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Enhancing corporate financial sustainability prediction through advanced risk analytics and real-time data insights

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Abstract

The research seeks to determine how real-time data perspectives and improved risk analytics can promote the forecast of corporate financial sustainability. In the present scenario, certain sectors face barriers in upholding financial health, making it essential to measure the forces of long-term financial transparency. While prior studies have investigated factors of financial sustainability, some research holistically associates both real-time operational information and advanced risk metrics throughout different sectors to measure their joint predictive ability. The research addresses such gaps by exploring the effect of particular real-time data perspectives (Total Current Assets, Turnover, Total Capital Expenditures, Net Debt per Share, EBIT Margin) and risk analytics (Operating Expenses, Total Debt, Total Non-current Liabilities, Total Current Liabilities) on corporate financial sustainability (Retained Earnings, Free Cash Flow, Net Income after Tax, and Gross Profit Margin). Panel data from 59,230 companies spanning 2009–2025 were analyzed using Fixed Effects regression with Driscoll-Kraay standard errors to account for heteroskedasticity, autocorrelation, and cross-sectional dependence, multicollinearity tests, correlation matrix, and descriptive statistics. The results indicate that liability structure and operational efficiency are crucial determinants of CFS. Total Current Liabilities (TCL) and Operating Expenses (OE) negatively impact financial sustainability, emphasizing the importance of short-term liquidity management and cost control. In contrast, strategically managed Total Debt Funds (TD) and Total Non-Current Liabilities (TNCL) positively contribute to CFS, highlighting the role of long-term debt in promoting financial resilience. Additionally, Total Current Assets (TCA), Turnover (TO), and Total Capital Expenditures (TCE) positively influence sustainability, whereas EBIT Margin (EBITM) shows a marginally negative effect, and Net Debt Per Share (NDPS) is statistically insignificant. The research suggests that corporate decision-makers prefer practical liability management, strategically support long-term revenue and capital development, and improve operational efficiency to stimulate effective long-term financial health.

Keywords: Corporate financial sustainability, Financial indicators, Financial prediction, Fixed effects model, Panel regression, Random effects model, Real-time data, Risk analytics.

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1. Introduction

Corporate financial sustainability is a significant topic as it deals with the organization's ability to remain viable and competitive in the long-run in today's dynamic business environments. It is defined by Hossain, et al. [1] as the ability to balance the consumption of the present capital and the viability of meeting the needs of the stakeholders, whereas Kong, et al. [2] defined it as the way of managing funds of an organization that leads to long-term success. Since the current business world is focusing on long-term financial sustainability of an organization, measuring and assessing risk has gained a lot of traction. They are viewed as a way to report the organisation's financial sustainability with a focus on profitability, cash flows, and other financial characteristics.

An important indicator for analyzing the financial sustainability of an organization is related to the generation and management of profits in a given company. Free Cash Flow (FCF), Net Income After Tax (NIAT), and Gross Profit Margin (GPM) are some performance indicators where they aid in the determination of the financial health of firms. For instance, GPM shows how well a firm is able to turn over its sales into profit [3]. FCF measure the ability of firms in generating cash inflow after operational costs, while maintaining the firm's sustainability [4] and NIAT focuses on impact of taxes on profit and sustainability in the long-run [5].

On the other hand, risk analytics that pertain to an evaluation of liabilities and the associated financial risks of the company operations are equally as crucial to the concept of financial sustainability. Total Debt (TD) and Total Current Liabilities (TCL) are some key metrics useful for determining the extent of risk exposure as well as the effect of the risk on the firm's profitability and sustainability. Mucharreira, et al. [6] and Wu, et al. [7] indicated that these financial indicators are important for assessing the ability of firms to maintain the balance of debt and sustainable development, as well as highlighting the role of risk analysis in predicting future financial problems.

In addition, real-time insights are used in organizations for obtaining information and make appropriate decisions in relation to their financial position. Financial Indicators (FI) including Earnings Before Interest and Taxes (EBIT) and Total Asset Turnover (TAT) along with Advanced Performance Metrics (APM) offers a real-time measure of the organizational productivity and the rate of returns obtained from its asset base [8, 9]. Historical financial values can be combined with these metrics for obtaining appropriate predictive capabilities, which are vital for any organization that endeavours to sustain its financial health in an ever-transforming economic environment.

It is evident that the literature on financial sustainability and risk management is present; however, there is a lack of literature in the field of risk analytics when it comes to real-time data and its impact on the concept of financial sustainability. Despite the previous researches such as Zabolotnyy and Wasilewski [10] and Aishwarya [11] that focused on certain aspects like capital structure and profitability, no research has been conducted that would integrate these aspects taking into account its risk and real-time figures. This gap in the research is very evident in organizations where financial sustainability is contingent upon the interdependencies between risk management strategies and operational metrics. Therefore, the current research seeks to investigate how advanced risk analytics as well as the utilization of real-time data for decision-making can promote corporate financial sustainability. The findings of the study would fill the existing gaps in the literature and can provide suggestions to both researchers and practitioners. This study addresses the following research question: How can advanced risk analytics and real-time data insights enhance the prediction of corporate financial sustainability? In order to address this main research question, it contains four sub-research questions as follows: (i) To what extent do risk analytics (total debt, liabilities, and operating expenses) influence corporate financial sustainability? (ii) How do real-time data insights, including advanced performance metrics and financial indicators, contribute to predicting corporate financial sustainability? (iii) Which combination of risk-related and financial variables most accurately predicts a company's financial sustainability? and (iv) What are the recommendation strategies for corporate decision-makers in managing financial risks and sustaining performance?

By addressing these research questions, the study will contribute towards a better understanding of how different organisations can utilize and sustain the long-term future by leveraging from risk analytics and real-time financial data.

2. Literature Review

The focus of this literature review section has been to review the past studies conducted on the aspects of Corporate financial sustainability, with a special focus on risk analytics, and real-time data insights. This literature review section combines the evidence on the relationship between operational efficiency, profitability, and the financial resilience in different industry types and locations to establish the hypotheses.

2.1. Corporate Financial Sustainability

Hossain, et al. [1] defined corporate sustainability as a firm's capability of carrying out its management activities and meet its customer and stakeholder requirements and expectations for a long-standing time. In the last few decades, it has become more prevalent for organizations that seek to measure the essential organizational functions, as argued by Wang, et al. [12]. Moreover, Kong, et al. [2] defined financial sustainability as approach of a firm towards maintaining their finances and achieving added value for the development of a future sustainable environment.

2.1.1. Gross Profit Margin (Gpm)

GPM represents the amount of gross income that corporate organizations make while achieving the total sales. Higher levels of GPM denote that a firm's sales are more effectively converted to gross profit leading to higher profitability [3]. According to International Financial Reporting Standards (IFRS) financial statement reports, margin in GPM is calculated as a percentage of sales. A study by Iliemena, et al. [13] aimed at analyzing relationship between environmental and social disclosures with GPM and Return on Capital Employed (ROCE) of the Nigerian manufacturing companies. The study identified a gap in the literatures on sustainability reporting (SR) while there are no Nigerian-based SR guidelines and standards. In order to fill this gap, this study employed ex-post facto research design whereas data samples were obtained from the sustainability reports and annual reports of 23 firms for the 10-year period (2012-2021). The data was analyzed using regression analysis and found out that the level of social disclosure has a positive impact on GPM.

2.1.2. Net Income After Tax (NIAT)

Paying taxes decreases the amount of net income of a company, while it also impacts the major financial stability indices that affect the market performance. A study by Wang [5] disclosed that net income possesses significant impacts on equity and return on net assets, the two key financial stability indicators. Wang asserted that income tax is a useful tool for analyzing financial performance, where financial stability is based on the tax planning. Return on equity and profitability both rises when the income tax rate is set to zero. However, it depends on reserves, assets, pre-tax income, and tax rates. The study concluded that profitability is the measure of sustainability and financial viability in the long-run [5]. Another study by Muhammad [14] that focused on banks operating in Nigeria stated that after-tax cash flow is the prior determinant of investment decisions. However, interest tax shield and depreciation tax shield were not much significant, where 30 per cent constant corporate tax rate had zero impact on investment decisions. These findings underscore the centrality of after-tax income to sustainability and financial planning metrics [14].

2.1.3. Free Cash Flow (FCF)

Free cash flow can be regarded as one of the key indicators of a company's financial stability since it shows their potential for making extra cash after paying for investment and operating costs. According to Ma and Park [4] a sustainable tax strategy is the one that is focused on reaching a steady level of tax performance rather than maximizing tax savings for the short-term. The authors concluded that companies using such management strategies had better earnings before tax, net income after tax, and good accruals, and especially free cash flow as compared to control firms. The findings from this study inform income constancy and robust monetary healthy for investors' evaluation. Also, better sustainable tax strategies were associated with increased corporate transparency, strong corporate governance, and recommended internal control mechanisms. A better Altman's Z scores are evident in firms where higher returns on assets, stable operating cash flows, and low operating cost risk volatilities are achieved. This reinforces the role of free cash flow and financial sustainability, in the long run [4].

