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## Article

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## Article

# Sentiments–Risk Relationship across the Corporate Life Cycle: Evidence from an Emerging Market

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**Abstract:** The influence of market sentiments on the bankruptcy risk propensity of firms has been extensively explored in the literature. However, less attention has been paid to whether the corporate life cycle plays any role in this nexus. The purpose of this research is to unveil how the corporate bankruptcy risk propensity responds to market sentiments, and whether this sentiments–risk relationship varies over different stages of the corporate life cycle. Using a sample of 301 Pakistani non-financial listed firms for 2005–2014, we employ two-step generalized method of moments (GMM) regression estimation to address the issue of endogeneity. Empirical evidence reveals that managers tend to escalate a firm’s bankruptcy risk during high market sentiments. Further analysis indicates that during the period of positive market sentiments, introduction stage firms prefer to assume the highest bankruptcy risk followed by decline and growth firms, while mature firms continue to be risk-averse. This research contributes to the corporate finance literature by suggesting that managerial risk-taking is influenced by market sentiments and corporate managers show a different attitude towards risk at different stages of the corporate life cycle. Therefore, to ensure enterprise sustainability, capital market regulators should have a robust risk management framework in place to discipline the excessive risk-taking by firm managers over different stages of the corporate life cycle. Moreover, investors and creditors shall take into consideration the respective life cycle stage of the firm to minimize the risk exposure of their investment portfolios. Our results are robust to alternate econometric specifications and alternate variable specifications.



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## 1. Introduction

Traditional finance theory proposes that in an efficient market, asset prices must equate to the present value of their prospective future cash flows (Brzeszczyński et al. 2015). Assuming the efficient-market hypothesis (EMH), asset prices reflect all the information about the fundamental value of the underlying security. Thus, movements in the stock market shall originate only with the new information about the fundamental value of the underlying security (Zhang 2008). However, researchers have raised their concerns over the validity of EMH in the real-life stock markets (Woo et al. 2020), mainly because of the enduring evidence of market anomalies (Guo et al. 2017b). Moreover, there are limited arbitrage opportunities available as different types of costs, such as transaction costs, etc., that can bar the arbitrageurs from taking advantage of market mispricing by irrational investors (Shleifer 2000). Therefore, to explain market anomalies, behavioral finance takes account of deviations from hyper-rationality due to investor sentiments and explores how this may affect asset prices, market outcomes, and the behavior of other investors (Zhang 2008; Shi et al. 2020).

Market sentiments generally refer to the “beliefs about future cash flows or discount rates that are not supported by the prevailing fundamentals” (Baker and Wurgler 2006). Sentiment-driven irrational investors in some periods overestimate the returns and in other periods underestimate the returns, probably because of overconfidence, speculation, and herding behavior (Barberis and Thaler 2003). Market sentiments play an integral role in the firm decision-making process. Managers tend to make heavy investments during the high investor sentiments period, while firms do not invest when sentiments are below fundamentals (Baker and Wurgler 2000). Moreover, the effect of investor sentiments on firm decisions to pay a dividend (Baker and Wurgler 2004), make investments (Gilchrist et al. 2005), curtail leverage (Cagli et al. 2018), and issue equity or debt (Baker and Wurgler 2002) is well documented.

The recent financial crisis has highlighted the significance of a firm’s bankruptcy risk in the financial literature (Oude Avenhuis 2013). Studies on bankruptcy risk reveal that it has a significant relationship with a firm’s investment decisions (Rose-Ackerman 1991), stock returns (Dichev 1998), bond returns (Altman and Hotchkiss 1993), and operational restructuring (Sudarsanam and Lai 2001). However, we observe a scarcity of research that addresses whether market sentiments have some degree of influence on firm bankruptcy risk.

Firms are like living organisms that generally evolve sequentially from birth to decline in their corporate life cycle (Miller and Friesen 1984; Adizes 2004), but inherently different from them due to their ability to skip a life cycle stage or revert to any previous stage (Dickinson 2011). Consequently, the strategies, structures, capabilities, and resources of the firm vary meaningfully with the change in its development phase (Miller and Friesen 1984). Studies on corporate life cycle also suggest that corporate life cycle stages have a strong impact on a firm’s financing (Ahsan et al. 2016), investment (Richardson 2006), risk (Habib and Hasan 2017), working capital management (Wang et al. 2020), investment and financing efficiency (Ahmed et al. 2020; Graciosa et al. 2020), earning management (Hussain et al. 2020), dividend policy (Byun et al. 2021), and profitability (Akbar 2014; Khan et al. 2016; Akbar et al. 2020b). However, we do not find any literature investigating the effect of corporate life cycle stages on the relationship between firm bankruptcy risk and market sentiments. To bridge this gap, the present research aims to examine the influence of market sentiments on bankruptcy risk of Pakistani listed firms and to observe whether this sentiment–risk relationship responds to the prevailing stage of the corporate life cycle in this important emerging market.

We have selected the Pakistan stock exchange (PSX) because of its exclusive market position due to following reasons. First, Bloomberg rated PSX as the third best performing market in the world since 2009 (Bloomberg 2016). Second, market sentiments play an integral role in the investment decision-making by Pakistani investors (Ahmed and Ullah 2013), and these sentiments are systematic components that are priced in the stock market (Sadaqat and Butt 2016). Moreover, stock returns on PSX can satisfactorily be explained by the Fama–French three-factor model (Ali et al. 2018). Third, PSX has a very low level of co-integration with developed equity markets (Hasan et al. 2008), offering global investors opportunities for portfolio diversification. Finally, in their review article, Habib and Hasan (2019) observed that very few studies are available on the implications of corporate life cycle in the context of emerging economies.

