

LEADING THROUGH CASH FLOW VOLATILITY: HOW CEO INTEGRITY MITIGATES INSOLVENCY RISK

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Abstract: This research examines the relationship between cash flow volatility and insolvency risk, with a specific focus on the moderating effect of CEO integrity among Pakistani non-financial corporations. By incorporating the concept of ethical leadership into the finance risk management literature, this research makes a significant contribution to the body of corporate governance research on emerging markets. Using the Generalised Method of Moments (GMM) with dynamic panel data, the empirical analysis uses a dataset of 103 listed non-financial firms on the Pakistan Stock Exchange (PSX) from 2012 to 2019. The findings provide evidence of a significant positive relationship between cash flow volatility and the risk of insolvency. Our results suggest that CEOs who demonstrate high integrity exhibit a reduced impact of cash flow volatility on the risk of insolvency. The findings are pertinent to the understanding of governance processes that can be used to reinforce organizational stability during financial uncertainty, especially within the context of Pakistan's emerging corporate environment.

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Safdar, A., Mirza, H. H., Hussain, H., Irshad, H. (2026)

*Leading Through Cash Flow Volatility: How CEO Integrity Mitigates Insolvency Risk***Keywords:** Insolvency risk; CEO integrity; Cash flow volatility; Debt maturity; Fixed collaterals; Profitability; Liquidity; Firm's age.**JEL CODES:** G30, G32, G33, M51.

1. Introduction

The connection between cash flow volatility and insolvency risk in corporate finance is a key area of study, especially in emerging economies. This invites an in-depth examination of the central role of executive leadership, particularly the Chief Executive Officer (CEO), in managing and overcoming such financial intricacies. This research examines the moderating role of CEO integrity on the connection between cash flow volatility and insolvency risk. This research is especially relevant in Pakistan, as corporate governance frameworks and ethical best practices are transforming. The role of CEO carries enormous influence to manage a firm's operations, make strategic choices, and evaluate how efficiently the firm's resources are being used. As the ultimate decision-maker, the CEO wields enormous power over corporate strategy, financial reporting, and the organization's broader ethics (Musa et al., 2023). The company's performance lies in the hands of the CEO and can influence the financial statements (Nurmayanti et al., 2022). This presents the significance of a CEO's skill sets and image in and out of the company. The leadership skills of the CEO, as represented by his steadfast adherence to integrity, can be used as an antidote to the detriments of unstable cash flows (Tetrault Sirsly, 2009). The ethical leadership of the CEO is central in inspiring an ethical culture of behavior, transparency, and accountability across the organization (Black, 2015). The study is grounded in the assertion that a CEO's commitment to ethical conduct and transparent financial reporting can significantly alter the trajectory of a firm facing volatile cash flows, steering it away from the edge of insolvency. This paper aims to extend the current literature by examining how CEO integrity influences the insolvency risk associated with cash flow volatility in Pakistani non-financial firms. It improves our understanding of financial risk management by emphasizing how ethical leadership can lessen the adverse effects of volatile cash flows.

Cash flow volatility is a pattern of unpredictable variations in a firm's cash inflows and outflows. Increased cash flow volatility raises a firm's risk of insolvency, as it can result in a lack of resources to meet commitments during bad times (Pordea et al., 2020). This is significant for both company management and stakeholders focused on financial stability. Firms with unstable cash flows will likely face times when their cash resources fall short, increasing the likelihood of negative

Safdar, A., Mirza, H. H., Hussain, H., Irshad, H. (2026)

Leading Through Cash Flow Volatility: How CEO Integrity Mitigates Insolvency Risk

shareholders' equity and insolvency, particularly during disruptive operations or economic fluctuations (Gleißner, 2020; Salotti & Carvalho, 2024). Many firms with positive equity may become insolvent in situations with high cash flow risk. For instance, 18% of the non-financial listed corporations in Brazil would experience negative equity under a 1% risk level, indicating the linear connection between cash flow volatility and insolvency risk (Salotti & Carvalho, 2024). Companies with more volatile cash flows will have lower leverage (less debt) because unpredictable cash flows make it more difficult to service debt reliably. Firms with high cash flow uncertainty prefer shorter-term debt to minimize long-term insolvency risk (Memon et al., 2018). In short, if a company's cash flow is unpredictable, it might face difficulties meeting its operational and financial obligations (Naser et al., 2024). Chay and Suh (2009) suggest that if management can correctly predict expected cash flow volatility, it can influence the firm's ability to secure external financing. Companies with unstable cash flows may find it more expensive to obtain external funding because financial providers struggle to forecast future financial behaviour and perceive them as riskier businesses. Increased cash flow volatility depresses firms' investments, leading to budget disruptions (Naser et al., 2024) and affecting the debt repayment capacity of firms.

The literature extensively supports the role of ownership in the financial stability of a firm (Sudarto et al., 2025); however, this study argues that a CEO with high integrity can significantly minimize the impact of such fluctuations on insolvency risk. We base our argument on ethical leadership theory, which states that CEO with high integrity are generally described as having firmly established moral values. They have an inherent strong compass that helps them identify and analyze the ethical factors involved in intricate decision-making. They are supposed to consider such considerations carefully and take ethical issues at the center of their strategic and operational decisions (Eisenbeiss et al., 2015). Additionally, such CEOs are dedicated to performing their roles to benefit their organizations' overall welfare and success.