2.1.4. Retained Earnings (RE)

RE is much-valued asset for organizations that help in improving performance and also reduce risks. It uses the retention rate or plowback ratio for evaluating the reinvestment plan of organizations. Dahmash, et al. [15] asserted that the corresponding operating cost can be controlled if the firm has higher retained earnings; means that, higher investment opportunities without the incremental operating costs, thereby supporting its financial stability. These earnings are placed in shareholders' equity section of the balance sheet [16]. A study by Yemi and Seriki [17] highlighted the direct correlation between earnings per share, dividend policy, and firm value with retained earnings and their corresponding impact on financial leverage and business valuation. Another study by Agembe, et al. [18] used the panel data of 42 non-financial firms for the period between 2016 and 2022 and revealed that there was positive association between the financial performance and retained earnings. Pecking Order Theory was used as a theoretical framework in this study where it found out that retained earning proved its significance for financial stability in volatile markets and call for broader validation across sectors [18].

2.2. Risk Analytics

Risk analytics plays a pivotal role in assessing and managing financial uncertainties that may affect corporate sustainability [19]. In this sub-section, common financial indicators used by organizations for determining their potential risk exposure, optimizing risk exposures, as well as ensuring economic sustainability and resilience in the long-run are all discussed.

2.2.1. Total Current Liabilities (TCL)

Gurung [20] noted that the total liabilities can be classified as current and non-current liabilities. As stated by Nuzula [21] although the business institutions bring a lot of economic impacts to Southeast Asian nations, the environmental issues

are not given proper consideration. Consequently, they are likely to affect corporate profitability since there is a rise in the environmental risk scores. This study examined some environmental factors and their effect on profitability with emphasis on return on assets (ROA). The findings revealed that environmental risk had no effect on ROA; however, when year, country, industry, and total amount of attributes were added into the analysis, significance appeared regardless of the fact that current liabilities and total assets were proved to have no effect on ROA.

2.2.2. Total Non-Current Liabilities (TNL)

Mucharreira, et al. [6] used the total liabilities to assets ratio to evaluate financial performance. This ratio shows the proportion of liabilities used to finance the firms' assets. A ratio lower than 1 indicates less financial riskiness while bringing more security to the creditors as it represents the organizations' financial sustainability in the long-run.

2.2.3. Total Debt (TD)

Hayes [22] defines the debt ratio as the proportion of a company's assets financed by debt. Wu, et al. [7] examined panel data from 2008–2019 and used the debt ratio for capital structure and current ratio for liquidity. The sustainability indicator used was return on equity (ROE) and examined cross-sectional independence and long-term co-integrated behaviors among variables. From the Generalized Method of Moments (GMM) analysis, it is evident that there is a positive relationship between capital structure and liquidity with financial sustainability. It also paved way to the improvement of corporate sustainability through their interaction. Operational efficiency, growth, and size had positive impacts while assets evaluated for tangibility had less impact. Further, mutually significant relationship was disclosed between ROE and other variables like operational efficiency, debt size, debt ratio, cash flow ratio, and current ratio.

2.2.4. Operating Expenses (OE)

A study by Boloș, et al. [23] where they developed a MAMDANI fuzzy controller for measuring the potential economic sustainability risks pertaining to the use of assets. Such risks occurrence is high when a firm's assets fail to generate economic returns. The controller's inputs are the asset operating expenses and their changes over the different periods and aimed at stabilizing operating costs and reducing financial sustainability risk. The study concluded that output and economic benefit variation refers to one of the important indicators used in the measurement of sustainability.

2.3. Real-time Data Insights

In this sub-section, how the enhanced financial indicators and performance metrics provide contributions to increased efficiency, resiliency, and long-term viability especially in an ever-changing business environment are discussed.

2.3.1. Advanced Performance Metrics (APM)

EBIT is an important measure for businesses towards assessing their profitability from its core operations, without including taxes and interest. It provides a steady form of measuring operational efficiency and aids in decision-making concerning the business performance, competition, and advancement [24]. Another key metric is Net debt, which is mostly used during acquisition or at certain low levels of economic cycles, as it exhibits the entity's capacity for enduring financial stress. Net debt is obtained by deducting Cash from the Total Amount of debts; and can be used with other performance indicators Hayes [25]. Orinya, et al. [26] emphasized that firms' financial performance should be evaluated through capital flow and stock, covering economic, human, environmental, and social capitals. Their study found that expenditures in economic capital—especially research and development—positively influence financial performance in Nigerian manufacturing firms.

2.3.2. Financial Indicators (FI)

Total Asset Turnover (TAT) is a financial ratio measure showing how effectively assets of the company have been utilized in order to generate sales [13]. Increased TAT means higher sales performance, the expansion of the market, and better financial results. Wu, et al. [27] study argued that there is a positive correlation between financial performance and TAT of the listed agricultural enterprises. It noted that a low asset turnover ratio is an indicator of resource constraint and limited capacity exploitation. Le Thi Kim, et al. [28] revealed that TAT, leverage, and sales growth are the factors that affect the financial performance when it is measured in terms of ROE or Return on Sales (ROS). In particular, TAT and sales growth are directly related to performance while leverage has an inverse relationship with it. However, Juliani, et al. [29] found TAT to have a negative and insignificant impact on financial performance.

2.4. Hypotheses Development

A financial sustainability study by Zabolotnyy and Wasilewski [10] was conducted on 12 food companies in Northern Europe with the data samples for the period of 2005 to 2015. Two indicators, such as continuity and value, were used by researchers in order to define financial sustainability. Current liabilities/current assets, total assets/total liabilities, revenue/retained earnings, and EBIT/interest expense were all used to assess continuity. On the other hand, total assets/revenue, price/book value, current assets/total assets, and equity/net profit were all used to assess value. While the authors do not explain why these criteria were used, fuzzy set logic was adopted by them, and derived findings related to overall financial sustainability, aggregated measures of continuity, and value. Lee, et al. [30] aimed to determine the effects that multinational business diversification might have on the Korean construction companies' financial sustainability. This study adopted the Vector Error Correction Model and found that the debt and current ratios have been used as a measure of financial sustainability while construction orders, both domestically and internationally, represented diversification. It was

also revealed by using the quarterly data from 2001 to 2015 that increased international orders have a negative impact on financial viability since debt ratios were high and current ratios were low. These findings suggested that there is necessity of long-term strategic planning for international ventures. Accordingly, this study proposes the following hypothesis (H1):

H_1: Risk analytics significantly influence corporate financial sustainability.

Aishwarya [11] investigated how capital structure impacts the Indian automobile firms' profitability. For this investigation, this study used the following indicators, including ROA, Operating Profit (OP), GPM, Return on Net Worth (RoNW), Return on Long-Term Funds (RoLT), and RoCE. While indicators like RoNW, RoLT, and RoCE have a direct positive relationship with capital structure; indicators like ROA, OP, and GPM have the negative effect. The study aimed at confirming the relationship between capital structure and profitability, whereby data from the 17 companies was collected from the year 2010 to 2019 and the fixed or random effects regression test was utilized. This study concluded that organizations should keep an efficient combination of equity and debt for performance improvement as well as effectively addressing the financial obligations Aishwarya [11]. Iotti, et al. [31] investigated the financial performance of 101 firms in the Parma PDO Ham industry. The analysis of 840 observations for the period of 10 years revealed that larger firms in the highest turnover category generate higher profitability through less inventory days and higher capital turnover [31]. Accordingly, this study proposes the following hypothesis (H2):

H2: Real-time data insights, such as advanced performance metrics and historical financial indicators, significantly influence corporate financial sustainability.

2.5. Research Gap

Despite existing literature related to financial sustainability offering significant insights, there are some gaps prevalent. For instance, in the study by Zabolotnyy and Wasilewski [10] the authors proposed an essential measurement framework concerning both the financial value and the continuity of a financial model; however, the rationale for choosing those indicators lacks generalizability. Another study by Aishwarya [11] provided an investigation of the profitability and capital structure relationship with regards to automobile firms operating in India; however, this investigation does not focus on broader risk dimensions or sustainability aspects. A study by Lee, et al. [30] examined the effects of multinational diversification on the financial performance of Korean construction companies. However, this study failed to emphasis long-term sustainability strategies in the construction firms. While Iotti, et al. [31] offer sector-based insights about profitability and capital efficiency within the Parma PDO Ham industry, their results remain limited to the analysis of the firm size and inventory without incorporating strong risk analysis or real-time financial data in their entirety. As a whole, these literatures have failed to provide a comprehensive approach on how exactly both risk analysis indicators (such as debt and liabilities) and real-time data (such as turnover and EBIT margin) impact financial sustainability across industries. This brings a significant gap in comprehending the integrative role of risk-based and operational metrics in influencing corporate financial sustainability in the long term.

3. Materials and Methods

This section discusses the included materials and methods to assess the influence of real-time performance metrics, risk indicators, and historical financial parameters on corporate financial sustainability. It contains the variables and metrics, along with their descriptions, including type, measurement, model specifications, data sources, sampling procedures, and data analysis methods.

3.1. Variables and Measures

This research aims to evaluate the impact of risk analytics, advanced performance, and historical financial indicators on corporate financial sustainability. The major independent variables were represented as total current liabilities, total non-current liabilities, total debt, operating expenses, EBIT margin, net debt per share, total capital expenditures, turnover, and total current assets (Table 1). On the other hand, dependent variables were gross profit margin, net income after tax, retained earnings, and free cash flow as shown in conceptual framework Figure 1.

