IOSR Journal of Economics and Finance (IOSR-JEF)
e-ISSN: 2321-5933, p-ISSN: 2321-5925.Volume 10, Issue 4 Ser. III (Jul. – Aug 2019), PP 75-86
www.iosrjournals.org

Corporate Risk, Firm Size and Financial Distress: Evidence from Non-Financial Firms Listed In Kenya

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***Abstract**: Financial distress (FD) is a common precursor to corporate failure that subjects investors to financial loss. In Kenya, FD has been rampant among several private and public commercial entities. This signifies presence of deep-seated corporate snags that hamper sustainability. Earlier studies have focused more on FD modeling while others provide conflicting findings pertaining to risk exposure and financial health. This study therefore examines the influence of corporate risk on FD. Additionally, the moderation effect of firm size on the relationship between corporate risk and FD was tested. This study is premised on Modigliani and Miller's first proposition and signaling theory. Aquantitative research design with a correlational approachwas adopted targeting all non-financial firms listed in Nairobi Securities Exchange (NSE) from year 2006 to 2015. The study collected secondary data from audited financial statements, daily stock prices and stock market indices. Data analysis involved hierarchical panel regression analysis. The results show that corporate risk significantly and positively influences FD. Unsystematic risk in terms of business and financial risk has a positive significant influence on FD in contrast to systematic risk proxied by market risk that has an insignificant positive effect. Interaction terms; corporate risk*firm size and unsystematic risk*firm size have a positive insignificant effect on FD while interaction term market risk*firm size relates negatively and insignificantly with FD. Large firms can accommodate more market risk without experiencing FD as opposed to unsystematic riskthat is more disastrous. This study recommends continuous proactive risk management practices that go beyond mere risk assessment so as to integrate risk exposures and incidents more so those that are internal.*

***Key Words:** Corporate Risk, Market Risk, Business Risk, Financial Risk, Firm Size, Financial Distress.*

Date of Submission: 03-08-2019 Date of Acceptance: 19-08-2019

I. Introduction

Financial distress (FD) is a global crisis reflected on the existing cases of corporate failure and bankruptcy. This can be traced back to historical dates as early as 1970s in connection to past financial crisis experienced by economies and commercial entities globally (Anderson, 2013; Hinds 1988). FD is a state that depicts an economic hitch in the operations of an entity and if successful turnaround is not administered on a timely basis the financial condition matures to events of default, absence of going concern, several attempts of recovery and restructuring strategies, operational inefficiency, incurring distress costs and liquidation (Carmassi & Patti, 2015; Muller, Steyn-Bruwer & Hamman, 2012). Distressed firms commonly experience traits such as; low or no value creation, high financial leverage as well as insufficient liquidity, a combination that eventually leads to exit options from an existing market share (Sitati &Odipo, 2009; Palinko & Svoob, 2016; Shaukat & Affandi, 2015). On the same note, other undertakings such as mergers and acquisitions, joint ventures, strategic alliances, delisting from the bourse, liquidation or major restructuring becomes subsets of business firms in grey zones headed to become distressed if not yet (Khaliq, Altarturi, Thaker, Harun, & Nahar, 2014; Muller et al., 2012).

The probability of distress in a trading organization is associated with high fixed costs, a number of illiquid assets compared to liquid assets and increased revenue sensitivity directly or indirectly influenced by economic recessions (Khaliq et al., 2014). Leveraged firms with compelling amounts of debt increase the probability of FD to a significant extent and this leads to other related costs such as; loss of exclusive financing, opportunity costs of projects, demotivated workforce due to lost confidence and bankruptcy costs (Berk et al., 2013; Khaliq et al., 2014). Volatility of operating profit is also a major determinant as to whether an entity is likely to encounter FD in the near future since it is directly proportional to increased susceptibility of business failure (Khaliq et al., 2014; Sporta, 2018). FD contributes to volatility in cash flows which reduces return on equity and exposes creditors to credit risk (Brown, Ciochetti & Riddiough, 2006). This translates to possible balance sheet conflicts in form of either negative working capital or outstanding non-current financial obligation (Carmassi & Patti, 2015: Outecheva, 2007).Carmassi and Patti (2015) identifies internal and external business