The contribution of this research is threefold. First, it extends the market sentiments literature by investigating its impact on a firm’s bankruptcy risk. In contrast, prior studies predominantly concentrated on the role of market sentiments in influencing investment risk, equity risk, and the overall risk of a firm. Furthermore, our results make an empirical contribution by demonstrating that firms’ managers take a higher risk during periods of high market sentiments. Second, we contribute to the growing body of literature on the corporate life cycle by demonstrating its relevance in the context of the managerial decision-making process. The study findings assert that corporate managers do change their risk-taking behavior at various stages of the corporate life cycle. Third, this research

has practical implications for corporate regulators, investors, creditors, and other stakeholders to stay vigilant of the irrational behavior of managers at different stages of the corporate life cycle and take corrective actions when necessary. Notwithstanding, corporate regulators can devise an efficient risk management framework for enterprises in light of the empirical evidence of this research to ensure corporate sustainability at various stages of firm life cycle.

The rest of this study is organized as follows; Section 2 presents a synthesis of literature and proposes the research hypotheses. Section 3 outlines research methodology, and Section 4 entails results and discussion. Section 5 presents robustness testing, while Section 6 concludes this study by outlining policy prescriptions for corporate regulators and stakeholders.

## 2. Literature Review and Hypotheses Development

Market-wide sentiments play an important role in firms' investment decisions as, during the period of high market sentiment, the overvaluation of stocks will encourage the managers to invest more (Polk and Sapientza 2004). However, these overpriced firms' managers tend to invest in negative NPV projects, whereas underpriced firms forego positive NPV projects (Baker et al. 2003). These findings contend that market overvaluation (undervaluation) coincides with higher (lower) investments even though the returns to these investments could be lower (higher) than expectations (Arif and Lee 2014). Moreover, some observe that during the period of high (low) investor sentiments, the returns on small, highly volatile, young, distressed, and extreme growth stocks will be low (high) (Baker and Wurgler 2006). Others find that high (low) market sentiments will yield low (high) returns in G7 stock markets (Bathia and Bredin 2013), reporting a negative association between investor sentiments and market returns, and researchers observe that young, medium growth, and large firms are more likely to get affected by sentiments (Vieira 2016). They consider bankruptcy risk to further investigate inconsistent patterns in the cross-section of returns (Fama and French 1996) and find that market sentiment provides a plausible explanation of why higher insolvency risk is linked to lower stock returns (Dichev 1998).

Furthermore, considering economic policy uncertainty (EPU) as a news variable, Chiang (2019) reveals that EPU has significant predictive power to anticipate future returns on a stock market. Some investors possess conservative heuristics that allow them to underweigh recent and/or past observations of earnings shocks to stock prices (Lam et al. 2012). Investors may underestimate the fundamental information of low book-to-market equity stocks and overreact to the information related to the firm's future growth, resulting in overpricing of these stocks. Consequently, these financially distressed firms earn lower stock returns (Campbell et al. 2008). A recent study observes that sentiments can enhance the intensity of credit risk contagion (Jiang and Fan 2018). Apart from this evidence, the pecking order theory (Myers and Majluf 1984) postulates that firms follow a financing hierarchy. Firms give first preference to internal funds, then debt, and lastly, equity capital. They further argue that when a firm issues new equity, investors believe that managers perceive their stock to be overvalued and are thus taking advantage of this overvaluation or positive sentiments.

Consequently, investors will place a lower value to the newly issued equity of such firms. To avoid this phenomenon, at the time of high/positive market sentiments when the market-to-book ratio of a company is also high, the managers will tend to borrow funds from external sources because this type of borrowing will be available at low rates and easy pay-back conditions. All of this evidence supports the notion that high market sentiments lead to substantial borrowing and lower stock returns mainly because of substantial investment in negative NPV projects that further increase the bankruptcy risk of a firm. Based on these arguments, we develop our first hypothesis:

**Hypothesis 1 (H1).** *High market sentiments lead to higher corporate bankruptcy risk.*

Firms with positive investor sentiments will assume high bankruptcy risk by making heavy investments. However, this is not the case forever. For example, during the stock market boom of the 1920s, real investment did not seem to rise sharply, and capital expenditures for 1925 to 1928 were 8.72, 8.69, 7.93, and 7.93 (billion USD) respectively (Blanchard et al. 1993). While, after the market crash of 1987, investment witnessed a growth of 0.081% for 1988 (Barro 1990). One plausible reason for these competing pieces of evidence provided by the economists such as Schumpeter (1939) is that a firm's aggregate investment could respond to the stage of its life cycle. They further assert that during the periods of high growth conjectures and less financial constraints (i.e., high market sentiments), firms usually tend to over-invest. On the contrary, during economic retrenchments when most firms face financial constraints (i.e., low market sentiments), firms are likely to under-invest.