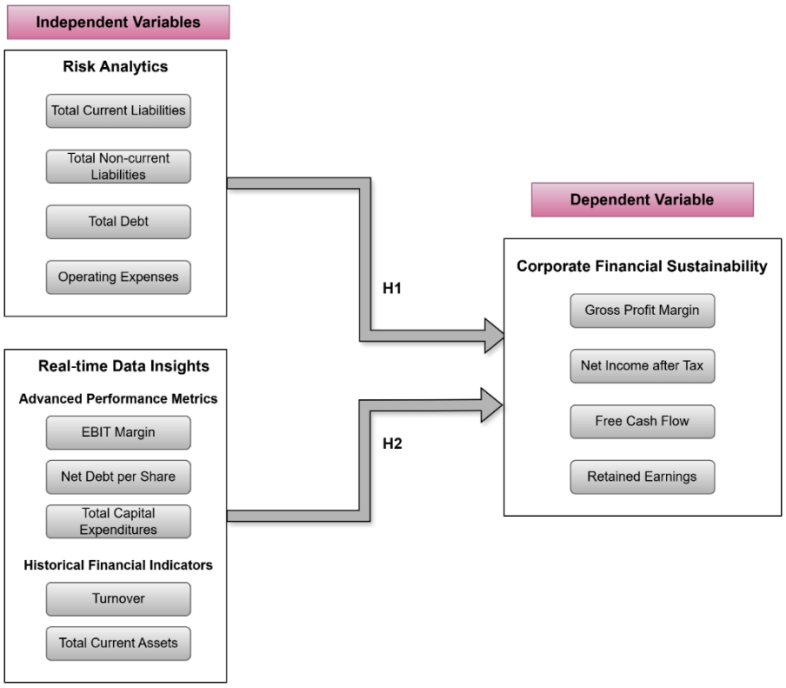

Figure 1. Conceptual framework of the study.

3.2. Hypotheses and Sub-Hypotheses

$H_{1:}$ Risk analytics significantly influence corporate financial sustainability.

$H_{1a:}$ Total current liabilities have a significant impact on corporate financial sustainability.

$H_{1b:}$ Total non-current liabilities have a significant impact on corporate financial sustainability.

$H_{1c:}$ Total debt has a significant impact on corporate financial sustainability.

$H_{1d:}$ Operating expenses have a significant effect on corporate financial sustainability.

$H_{2:}$ Real-time data insights, such as advanced performance metrics and historical financial indicators, significantly influence corporate financial sustainability.

$H_{2a:}$ EBIT margin has a significant impact on corporate financial sustainability.

$H_{2b:}$ Net debt per share has a significant impact on corporate financial sustainability.

$H_{2c:}$ Total capital expenditures have a significant impact on corporate financial sustainability.

$H_{2d:}$ Turnover has a significant impact on corporate financial sustainability.

$H_{2e:}$ Total current assets have a significant impact on corporate financial sustainability.

In this study, the measurement of chosen variables has been depicted as follows (Table 1):

Table 1.
Measurement of variables.

Type	Variables		Measurement	Previous Studies
Dependent	Corporate Financial Sustainability (CFS)	Gross Profit Margin (GPM)	Gross profit/sales	Iliemena, et al. [13] and Majka [24]
		Net Income After Tax (NIAT)	Revenue – Profit or earnings after all taxes and expenses	Herman and Zsido [32] and Kenton [33]
		Free Cash Flow (FCF)	The amount of cash a company produces after deducting expenditures required to sustain its operations and preserve its capital assets.	Elahi, et al. [34] and Fernando [35]
		Retained Earnings (RE)	Beginning Period RE + Net Income – Cash Dividends – Stock Dividends	Zabolotnyy and Wasilewski [10] and Fernando [35]
Independent	Risk Analytics (RA)	Total Current Liabilities (TCL)	Liabilities that are expected to be settled or will necessitate the use of current assets within one year.	Sawitri [36] and Tamplin [37]
		Total Non-current Liabilities (TNCL)	Represents a company's long-term financial obligations, consisting of debts or commitments that are not due for repayment within the next year.	Sawitri [36] and Gustafson [38]
		Total Debt (TD)	Represents the total amount of a company's	Sawitri [36] and

			financial obligations, including both short-term and long-term debts. It is calculated by combining the company's short-term debt (payable within one year) with its long-term debt (payable after one year).	HighRadius [39]
		Operating Expenses (OE)	Operating expenses encompass costs such as rent, equipment, inventory, marketing, payroll, insurance, and allocations for research and development.	Osazefua [40] and Kenton [41]
	Advanced Performance Metrics (APM)	EBIT Margin (EBIT)	It reflects the earnings generated from a company's core business activities, excluding the impact of interest expenses and income taxes.	Majka [24]
		Net Debt Per Share (NDPS)	(Total debt – cash)/Number of outstanding shares	Schoenmaker and Schramade [42] and CFI [43]
		Total Capital Expenditures (TCE)	It refers to expenditures made, either in cash or on credit, to acquire long-term physical or fixed assets that are essential for a company's operational activities.	Orinya, et al. [26] and Vipond [44]
	Historical Financial Indicators (HFI)	Turnover (TO)	It measures how effectively the company collects payments from its debtors, reflecting the efficiency of its credit policies and debt collection processes.	Osazefua [40]; Sawitri [36] and Nogueira, et al. [45]
		Total Current Assets (TCA)	It includes cash, cash equivalents, accounts receivable, inventory, marketable securities, and prepaid expenses. These assets that are expected to be converted into cash or used up within one year.	Osazefua [40]; Herman and Zsido [32] and Hayes [25]

3.3. Model Specification

A quantitative and explanatory research design was adopted in this study based on secondary panel data [46]. This research approach is used to assess how different risk analytics, historical financial data, and advanced performance metrics influence corporate financial sustainability. Accordingly, two distinct ordinary linear regression (OLS) models were designed to test the proposed hypotheses.

Model 1: Impact of Risk Analytics on Corporate Financial Sustainability

$$CFS_i = \beta_0 + \beta_1 TCL_i + \beta_2 TNCL_i + \beta_3 TD_i + \beta_4 OE_i + \epsilon_i$$

Where:

CFS = Corporate Financial Sustainability (represented by Gross Profit Margin, Net Income after Tax, Free Cash Flow, Retained Earnings)

TCL = Total Current Liabilities

TNCL = Total Non-current Liabilities

TD = Total Debt

OE = Operating Expenses

β_0 = Intercept of the equation

$\beta_1, \beta_2, \beta_3,$ and β_4 = Coefficients assigned to the predictor variable

ε = Error term.

Model 2: Impact of Real-Time Data Insights on Corporate Financial Sustainability

$$CFS_i = \beta_0 + \beta_1 EBIT_i + \beta_2 NDPS_i + \beta_3 TCE_i + \beta_4 TO_i + \beta_5 TCA_i + \epsilon_i$$

Where:

CFS = Corporate Financial Sustainability

EBIT = EBIT Margin

NDPS = Net Debt per Share

TCE = Total Capital Expenditures

TO = Turnover

TCA = Total Current Assets

β_0 = Intercept of the equation

$\beta_1, \beta_2, \beta_3,$ and β_4 = Coefficients assigned to the predictor variable

ε = Error term.

3.4. Sampling and Data Collection

The secondary panel data used in this study were collected from public sources, including financial records from listed companies operating across various sectors, such as energy, export, trade, and finance [26]. Initially, the target population of the study included over 60,876 companies across different stock exchanges. However, a purposive sampling approach was implemented, and 59,230 companies across different countries, such as India, Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, the Faroe Islands, Greece, Guernsey, Hungary, Iceland, the Republic of Ireland, the Isle of Man, Italy, Jersey, Latvia, Liechtenstein, Lithuania, Luxembourg, Norway, Poland, Portugal, the Republic of Montenegro, Romania, Russia, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Ukraine, and the United Kingdom, etc. from different industries like oil & gas, chemicals & mining, drug retailers, etc. were finalized based on their availability and provision of financial data during the period from 2009 to 2025. This extended period was chosen to reduce the impacts of short-term anomalies and to capture the insights from long-term trends. Financial data with a multi-year horizon is recommended for this study, as it provides accurate insights into corporate performance indicators. However, the stabilization of accounting distortions would be represented over time [47].

The chosen time frame allowed to investigate the hypothesized relationships between corporate financial sustainability, risk analytics, advanced performance metrics, and historical financial data. Thus, the collected data would capture risk indicators, financial sustainability measures, advanced performance metrics, and historical financial variables that directly address the proposed research questions and hypotheses. These measures ensure the reliability in assessing the impact of financial dynamics and risk indicators on corporate sustainability. Moreover, exclusion criteria were applied to ignore companies with irregular financial reporting or significant data gaps to ensure data reliability and validity. In addition, the credible sources were considered for data collection, such as company annual reports, Morningstar, Yahoo Finance, and regulatory filings.