Research indicates that CEO integrity and related personal attributes, e.g, narcissism, can significantly affect the risk of corporate insolvency (Faghekarimi et al., 2022). CEOs who demonstrate higher integrity, such as seeking diverse advice, showing less narcissism, and, in some contexts, being female, are associated with lower insolvency risk for their firms. CEOs seeking advice from internal and external sources are more aware of insolvency risks. They are more likely to initiate restructuring decisions, which can help reduce the likelihood of insolvency. The diversity of advice, especially within the top management team, strengthens this

Safdar, A., Mirza, H. H., Hussain, H., Irshad, H. (2026)

Leading Through Cash Flow Volatility: How CEO Integrity Mitigates Insolvency Risk

positive effect (Achbah, 2023). Literature suggests that certain integrity-related traits, such as risk aversion and conscientiousness, may contribute to better risk management. In contrast to the above, lesser CEO integrity can damage the firm's goodwill and put the company at risk of insolvency. In the context of agency theory, as first introduced by Meckling and Jensen (1976) and later expanded upon by Jensen (1986), it suggests that such CEOs tend to undertake activities that create agency costs for the company's shareholders. Studies consistently find a significant positive relationship between CEO narcissism and insolvency risk. Narcissistic CEOs are more likely to engage in riskier decision-making, increasing the likelihood of financial instability and insolvency within their organizations (Khanchel et al., 2024).

We assert our contribution to the existing body of knowledge in two ways. Firstly, we introduce the moderating influence of CEO integrity on the relationship between cash flow volatility and insolvency risk. This study posits that cash flow volatility has a positive correlation with insolvency risk; however, CEO integrity mitigates the effect of cash flow volatility on the firm's insolvency risk. The current study established that agency theory underpins the relationship between CEO integrity and insolvency risk, positing that ethical leadership aligns the interests of CEOs with those of shareholders, thereby reducing agency costs. CEOs with high integrity ensure that agency conflicts are minimized. They try to prevent opportunistic behavior and ensure that managerial decisions align to maximize shareholder wealth (Al Haddad & Juhmani, 2020). Stakeholder theory emphasizes that integrity-driven leadership fosters the well-being of all stakeholders, ultimately contributing to financial health and stability. Ethical Leadership theory posits that CEOs with high integrity have strong moral values. These leaders are skilled in identifying and assessing the ethical dimensions of decision-making scenarios. They thoughtfully weigh these considerations and prioritize ethical aspects in their business decisions (Eisenbeiss et al., 2015). CEOs demonstrating high integrity are dedicated to acting in the best interests of their companies. Conversely, CEOs with low integrity often engage in opportunistic behaviors, raising agency costs. Evidence of empirical testing of these relationships is lacking in the literature, so we address this essential yet relatively unexplored aspect by empirically examining the moderating impact of CEO integrity on the relationship between cash flow volatility and insolvency risk. Secondly, this is the first evidence from an emerging economy. Pakistan, an emerging country, has a unique governance structure, and unlike other developing countries, the business environment in Pakistan is different (Samanta, 2019). According to the Global Competitive Index, Pakistan was ranked 107 out of 140

Safdar, A., Mirza, H. H., Hussain, H., Irshad, H. (2026)

Leading Through Cash Flow Volatility: How CEO Integrity Mitigates Insolvency Risk

countries in 2018 and 110 out of 141 countries in 2019 on governance quality parameters (Habib et al., 2022), reflecting governance issues that may lead to business failure. Henceforth, the emerging market Z-score model is used to capture insolvency risk for non-financial listed firms in Pakistan.

The remainder of the paper is organized as follows: Section 2 deals with reviewing the literature and developing hypotheses, Section 3 provides research methodology, Section 4 discusses the estimated results, and Section 5 presents the conclusion and direction for future researchers.

2. Literature Review

2.1. Cash Flow Volatility and Insolvency Risk

Insolvency risk has attracted considerable attention in prior research due to its critical implications for firms' stability (see, for example, Xuezhou et al., 2020; Xuezhou, 2022; Hussain et al., 2025). The unpredictability of a company's cash flow, referred to as cash flow volatility (CFV), is a critical factor influencing its financial health and risk. Several studies have sought to analyze the effects of cash flow volatility on corporate risk, highlighting the value of managing and responding appropriately to such fluctuations to achieve sustainable financial health (Cleary, 2006; Fazzari & Petersen, 1990). The results of such studies point towards recognizing the need to address cash flow instability as a key factor in securing a firm's general financial health.

Cash flow volatility is likely to be negatively related to firm value since high cash flow volatility indicates high operating risks, which are negative signals to investors and lead to a loss in firm value (Njuguna et al., 2022). The relationship between insolvency risk (IR) and cash flow volatility depends on the manner in which a firm's growth opportunities are associated with its residual assets. The probability of a company's growth is associated with the nature of the relationship between cash flow volatility and insolvency risk. Existing research suggests that minimizing cash flow volatility has a positive impact on the overall value of the company (Giarto & Fachrurrozie, 2020; Scordis et al., 2008). The reduction in a firm's cash flow leads to an increase in business difficulties (Karas & Režňáková, 2020), and the firms face failures (Phan et al., 2022).

Scordis et al. (2008) emphasize how important it is to understand the complicated connections of CFV and risk appropriately. Cash flow volatility often leads to reduced investments in crucial areas, such as capital expenditures, research and development (R&D), and marketing. The relation between CFV and IR depends on the relative value of a company's development prospects. This implies that higher

Safdar, A., Mirza, H. H., Hussain, H., Irshad, H. (2026)

Leading Through Cash Flow Volatility: How CEO Integrity Mitigates Insolvency Risk

cash flow ensures business continuity. Companies with low cash flow from operating activities find it difficult to obtain financing at a lower cost (Tufano, 1996) because creditors struggle to assess the firm's ability to repay its current obligations (Romadhina et al., 2022).