exposures to be the key pillars of FD. The latter study views internal risk as controllable and relating to investment and financial decisions while external risk on the other hand is random thus inevitable though a key component for the functioning of a financial system. Gupta, Chaudhry and Gregoriou (2016) associates FD with market uncertainty whereby its presence is evident if the average market value declines by at least 20% or if earnings before interest, tax, depreciation and amortization (EBITDA) to financial expense ratio is less or equal to 0.8 consistently. Similarly, the gravity of market exposure increases the frequency of negative daily stock returns hence positively influencing tail risk and FD more so on longer time horizons (Gupta Chaudhry & Rekik, 2017). Bokpin, Aboagye & Osei (2010) established that business financial soundness is dependent on the financial risk management. Conversely, embracing value intensified risks translates to business growth and performance (Bokpin et al., 2010; Litov, John & Yeung, 2006; Pindado, Rodrigues & De La Torre, 2006).

Listed and unlisted firms in Kenya have experiencedFD and corporate failure. Recent cases of severely distressed firms include; Kenya Airways, Uchumi Ltd., Mumias Sugar, Marshalls E.A., Home Afrika, A. Baumann & Co, Express Kenya, Sameer Africa, E.A. Portland Cement, Atlas A.I., Eveready E.A., Kenatco Transport Ltd., Kisumu Cotton Mills, Pan African Vegetable Products, E.A. Coast Fisheries, Nakumatt Holdings, Dubai bank, Chase bank and Imperial bank (CBK, 2016; Cytonn Investments, 2018; ICDC, 2015; NSE, 2017). These firms have suffered persistent losses, operational inefficiency, take-over bids, delisting, receivership and liquidation. In addition, CBK (2016) affirms that some distressed companies sought for buyouts to remain afloat.

Empirical studies show mixed findings between FD and risk proxies. Gupta et al. (2017) established that market risk significantly and positively enhanced FD. Conversely, Waqas and Md-Rus (2018) found market risk correspondence and idiosyncratic risk to insignificantly predict FD. Firm-specific risk and systematic risk have also been found to be significantly associated with financial distress costs (Almeida &Philippon, 2007; Gathecha, 2016; Outecheva, 2007; Rashid, 2014). On the contrary, Simlai (2014) asserts that common risk factors including systematic exposure, hardly plays any role in estimating the risk premium of distressed stocks. Firms can accommodate more financial risk with a high probability of survival and growth hence risk negatively relates with FD (Castanias, 1983; Litov et al., 2006). However, Rashid (2014) found that companies with high firm-specific risk are exposed to distress costs hence, they integrate risk models in financial decisions. Almeida and Philippon (2007) further demonstrated that systematic risk increases the present value of distress costs. Despite risk increasing the propensity to bankruptcy (Fang, 2016; Marin, 2013), this was found to be insignificant by Cassar and Holmes (2003). These contradicting results pertaining the relationship between FD and risk further motivates this study to determine the factual analytical influence of corporate risk on FD while considering the moderation effect from firm size.

II. Literature Review

The research concept of this study is premised on signaling theory and the first proposition of Modigliani & Miller.Ross (1977) postulated the signaling equilibrium theory stemming from information asymmetry between a firm's management and outside investors, holding that despite managers possessing insider information, the capital structure decision they adopt sends informative signals to the market. Grounding this aspect theoretically, debt financing is an indicator that the management of a firm is optimistic of future earnings (Naidu, 2013). Modigliani and Miller (1958) argues that only operating income and risk associated with an investment affects the firm value other than the capital structure. Existing empirical literature shows an account of conflicting findings regarding the relationship between corporate risk and financial distress. Gathecha (2016) revealed that systematic risk significantly influences FD based on a sample of publicly trading firms in Kenya as an emerging market between year 2004 to 2012. In contrast, Idrees and Qayyum (2018) studied publicly trading firms in Pakistan and revealed that distress risk cannot be quantified as a systematic risk on the premise that there exists an insignificant market equity effect on the distressed stock returns. However, Almeida and Philippon (2007) proved that the present value of costs related to FD significantly depends on the risk premia associated with systematic exposure. On the contrary, Simlai (2014) found out that FD contributes to a negative risk premium but the systematic risk component fails to significantly affect the size and value of a firm.