3.5. Data Analysis

To explore the impacts of risk analytics, historical financial data, and advanced performance metrics on corporate financial sustainability, a structured quantitative approach was implemented in the data analysis. This approach began with the determination of descriptive statistics to provide a summary of the dataset, including measures of dispersion and central tendency, such as means, min, max and standard deviations. Then, correlation analysis was conducted to determine the strength and linear relationships between independent and dependent variables. The panel regression test was also carried out in this study to test the hypotheses and predicted power of independent variables on corporate financial sustainability. To perform all these statistical analyses, STATA software was employed, and the results were interpreted based on significant values ($p<0.05$) [26].

4. Results

The analytical approach began with extracting descriptive statistics for all variables to characterize the sample distribution. Next, a complete correlation table was produced to identify the linear associations between the variables. This process was an essential phase, improved by the VIF ("Variance Inflation Factor") analysis, to strictly ensure the lack of multicollinearity, associated with developed econometric protocols [48]. For hypothesis testing, Ordinary Least Squares (OLS) was initially employed, followed by the Hausman test to correctly select between the Fixed Effects and Random Effects panel models. Finally, a cross-sectional dependency test was performed on each model to ensure the independence of firm-specific errors, guiding the eventual adoption of robust standard errors.

4.1. Sample Distribution Characteristics

The descriptive statistics for all variables are presented in Table 2, stemming from a large dataset involving 592,300 observations throughout all measures. The significant sample, covering companies in finance, trade, export, and energy from 2009 to 2025, shows extensive heterogeneity throughout the corporate financial fields. The key pattern is the dramatic difference between the Mean and the Median, coupled with extremely high Skewness and Kurtosis, signaling the dominance of large outliers.

Large variations were obtained for the CFS (corporate financial sustainability) representations. CFS revealed a wide range from a significant negative minimum (−64.60) to a high maximum (120.90). It has a Mean effectively close to zero (-1.12×10^{-11}) but high Kurtosis (6,982.21), showing that while the average is balanced, the individual observations are tightly clustered around zero, punctuated by extreme positive and negative values.

The variables introducing risk analytics [TCL (Total Current Liabilities), OE (Operating Expenses), TD (Total Debt), and TNCL (Total Non-current Liabilities)], all showed wide mean values and consistently high standard deviations (e.g., TD mean of 3.76×10^{8} with a Std. Dev. of 9.21×10^{9}), suggesting immense changes in companies' financial structure and operational scale. A crucial finding is the large difference between the Mean and the Median for these variables (e.g., OE Mean is 1.81×10^{8} while the Median is only 0.06). This confirms that a small group of large corporations accounts for the vast majority of the total debt and expenses. The high positive Skewness (e.g., 66.33 for TCL) further emphasizes that the distributions are heavily skewed towards lower values, with the long right tail representing the immense scale of the financial giants in the sample. Such clear diversity emphasized the different risk exposure throughout the sampled units.

Table 2.
Descriptive statistics of all variables.

Variables	Mean	Std. Dev.	Min.	25th Percentile	Median	75th Percentile	Max.	Skewness	Kurtosis
CFS	-1.12×10^{-11}	0.5650	−64.60	−0.23	−0.01	0.22	120.90	33.49	6,982.21
TCL	1.33×10^{8}	6.10×10^{9}	-1.02×10^{11}	-6.34×10^{8}	1.47×10^{6}	9.90×10^{8}	1.15×10^{12}	66.33	10,763.56
TNCL	1.45×10^{8}	2.90×10^{9}	-1.36×10^{11}	-1.06×10^{9}	5.01×10^{6}	1.25×10^{9}	3.21×10^{11}	16.07	1,029.06
TD	3.76×10^{8}	9.21×10^{9}	-2.01×10^{11}	-1.10×10^{9}	1.33×10^{7}	2.07×10^{9}	1.98×10^{12}	53.61	9,779.37
OE	1.81×10^{8}	3.63×10^{9}	-2.15×10^{11}	-3.72×10^{8}	0.06	8.17×10^{8}	3.95×10^{11}	21.03	1,459.74
EBITM	7.51×10^{5}	9.28×10^{6}	-7.84×10^{7}	-4.18×10^{6}	42,437.06	5.68×10^{6}	1.82×10^{9}	33.43	5,771.66
NDPS	3.12×10^{6}	6.53×10^{8}	-4.24×10^{10}	-1.84×10^{8}	0.50	1.93×10^{8}	2.81×10^{10}	88.78	23,545.22
TCE	2.57×10^{7}	8.79×10^{8}	-1.87×10^{10}	-2.35×10^{8}	6.46×10^{5}	2.77×10^{8}	1.62×10^{11}	56.52	9,160.03
TO	4.81×10^{7}	1.76×10^{9}	-9.36×10^{9}	-8.02×10^{7}	3.19×10^{6}	2.56×10^{8}	5.27×10^{11}	119.68	33,210.92
TCA	1.95×10^{8}	6.68×10^{9}	-1.33×10^{11}	-4.53×10^{8}	6.26×10^{6}	1.06×10^{9}	1.15×10^{12}	61.24	9,087.26

Note: N=592,300 observations; CFS = Corporate Financial Sustainability; TCL = Total Current Liabilities; TNCL = Total Non-Current Liabilities; TD = Total Debt; OE = Operating Expenses; EBITM = EBIT Margin; NDPS = Net Debt Per Share; TCE = Total Current Expenditures; TO = Turnover; TCA = Total Current Assets.

Table 1.
Correlation matrix of all variables.

Variable	CFS	TCL	TNCL	TD	OE	EBITM	NDPS	TCE	TO	TCA
CFS										
TCL	-0.0581***									
TNCL	0.2063***	0.1990***								
TD	0.3422***	-0.0137***	0.1968***							
OE	0.1942***	0.0061***	0.1163***	0.6841***						
EBITM	0.1263***	0.0528***	0.0124***	0.1874***	-0.0328***					
NDPS	**0.0005**	**-0.0002**	**0.0012**	**-0.0005**	**-0.0002**	**0.0004**				
TCE	0.1591***	0.1210***	0.0745***	0.0593***	0.0365***	0.0736***	**0.0003**			
TO	0.2720***	0.0860***	0.0284***	0.3567***	-0.0369***	0.5128***	**0.0010**	0.1789***		
TCA	0.5194***	0.5222***	0.1752***	0.1511***	0.0443***	0.1695***	**-0.0001**	0.0483***	0.2925***	

Note: *Significant at 10%; **Significant at 5%; ***Significant at 1%.

Similarly, Historical Financial Indicators and Advanced Performance Metrics, suggesting TCA (Total Current Assets), TO (Turnover), TCE (Total Capital Expenditures), NDPS (Net Debt Per Share), and EBITM (EBIT Margin), illustrated significant wide ranges and means. TO (Turnover) is the most volatile metric, with an extreme Skewness of 119.68 and the highest Kurtosis of 33,210.92. This indicates that the turnover distribution is overwhelmingly concentrated at the low end, with exceptional sales figures from a few firms driving the overall average. TCA (Total Current Assets) and TCE (Total Capital Expenditures) also show massive standard deviations relative to their means, continuously pointing to the different asset management strategies, investment strengths, and operational performance incorporated by the firms. EBITM (EBIT Margin) and NDPS (Net Debt Per Share) displayed wide ranges and extended standard deviations. EBITM has a Mean of 7.51×10^5 with a standard deviation of 9.28×10^6, showing significant distribution in operational profitability. NDPS exhibits some of the most extreme values, with a staggering Kurtosis of 23,545.22, showing highly different debt positioning and earning generation abilities throughout companies, primarily influenced by severe outliers.

Hence, the broad statistical series throughout all variable categories requires effective analytical approaches to appropriately obtain the aspects of financial sustainability within such a changing corporate culture. The highly non-normal distributions, characterized by extreme Skewness and Kurtosis, are primarily driven by the influence of large financial outliers. To mitigate this bias and normalize the data for subsequent modeling, natural logarithmic methods were used to handle the outliers and prepare the variables for econometric analysis. This methodological step ensures that the resulting statistical models accurately reflect the relationships within the majority of the data rather than being distorted by a few extreme observations.

4.2. Correlation Matrix

Table 3 presents the Pearson correlation coefficients between the dependent variable, Corporate Financial Sustainability (CFS), and the set of log-transformed independent variables. The analysis reveals several significant relationships, all confirmed at the 1% level. Focusing on the dependent variable, CFS exhibits its strongest positive correlation with Total Current Assets (TCA) (0.5194), suggesting that a healthy asset base and liquidity are the primary indicators of greater financial sustainability. Other strong positive links are observed with Total Debt (TD) (0.3422) and Turnover (TO) (0.2720), which implies that larger, stable firms with high sales volumes are better positioned for sustainability, despite carrying higher debt. The only significant negative correlation is a weak one with Total Current Liabilities (TCL) (−0.0581), indicating that reliance on short-term obligations slightly impedes sustainability. Regarding inter-variable relationships, the analysis of inter-variable correlation reveals a notable high correlation coefficient between TD and Operating Expenses (OE) (0.6841). This strong association highlights the synchronized movement between the scale of debt and operational costs, which could suggest a common underlying factor of firm size in their measurement. The table also demonstrates a general absence of severe multicollinearity among the independent variables, as the majority of their correlation coefficients are less than 70% (0.7). To support the absence of multicollinearity, a Variance Inflation Factor test (VIF) would typically be carried out, focusing specifically on the 0.6841 relationship. Furthermore, Net Debt Per Share (NDPS) shows virtually no linear correlation with any other variable, suggesting its independent contribution to the model.