Several researchers have documented the impact of cash flow volatility on credit ratings. Credit ratings help investors and creditors to determine the financial health of a firm. The different level of ratings provided by the rating agencies helps to minimize the information asymmetry among the investors and the firms (Li et al., 2023). According to Goel and Thakor (2003), in a world where information is costly, cash flow volatility exacerbates information asymmetries. Rating agencies and investors require clear information about the firm to determine its actual value accurately. Minton et al. (2002) warned that in the absence of clear information, these external stakeholders often undervalue the firm, rather than incorporating volatility into stock forecasting, resulting in low investments. Thus, managers act to reduce their firm's cash flow volatility in anticipation of higher shareholder value (Scordis et al., 2008).

Phan et al. (2022) employed quantile regression to empirically examine the impact of cash generated from operating, financing, and investing activities on the financial distress of Vietnamese firms. The cash flow from operating and financing activities has a negative relationship, whereas investing activities have a positive relationship with firm failure. Hamid and Siddiqui (2023) reported that operating cash flow is negatively related to firm default, as they examined the factors contributing to default among non-financial firms in Pakistan. Smithson and Simkins (2005) investigated the impact of cash flow volatility on the likelihood of financial distress. Higher cash flow volatility leads to lower corporate investment and share values. Li et al. (2023) also reported a significant influence of cash flow risk on the distress of US firms. Douglas et al. (2020) investigated the impact of cash flow volatility on earnings persistence and found an insignificant relationship. Therefore, we hypothesize that: H₁: Cash flow volatility increases the insolvency risk of a firm.

2.2. CEO Integrity and Insolvency Risk

Corporate Governance is a fundamental concept to understand the relationship between agents (managers) and principals (stockholders). Corporate governance helps overcome agency problems by minimizing the conflicts and aligning the interests of managers and stockholders (Ali et al., 2021). The role of managers is to create value for the stockholders by efficiently utilizing the resources of a firm (Njuguna et al., 2022). The efficient utilization of firm resources and the effective assessment of risks by managers are crucial for the growth and development of a

Safdar, A., Mirza, H. H., Hussain, H., Irshad, H. (2026)

Leading Through Cash Flow Volatility: How CEO Integrity Mitigates Insolvency Risk

company. Managerial decisions of investing in risky assets and overinvesting during times of uncertainty lead to a high risk of insolvency. Managers may expect a high return in this situation, but it conflicts with the shareholders' interests. In an agency relationship, every business manager faces a dilemma in which they must balance protecting their interests with taking riskier steps to foster shareholders' wealth (Ali et al., 2021). According to agency theory (Jensen, 1986), the CEO's unscrupulous actions may result in agency costs for shareholders.

Ethical leadership theory posits that when CEOs make decisions with high integrity and ethical standards, it intensely impacts how a company addresses risks. Studies such as Brown et al. (2005) emphasise that moral leadership, of which the CEO's integrity is a key element, creates a climate of confidence and commitment that affects administrative performance. Essentially, having a CEO with strong ethical values proves beneficial for steering and safeguarding a company's performance (Brown & Treviño, 2006). This implies that the moral framework set by a CEO influences critical decisions related to managing cash flow, structuring assets and debt, and directing insolvency risks. CEOs with high integrity guide the organization in making ethical decisions, which are in the best interest of shareholders, contributing to the responsible handling of insolvency risk.

Erhard et al. (2009) investigated CEO traits and documented that CEO integrity is a necessary condition for firm performance. Dikolli et al. (2012) provide empirical evidence of an association between CEO integrity and earnings management. CEOs of publicly listed firms are evaluated by prospective investors, shareholders, and debtors (Skarlicki et al., 2023). CEOs with negative reputations face difficulties in gaining shareholder trust and attracting investments. Skarlicki et al. (2023) reported that CEO integrity remains a significant predictor of investors' decision to invest in the business. Financial analysts value CEO integrity because they can more confidently assume the information being transmitted is accurate.

According to Ang et al. (2000), the integrity of the CEO is a key factor that influences management performance. Integrity of the CEO, as a moderator in financial relationships, is important in establishing the significance of economic variables relative to the threat of imminent insolvency. Pham and Tran (2020) have extensively discussed the measurement issues of CEO integrity and pointed towards the possible role of CEO reputation in mitigating the insolvency risk of a firm. Therefore, we hypothesize that:

H₂: CEO integrity mitigates the firm's insolvency risk.

H₃: CEO integrity has a positive moderating effect on the relationship between cash-flow volatility and insolvency risk.