Moreover, the "firms in financial distress are likely to be disproportionately sensitive to broad waves of investor sentiment" (Baker and Wurgler 2007). It is also documented that their debt maturity structure can be different during the different stages of firms' life cycle. Growth stage companies can have debt at lower rates as compared to introductory firms (Al-Hadi et al. 2019). Based on these propositions, we argue that firm bankruptcy risk at different stages of its life cycle may respond differently to the prevalent market-wide sentiments. For instance, during the introduction stage of the life cycle, firms require higher investment in plant and equipment (Jaafar and Halim 2016) and are also more prone to market mispricing because of information asymmetry and perceived uncertainty about their future returns. Consequently, these firms tend to assume more risk by making heavy investments (Polk and Sapienza 2004).

Firms at the introductory and decline stages are more likely to take risks, and at growth and maturity stages are risk-averse. During high investor sentiment periods, managers increase their risk-taking propensities. Each stage of the corporate life cycle has explanatory power to judge the firm's risk-taking behavior (Zhang and Xu 2020). Growth firms heavily rely on external financing, as their demand for capital is higher than their ability to generate funds internally (Lemmon and Zender 2010). As such, these firms require additional capital to establish their brand identity and product differentiation. Therefore, they strive to sustain the overvaluation of stocks to raise more capital to fund projects, and their cost of equity capital will be lower than introduction firms (Hasan et al. 2015). Another study argues that more CSR activities can reduce financial distress, and this association is more pronounced at firms' maturity stage (Habib and Hasan 2017).

Consistent with the life cycle theory, firms paying more dividends are larger, more profitable but possess fewer chances of growth than less dividend-paying firms (Coulton and Ruddock 2011). Moreover, mature firms are likely to invest less in intangibles such as advertisement and R&D (Adizes 2004) and prefer to maintain their existing assets and profit levels (Richardson 2006) due to a lack of future growth opportunities that lead to lesser need for additional borrowing (Barclay and Smith 2005). Based on these arguments, market sentiments seem to be unimportant for the investment decisions of mature firms. Furthermore, lack of profit and loss of market share characterize the decline phase of the corporate life cycle (Benmelech et al. 2010). To overcome this problem and revert to profitability, declining firms assume more risk by investing substantially in R&D (Dickinson 2011) financed through additional capital that will be easily available during the period of high market sentiments. Moreover, the role of the shakeout stage in the corporate life cycle is unclear in theory (Dickinson 2011).

The past literature has competing arguments about this stage of the life cycle. Some argue that this is the most exciting stage of a corporate life cycle when substantial major and minor product-line innovations occur. Consequently, firm size increases and organizations tend to be proactive and rapidly growing (Miller and Friesen 1984; Lester and Parnell 2008). On the contrary, others observe that number of products begins to decline at this stage of a firm's life cycle leading to a decline in prices (Dickinson 2011). Due to conflicting observations about the shakeout stage and following previous studies (Habib and Hasan



2017; Hasan et al. 2015; Akbar et al. 2019), we consider the shakeout stage as a base to compare and interpret the results of other stages of the life cycle. As such, we put forward the second hypothesis as under:

**Hypothesis 2 (H2).** *Compared to the shakeout stage, bankruptcy risk propensity of introduction, growth, and decline stage firms will be higher during the period of high market sentiments, whereas mature firms will continue to be risk-averse.*

### 3. Methodology

#### 3.1. Sample and Data Selection

The data set of this study comprises 301 non-financial listed firms nested in 12 different sectors for 10 years (2005–2014) giving us 2789 firm-year observations. In Table 1, we present the distribution of sample firms and observations in 12 different sectors.

**Table 1.** Sample selection and industry-wise distribution of data.

Industry	Number of Firms	% of Observations
Textiles	118	39.2
Chemicals, Chemical Products, and Pharmaceuticals	40	13.29
Other Non-Metallic Mineral Products—Overall	28	9.3
Other Manufacturing	25	8.3
Motor Vehicles, Trailers, and Auto-parts	21	6.98
Food	16	5.32
Fuel and Energy	14	4.65
Information, Comm., and Transport Services	10	3.32
Coke and Refined Petroleum Products	10	3.32
Paper, Paperboard, and Products	7	2.33
Other Service Activities	7	2.33
Electrical Machinery and Apparatus	5	1.66
Total	301	100

Authors' calculation.

We used publications of the State Bank of Pakistan (SBP) to collect the data for our main explanatory variable: market-wide sentiments and dependent and control variables<sup>1</sup>. We obtained cash flow data from the Osiris database, GDP growth and inflation rates from WDI<sup>2</sup>, and industrial growth rates from CIA Fact Sheet.

In Table 2, we present the life cycle-wise distribution of our sample. It shows that 43% of selected firms are mature, thus facing no serious financial trouble; introduction, growth, and shakeout stages represent 18%, 18%, and 14% share, respectively. This sample categorization also shows that, during the observed time period, only 7% of Pakistani listed firms are in the most dangerous stage of their life cycle, i.e., decline stage. Overall, sampled firms are fairly distributed in all the stages of the life cycle suggested by Dickinson (2011).

**Table 2.** Life cycle-wise distribution of sampled data.

Life Cycle Stage	Number of Firm-Year Observations	% of Firm-Year Observations
Introduction	496	18
Growth	509	18
Mature	1210	43
Shakeout	390	14
Decline	18	7
Total	2789	100

Authors' calculation.