Gupta et al. (2016) studied the influence of downside risk on FD among the U.S. listed firms from year 1985 to 2015, confirming risk to be an insignificant predictor of financial distress at above 90% accuracy level. Conversely, Fang (2016) found out that adverse exposures associated with financing decisions, investment decisions, dividend payout and capital recovery, outrageously impact on financial distress. Comparatively, Ahmed, Azevedo and Guney (2014) sampled non-financial firms listed at London Stock Exchange from year 2005 to 2012 and figured out that when risk is mitigated, firm value and financial performance have a positive significant association with each other. Evidently, sampled firms that had entrenched risk management strategies were not significantly affected by the 2008-09 financial crisis (Ahmed et al., 2014).

Using a distressed and non-distressed pair matched sample of U.S. firms trading between year 1994 to 2004, Marin (2013) established that entities embracing risk management practices in control of external volatility, lowers the odds of financial distress and filing for bankruptcy by 89.5%. The author argues that risk management positively and significantly relates to the going concern of a firm and a similar association stands out between firm exposure and financial distress.Similarly, Gupta et al. (2017) determined the relationship between financial distress and tail risk to be positive and significant more so on longer horizons of 3 to 5 years. This was based on a sample of publicly trading U.S. firms from year 1990 to 2016. In contrast, Litov et al. (2006) uncovered corporate risk to have a significant positive relationship with firm growth using a cross-country panel data from 39 states. The authors argue that for management to safeguard investment returns, it adopts more of a risk taking attitude. This denotes a negative and significant relationship between corporate risk and financial distress. On the same note, non-equity stakeholders such as financing institutions compel firms to more corporate risk in protecting their interest probably by way of having restrictive debt covenants with corresponding terms that favourably protects lenders at the expense of firm exposure.

Rashid (2014) discovered that idiosyncratic risk is a significant economic influencer in a firm compared to systematic risk factors using panel data from 1,025 non-financial U.K. firms from year 1981 to 2009.Firms reduce leverage when earnings volatility rises (Rashid, 2014). In concurrence, Bokpin (2010) examined panel data of listed firms in Ghana Stock Exchange operating from year 2002 to 2007 and found out that unsystematic risk in terms of business and financial risks significantly drives the financial stability of a firm. On the contrary, Cassar and Holmes (2003) established that the exposure surrounding a business entity to be a weak influencer of FD. Relatively, Waqas and Md-Rus (2018) determined idiosyncratic risk to be an insignificant predictor of FD using a sample of 290 non-financial firms listed at Pakistan Stock Exchange from year 2007 to 2016. Castanias (1983) reports negative association between financial risk and financial distress.However, individual risk components and aggregated risk have divergent effect on financial performance (Chee-Wooi & Brooks, 2015).

Idrees and Qayyum (2018) observed that the likelihood of a firm becoming financially distressed increases with increase in firm size in terms of market value as a result of levered stock. Conversely, Waqas and Md-Rus (2008) disclosed that smaller firms in reference to assets held, are more susceptible to FD. Chancharat (2008) applied survival analysis techniques on a sample of 1,117 companies trading between year 1989 to 2005 andestablished that firm size is a significant positive determinant of FD. In contrast, Ozkan (1996) found out that small firms listed in U.K. have a higher likelihood of facing financial distress and being liquidated in contrast to larger firms. Comparatively, Rafique (2018) identified a positive association between firm size and operating profit from a sample of 67 firms listed in Karachi Stock Exchange from year 2012 to 2016. This translates to FD relating negatively with firm size. On the contrary, Wang (2017) explored a dataset of firms listed in China Stock Market from year 1988 to 2016, concluding that FD cannot be inferred from firm size nor book to market value. Gathecha (2016) ascertained that firm size has insignificant effect on FD. In a study involving commercial banks in Ethiopia from year 2002 to 2012,Gebreslassie (2015) established that firm size proxied by total assets has no effect on financial distress.