Table 1. Literature Review

Author(s) & Year	Purpose of Study	Sample	Estimation Technique	Main Findings
Cleary (2006)	Examined financial constraints and investment–cash flow sensitivity	International firms	Regression analysis	Financially constrained firms are more sensitive to cash flow volatility
Fazzari & Petersen (1990)	Analyzed the effect of cash flow on investment	US manufacturing firms	Panel regression	Cash flow volatility significantly impacts investment decisions
Njuguna et al. (2022)	Studied CFV and firm value	Listed firms (Kenya)	Panel regression	High CFV is negatively related to firm value
Giarto & Fachrurrozie (2020)	Investigated CFV and leverage impact on firm value	Indonesian listed firms	Regression analysis	CFV reduces firm value, and leverage worsens the effect
Scordis et al. (2008)	Assessed CFV and risk management	US insurance firms	Quantitative analysis	CFV reduces investments in capital & R&D, increases risk
Karas & Režňáková (2020)	Analyzed determinants of firm failure	European firms	Logistic regression	A reduction in cash flow increases business difficulties and failures
Phan et al. (2022)	Examined cash flow components & distress	500 Vietnamese firms	Quantile regression	Operating & financing cash flow reduces distress; investing CF increases it.
Tufano (1996)	Investigated risk management in gold mining	US gold mining firms	Case-based empirical analysis	Firms with volatile cash flow face higher financing costs
Romadhina et al. (2022)	Studied CFV & financing constraints	Indonesian firms	Panel regression	Low operating CF increases financing constraints
Li et al. (2023)	Investigated the CF risk of distress	US firms	Panel regression	CF risk increases the probability of financial distress
Goel & Thakor (2003)	Analyzed CFV & information asymmetry	Theoretical/empirical	Model & regression	CFV exacerbates info asymmetry, reduces firm value
Minton et al. (2002)	Studied volatility in forecasting distress	US firms	Regression & forecasting models	High CFV linked with undervaluation, lower investment

Safdar, A., Mirza, H. H., Hussain, H., Irshad, H. (2026)

Leading Through Cash Flow Volatility: How CEO Integrity Mitigates Insolvency Risk

Author(s) & Year	Purpose of Study	Sample	Estimation Technique	Main Findings
Hamid & Siddiqui (2023)	Determinants of default in Pakistan	Pakistani non-financial firms	Logistic regression	Operating cash flow reduces default risk
Smithson & Simkins (2005)	Risk management and financial distress	US corporations	Survey & empirical review	High CFV reduces investment & firm value
Douglas et al. (2020)	Studied CFV & earnings persistence	European firms	Regression	CFV has an insignificant effect on earnings persistence
Ali et al. (2021)	Studied governance and performance	Emerging market firms	Panel regression	Good governance reduces insolvency risk
Jensen (1986)	Introduced agency costs of free cash flow	US corporations	Theoretical framework	Misuse of cash flow increases agency costs
Brown et al. (2005)	Examined ethical leadership effects	US firms	Survey & regression	CEO integrity builds trust, reduces risk
Brown & Treviño (2006)	Reviewed ethical leadership theory	Conceptual & empirical studies	Literature review	Ethical CEOs positively influence performance
Erhard et al. (2009)	Investigated CEO traits	Conceptual/empirical	Theoretical model	CEO integrity is necessary for sustainable performance
Dikolli et al. (2012)	CEO integrity & earnings management	US public firms	Empirical regression	CEO integrity improves earnings quality
Skarlicki et al. (2023)	Examined integrity & investor trust	Global firms	Survey & analysis	CEO integrity predicts investor confidence
Ang et al. (2000)	Studied agency costs & ownership	US small firms	Regression	Integrity is critical to mitigate agency costs
Pham & Tran (2020)	Studied CEO integrity & governance	Asian firms	Panel regression	CEO integrity reduces insolvency risk, improves governance

Source: author's own compilation based on various sources.

It is evident from the summary of the literature review presented in Table 1 above that the moderating role of CEO integrity is mainly neglected in existing corporate literature. Moreover, most of the studies are conducted in advanced economies, and the evidence from emerging economies is limited. Our study attempts to address these research gaps.

Safdar, A., Mirza, H. H., Hussain, H., Irshad, H. (2026)

Leading Through Cash Flow Volatility: How CEO Integrity Mitigates Insolvency Risk

3. Methodology and empirical data

The current research specifically deals with the analysis of non-financial companies listed on the Pakistan Stock Exchange (PSX) from 2012 to 2019. Of the 351 companies listed on the Pakistan Stock Exchange, the dataset contains 103 non-financial companies for research purposes. The sample specifically excludes financial sector firms, merger and acquisition firms, defaulting firms, and firms having missing annual data for certain years. This encompasses all companies with full information during the study period, serving as the foundation for a thorough analysis of the chosen non-financial companies listed on the PSX. The information properly gathered from annual reports of companies during the given timeframe guarantees the strength and credibility of the research.

3.1. Measurement of Variables

3.1.1. Dependent Variable

Insolvency Risk (*Insolvency_Risk*) refers to the likelihood that a listed non-financial firm in Pakistan could experience financial distress or an inability to meet its financial obligations. The emerging-market Z-score, as introduced by Altman (2005), is being used as the measuring instrument of insolvency risk. The Z-score is a compound index that takes various financial ratios into account to estimate the possibility of insolvency risk. This model has been created mainly for emerging markets, and it provides a thorough and precise assessment of a company's insolvency risk. Hussain et al. (2019) and Hussain et al. (2022) confirm the validity of the chosen measuring instrument. The addition of the Altman Z-score model is appropriate for the Pakistani environment, considering it is an emerging market. Conventional financial models often struggle to capture the distinctive dynamics of developing economies, and Altman's model is specifically designed to bridge this gap.