### 3.2. Measurement of Variables

#### 3.2.1. Explanatory Variables

Market sentiments and interaction between market sentiments and corporate life cycle stages (sentiments \* life cycle stages) are the explanatory variables of this study. In the literature, we found different models to measure investor sentiments by employing a wide array of measures such as IPO first-day returns, issuance volume, and trading volume (Derrien 2005), equity issuance as a fraction of total capital issuance (Baker and Wurgler 2000), weight assignments using a pseudo-Bayesian approach (Lam et al. 2010), trading volume (Baker and Stein 2004), a Bayesian approach to elucidate market inefficiency during financial crises (Guo et al. 2017a), the difference in the average market-to-book ratio of dividend payers versus non-payers (Baker and Wurgler 2004), and a composite investor sentiment index (Baker and Wurgler 2006). By following recent studies (Al Samman and Al-Jafari 2015; Abdelhedi-Zouch and Ghorbel 2016), we used trading volume as a proxy to measure the market sentiments (hereafter, SENT) proposed by Baker and Stein (2004). We tend to agree with their line of argument that high trading volume or market liquidity is a sign of overvaluation by irrational investors. In a market with short-sale constraints, retail investors will prefer to invest if they are optimistic. Thus, high market liquidity is an indicator of the positive sentiments of irrational investors.

#### 3.2.2. Corporate Life Cycle Stages

Assessing the life cycle stage of an individual firm is a difficult task. A firm may have many overlapping and distinct life cycle stages because of its diverse product offerings in multiple industries and markets. To overcome this measurement problem, Dickinson (2011) proposes the cash flow methodology. She argues that a firm's cash flow statement captures differences in its growth, profitability, allocation of resources, and risk. Thus, one can classify the firms in different life cycle stages such as 'introduction', 'growth', 'maturity', 'shakeout', and 'decline' by using cash flow from operating, investing, and financing activities. We adopted this methodology that we have summarized in Table 3.

**Table 3.** Expected net cash flow pattern over the corporate life cycle.

Life Cycle Stage	Net Cash Flows from Operations	Net Cash Flows from Investments	Net Cash Flows from Financing
Introduction	—	—	+
Growth	+	—	+
Mature	+	—	—
Decline	—	+	+ or —
Shakeout	Any pattern other than those of mentioned above		

'+' means net cash flows > '0' and '—' means net cash flows < '0'.

#### 3.2.3. Why Net Cash Flows-Based Measure of the Life Cycle?

The corporate life cycle does not proceed in a sequential manner (Lester et al. 2003). The theory of strategic choice postulates that corporate managers who identify the need for a strategic change in their corporations may have to change the organizational dynamics that determine the corporate life cycle to attain long-term competitiveness (Lester and Parnell 2008). Many empirical measures of life cycle stages use firm growth, age, and size, which are sequential measures (Khan and Watts 2009) and are criticized because of their non-cyclical nature and inappropriateness in real-world scenarios (Levie and Lichtenstein 2010). However, modern firms maintain dynamic portfolios of multiple products in various markets that potentially traverse different product life cycle stages at a cross-section (Dickinson 2011). As such, Dickinson (2011) proposes a cash flow pattern as a dynamic, cyclical, and non-sequential measure of the corporate life cycle because it reflects the overall financial information of a firm rather than a single measure of the firm-related characteristics such as firm age, size, sales growth, etc.

### 3.2.4. Dependent Variable

Firm bankruptcy risk is the dependent variable of this study. It is extremely challenging to predict insolvency risk as firms have expanded their businesses around the globe in complex and sophisticated ways to hide their actual financial position (Kliestik et al. 2018). Although, the relevant literature provides a wide range of models to measure the bankruptcy risk. Most of these models have employed different financial ratios in their bankruptcy prediction models (for a good overview of these models, see e.g., Altman 1968; Zmijewski 1984; Hosaka 2019). However, improper selection of a bankruptcy model can adversely affect the results of a study. For example, numerous studies have tried to measure the bankruptcy risk using a single firm level variable such as a book-to-market ratio, size, leverage, age, dividend payout, debt ratings, and group membership. Meanwhile, researchers question the ability of these variables as a single predictor of bankruptcy risk. For instance, highly leveraged firms would be at the peak of insolvency risk, but this will not be true for an efficiently managed firm in a growing industry (Cleary 1999; Griffin and Lemmon 2002).

Nevertheless, it is evident that each country has its unique corporate dynamics, and thus prefers to have different variables to construct a bankruptcy risk prediction model (Kovacova et al. 2019). Therefore, we used Z-score (Altman 1968) and ZMI-score (Zmijewski 1984), two widely used measures of insolvency risk (Laeven and Levine 2009; Kanagaretnam et al. 2011) to proxy a firm's bankruptcy risk. Researchers have found Altman's Z-score an effective and accurate tool to assess the financial distress of non-financial firms in Pakistan (Awais et al. 2015; Hussain et al. 2014; Roomi et al. 2015). In the Altman (1968) model, low (high) values of the Z-score indicate that firm is at a higher (lower) level of risk. Thus, we used the inverse of the Z-score in the regression analysis. Moreover, we used the ZMI-score (Zmijewski 1984) as an alternative measure of bankruptcy risk, a widely used measure of bankruptcy risk in the literature (Grice and Dugan 2003). The ZMI-score values lie between 0 and 1. If the score lies at or above 0.50, it is associated with a higher level of bankruptcy risk, while a score of below 0.50 refers to the situation of lower insolvency risk.

### 3.2.5. Firm-Level Controls

Prior studies suggest numerous internal factors that can influence a firm's risk-taking behavior (e.g., firm size, growth, capital expenditure, leverage, and profitability). Therefore, we included six firm-level controls that researchers found to be associated with firm risk-taking (Habib and Hasan 2017). An omission of these internal controls could give rise to the unobserved heterogeneity and correlated omitted variable problem. Moreover, to cope with data outliers, we winsorized firm-level controls at the 4% level in both tails.