In reference to firm size as a moderator, Kannadhasan and Nandagopal (2009) examined the moderation effect of firm size as a function of non-current assets in the relation between business strategy and firm performance using Indian automotive firms. Firm performance as a response variable was operationalized in terms of; return on assets, return on net worth and sales growth. The results disclosed that the interaction term (firm size*business strategy) insignificantlyaffected return on assets. However, the effect became significant when the interaction term (firm size*business strategy) was tested against the response variable in terms of either return on net worth or sales growth. The results in the latter study implied that firm size fails to significantly moderate all aspects of firm performance. Muigai and Muriithi (2017) found out that firm size in terms of total assets, significantly moderates the relationship between capital structure decisions and financial distress based on Kenyan non-financial firms trading publicly. The study concluded that debt influences financial distress adversely and significantly but when debt interacts with firm size (firm size*debt financing) the effect on financial distress favourably changes implying that large firms can accommodate more debt without suffering from financial distress in contrast to smaller firms. In a study on the interaction effect of firm size in the relation between firm performance and growth, Abbasi and Malik (2015) examined a sample of 50 firms in Pakistan and determined that the product term (firm size*growth) has a significant effect on firm performance therefore upholding that firm size significantly moderates the relationship.

A number of studies are biased on either exploring systematic risk or unsystematic risk solitarily other than evaluating the effect from the aggregate of the two components. Additionally, there exists contradicting associations of risk and FD. This study therefore fills the research gapby analyzing corporate risk as a function of both systematic and unsystematic risk dimensions and addressing the past contradicting results based on a Kenyan perspective of non-financial firms that trade publicly. Additionally, the interaction effect of firm size in the relation between corporate risk and FD is also examined.

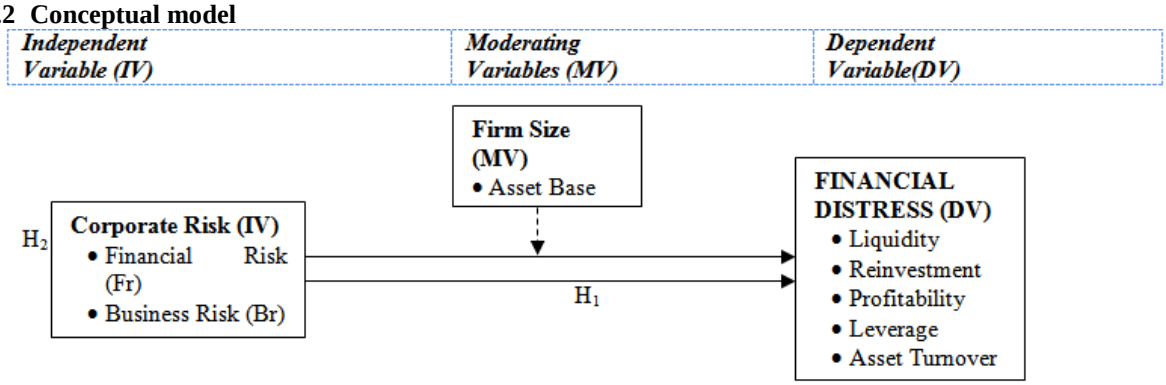
2.1 Research hypothesis

This study formulates the following null hypotheses:

H_{01}: Corporate risk has no significant influence on financial distress in firms quoted at the Nairobi Securities Exchange.

H_{02}: The interaction of Corporate risk and firm size does not significantly influence financial distressin firms quoted at the Nairobi Securities Exchange.

2.2 Conceptual model



III. Research Methodology

3.1 Research philosophy and research design

This study was guided by a positivism philosophy in testing the outlined hypotheses. Empiricism is the backbone of positivism and therefore research knowledge is validated on the basis of reason and logic (Saunders et al., 2009). A quantitative research design was adopted to statistically examine the response of financial distress accustomed to corporate risk as well as the interaction effect from firm size and corporate risk.