The Altman Z-score is calculated using the following formula:

$$Z = 6.56(A) + 3.26(B) + 6.72(C) + 1.05(D) + 3.25 \quad (1)$$

Where:

$A = \text{Working Capital} / \text{Total Assets}$

$B = \text{Retained Earnings} / \text{Total Assets}$

$C = \text{Earnings Before Interest and Taxes (EBIT)} / \text{Total Assets}$

$D = \text{Market Value of Equity} / \text{Total Liabilities}$

$E = \text{Sales} / \text{Total Assets}$

Safdar, A., Mirza, H. H., Hussain, H., Irshad, H. (2026)

Leading Through Cash Flow Volatility: How CEO Integrity Mitigates Insolvency Risk

The Z-score provides a single numerical value, and Altman suggested specific ranges for interpretation: a Z value greater than 5.85 indicates a firm is in a safe zone (Financially Healthy); a Z value greater than 3.75 but less than 5.85 represents grey zone (Indeterminate); z score value of less than 3.75 indicates distress Zone (Financial Distress/Bankruptcy Risk). The specific scores indicate that an increase in Z score reduces the chances of insolvency risk.

3.1.2. Independent and Moderating Variables

Cash-flow volatility (Cash_Volatility), independent variable, is the degree of variability or deviation in the cash flow of a company over a specified period of time. It is a significant indicator used to evaluate the stability of the cash inflow and outflow of a company. The operationalization of cash flow volatility for this study entailed applying the 3-year lagged Return on Assets (ROA) following Hussain et al. (2019). The rationale for a lagged ROA as a proxy for cash-flow volatility relies on the basis that the firm's financial performance, as measured by ROA, is an indicator of its past capacity to generate profit compared to available resources. A lagged return on assets enables us to account for past financial performance, giving a better picture of the stability of the company in producing profits over a sustained period. ROA indirectly indicates the effectiveness with which a business uses its assets to make profits, affecting the flow of cash.

CEO integrity is measured using three proxies operationalized by Pham and Tran (2020). The three proxies are represented as;

- $CEO_Integrity (A) = (Sales / Total Assets) \div (Board Independence \times Audit Committee Independence)$

The sales-to-asset ratio gauges asset utilization, which reflects the ability of a CEO to utilize firm assets to produce revenue. The denominator (Board Independence $\times$ Audit Committee Independence) captures the quality of corporate governance, which is the strength of combining Board independence (internal governance), which facilitates proper checks and balances, and minimizes managerial opportunism. Auditing standards (external governance) ensure transparency, accountability, and regulatory compliance.

- $CEO_Integrity (B) = (Sales / Operating Expenses) \div (Board Independence \times Auditing Standards)$

Safdar, A., Mirza, H. H., Hussain, H., Irshad, H. (2026)

Leading Through Cash Flow Volatility: How CEO Integrity Mitigates Insolvency Risk

The numerator (Sales / Operating Expenses) is the Expenditure Efficiency Ratio, showing how well a CEO converts operational spending into revenue. The denominator is again the composite governance factor (Board Independence × Auditing Standards).

- $CEO_Integrity (C) = (Net\ Income) \div (CEO\ perks)$

This ratio identifies the harmony between profitability for the company and the personal benefits of the CEO. An ethical CEO is supposed to receive reasonable rewards in line with company performance. A low-integrity CEO, however, might demand high benefits or expensive perks even when the company performs poorly. An elevated ratio suggests the compensation of the CEO is modest compared to the net income of the firm, implying high integrity and alignment with shareholders. A low ratio might imply self-enrichment practices, which suggest low integrity and poor alignment with firm interests.

3.1.3. Control Variables

Fixed collaterals, as operationalized in this research, refer to the ratio of fixed assets to total assets. The ratio is calculated by dividing the value of fixed assets by the total value of assets (Hussain et al., 2021). Debt Maturity is operationalized as long-term debt scaled by total debt. This measure captures the proportion of a firm's total debt that falls under long-term obligations. The debt maturity measurement aligns with the approach proposed by Hussain et al. (2020). Profitability, liquidity, and age are the control variables operationalized using earnings per share, current ratio, and the years the firm has been listed on the stock exchange.

3.2. Econometric Model

The statistical models, considering the hierarchical multiple regression approach, lay out the research framework of this study. Equation 2 represents the direct relation between *Cash_Volatility* and insolvency risk (*Insolvency_Risk*), considering the control variables.

$$(Insolvency_Risk)_{it} = \beta_0 + \beta_1(Cash_Volatility)_{it} + \beta_2(Collateral)_{it} + \beta_3(Debt_Maturity)_{it} + \beta_4(Age)_{it} + \beta_5(Liquidity)_{it} + \beta_6(Profitability)_{it} + \varepsilon_{it} \quad (2)$$

The statistical model in equation 3 covers the direct relationship between the moderated variable, CEO integrity, and the IR, considering the independent and control variables.

Safdar, A., Mirza, H. H., Hussain, H., Irshad, H. (2026)

Leading Through Cash Flow Volatility: How CEO Integrity Mitigates Insolvency Risk

$$(Insolvency_Risk)_{it} = \beta_0 + \beta_1 (Cash_Volatility)_{it} + \beta_2 (CEO_Integrity)_{it} + \beta_3 (Collateral)_{it} + \beta_4 (Debt_Maturity)_{it} + \beta_5 (Age)_{it} + \beta_6 (Liquidity)_{it} + \beta_7 (Profitability)_{it} + \varepsilon_{it} \quad (3)$$

Equation 4 represents the moderating effect of CEO integrity and incorporates interaction terms.