4.3. Multicollinearity Test

The results of the VIF further confirm the absence of multicollinearity with moderate centered VIF statistics (i.e., VIF<5). Specifically, the highest centered VIF is 1.000 (for NDPS), and the lowest is 0.317 (for TNCL), confirming that the independent variables are not overly redundant (Table 4).

The fixed and random effect models are a more accurate form of the ordinary least square method because they recognise firm-specific factors (effects) that are permanent or temporal [49]. These methods are preferred because they allow for evaluating relationships in a dynamic environment and controlling for other determinants of corporate financial sustainability. They do not ignore the unit effect of the entities. The omission of these individual factors (both cross-sectional and period effects) from a panel regression model can lead to omitted variable bias and this can be detected using the Omitted random effect test. Further tests (Hausman test) can then be done to determine whether this unit effect(s) (if any) are correlated with regressors or uncorrelated with regressors and thus, will guide us as to whether to use the fixed effect model or random effect model, respectively.

4.4. Fixed/Random Effect Test for Panel Data

The Pooled OLS regression results were tested for unit effects to detect omitted variable bias. The Omitted Random Effect Test was conducted using the Breusch–Pagan Lagrange Multiplier test [50]. The null hypothesis of this test is that variance across entities (cross-section and time) is zero (i.e., no panel effect), which would suggest that a simple OLS model is appropriate.

The highly significant Breusch–Pagan statistic for both Model 1 (1664.24) and model 2 (4467.38) leads to the rejection of the null hypothesis (Table 5). This indicates that there is a significant panel effect across cross-sections, necessitating the application of either the Random Effect (REM) or Fixed Effect (FEM) model that accounts for these entity-specific differences. Since both statistics are significant at the 1% level, this indicates that there is a significant panel effect across cross-sections, necessitating the application of either the Random Effect (REM) or Fixed Effect (FEM) model that accounts for these entity-specific differences. Consequently, the Pooled OLS model is deemed inefficient and inappropriate for estimating the relationship for Corporate Financial Sustainability (CFS). The next methodological step is to conduct the Hausman test to select between the REM and FEM specifications.

4.5. Hausman Test on OLS Regression Results

After considering the necessity of accounting for cross-sectional effects (as established by the Breusch–Pagan test), the Hausman test was utilized to determine whether the Fixed Effect (FEM) or Random Effect (REM) model would be more appropriate [51]. The null hypothesis (H_0) is that the Random Effect model is the preferred and more efficient model, while the alternative hypothesis suggests the Fixed Effects model is more adequate. The details of each model along with the Hausman $\chi 2$ statistic are shown in Tables 6 and 7. The Hausman test for Model 1 (Table 6) reported a highly significant Chi-Square statistic of 1803.81 ($p<0.01$). This strong evidence leads to the rejection of the null hypothesis (H_0 for REM). Consequently, the Fixed Effects Model (FEM) is deemed the appropriate and most efficient estimator for Model 1. The FEM results show that the model is highly significant (F-statistic=7168.53; $p<0.01$) and explains 14.88% (R^2=0.1488) of the within-firm variation in Corporate Financial Sustainability (CFS). All four focal independent variables—Total Current Liabilities (TCL) [−0.0217], Total Non-Current Liabilities (TNCL) [0.0388], Total Debt Funds (TD) [0.0755], and Operating Expenses (OE) [−0.0272]—were found to be highly significant ($p<0.01$) in determining CFS. Specifically, long-term financing (TD and TNCL) positively impacts CFS, while short-term obligations (TCL) and operational costs (OE) negatively impact it. Similarly, the Hausman test for Model 2 (Table 7) reported a highly significant Chi-Square statistic of 5839.02 ($p<0.01$). This result necessitates the rejection of the null hypothesis for the REM. Therefore, the Fixed Effects Model (FEM) is also adopted for Model 2. The FEM is highly significant (F-statistic=17215.01, $p<0.01$) with an explanatory power of 31.14% (R^2=0.3114), indicating a stronger fit than Model 1. The results indicate that Total Current Assets (TCA) [0.0959], Total Capital Expenditures (TCE) [0.0188], and Turnover (TO) [0.0076] are highly significant ($p<0.01$) and positive determinants of CFS. EBIT Margin (EBITM) is also highly significant ($p<0.01$), but shows a small negative coefficient of [−0.0011]. Crucially, Net Debt Per Share (NDPS) was found to be statistically insignificant (t-statistic 0.44), suggesting it does not have a measurable linear effect on CFS within this specific model. The consistent selection of the FEM for both models suggests that the unobserved, time-invariant, firm-specific characteristics are correlated with the explanatory variables, making the FEM necessary to obtain unbiased and consistent estimates of the impact of financial variables on CFS.

Table 4.
Variance inflation factor test for multicollinearity.

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
TCL	3.72e+19	1.63	0.612
TNCL	8.42e+18	3.15	0.317
TD	8.48e+19	1.58	0.634
OE	1.32e+19	1.65	0.607
EBITM	8.61e+13	1.72	0.583
NDPS	4.27e+17	1.00	1.000
TCE	7.73e+17	1.07	0.936
TO	3.10e+18	1.97	0.507
TCA	4.46e+19	1.21	0.828

Table 5.
Omitted random effect test for corporate financial sustainability (GPM, NIAT, FCF, and RE models) for model 1 & model 2.

Null Hypothesis: No Panel Effects		
Dependent Variable (CFS)	**Model 1**	**Model 2**
Breusch–Pagan χ^2	(1664.24)***	(4467.38)***

Note: (), t-statistics; * ** ***, probabilities (* Significant at 10%, ** Significant at 5%, *** Significant at 1%).

Table 6.
Hausman test along with panel OLS, REM, and FEM for model 1.

Regressors	Pooled OLS	Random Effect Model	Fixed Effect Model
Constant	[2.184] (192.54)***	[2.2126] (194.35)***	[2.4842] (200.55)***
Total Current Liabilities (TCL)	[-0.0145] (69.16)***	[-0.0152] (-72.52)***	[-0.0217] (-97.72)***
Total Non-Current Liabilities (TNCL)	[0.0406] (128.75)***	[0.0404] (128.13)***	[0.0388] (115.81)***
Total Debt Funds (TD)	[0.0685] (212.65)***	[0.0691] (213.54)***	[0.0755] (211.56)***
Operating Expenses (OE)	[-0.0175] (-40.68)***	[-0.0184] (-42.54)***	[-0.0272] (-57.64)***
R^2	0.1467	0.1467	0.1488
Adjusted R^2	0.1467	-	0.1488
F-stat/ Wald χ^2	(7835.91)***	(101838.53)***	(7168.53)***
Hausman χ^2	-	-	(1803.81)***
Serial Correlation	-	-	(-0.0171)***
Heteroskedasticity	-	-	(9555605.64)***

Note: [], coefficients; (), t-statistics; * ** ***, probabilities (* Significant at 10%, ** Significant at 5%, *** Significant at 1%).

Table 7.
Hausman test along with panel OLS, REM, and FEM for model 2.

Regressors	Pooled OLS	Random Effect Model	Fixed Effect Model
Constant	[1.1576] (110.49)***	[1.1501] (110.12)***	[1.1234] (103.15)***
EBIT Margin (EBIT)	[-0.0025] (-21.88)***	[-0.0022] (-19.37)***	[-0.0011] (-9.61)***
Net Debt Per Share (NDPS)	[0.0001] (0.38)	[0.0001] (0.40)	[0.0001] (0.44)
Total Current Expenditures (TCE)	[0.0229] (104.47)***	[0.0220] (100.31)***	[0.0188] (81.12)***
Turnover (TO)	[0.0082] (94.09)***	[0.0081] (92.95)***	[0.0076] (84.28)***
Total Current Assets (TCA)	[0.0912] (423.73)***	[0.0923] (428.41)***	[0.0959] (422.40)***
R^2	0.2992	0.2992	0.3114
Adjusted R^2	0.2992	-	0.3114
F / Wald χ^2	(18061.98)***	(255829.70)***	(17215.01)***
Hausman χ^2	-	-	(5839.02)***
Serial Correlation	-	-	(0.0360)***
Heteroskedasticity	-	-	(5342309.20)***

Note: [], coefficients; (), t-statistics; * ** ***, probabilities (*Significant at 10%, **Significant at 5%, ***Significant at 1%).

4.6. Cross-Sectional Dependence Test

The Driscoll-Kraay fixed-effects regression was conducted on two models to examine the impact of financial structure and operational performance variables on corporate financial sustainability (CFS). The use of Driscoll-Kraay standard errors accounts for cross-sectional dependence, heteroskedasticity, and serial correlation, ensuring that the t-statistics and p-values are reliable despite the large panel dataset [52].

Table 8.
Fixed effects model with Driscoll-Kraay standard errors (model 1).

Regressors	Coefficient	Std. Error	t-statistic	P-value
Constant	2.4842	0.4405	5.64***	0.000
Total Current Liabilities (TCL)	-0.02174	0.00731	-2.97**	0.016
Total Non-Current Liabilities (TNCL)	0.03876	0.00769	5.04***	0.001
Total Debt Funds (TD)	0.07554	0.00387	19.52***	0.000
Operating Expenses (OE)	-0.02718	0.00872	-3.12**	0.012

Note: *Significant at 10%, **Significant at 5%, ***Significant at 1%.