### 3.2.6. Country-Level Controls

The literature suggests including country-level controls such as industrial growth (INDGR), GDP growth (GGDP), and inflation rate (INF) to account for their influence on firm risk-taking behavior (Habib and Hasan 2017). Therefore, we employed the three country-level controls in our regression analysis. Complete details of the dependent and independent variables are provided in Table 4.

## 3.3. Methodology

The nature of our econometric model is dynamic, where data comprised both time series and cross-sectional elements. Moreover, both our dependent and independent variables were calculated using financial ratios that have been derived from identical components. Hence, the issue of endogeneity could persist in our model and may give rise to several issues, such as biased estimation of coefficient standard errors and wrong interpretation of the results. Therefore, by following Akbar et al. (2020a, 2021), the latest dynamic panel data technique known as two-step system GMM regression introduced by Roodman (2009) was employed to solve this issue. This technique employs the lagged



explanatory variables along with the lags of endogenous variables as instruments in the regression model to address the endogeneity problem.

**Table 4.** Variable definitions.

Variable Category and Name	Description	Calculation
Dependent variables:		
Altman Z-score	Z-score	$= 1.2 \left( \frac{\text{working capital}}{\text{Total assets}} \right) + 1.4 \left( \frac{\text{Retained Earnings}}{\text{Total assets}} \right) + 3.3 \left( \frac{\text{EBIT}}{\text{Total assets}} \right) + 0.6 \left( \frac{\text{Market value of equity}}{\text{Total liabilities}} \right) + 1.0 \left( \frac{\text{Sales}}{\text{Total assets}} \right)$
Zmijewski score	ZMI-Score	$= -4.3 - 4.5 \left( \frac{\text{Net Income}}{\text{Total assets}} \right) + 5.7 \left( \frac{\text{Total liabilities}}{\text{Total assets}} \right) + 0.004 \left( \frac{\text{Current assets}}{\text{current liabilities}} \right)$
Independent variables:		
Market sentiments	SENT	Market sentiments are measured using the <a href="#">Baker and Stein (2004)</a> model. For this purpose, we took the natural log of annual trading volume of shares at KSE.
Interaction between market sentiments and corporate life cycle stages	SENT × LCS	Different stages in the corporate life cycle such as introduction, growth, maturity, and decline are interacted with market-wide sentiments
Firm-level Controls:		
Firm size	FSIZE	Natural log of firms' market value of equity
Profit margin	PM	Net profit before taxes/total sales
Leverage	LEVG	(Current liabilities + non-current liabilities)/Shareholders' equity
Market-to-book ratio	MTB	Market value of equity/book value of equity
Sales growth	SGROW	Sales growth is measured by the ratio of current year sales to lagged sales
Fixed assets growth rate	FAGR	Fixed assets growth is measured as current year fixed assets scaled by lagged fixed assets
Country-level Controls:		
Industrial growth	INDGR	Annual percentage increase in industrial production of Pakistan
Growth in gross domestic product	GGDP	Annual GDP growth rate
Inflation rate	INF	Annual rate of inflation

Authors' calculation.

## 4. Empirical Model, Results, and Discussion

### 4.1. Regression Model

We present our model in the following two equations:

$$\text{Bankruptcy risk}_{it} = \alpha_0 + \beta_1 \text{SENT}_{it} + \beta_2 \text{FSIZE}_{it} + \beta_3 \text{LEVG}_{it} + \beta_4 \text{MTB}_{it} + \beta_5 \text{SGROW}_{it} + \beta_6 \text{PM}_{it} + \beta_7 \text{FAGR}_{it} + \beta_8 \text{INDGR}_{it} + \beta_9 \text{GGDP}_{it} + \beta_{10} \text{INF}_{it} + \varepsilon_{it} \quad (1)$$

$$\text{Bankruptcy risk}_{it} = \alpha_0 + \sum_{k=1}^4 \beta_k \text{SENT}_{it} * \text{FLCS}_{kit} + \beta_5 \text{FSIZE}_{it} + \beta_6 \text{LEVG}_{it} + \beta_7 \text{MTB}_{it} + \beta_8 \text{SGROW}_{it} + \beta_9 \text{PM}_{it} + \beta_{10} \text{FAGR}_{it} + \beta_{11} \text{INDGR}_{it} + \beta_{12} \text{GGDP}_{it} + \beta_{13} \text{INF}_{it} + \varepsilon_{it} \quad (2)$$

where SENT represents investor sentiments that are measured by taking the natural log of annual trading volume of shares at KSE; SENT\*FLCS is a vector of dummy variables that denotes different stages in the corporate life cycle (introduction, growth, mature, and decline) interacting with the prevailing market-wide sentiments, while  $\beta_2$  to  $\beta_5$  indicate SENT\*Introduction, SENT\*Growth, SENT\*Mature, and SENT\*Decline respectively; FSIZE is the natural log of the firm's market value of equity; LEVG is (current liabilities + non-current liabilities)/shareholders' equity; MTB is the market value of equity/book value of equity; SGROW is the ratio of current year sales to lagged sales; PM is net profit before taxes/total sales; FAGR is current years' fixed assets scaled by lagged fixed assets; INDGR

is the annual percentage increase in industrial production of Pakistan; GGDP is annual GDP growth rate; and finally, INF is the annual rate of inflation.