$$(Insolvency_Risk)_{it} = \beta_0 + \beta_1 (Cash_Volatility)_{it} + \beta_2 (CEO_Integrity)_{it} + \beta_3 (Cash_Volatility \times (CEO_Integrity))_{it} + \beta_4 (Collateral)_{it} + \beta_5 (Debt_Maturity)_{it} + \beta_6 (Age)_{it} + \beta_7 (Liquidity)_{it} + \beta_8 (Profitability)_{it} + \varepsilon_{it} \quad (4)$$

4. Empirical results

4.1. Descriptive statistics

Table 2. Descriptive Statistics

Variable	Mean	Std. Dev	Min	Max
<i>Insolvency_Risk</i>	7.72	11.05	-40.81	211.86
<i>Cash_Volatility</i>	4.17	47.50	0.025	120.63
<i>CEO_Integrity (A)</i>	0.637	0.580	0.004	07.760
<i>CEO_Integrity (B)</i>	10.98	22.88	0.041	556.54
<i>CEO_Integrity (C)</i>	53.05	103.58	-613.72	936.37
<i>Collateral</i>	0.515	0.288	0.027	5.009
<i>Debt_Maturity</i>	0.268	0.215	0.000	1.730
<i>Age</i>	35.59	16.58	5.000	86.00
<i>Liquidity</i>	1.69	1.53	0.081	19.42
<i>Profitability</i>	0.077	0.125	-0.500	2.00

Source: author's own calculations.

Table 2 presents the means and standard deviations of the data series, establishing the framework for a comprehensive understanding of the dataset used in subsequent estimations. The mean value of *Insolvency_Risk* measured through Z score is 7.72, and the standard deviation is 11.05 for the reported data. The mean of *Cash_Volatility* is 4.177, and its standard deviation is 47.50, which represents a relatively high dispersion in the cash flow volatility measure. This highlights a significant variation in cash flow volatility among the listed non-financial firms in Pakistan. The substantial range of CFV is noteworthy due to its potential implications for firms in meeting financial obligations, which can lead to long-term

Safdar, A., Mirza, H. H., Hussain, H., Irshad, H. (2026)

Leading Through Cash Flow Volatility: How CEO Integrity Mitigates Insolvency Risk

solvency problems. The average value of CEO Integrity (A) in non-financial firms in Pakistan is 0.637, with a standard deviation of 0.580. The CEO_Integrity (B) scores reported a mean of 10.98 and a standard deviation of 22.88. The average *CEO_Integrity (C)* is 53.05 with a standard deviation of 103.58, implying high dispersion in the data. The average debt maturity for the listed non-financial firms is 0.268, with a standard deviation of 0.215. This signifies a range of debt maturity levels, indicating diversity between the firms. The minimum and maximum observed values (0 and 1.73) highlight the diversity that debt maturity structures present. The average *Collateral* stands at 0.515 with a standard deviation of 0.288. This indicates a moderate reliance on fixed collaterals, often surrounded by non-financial firms, when securing loans. The range from a minimum value of 0.027 to a maximum of 5.009 signifies diverse practices across firms. The descriptive results also reveal that the sample firms are from different age groups, ranging from 5 to 86 years. Similarly, the liquidity variable also shows a minimum value of 0.081 and a maximum value of 19.42. Our sample also represents companies with both positive and negative earnings.

4.2. Correlation analysis

Table 3. Correlation Matrix

	AGE	Collateral	Debt_Maturity	Profitability	Insolvency_Risk	CEO_Integrity (A)	CEO_Integrity (B)	CEO_Integrity (C)	Liquidity
Collateral	-0.02								
Debt_Maturity	-0.16*	0.40*							
Profitability	0.03	0.03	-0.12*						
Insolvency_Risk	0.01	-0.02	0.04	0.26*					
CEO_Integrity (A)	0.06	-0.04	-0.25*	0.36	.101*				
CEO_Integrity (B)	-0.18*	0.003	-0.01	-0.03	-0.03	.09*			
CEO_Integrity (C)	-0.06	-0.04	0.06*	0.33*	0.05	.028	0.07		
Liquidity	-0.06	-0.19*	0.02	0.23*	0.32*	-.001	-0.06	0.10	
Cash_Volatility	-0.01	-0.12*	-0.12*	0.20*	0.03	.102*	-0.005	-0.03	0.036

Source: author's own calculations.

Safdar, A., Mirza, H. H., Hussain, H., Irshad, H. (2026)

Leading Through Cash Flow Volatility: How CEO Integrity Mitigates Insolvency Risk

The present study employs correlation analysis to investigate the linear association between the variables of the study. Correlation analysis also helps in detecting issues related to multicollinearity among independent variables. Table 3 illustrates the correlation among the selected variables. The purpose is to identify the possible multicollinearity among the study variables. The values reported in the table indicate an association among the study variables; however, the values fall within the expected range and do not suggest evidence of multicollinearity.

4.3. Regression analysis

Table 4. Impact of Cash Flow Volatility on Insolvency Risk: System GMM Approach

	<i>Coefficeint</i>	<i>Std.Err</i>	<i>z – stat</i>	<i>Sig</i>
<i>Constant</i>	0.471	.001	257.24	0.000
<i>Cash_volatility</i>	-0.017	.013	-1.31	0.191
<i>Collateral</i>	02.35	.419	5.62	0.000
<i>Debt_Maturity</i>	-02.86	.385	-7.43	0.000
<i>Age</i>	0.157	.014	11.06	0.000
<i>Liquidity</i>	1.132	.073	15.44	0.000
<i>Profitability</i>	19.94	.804	24.78	0.000

Source: author's own calculations.