Table 9.
Fixed effects model with Driscoll-Kraay standard errors (model 2).

Regressors	Coefficient	Std. Error	t-statistic	P-value
Constant	1.12357	0.7316	1.54	0.159
EBIT Margin (EBITM)	-0.0011	0.0006	-2.07*	0.068
Net Debt Per Share (NDPS)	0.0001	0.0001	1.18	0.268
Total Current Expenditures (TCE)	0.0188	0.0044	4.25***	0.002
Turnover (TO)	0.0077	0.0030	2.53**	0.032
Total Current Assets (TCA)	0.0959	0.0305	3.15**	0.012

Note: *Significant at 10%, **Significant at 5%, ***Significant at 1%.

For Model 1, which included Total Current Liabilities (TCL), Total Non-Current Liabilities (TNCL), Total Debt Funds (TD), and Operating Expenses (OE), the results, estimated using the Fixed Effects model with Driscoll-Kraay robust standard errors (Table 8), confirmed all variables are statistically significant determinants of Corporate Financial Sustainability (CFS). TCL had a significant negative effect on CFS ($\beta=-0.02174$, $p=0.016$), while TNCL ($\beta=0.03876$, $p=0.001$) and TD ($\beta=0.07554$, $p=0.000$) had significant positive effects. OE also showed a significant negative effect ($\beta=-0.02718$, $p=0.012$). These findings strongly suggest that short-term liabilities and operating costs reduce financial sustainability, whereas long-term liabilities and total debt funds (reflecting stable financing capacity) contribute positively to firm stability.

For Model 2, which included EBIT Margin (EBITM), Net Debt Per Share (NDPS), Total Capital Expenditures (TCE), Turnover (TO), and Total Current Assets (TCA), the results (Table 9) showed that NDPS was not statistically significant ($\beta=0.0001$, $p=0.268$). EBITM was marginally significant with a small negative coefficient ($\beta=-0.0011$, $p=0.068$). In contrast, TCE ($\beta=0.0188$, $p=0.002$), TO ($\beta=0.0077$, $p=0.032$), and TCA ($\beta=0.0959$, $p=0.012$) had significant positive effects on CFS. The strongest impact comes from TCA, confirming the critical role of liquidity. This indicates that asset management, sales volume, and strategic investment are important drivers of financial sustainability, while per-share debt measures are not, and marginal profitability (EBITM) has an ambiguous or negligible effect in this context. Overall, the results of both models highlight the critical roles of financial structure and operational performance in enhancing corporate financial sustainability

4.7. Hypothesis Testing

The Table 10 clearly summarizes the inferences from the hypothesis analysis. Most of the proposed hypotheses were statistically supported by the Driscoll-Kraay fixed-effects regression outcomes, which provide robust estimates for the impact of financial variables on Corporate Financial Sustainability (CFS).

In particular, Hypotheses H1a to H1d, regarding the significant role of the liability and expense variables, all received strong empirical support ($p<0.05$). Specifically, H1a (TCL → CFS) and H1d (OE → CFS) were supported with significant negative effects ($\beta_{TCL} = -0.02174$; $\beta_{OE} = -0.02718$), confirming that excessive short-term debt and operational costs are detrimental to sustainability. Conversely, H1b (TNCL → CFS) and H1c (TD → CFS) were supported with significant positive effects ($\beta_{TNCL} = 0.03876$; $\beta_{TD} = 0.07554$), indicating that long-term financing capacity is key to stable financial health.

Similarly, hypotheses H2c, H2d, and H2e, which considered the significant positive effects of Total Capital Expenditures (TCE), Turnover (TO), and Total Current Assets (TCA) on CFS, were also strongly supported ($p<0.05$). The coefficient for TCA ($\beta=0.0959$) was the largest among this group, underscoring the critical importance of liquidity and a strong current asset base in driving financial sustainability.

H2a (EBITM → CFS) and H2b (NDPS → CFS) were the only exceptions. While EBITM was marginally significant with a small negative effect ($\beta=-0.0011$, $p<0.10$), NDPS was found to be statistically insignificant (t-value=1.18), indicating limited independent predictive power of this per-share debt metric in this context. These results collectively emphasize the combined and critical influence of financial structure (e.g., preference for TNCL/TD over TCL) and operational performance variables (asset management, sales, and investment) in forecasting a firm's sustainable financial performance, highlighting the importance of well-managed liabilities, debt financing, operational expenditures, and asset management in sustaining corporate financial viability.

Table 10.
Hypotheses testing

Hypotheses	Regressors	Coefficient [t-value]	Inference
Model 1			
H1a: TCL → CFS	Total Current Liabilities	−0.02174 [−2.97]**	Supported (Significant Negative Effect)
H1b: TNCL → CFS	Total Non-Current Liabilities	0.03876 [5.04]***	Supported (Significant Positive Effect)
H1c: TD → CFS	Total Debt Funds	0.07554 [19.52]***	Supported (Significant Positive Effect)
H1d: OE → CFS	Operating Expenses	−0.02718 [−3.12]**	Supported (Significant Negative Effect)
Model 2			
H2a: EBITM → CFS	EBIT Margin	−0.0011 [−2.07]*	Supported (Significant Negative Effect)
H2b: NDPS → CFS	Net Debt Per Share	0.0001 [1.18]	Not Supported (Insignificant Effect)
H2c: TCE → CFS	Total Current Expenditures	0.0188 [4.25]***	Supported (Significant Positive Effect)
H2d: TO → CFS	Turnover	0.0077 [2.53]**	Supported (Significant Positive Effect)
H2e: TCA → CFS	Total Current Assets	0.0959 [3.15]**	Supported (Significant Positive Effect)

Note: *Significant at 10%, **Significant at 5%, ***Significant at 1%.

5. Discussion

The research explored how real-time data insights and risk analytics promote CFS prediction. These outcomes facilitate an inclusive insight into the complex aspects of long-term financial viability among recorded organizations, expanding prior studies by holistically understanding the combined role of risk-based and operational metrics.

At the same time, the empirical outcomes continuously emphasise the significant role of several financial variables, integrating with an explanation of corporate sustainability as the competency to maintain practices while addressing stakeholder demands over a long duration [1]. This analysis leverages the concept that present financial success need not compromise future possibility [2].

Total Non-Current Liabilities (TNCL) ($p=0.001$, $\beta=0.03876$) revealed a highly significant positive effect on CFS, supporting H1b. Most critically, Total Debt (TD) ($p=0.000$, $\beta=0.07554$) also displayed a highly significant positive effect on financial sustainability, supporting H1c. This finding suggests that for large, established firms, high total debt capacity—often long-term in nature—serves as "financial slack" and signals stability to the market, enabling strategic growth and reducing financial fragility over the long term. Conversely, Total Current Liabilities (TCL) ($p=0.016$, $\beta=-0.02174$) and Operating Expenses (OE) ($p=0.012$, $\beta=-0.02718$) both revealed substantial negative effects on financial sustainability, supporting Hypotheses H1a and H1d. This confirms that excessive short-term obligations and high operating costs significantly strain a firm's immediate liquidity and efficiency, directly limiting its long-term viability. This validates financial prudence that incorporates [21] application that unbalanced risks can impact profitability. The negative effect of operating costs emphasizes the significance of cost control for decreasing financial sustainability risk, as indicated by Boloș, et al. [23].

The strong positive effect of Total Current Assets (TCA) ($p=0.012$, $\beta=0.0959$) on CFS underscores the essential influence of robust working capital management and liquidity, supporting H2e. Appropriate current assets facilitate an essential buffer against short-term barriers, increasing a company's competency to uphold practices and seize opportunities. Turnover (TO) ($p=0.032$, $\beta=0.0077$) employed a statistically significant positive effect on financial sustainability, supporting H2d. Continuous turnover suggests strong operational activity and market demand, both primary components for sustainable development. This outcome strengthens the area that strong revenue generation is a major force of long-term

sustainability, aligned with the outcomes by Le Thi Kim, et al. [28] and Wu, et al. [27] on sales efficiency. The nuanced outcome for Total Capital Expenditures (TCE) ($p=0.002$, $\beta=0.0188$) is specifically relevant, as it revealed a highly significant positive effect on CFS, supporting H2c. This finding is demonstrated as the effective use of investment to optimize future sustainability, suggesting that capital costs are effectively managed to produce returns over time [26].

EBIT Margin (EBITM) ($p=0.068$, $\beta=-0.0011$) revealed a marginally significant negative effect on CFS, which contradicts the hypothesized positive relationship but is statistically supported (H2a). This suggests that high marginal profitability, though an essential metric [24] may be associated with strategies that forego necessary long-term investments or expose the firm to higher structural risk, ultimately impeding sustainability in this highly heterogeneous sample. Remarkably, Net Debt Per Share (NDPS) ($p=0.268$, $\beta=0.0001$) possesses no statistically significant effect on CFS. This finding results in non-support of H2b. The insignificance of this finding indicates that, within such a complex model, NDPS is not a competent singular predictor of complete financial sustainability, as its effects are likely already captured by the more foundational scale and structure metrics (TD, TNCL, TCL).

