTEMS INC
18	FICO US Equity	FAIR ISAAC CORP
19	FIS US Equity	FIDELITY NATIONAL INFO SERV
20	FISV US Equity	FISERV INC
21	FLT US Equity	FLEETCOR TECHNOLOGIES INC
22	GPN US Equity	GLOBAL PAYMENTS INC
23	GDOT US Equity	GREEN DOT CORP-CLASS A
24	GSKY US Equity	GREENSKY INC-CLASS A
25	INFO US Equity	IHS MARKIT LTD
26	ICE US Equity	INTERCONTINENTAL EXCHANGE IN
27	JKHY US Equity	JACK HENRY and ASSOCIATES INC
28	LC US Equity	LENDINGCLUB CORP
29	MKTX US Equity	MARKETAXESS HOLDINGS INC
30	MA US Equity	MASTERCARD INC - A
31	CASH US Equity	META FINANCIAL GROUP INC
32	MCO US Equity	MOODY'S CORP
33	MSCI US Equity	MSCI INC
34	NDAQ US Equity	NASDAQ INC
35	PYPL US Equity	PAYPAL HOLDINGS INC
36	RP US Equity	REALPAGE INC
37	SPGI US Equity	S&P GLOBAL INC
38	SEIC US Equity	SEI INVESTMENTS COMPANY
39	SQ US Equity	SQUARE INC – A
40	SSNC US Equity	SS&C TECHNOLOGIES HOLDINGS
41	TRI US Equity	THOMSON REUTERS CORP
42	TRU US Equity	TRANSUNION
43	VRSK US Equity	VERISK ANALYTICS INC
44	VIRT US Equity	VIRTU FINANCIAL INC-CLASS A
45	V US Equity	VISA INC-CLASS A SHARES
46	WU US Equity	WESTERN UNION CO
47	WEX US Equity	WEX INC
48	WETF US Equity	WISDOMTREE INVESTMENTS INC