3.2 Study population and data

The target population for the study entailed all the 47 non-financial companies listed at NSEin between the beginning of year 2006 and end of 2015. Listed firms were deemed appropriate for the study because they have the capacity to give an ideal representation of most forms of corporate bodies in Kenya. Financial firms were omitted on the premise that they are closely regulated in reference to liquidity and capital reservations hence are likely to unreasonably influence the results. The study relied on secondary data collected from; audited financial statements, AGM reports, financial market rates from Central Bank of Kenya, NSE stock market indices and daily stock prices in between year 2006 to 2015.Table 1 shows the sector wise classification of the 47 non-financial firms.

Table 1: Non-financial Firms Listed in NSE

#	Sector Classification	No. of Firms
1.	Agricultural Sector	8
2.	Automobiles and Accessories	3
3.	Commercial and Services	12
5.	Construction and Allied	5
4.	Energy and Petroleum	5
6.	Investment (non-financial only)	3
7.	Manufacturing and Allied	10
8.	Telecommunication & Technology	1
	Total	**47**

Source: NSE, 2015

3.3 Measurement of study variables

Financial distress (FD)

FD indices were derived from the Altman's Z-scoremodel. Empirically, the Z-score model has proved to be appropriately applicable in predicting FD and accurately classifying distressed and non-distressed firms(Altman, 2018; Carmassi & Patti, 2015; Gebreslassie, 2015; Khaliq, et al., 2014; Sitati & Odipo, 2009).The Altman Z-score model adapted in this study adequately encompasses the micro and macro facets of a business environment hence providing representative FD indices for further analysis. Specifically, the model takes the following form:

$$Z_{Score} = 0.012X_1 + 0.014X_2 + 0.033X_3 + 0.006X_4 + 0.999X_5 \quad \text{(i)}$$

Subject to the following model constraints
Z > 2.99 = Safe Zone; 2.99 > Z > 1.8 = Grey Zone; Z < 1.8= Distress Zone

Table 2: Financial Distress Model Variables

Xn	Ratio Variable	Objective
X_1	Working Capital to Total Assets [WC/TA]	Measure liquidity level standardized by total capitalization in terms of asset base.
X_2	Retained Earnings to Total Assets [RE/TA]	Measure reinvestment level from the dimension of self-financing ability.
X_3	Earnings Before Interest and Taxes to Total Assets [EBIT/TA]	Measure operating profitability as a function of earning power through firm assets.
X_4	Market Value of Equity to Book Value of Total Debt	Measure leverage level in terms of market value of shareholders' capital (preferential & ordinary) and overall debt. This describes the extent to which value of assets can reduce before total debt outweighs equity.
X_5	Sales to Total Assets	Measure assets turnover in terms of gauging the ability to generate revenue.

Corporate risk (CR)

Corporate risk is viewed as the aggregate vulnerability in an entity whose effect leads to volatility of cash flows (Korinek, 2017). Riskwas measured as an aggregate function of systematicand unsystematic risks. Systematic risk was proxied by market riskwhileunsystematic (idiosyncratic) risk entailed both business risk and financial risk. Market risk was measured on the basis of market beta derived through the Capital Asset Pricing Model (CAPM). Burger (2012) reveals the relevance of CAPM despite any literature supporting otherwise in that it proves to have superior risk estimates prominently relied on in corporate finance. Assets in a market portfolio have beta value (βi) equal to 1 and therefore if $\beta i > 1$ it denotes high risk because such stock is more volatile than the market while if $\beta i < 1$, it's an indication of low risk in that the stock volatility in comparison to the market is low (Faisal, Khan, Al-Aboud, 2018). Market risk is derived from:

$$Mr = Market\ Beta = B_i = \frac{COV(R_i, R_m)}{\delta^2(R_m)}$$

Where
Mr = Market Risk
COV (R_i, R_m) = Covariance of stock returns and market returns
δ^2 (R_m) = $Var(R_m)$ = Variance of market returns

Business risk is associated with insufficient operating income whose root cause is embedded on business strategies and policies that reflect on internal failures (Alshubiri, 2015; Rattiner, 2009). Business risk is determined from the operating earnings variance in a financial period (Alshubiri, 2015). The variability is measured by the standard deviation of operating income with respect to the average operating earnings over time (Rattiner, 2009). Business risk is derived from:

$$Br = \frac{\delta x_t}{\bar{x}_t} = \frac{\sqrt{\frac{1}{n}\sum_{i=1}^{n}(Xi-m)^2}}{\frac{1}{n}\sum_{i=1}^{n} Xi}$$

Where
Br = Business Risk
δx_t = Standard deviation of operating earnings at period 't'
n = Number of values
$\bar{x}_t = m$ = Average operating earnings at period 't'
x = Operating profit in form of EBIT adjusted for; non-trading expenses, investment income, finance income or cost, insurance claim and asset revaluation gain or loss.