Finally, this research ensures that while conventional risk metrics such as operating costs and short-term debt are essential, the strategic application of long-term capital (TD, TNCL), effective revenue generation (TO, TCE), and robust liquidity (TCA) are similarly essential for financial sustainability. The outcome facilitates particular perspectives into which financial devices employ the most significant role, directly covering how real-time data insights and advanced risk analytics promote the prediction of CFS.

6. Conclusion

The research was developed to investigate how real-time data insights and advanced risk analytics can promote the planning of Corporate Financial Sustainability (CFS), based on an inclusive evaluation of panel data from recorded organizations across different sectors. The outcomes from the conducted Fixed Effects regression with Driscoll-Kraay standard errors provide effective empirical evidence, significantly contributing to the understanding of corporate financial viability. This study successfully demonstrated that a combination of particular real-time data insights and risk analytics facilitates improved predictive competencies for CFS, with most of the sub-hypotheses receiving empirical support.

The study produced several major outcomes that highlight critical aspects of financial sustainability. The analysis confirmed that liability structure and operational efficiency play a central role. Total Current Liabilities (TCL) and Operating Expenses (OE) exhibited significant negative effects on CFS. Such findings emphasize the essential need for practical short-term liquidity management, balanced support, and cost control, as pressures in these areas can directly weaken sustainability. Conversely, Total Debt Funds (TD) and Total Non-Current Liabilities (TNCL) revealed significant positive effects, indicating that long-term debt, when strategically allocated to productive investments, stimulates future development and promotes financial resilience. These results underscore the distinction between long-term strategic financing and short-term operational liabilities.

Additionally, real-time data insights, reflected through financial indicators and advanced performance metrics, were found to be important predictors of CFS. Total Current Assets (TCA) showed a strong positive association, highlighting the critical importance of robust working capital and liquidity management for financial stability. Turnover (TO) and Total Capital Expenditures (TCE) also positively influenced CFS, confirming that sustainable growth depends on both revenue generation and strategic investment. EBIT Margin (EBITM) displayed a marginally significant negative effect, suggesting occasional conflicts between maximizing short-term profitability and long-term sustainability. Net Debt Per Share (NDPS) was statistically insignificant, indicating a limited impact on CFS relative to other broader financial variables.

The research provides different strategic suggestions for corporate decision-makers, concentrated on sustaining performance and managing financial risks. Organizations need to prefer practical liability management by seriously controlling TD and TCL. Improving OE through continuous review is considered essential. The positive role of TNCL indicates that carefully predicted long-term investments, financed completely, are essential for future sustainability, while TCE leads to short-term strain. Additionally, decision-makers need to concentrate on effective EBITM and continuous TO for major revenue growth and profitability. Finally, upholding sufficient TCA is crucial for effective working capital resilience and management.

7. Limitations and Future Research

This research study faced inherent challenges and limitations that influenced the data's generalizability while providing insights into the predictive factors of corporate financial sustainability. These would lead to future research suggestions.

7.1. Research Challenges and Limitations

The major practical challenges were relevant to data availability across the extensive timeframe of 2009 to 2025, which, despite resulting in a robust 592,300 observations, required extensive cleaning owing to data missingness and the necessary application of log-transformation to mitigate the extreme bias from corporate financial outliers. A conceptual challenge was to define and measure corporate financial sustainability, which required careful justification for the specific CFS proxy used.

The research is limited methodologically to providing insights into qualitative managerial decisions since it relies on secondary panel data.

- The significant limitation is excluding non-financial parameters like ESG performance, which is essential for financial sustainability. Thus, it leads to an incomplete overview of data findings to assess the influencing factors of CFS.

- Although the advanced panel approach was utilized, the Fixed Effects regression model assumes linearity (on the log-transformed variables). It might not fully capture the complex relationships, such as non-linear threshold effects, which could explain the counter-intuitive findings like the marginally negative coefficient for EBIT Margin.
- While the Fixed Effects Model controls for unobserved time-invariant endogeneity, the issue of time-varying endogeneity or reverse causality (where sustainable firms choose certain debt/investment levels) remains to be considered. The robust VIF confirmed the absence of multicollinearity, yet the model's structure prevents a definitive statement on the causality of the relationships.
- The analysis combines four distinct sectors (finance, trade, export, energy). Although unit effects were controlled for, the reported coefficients represent an aggregate effect, which may mask significant sector-specific mechanisms that influence CFS.

7.2. Future Research Directions

The dependency on secondary panel data indicates the evaluation is limited by accessible financial reporting. Further studies tend to investigate the association of non-financial data, including ESG ("environmental, social, and governance") metrics, which are growingly determined as essential for complete corporate sustainability. Furthermore, exploring the mediating or moderating role of macroeconomic conditions or industry-specific factors leads to facilitates further nuanced assessment. Further research also incorporates alternative statistical frameworks, such as machine learning algorithms, to expose non-linear relationships and differentiate predictive accuracy. This study contributes significantly to the measurement of CFS, facilitating transparent approaches for organizations to promote their predictive competencies and incorporate effective policies for long-term financial health

References

[1] M. B. Hossain, S. Nassar, M. U. Rahman, A. Dunay, and C. B. Illés, "Exploring the mediating role of knowledge management practices to corporate sustainability," *Journal of Cleaner Production*, vol. 374, p. 133869, 2022. https://doi.org/10.1016/j.jclepro.2022.133869

[2] Y. Kong, M. Donkor, M. Musah, J. A. Nkyi, and G. O. A. Ampong, "Capital structure and corporates financial sustainability: evidence from listed non-financial entities in Ghana," *Sustainability*, vol. 15, no. 5, p. 4211, 2023. https://doi.org/10.3390/su15054211

[3] R. O. Iliemena and N. B. Ijeoma, "Effect of sustainability reporting on firm performance," presented at the Unpublished seminar. School of postgraduate studies, Nnamdi Azikiwe University, 2019.

[4] H. Y. Ma and S. J. Park, "Relationship between corporate sustainability management and sustainable tax strategies," *Sustainability*, vol. 13, no. 13, p. 7429, 2021. https://doi.org/10.3390/su13137429

[5] Q. Wang, "Income tax planning as a tool for achieving financial stability," *Engineering Economics*, vol. 33, no. 5, pp. 496-506, 2022. https://doi.org/10.5755/j01.ee.33.5.29785

[6] P. R. Mucharreira, M. G. Antunes, N. Abranja, M. R. T. Justino, and J. T. Quirós, "The relevance of tourism in financial sustainability of hotels," *European Research on Management and Business Economics*, vol. 25, no. 3, pp. 165-174, 2019. https://doi.org/10.1016/j.iedeen.2019.07.002

[7] N. Wu *et al.*, "Do liquidity and capital structure predict firms' financial sustainability? A panel data analysis on quoted non-financial establishments in Ghana," *Sustainability*, vol. 15, no. 3, p. 2240, 2023. https://doi.org/10.3390/su15032240

[8] I. Isnandar, M. Mira, and W. O. Rayyani, "The effect of financial ratio in predicting profit growth in transportation and logistics sector companies," *Proceeding Medan International Conference on Economic and Business*, vol. 1, pp. 616-628, 2023.

[9] A. Hayes, "Current assets: What it means and how to calculate it, with examples," Investopedia, 2025. https://www.investopedia.com/terms/c/currentassets.asp

[10] S. Zabolotnyy and M. Wasilewski, "The concept of financial sustainability measurement: A case of food companies from Northern Europe," *Sustainability*, vol. 11, no. 18, p. 5139, 2019. https://doi.org/10.3390/su11185139

[11] P. Aishwarya, "A study on impact of capital structure on profitability of companies listed in indian stock exchange with respect to automobile industry," *arXiv preprint arXiv:2207.00720*, 2022. https://doi.org/10.48550/arXiv.2207.00720

[12] Z. Wang, M. Akbar, and A. Akbar, "The interplay between working capital management and a firm's financial performance across the corporate life cycle," *Sustainability*, vol. 12, no. 4, p. 1661, 2020. https://doi.org/10.3390/su12041661

[13] R. Iliemena, M. Amedu, and R. Uagbale-Ekatah, "Empirical examination of sustainability reporting, return on capital employed and gross profit margin," *European Journal of Sustainable Development Research*, vol. 7, no. 1, p. em0204, 2023. https://doi.org/10.29333/ejosdr/12539

[14] Y. S. Muhammad, "Effect of corporate income tax rate on investment decisions of listed deposit money banks in Nigeria," *Comparative Study on The Effects of Tax Audit on Value Added Tax (Vat) Compliance In*, vol. 45, 2019.

[15] F. N. Dahmash, H. Alshurafat, R. Hendawi, A. B. Alzoubi, and H. Al Amosh, "The retained earnings effect on the firm's market value: Evidence from Jordan," *International Journal of Financial Studies*, vol. 11, no. 3, p. 89, 2023. https://doi.org/10.3390/ijfs11030089

[16] J. Fernando, "Retained earnings in accounting and what they can tell you," Investopedia, 2024. https://www.investopedia.com/terms/r/retainedearnings.asp

[17] A. E. Yemi and A. I. Seriki, "Retained earnings and firms' market value: Nigeria experience," *The Business & Management Review*, vol. 9, no. 3, pp. 482-496, 2018.