Table 4 presents the results of Equation 2, which uses cash flow volatility as the primary determinant of insolvency risk, along with other control variables. The estimated results indicate that cash flow volatility reduces the Z-score of a firm, suggesting that high cash flow volatility increases the company's risk of insolvency. However, the results are not statistically significant, meaning that the coefficient of cash flow volatility is not significantly different from zero. However, collateral has a significantly positive relationship, debt maturity has a significantly negative relationship, and age, Liquidity, and profitability have a significantly positive relationship with the z-score.

Safdar, A., Mirza, H. H., Hussain, H., Irshad, H. (2026)

Leading Through Cash Flow Volatility: How CEO Integrity Mitigates Insolvency Risk

**Table 5. Impact of Cash Flow Volatility and CEO Integrity on Insolvency Risk:
System GMM Approach**

Variables	CEO_Integrity (A)		CEO_Integrity (B)		CEO_Integrity(C)	
	Coefficient	Sig	Coefficient	Sig	Coefficient	Sig
Constant	.469***	0.000	.471***	0.000	.472***	0.000
Cash_Volatility	-.015	0.219	-.017	0.176	-.016	0.170
CEO_Integrity	1.285***	0.000	.0004	0.721	.005***	0.000
Collateral	1.391***	0.001	2.339***	0.000	1.745***	0.000
Debt_Maturity	-2.925***	0.000	-2.818***	0.000	-2.713***	0.000
Age	.1664***	0.000	.1584***	0.000	.155***	0.000
Liquidity	1.086***	0.000	1.143***	0.000	1.085***	0.000
Profitability	17.84***	0.000	19.95***	0.000	21.78***	0.000

*** significant at the level less than 1%

Source: author's own calculations.

Table 5 presents the estimated results of equation 3. The table is divided into four sections. The first section displays the variable names, and the remaining three sections present the estimated results of Equation 2 using three different proxies of CEO integrity. Our results suggest that cash flow volatility has a negative relationship with the Z-score, indicating that an increase in cash flow volatility is associated with a higher risk of insolvency for a company. On the other hand, CEO integrity has a significantly positive coefficient, suggesting that CEO integrity positively affects the Z-score and therefore reduces the firm's risk of insolvency. Our results align with the existing literature, which provides evidence of the positive impact of CEO integrity on a firm's risk profile. These results are also robust and consistent across alternative proxies of CEO integrity proposed by Pham and Tran (2020). Regarding the control variables, our findings align with all three integrity proxies. Collateral shows a positive association with the Z-score, indicating that it lowers a firm's insolvency risk, whereas debt maturity is linked to higher insolvency risk. Older firms are less susceptible to insolvency, and both liquidity and profitability contribute to enhancing a firm's risk profile.

Table 6. Moderating Impact of CEO Integrity on Insolvency Risk: System GMM Approach

	<i>CEO_Integrity (A)</i>		<i>CEO_Integrity (B)</i>		<i>CEO_Integrity(C)</i>	
	Coefficient	Sig	Coefficient	Sig	Coefficient	Sig
<i>Constant</i>	.467***	0.000	.471***	0.000	.471***	0.000
<i>Cash_Volatility</i>	-0.712**	0.028	-0.004	0.763	-0.024**	0.029
<i>CEO_Integrity</i>	0.798**	0.026	0.005	0.247	0.007***	0.000
<i>CEO_Integrity</i> $\times$ <i>Cash_Volatility</i>	0.257***	0.000	.221***	0.000	.0004**	0.050
<i>Collateral</i>	0.296***	0.000	2.31***	0.000	1.65***	0.000
<i>Debt_Maturity</i>	-2.95***	0.000	-2.70***	0.000	-2.74***	0.000
<i>Age</i>	0.152***	0.000	.157***	0.000	.156***	0.000
<i>Liquidity</i>	1.13***	0.000	1.13***	0.000	1.11***	0.000
<i>Profitability</i>	15.17***	0.000	19.98***	0.000	21.85***	0.000

*** Significant at the level less than 1%; ** Significant at the level less than 5%

Source: author's own calculations.

Table 6 presents the estimated results of CEO integrity as a moderating variable. The coefficient of Cash Volatility, -0.712, is significant at the 5% level, which demonstrates a significant negative relationship with the Z score. The negative relationship shows that cash flow volatility increases the insolvency risk of a firm. The coefficient value of CEO_Integrity A is significantly positive, which shows that CEO integrity has a positive impact on the z-score. The positive relationship suggests that CEO integrity reduces the firm's risk of insolvency. The coefficient of the interaction term between CEO integrity and cash volatility captures the moderating impact of CEO integrity. The positive value of the interaction term is highly significant, indicating that the CEO's integrity has a positive moderating effect on the relationship between cash flow volatility and the risk of insolvency. Our results are robust to alternative proxies of CEO integrity. For instance, similar results are also observed using alternative proxies of CEO_Integrity. Using CEO_Integrity (B), the coefficient of Cash Volatility is negative, -0.004; however, it is statistically not different from zero. The coefficient of CEO integrity is again significantly positive, and the interaction term between CEO integrity and cash flow volatility is also positive. This supports our hypothesis that CEO integrity mitigates the negative impact of cash volatility on a firm's financial condition. Similarly, the effect of cash flow volatility is significantly adverse when using CEO Integrity (C) as a proxy, and the impact of CEO integrity is also positive and statistically different from zero. The interaction term reconfirms our assertion that CEO integrity has a positive

Safdar, A., Mirza, H. H., Hussain, H., Irshad, H. (2026)

Leading Through Cash Flow Volatility: How CEO Integrity Mitigates Insolvency Risk

moderating effect on the negative impact of cash flow volatility on the firm's financial stability. Regarding control variables, our results are consistent with all three proxies of integrity. Collateral has a positive relationship with the Z-score, indicating that collateral reduces the insolvency risk of a firm, whereas debt maturity increases this risk. Old firms are less prone to insolvency risk; similarly, liquidity and profitability improve a firm's risk profile.