Financial risk is a vulnerability that exclusively reflects on the composition of capital structure, financing decisions and monetary obligations implied (Alshubiri, 2015; Rattiner, 2009). Financial risk is equated to the degree of financial leverage resulting from the percentage change in earnings per share with respect to percentage change in earnings before interest and taxes (Rattiner, 2009). Financial risk therefore stems from:

$$\frac{\%\,\Delta\ in\ EPS}{\%\,\Delta\ in\ EBIT} = \frac{\frac{EPS_2 - EPS_1}{EPS_1}}{\frac{EBIT_2 - EBIT_1}{EBIT_1}} = \frac{EPS_2 - EPS_1}{EBIT_2 - EBIT_1} * \frac{EBIT_1}{EPS_1}$$

Where
% Δ = Percentage change
EPS = Earnings per share
EBIT = Earnings before interest and taxes

Firm size (FS)

Firm size was expressed in terms of the total asset base in a firm. The asset values were further expressed in terms of natural logarithms in control of large value scale diversityacross the firms under study. Conversion of wide-ranging values into natural logarithms provides an ideal analyzable scale (Ahmed et al., 2014; Muigai & Muriithi, 2017). FS is therefore expressed as:

$$FS = \ln(TA) = \ln(NCA + CA) = \log_e(NCA + CA)$$
$$Given\ that; e^{\ln(NCA+CA)} = (NCA + CA)$$

Where

FS	=	Firm size factor
TA	=	Total assets [Non-Current Assets (NCA) + Current Assets (CA)]
1n	=	Natural Logarithm
e	=	Euler's Number

3.4 Data analysis and model specification

Panel regression analysis was applied to examine data from non-financial firms listed at NSE from year 2006 to 2015, catering for both cross-sectional and time series dimensions in the longitudinal unbalanced panel data. NSE (2017) reports that some firms in the sample were not consecutively listed within the 10-year study period due to; listing after year 2006, delisting and suspension following takeover bids, non-compliance or liquidation.The voluminous financial data collected was initially organized using Microsoft excel spreadsheet and python program before running the panel regression analysis through R (version 3.5.3) statistical software.Panel regression model diagnostics involved; Lagrange multiplier (Honda), F-test, Hausman and Breusch Pagan tests. Linear regression diagnostics involved testing for; normality, multicollinearity, linearity and homoscedasticity. Additionally, F-statistics and t-test were used to make inferencesregarding analysis of variance, model fitness and hypothesis testing. The panel regression model is given as:

$$FD_{it} = \beta_0 + \sum_{i=1}^{n} \beta_i X_{it} + \mu_i$$

Where

FD_{it}	=	Financial distress index forfirm 'i' at time 't'
i	=	Individual firm as a unit of observation (47 firms)
t	=	Time period (2006, 2007, …, 2015)
β_o	=	Intercept term
β_i	=	Effect of coefficient variable on the dependent variable
X_{it}	=	Vector of independent variable
μ_i	=	Time varying random term/ random error term

Hierarchical panel regression models were derived to analyze the association between corporate risk (CR) and financial distress (FD) while moderating for firm size (FS) as shown in Hierarchy 1 and 2.