[18] A. J. Agembe, J. W. Chesoli, and C. Ngacho, "The relationship between retained earnings and financial performance of listed non-financial firms: An econometrics examination," *Journal of Finance and Accounting*, vol. 8, no. 7, pp. 64-75, 2024. https://doi.org/10.53819/81018102t4285

[19] G. C. Landi, F. Iandolo, A. Renzi, and A. Rey, "Embedding sustainability in risk management: The impact of environmental, social, and governance ratings on corporate financial risk," *Corporate Social Responsibility and Environmental Management*, vol. 29, no. 4, pp. 1096-1107, 2022. https://doi.org/10.1002/csr.2256

[20] M. Gurung, "Total liabilities: Definition, calculation,types & limitation," Investing, 2024. https://www.investing.com/academy/analysis/total-liabilities-definition/#:~:text=Total%20liabilities%20refer%20to%20the,equity%20to%20gauge%20financial%20health

[21] N. F. Nuzula, "Does environmental risk affect the firms' financial performance?," in *IOP Conference Series: Earth and Environmental Science (Vol. 239, No. 1, p. 012049). IOP Publishing*, 2019.

[22] A. Hayes, "What is the debt ratio?," Investopedia, 2024. https://www.investopedia.com/terms/d/debtratio.asp#:~:text=The%20higher%20the%20debt%20ratio,find%20sustainable%20uses%20for%20debt

[23] M.-I. Boloș, I.-A. Bradea, C. D. Sabău-Popa, and L.-A. Ilie, "Detecting financial sustainability risk of the assets using MAMDANI fuzzy controller," *Technological and Economic Development of Economy*, vol. 25, no. 5, pp. 1039-1057, 2019. https://doi.org/10.3846/tede.2019.10551

[24] M. Majka, "Understanding profit margin," Research Gate, 2024. https://www.researchgate.net/profile/Marcin-Majka-2/publication/381402426_Understanding_Profit_Margin/links/666b659685a4ee7261c0e00d/Understanding-Profit-Margin.pdf

[25] A. Hayes, "How net debt is calculated and why it matters to a company," Investopedia, 2025. https://www.investopedia.com/terms/n/netdebt.asp#:~:text=Net%20debt%20is%20a%20key,withstand%20the%20financial%20difficulties%20ahead

[26] J. O. Orinya, A. K. Kurfi, and B. A. Kofarmata, "Financial performance implications of corporate sustainable expenditures in economic capital: The case of listed manufacturing firms in Nigeria," *FUDMA Journal of Accounting and Finance Research [FUJAFR]*, vol. 2, no. 2, pp. 1-16, 2024. https://doi.org/10.33003/fujafr-2024.v2i2.90.1-16

[27] J. Wu, Y. Li, and M. Zhu, "Empirical analysis of rural influencing factors on listed agribusiness financial performance," *Agricultural Economics and Management*, vol. 3, pp. 22-27, 2010.

[28] N. Le Thi Kim, D. Duvernay, and H. Le Thanh, "Determinants of financial performance of listed firms manufacturing food products in Vietnam: regression analysis and Blinder–Oaxaca decomposition analysis," *Journal of Economics and Development*, vol. 23, no. 3, pp. 267-283, 2021. https://doi.org/10.1108/JED-09-2020-0130

[29] D. I. Juliani, S. Karyatun, and K. Digdowiseiso, "The effect of current ratio, total asset turnover and debt to equity ratio on the financial performance of manufacturing companies listed on the Indonesia stock exchange for the 2016-2020 period," *Jurnal Syntax Admiration*, vol. 4, no. 4, pp. 630-643, 2023. https://doi.org/10.46799/jsa.v4i4.863

[30] S. Lee, Y. Ahn, and S. Shin, "The impact of multinational business diversification on the financial sustainability of construction firms in Korea," *Sustainability*, vol. 8, no. 10, p. 997, 2016. https://doi.org/10.3390/su8100997

[31] M. Iotti, E. Manghi, and G. Bonazzi, "Financial performance of companies associated with the PDO Parma ham consortium: Analysis by quartile of firms," *Journal of Agriculture and Food Research*, vol. 13, p. 100598, 2023. https://doi.org/10.1016/j.jafr.2023.100598

[32] E. Herman and K.-E. Zsido, "The financial sustainability of retail food SMEs based on financial equilibrium and financial performance," *Mathematics*, vol. 11, no. 15, p. 3410, 2023. https://doi.org/10.3390/math11153410

[33] W. Kenton, "Net income after taxes (NIAT): Definition, calculation, example," Investopedia, 2022. https://www.investopedia.com/terms/n/net-income-after-taxes-niat.asp

[34] M. Elahi, H. AHMAD, M. SHAMAS UL HAQ, and A. Saleem, "The impact of operating cash flows on financial stability of commercial banks: Evidence from Pakistan," *The Journal of Asian Finance, Economics and Business*, vol. 8, no. 11, pp. 223-234, 2021.

[35] J. Fernando, "Free cash flow (FCF): How to calculate and interpret it," Investopedia, 2025. https://www.investopedia.com/terms/f/freecashflow.asp

[36] N. N. Sawitri, "Analysis of financial ratio on financial performance and sustainability report as intervening variable," *Atestasi: Jurnal Ilmiah Akuntansi*, vol. 6, no. 2, pp. 661-670, 2023. https://doi.org/10.57178/atestasi.v6i2.729

[37] T. Tamplin, "Current liabilities. Finance strategists," 2023. https://www.financestrategists.com/accounting/liabilities-and-contingencies/current-liabilities/. [Accessed 14 May 2025]

[38] B. Gustafson, "Noncurrent liabilities: Definition, ratios and types.," Ramp, 2025. https://ramp.com/blog/what-are-noncurrent-liabilities

[39] HighRadius, "How to calculate total debt: A simple guide," 2024. https://www.highradius.com/resources/Blog/what-is-total-debt-and-how-to-calculate-it/#:~:text=Total%20debt%20represents%20the%20sum%20of%20all%20financial%20obligations%20a,of%20the%20company's%20overall%20debt

[40] I. J. Osazefua, "Operational efficiency and financial sustainability of listed manufacturing companies in Nigeria," *Journal of Accounting and Taxation*, vol. 11, no. 1, pp. 17-31, 2019. https://doi.org/10.5897/JAT2018.0329

[41] W. Kenton, "Operating expense (OpEx) Definition and examples," Investopedia, 2024. https://www.investopedia.com/terms/o/operating_expense.asp#:~:text=An%20operating%20expense%20is%20an,allocated%20for%20research%20and%20development

[42] D. Schoenmaker and W. Schramade, *Valuing public equity. In Corporate Finance for Long-Term Value*. Cham: Springer International Publishing, 2023.

[43] CFI, "Net debt corporate finance institute," https://corporatefinanceinstitute.com/resources/valuation/net-debt/, 2025.

[44] T. Vipond, "Capital expenditure (CapEx). Corporate finance institute," 2025. https://corporatefinanceinstitute.com/resources/accounting/capital-expenditure-capex/. [Accessed: 14 May 2025].

[45] E. Nogueira, S. Gomes, and J. M. Lopes, "Financial Sustainability: Exploring the Influence of the Triple Bottom Line Economic Dimension on Firm Performance," *Sustainability (2071-1050)*, vol. 16, no. 15, p. 6458, 2024. https://doi.org/10.3390/su16156458

[46] N. Walliman, *Research methods: The basics*. London, UK: Routledge, 2021.

[47] S. Loprevite, D. Raucci, and D. Rupo, "KPIs reporting and financial performance in the transition to mandatory disclosure: The case of Italy," *Sustainability*, vol. 12, no. 12, p. 5195, 2020. https://doi.org/10.3390/su12125195

[48] S. Linares-Mustarós, G. Coenders, and M. Vives-Mestres, "Financial performance and distress profiles. From classification according to financial ratios to compositional classification," *Advances in Accounting*, vol. 40, pp. 1-10, 2018. https://doi.org/10.1016/j.adiac.2017.10.003

[49] J. Osazefua Imhanzenobe, "Managers' financial practices and financial sustainability of Nigerian manufacturing companies: Which ratios matter most?," *Cogent Economics & Finance*, vol. 8, no. 1, p. 1724241, 2020. https://doi.org/10.1080/23322039.2020.1724241

[50] A. Pandey, R. Kiran, and R. K. Sharma, "Investigating the determinants of financial inclusion in BRICS economies: panel data analysis using fixed-effect and cross-section random effect," *Sustainability*, vol. 15, no. 2, p. 1603, 2023. https://doi.org/10.3390/su15021603

[51] W. H. Greene, *Econometric analysis*, 6th ed. Upper Saddle River: Pearson Prentice Hall, 2008.

[52] M. Ridwan, A. J. Urbee, L. C. Voumik, M. K. Das, M. Rashid, and M. A. Esquivias, "Investigating the environmental Kuznets curve hypothesis with urbanization, industrialization, and service sector for six South Asian Countries: Fresh evidence from Driscoll Kraay standard error," *Research in Globalization*, vol. 8, p. 100223, 2024. https://doi.org/10.1016/j.resglo.2024.100223