5. Discussion

Our study provides important insights into the relationship between cash flow volatility, CEO integrity, and insolvency risk. The estimated results reveal a consistent negative association between cash flow volatility and the Z-score, implying that greater volatility in cash flows significantly increases the probability of insolvency. These results are aligned with earlier studies, such as Minton & Schrand (1999), which argued that volatile cash flows reduce firm stability and increase the probability of financial distress. Based on the significance of the estimated results, we accepted H1. However, unlike studies that emphasize financial policies and capital structure adjustments as primary mitigating mechanisms (Graham & Harvey, 2001), our findings highlight the central role of leadership attributes, specifically CEO integrity, in shaping a firm's financial resilience. The moderating role of CEO integrity is particularly critical. The significant positive interaction term between integrity and cash flow volatility confirms our primary hypothesis that CEO integrity mitigates insolvency risk by offsetting the negative consequences of volatile cash flows. This finding lends support to behavioral finance theories emphasizing leadership credibility and ethical conduct as determinants of investor and creditor confidence. Based on the statistical significance of the results, H2 and H3 are also accepted.

6. Conclusions

This study contributes to the existing body of literature on insolvency risk by providing empirical evidence on the moderating impact of CEO integrity on the relationship between cash flow volatility and risk of insolvency. We provide insight into effective financial risk management. Our evidence suggests that while cash-flow volatility tends to increase insolvency risk, CEO integrity can reduce this impact, which highlights the significance of ethical leadership in corporate governance. The findings indicate that companies with CEOs of high integrity are more capable of handling financial uncertainty, implying the important part played by ethical leadership. The research highlights the importance of integrating integrity surveys in

Safdar, A., Mirza, H. H., Hussain, H., Irshad, H. (2026)

Leading Through Cash Flow Volatility: How CEO Integrity Mitigates Insolvency Risk

corporate governance systems and designing risk strategies, taking into consideration both financial indicators and leadership ethics.

The main added value of this paper lies in its novel focus on CEO integrity as a moderating factor between cash flow volatility and insolvency risk, an aspect largely neglected in prior research on financial risk management. By linking leadership ethics with insolvency outcomes, this study offers a fresh perspective on corporate governance literature.

From a policy perspective, the results of the study suggest that SECP should integrate formal ethical assessment frameworks into corporate governance codes, making integrity-based evaluations a regular requirement for listed firms. Moreover, SECP can also incentivize integrity in terms of tax rebates or government ratings tied to ethical leadership in companies. In terms of practical implications, the study recommends that there should be a structured mechanism to evaluate the CEO's ethical leadership and integrity in an organization. These objectives can be achieved by considering peer review and feedback from employees at the time of the annual performance evaluation of the CEO. Mandatory ethical audits may further support this impact, enacting a business culture where integrity-based leadership becomes the standard. Finally, this research not only adds to the theoretical body of knowledge regarding the moderating role of CEO integrity between cash flow volatility and risk of insolvency but also offers practical insights into improving corporate governance and financial stability in emerging economies like Pakistan. Future research can extend this work by analyzing similar dynamics across other regions and industries to further underscore the pivotal role of moral leadership in managing financial risk. Although the study focuses on evidence from Pakistan, its findings can be applied to other emerging economies with similar institutional structures, weak governance, and volatile financial systems. However, this research has a limitation. Using accounting ratio-based integrity measures may limit the depth of the analysis, and cultural or institutional differences may limit the generalizability of the results across diverse economies. Future research may enhance the generalizability of our research model by including cross-country data, alternative measures of leadership integrity, and sector-specific analyses. The study has significant implications for the broader economic community. By demonstrating that leadership integrity mitigates insolvency risk, it highlights the crucial role of ethical governance in promoting financial stability, enhancing investor confidence, and promoting sustainable economic development. For financial institutions, regulators, and investors, the findings underscore the importance of integrity as not merely a moral attribute but also an economic asset with measurable benefits.

Safdar, A., Mirza, H. H., Hussain, H., Irshad, H. (2026)

Leading Through Cash Flow Volatility: How CEO Integrity Mitigates Insolvency Risk

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Author Contributions

The principal author, AS, conceived the idea and analyzed the literature to identify the research gap. HHM applied statistical techniques, analyzed the results, and prepared the methodology and literature review section. HH and HI were responsible for data collection, assembling, and cleaning, along with finalizing the write-up of the paper.

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Safdar, A., Mirza, H. H., Hussain, H., Irshad, H. (2026)

Leading Through Cash Flow Volatility: How CEO Integrity Mitigates Insolvency Risk

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Safdar, A., Mirza, H. H., Hussain, H., Irshad, H. (2026)

Leading Through Cash Flow Volatility: How CEO Integrity Mitigates Insolvency Risk

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Safdar, A., Mirza, H. H., Hussain, H., Irshad, H. (2026)

Leading Through Cash Flow Volatility: How CEO Integrity Mitigates Insolvency Risk

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