Hierarchy 1: CR; FS; CR*FS

Model 1 $FD_{it} = \beta_0 + \beta_1 CR + \mu_i$ …… (H_1M_1)

Model 2 $FD_{it} = \beta_0 + \beta_1 CR + \beta_2 FS + \mu_i$ …….... (H_1M_2)

Model 3 $FD_{it} = \beta_0 + \beta_1 CR + \beta_2 FS + \beta_3 CR * FS + \mu_i$ …….. (H_1M_3)

Hierarchy 2: Mr; Ur; FS; Mr*FS; Ur*FS

Model 1 $FD_{it} = \beta_0 + \beta_1 Mr + \beta_2 Ur + \mu_i$..... (H_2M_1)

Model 2 $FD_{it} = \beta_0 + \beta_1 Mr + \beta_2 Ur + \beta_3 FS + \mu_i$..... (H_2M_2)

Model 3 $FD_{it} = \beta_0 + \beta_1 Mr + \beta_2 Ur + \beta_3 FS + \beta_4 Mr * FS + \beta_5 Ur * FS + \mu_i$..... (H_2M_3)

Where;

β_o = Intercept term

μ_i = Random error term

FD_{it} = Financial Distress index for a firm at a given time

$\beta_1, \beta_2 \ldots \beta_5$ = Effect of coefficient variable on response variable

CR&FS = Corporate Risk& Firm Size

Mr= Market Risk (Systematic Risk)

Ur= Unsystematic Risk (Business Risk + Financial Risk)

IV. Results And Discussions

4.1 Descriptive statistics

Table 3 shows a rising trend of firms becoming financially distressed more so from year 2012 to 2015 with a percentage increment from 28.9% to 46.2%. Likewise, the percentage of safe firms dropped from 50% to 35.9%. This further supports the identified research problem as described in the introduction section of this paper. On the contrary, Table 4 indicates that on average the non-listed firms are financially safe over the period*(□$\bar{x}$ = 4.350)*. However, the latter descriptive is biased in that mean as a measure of central tendency is affected by presence of extreme values in a data distribution. High degree of variation *(δ=8.638)* and range *(122.03)* also explains the bias in the mean. Skewed data in an interval or ratio scale is inaccurately described by mean (Heiman, 2011).

Table 3: Classification of Firms

	Distress Zone		Grey Zone		Non-Distress Zone	
Years	**Frequency**	**%**	**Frequency**	**%**	**Frequency**	**%**
2006	5	14.7	14	41.2	15	44.1
2007	5	14.3	11	31.4	19	54.3
2008	7	20.0	10	28.6	18	51.4
2009	10	27.0	8	21.6	19	51.4
2010	8	22.9	10	28.6	17	48.6

2011	9	23.7	12	31.6	17	44.7
2012	11	28.9	8	21.1	19	50.0
2013	12	30.0	9	22.5	19	47.5
2014	15	37.5	8	20.0	17	42.5
2015	18	46.2	7	17.9	14	35.9
2006 – 2015	100	27.0	97	26.1	174	46.9

Table 4: Descriptive Summary

Variable	Min	Q1	Median	Mean	Q3	Max	SD
Z-score	– 1.237	1.717	2.790	4.350	4.714	120.794	8.638
CR	– 395.86	1.341	2.236	1.520	3.400	111.37	22.714
Mr	– 8.949	0.123	0.471	0.490	0.829	4.850	0.760
Fr	– 396.30	0.318	0.995	0.308	1.839	108.52	22.440
Br	– 29.05	0.380	0.528	0.722	1.011	12.716	4.446
Firm Size	17.73	21.30	22.39	22.42	23.50	26.56	1.73

Among the components of unsystematic risk, financial risk has the highest variance *(δ = 22.440)* followed by business risk *(δ = 4.446)* as shown in Table 4. This indicates that the firms hardly share similar idiosyncratic risk exposures. Market risk has less variance across the firms *(δ = 0.760)* and this explains that systematic exposure is common to all firms. Firm size is observed to be fairly consistent. However, the data is tested for outliers prior to having inferential statistics.

4.2 Panel regression model diagnostics

Random effects model proved to be the most appropriate for this study's dataset. This was tested against the pooled OLS and fixed effects model using 4 statistical tests as shown in Table 5. Hypothetical discriminations were checked against the P-values associated with each test at 5% level of significance.