#### 4.2. Descriptive Analysis

Table 5 presents summary statistics of the variables. Z-score and ZMI-score are two different measures of bankruptcy risk. It is worth mentioning that ZMI-score has a smaller number of observations as the financial ratios used to calculate this variable have many missing values. Overall, both measures are showing identical trends across the corporate life cycle stages. The average of our sentiment proxy SENT is highest when firms are at the growth stage (10.86), while lower for the declining firms (10.70). A market-to-book ratio mean of 1.04 signifies that, on average, the market did not overprice the sampled firms. Fixed assets are growing at an average pace of 0.276%. Among country-level controls, average industrial growth, GDP growth, and inflation rates are 4.39%, 3.87%, and 11.01%, respectively.

**Table 5.** Life cycle-wise summary statistics.

Variables	N	Mean	SD	Birth	Growth	Mature	Shakeout	Decline
Z-score	2789	−2.180	3.034	−1.290	−1.770	−2.83	−2.380	−0.929
ZMI-Score	2755	0.331	0.268	0.452	0.317	0.269	0.319	0.470
SENT	2789	10.79	0.365	10.81	10.86	10.76	10.79	10.70
FSIZE	2789	13.39	2.27	12.92	13.60	13.74	13.24	12.13
LEVG	2789	1.470	44.47	1.81	−0.770	2.35	1.22	1.480
MTB	2789	1.040	10.30	0.307	1.010	1.35	1.13	0.839
SGROW	2789	0.317	6.30	0.243	0.372	0.147	1.00	0.038
PM	2789	−17.20	287.4	−24.90	−2.74	0.995	−22.8	−144.3
FAGR	2789	0.276	2.050	0.246	0.399	0.195	0.444	0.194
INDGR	2789	4.390	3.080	4.64	4.93	4.15	4.41	3.740
GGDP	2789	3.870	1.780	3.80	4.35	3.80	3.79	3.450
INF	2789	11.010	3.950	11.60	10.30	10.90	11.08	11.20

Authors' calculation.

Table 6 depicts the pair-wise correlation analysis for the dependent and independent variables of the study. Z-score and ZMI-score have a significant but negative correlation with sentiments. Bankruptcy risk has a positive correlation with firm leverage, market-to-book ratio, sales growth, and a country's inflation rate, suggesting that growing firms with high debt undertake more risk, especially during times of a higher inflation rate. However, the negative association of Z-score with FSIZE, PM, INDGR, and GGDP infers that bigger and profitable firms that operate in competitive and growing industries and the growing economy tend to reduce their bankruptcy risk due to competitive pressure and a conducive business environment. A negative correlation between firm size and leverage indicates that large firms do not prefer debt and may rely on their internal sources to finance their needs, as observed in a recent study (Ahsan and Qureshi 2017). In contrast, small firms are more prone to external debt financing.

**Table 6.** Pairwise correlation.

	Z-Score	ZMI	SENT	FSIZE	LEV	MTB	SGROW	PM	FAGR	INDGR	GDP
Z-score	1.00										
ZMI	0.44 *	1.00 *									
SENT	−0.10 *	−0.06	1.00								
FSIZE	−0.38 *	−0.38 *	0.11 *	1.00							
LEV	0.00	0.00	0.01	−0.01	1.00						
MTB	0.07 *	−0.03	−0.00	0.09 *	0.43 *	1.00					
SGROW	0.01	0.03	0.01	0.00	−0.002	−0.00	1.00				
PM	−0.11 *	−0.18 *	0.03	0.08 *	0.00	0.00	0.00	1.00			
FAGR	−0.01	−0.04 *	−0.01	0.02	0.00	0.00	−0.00	−0.01	1.00		
INDGR	−0.09 *	−0.06	0.76 *	0.06 *	0.03	−0.006	0.00	0.03	−0.03	1.00	
GGDP	−0.09 *	−0.07	0.65 *	0.10 *	0.01	−0.008	0.01	0.02	0.02	0.60 *	1.00
INF	0.04 *	0.08	0.21 *	−0.09 *	−0.01	0.00	−0.01	0.00	−0.01	−0.27 *	−0.73 *

Authors' calculation. The values in the table are correlation coefficients, while \* indicates  $p < 0.05$ .

To test the multicollinearity issue among explanatory variables, we applied variance inflation factor (VIF) analysis, and VIF values for all the variables are below 10 (see Appendix A). As such, it rules out the possibility of multicollinearity in the proposed models (Kennedy 2008).

#### 4.3. Regression Results

In Table 7 we present the results of the regression of bankruptcy risk measure Z-score separately on two different proxies of investor sentiments, interaction variables of investor sentiment, and life cycle stages along with several firm- and country-level control variables. Consistent with H1, we find positive and statistically significant coefficients of SENT for Z-score suggesting that firms assume greater insolvency risk during the period of high market sentiments. These findings have two potential implications. First, managers rationally cater market overvaluation of noise traders and assume higher risk by investing more during the period of high market sentiments. Second, managers get themselves caught up in the market elation and overestimate the present value of expected future cash flows and thus want to take advantage by increasing investment during the period of high investor sentiments. Our results are in line with earlier studies (Arif and Lee 2014; Polk and Sapienza 2004). From a life cycle perspective, the interaction variable SENT\*Intro has a significant positive association with bankruptcy risk. The reported coefficients indicate an increase in bankruptcy risk in the period of high market sentiments. This outcome reveals that managers of introduction firms assume higher risk by making heavy investments during the period of positive market sentiments. Introduction firms generally have limited access to external financing (Akbar et al. 2019), and as such, high market sentiments provide them an opportunity to avail financing at a lower cost. Further, SENT\*Growth also has a significant positive coefficient with bankruptcy risk. However, smaller coefficients during the growth stage (0.889) unveil that the increase in bankruptcy risk for the growing firm is less pronounced as compared to the introduction stage (1.257) firms. These results support the notion that although growth firms also assume relatively higher bankruptcy risk during periods of high market sentiments, the dynamics of growth firms are however different from other firms. The plausible explanation may be that growth in firm sales, assets, and profits assists them to reduce the adversity of growing debt ratios. Further, these usually fast-growing enterprises can raise desired capital through debt and/or equity; however, benefiting from the market sentiments, these firms can raise more equity capital and consequently lessen their insolvency risk levels (Baker and Wurgler 2002).

Furthermore, cash flows generated from internal operations of mature firms that generally have limited growth opportunities reduce the need for external capital (Bulan and Yan 2009). These firms may not affect their risk profile. Our empirical results find a significantly negative association between SENT\*Mature and bankruptcy risk, which is consistent with the proposition. Additionally, a significant positive relationship between SENT\*Decline and insolvency risk conjectures that the managers of declining firms assume higher risk by making hefty investments in a turnaround attempt. Concerning the firm-level controls, FSIZE, PM, and LEVG exhibit a significant negative relationship with bankruptcy risk suggesting that larger firms having high profit margins and high debt levels tend to assume lesser risk, and perhaps with more valued assets these firms command market power in a less competitive business environment and may also be able to diversify their operations to maintain stability in their returns and consequently can demonstrate good reputation and better creditworthiness in the market to help reduce bankruptcy risk (Rego et al. 2009). Interestingly, there is a negative association between our bankruptcy risk proxies and LEVG, which strengthens our proposition that solely leverage is not an appropriate measure of bankruptcy risk. Moreover, a significant positive association of MTB and FAGR with insolvency risk implies that firms tend to take more risk to fuel their assets' growth. In the context of country-level controls, industrial growth, GDP growth, and high inflation rates help decrease the bankruptcy risk of the sampled firms.

**Table 7.** Two-step system GMM regression results.

Variable	(Model 1)	(Model 2)
	Z-Score	Z-Score
SENT	0.0557 * (2.34)	
SENT × Intro		1.257 *** (19.80)
SENT × Growth		0.889 *** (9.04)
SENT × Mature		−1.092 *** (−18.94)
SENT × Dec		1.139 *** (6.87)
FSIZE	−0.439 *** (−14.61)	−0.394 *** (−11.29)
LEVG	−0.00561 *** (−27.52)	−0.00581 *** (−17.83)
MTB	0.0533 *** (60.40)	0.0518 *** (32.72)
SGROWTH	−0.0203 *** (−8.89)	−0.0226 *** (−10.87)
PM	0.000568 *** (9.00)	0.000675 *** (13.44)
FAGR	0.0285 *** (29.03)	0.0134 *** (8.64)
INDGR	−0.0363 *** (−10.65)	−0.0505 *** (−10.17)
GGDP	−0.0795 *** (−5.58)	−0.130 *** (−6.29)
INF	−0.0180 *** (−4.08)	−0.0462 *** (−6.30)
N	2487	2487
Ar2	1.20	1.09
Ar2p	0.231	0.277
Hansen	175.13	169.01

Authors' calculation; t-statistic in parentheses, \*  $p < 0.1$ , \*\*\*  $p < 0.01$ .

## 5. Robustness Check

As a robustness check, we have employed an alternative bankruptcy risk proxy, ZMI-score (Zmijewski 1984), with values ranging between 0 and 1. If the score lies at or above 0.50, it is associated with a higher level of bankruptcy risk, and a score of below 0.50 refers to the situation of low insolvency risk.

Table 8 reports the results of the two-step GMM regression analysis. Consistent with our previous findings, ZMI-score has a positive and statistically significant ( $p < 0.01$ ) association with market sentiments measure SENT. A positive and statistically significant ( $p < 0.01$ ) relationship between insolvency risk measure and SENT\*Intro suggests that managers of introduction firms take full advantage of market mis-valuation by noise traders to fulfil their capital requirements. Investors' sentiments at the growth stage (coefficient, 0.0381) of the corporate life cycle have a negatively significant ( $p < 0.05$ ) relationship with its bankruptcy risk. However, the intensity of this association is less pronounced than introduction firms (coefficient, 0.256). A significant association of SENT\*Mature with firm bankruptcy risk measure suggests that mature firms also respond to the market-

wide sentiments by increasing their debt ratios. A negative and statistically significant association between SENT\*Decline reveals that the vulnerable condition of declining firms is exposed to the investors and creditors; therefore, such firms have limited ability to borrow from external sources even during positive market sentiments. Although an increase in investors' sentiment can increase the bankruptcy risk of a firm, we do not find any evidence suggesting a decline in risk-taking during low market sentiments. Further, firm size is negatively associated with its bankruptcy risk ( $p < 0.01$ ), implying that large firms tend to assume less risk because they are expected to show better creditworthiness and consistency in their returns due to their market power in a high concentration market. A significant and negative association between insolvency risk and market-to-book ratio depicts that firms with high MTB ratios are less prone to assume bankruptcy risk.

**Table 8.** GMM regression results.

Variable	Model 1	Model 2
	ZMI-Score	ZMI-Score
SENT	0.0641 *** (17.90)	
SENT × Intro		0.256 *** (24.86)
SENT × growth		−0.0381 ** (−2.89)
SENT × mature		0.0314 *** (3.48)
SENT × Dec		−0.0668 ** (−2.71)
FSIZE	−0.0853 *** (−21.77)	−0.0717 *** (−11.04)
LEVG	0.000078 *** (7.56)	0.0000457 ** (3.17)
MTB	−0.000975 *** (−12.94)	−0.000731 *** (−13.16)
SGROWTH	−0.00215 *** (−8.87)	−0.00212 *** (−4.13)
PM	0.000036 ** (2.69)	0.00005 *** (4.47)
FAGR	−0.00205 *** (−9.00)	−0.000638 * (−2.15)
INDGR	−0.00703 *** (−15.47)	−0.00744 *** (−12.17)
GGDP	−0.00842 *** (−5.47)	−0.00204 (−1.04)
INF	0.000323 (0.65)	−0.000488 (−0.68)
N	2451	2451
Ar2	−2.14	−1.43
Ar2p	0.032	0.152
Hansen	179.90	147.08

Authors' calculation; t-statistic in parentheses, \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

## 6. Conclusions

This study examines market sentiments as a potential determinant of firm bankruptcy risk propensity. It also investigates how the prevailing stage of the corporate life cycle



might moderate any relationship between the two. For this purpose, we used Baker and Stein's (2004) sentiment measure and Dickinson's (2011) measure of corporate life cycle stages. Further, we employed two widely used measures of a firm's bankruptcy risk—Z-score (Altman 1968) and ZMI-score (Zmijewski 1984)—as the dependent variables. We found that during the period of high market sentiments, managers tend to assume higher bankruptcy risk. Concerning the corporate life cycle stages, introduction, growth, and decline firms increase their bankruptcy risk during high market sentiments. In contrast, the sentiments do not significantly affect the bankruptcy risk behavior of mature firms. It is noteworthy that 43% of our sample consists of mature firms. Our empirical results entail that mature firms are more prudent in their risk management practices compared to their counterparts. During positive market sentiments, the introduction firms assume the highest bankruptcy risk, followed by the decline firms, while the risk-taking propensity of the growth firms was less pronounced.

The present research contributes to the corporate finance literature by exploring the nexus between market sentiments and a firm's bankruptcy risk. Furthermore, our study unleashed the role of corporate life cycle in the association between market sentiments and a firm's bankruptcy risk, which has practical and policy ramifications for various corporate stakeholders. Our empirical results suggest a fairly 'U-shaped' relationship between market sentiments and firm bankruptcy risk over the corporate life cycle, implying that firm regulators should have a proper risk assessment framework in place at each stage of the corporate life cycle to effectively control firms' excessive bankruptcy risk-taking behavior in the capital market. This research provides a timeline of the observed risk-taking behavior of the managers, which has important implications for the stockholders as they should remain vigilant of managers' irrational investment behavior over the corporate life cycle. In particular, investors can consider the firm's respective life cycle stage to minimize the risk exposure of their investment portfolios. Overall, our results have practical significance and imperative theoretical value for corporate bankruptcy risk management practice, especially in an emerging market. Our work provides effective guidelines to regulators for the capital markets in emerging markets to formulate a dynamic and resilient bankruptcy risk management strategy for each stage of the corporate life cycle to avoid the chances of being bankrupt. Such a framework shall contribute to sustainability in the capital market.

The present research elucidates the sentiments–bankruptcy risk nexus over the corporate life cycle in the context of Pakistan. However, this research bears some limitations and identifies some directions for future research. First, it is single-country research conducted in Pakistan. Hence, the results may only be generalizable to other economies with similar dynamics and stages of economic development. Second, our data set is limited to the non-financial sector. Thus, the financial sector is out of the scope of this research. Although, the present study uncovers an important dimension in the corporate life cycle research. However, our study also bears some limitations. First, considering the data availability constraints, we have employed only one proxy to measure market sentiments. Second, we have used measures of bankruptcy risk that were developed in the context of developed economies, although their consistency in the case of emerging economies is well documented. It would be nice to develop and use bankruptcy risk measures exclusively for emerging economies.

Future lines of research in this domain can examine the impact of market sentiments on stock market volatility. Moreover, it will be interesting to see how risk-taking affects a firm's operating performance at different stages of the corporate life cycle. Nevertheless, it will be interesting to see the role of gender in decision-making across the corporate life cycle (Jiang and Akbar 2018). Finally, researchers should focus on developing measures of market sentiments that are specifically suitable for emerging markets.

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## Appendix A

**Table A1.** Variance inflation factor (VIF) analysis.

Variable	VIF	1/VIF
GDP	4.09	0.244351
INF	2.48	0.403510
SENT	1.85	0.540860
INDGR	1.84	0.542529
MTB	1.25	0.801383
LEVG	1.23	0.809805
FSIZE	1.18	0.847484
INCOM	1.13	0.882212
PM	1.01	0.990721
FAGR	1.00	0.995220
SGROW	1.00	0.999317
Mean VIF	1.64	

## Notes

<sup>1</sup> Obtained from SBP publication ‘Balance Sheet Analysis’.

<sup>2</sup> Of the World Bank.

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