Table 5: Model Diagnostics

	Test		Test Hypothesis
1.)	Lagrange Multiplier - Breush Pagan	*P-value = 2.2e–16 < 0.05 α*	H_0: No panel effect H_1: Panel effect exists
2.)	Lagrange Multiplier - Honda	*P-value = 2.2e–16 < 0.05 α*	H_0: Pooled OLS model is appropriate H_1: Random effects model is appropriate
3.)	F-test	*P-value = 2.2e–16 < 0.05 α*	H_0: Pooled OLS model is appropriate H_1: Fixed effects model is appropriate
4.)	Hausman Specification Test	*P-value = 0.7353 > 0.05 α*	H_0: Random effects model is appropriate H_1: Fixed effects model is appropriate

4.3 Linear regression diagnostics

Outliers

An initial regression was run to test for outliers using Mahalanobis distance *(cut-off = 5%, 3 variables [FD, CR, FS] = 7.82)* and Cook's distance *(cut-off = [4/n-k-1] = 0.01092896).*Solitarily, 9 and 12 outliers were identified by Mahalanobis and Cook's distance respectively while 4 outliers were common in both tests. The study harmonized all outliers from the two tests to a total of 17.

Normality

Normality was inspected from the regression standardized residual histogramshown in Figure 1 (F1) as well as the Shapiro-Wilk normality test*(W-value = 0.91301; P-value = 2.001e–13).*The test's W-value is closer to unity since it nears 1 thus confirming normal distribution. Given a voluminous dataset, W-value in Shapiro-Wilk test aids in making an objective inference (Das & Imon,2016). The test has an inherent bias thatincreases the probability of rejecting the null hypothesis that the dataset is distributed normally hence resulting to type I error (Das & Imon,2016; Field, 2009).

Multicollinearity

Collinearity between variables was absent *($r \leq +0.5$; $r \geq -0.5$)* as shown in Table 6. This implies lack of strong positive or negative correlation. Multicollinearity exists if the correlation coefficient *r* is close to perfect correlation such that *r*> 0.9 (Field, 2009). In agreement, Table 7 shows no collinearity*(1 ≤Variance Inflation Factor [VIF]≤ 5;tolerance > 0.1)*. VIF in a scale between 1 – 5 or tolerance > 0.1 confirms no collinearity (Field, 2009; Sporta, 2018).

Table 6: Correlational Matrix

	Corporate Risk	Financial Distress	Firm Size
Corporate Risk	1.00000	– 0.1384596	0.1872675
Financial Distress	– 0.1384596	1.00000	0.0524750
Firm Size	0.1872675	0.0524750	1.00000

Table 7: Collinearity Statistics

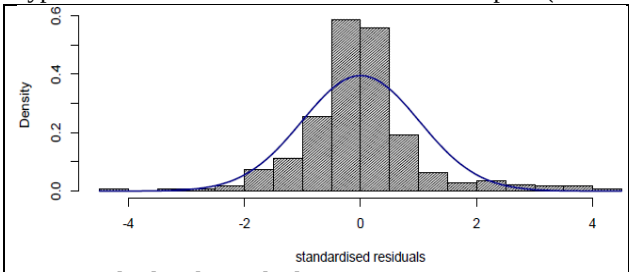
Variables	Collinearity Statistics	
	VIF	Tolerance
Corporate Risk	1.0363	0.9649
Firm Size	1.0363	0.9649

Linearity

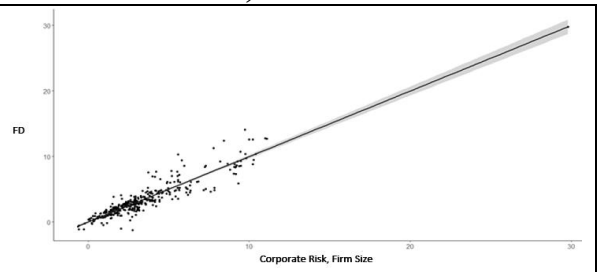
The scatter plot in Figure 1 (F2) shows the data is linear. The regression standardized residual points lie along the abline. A scatter plot is deemed ideal in visualizing linearity more so when data is free from outliers (Schreiber-Gregory, 2018).

Homoscedasticity

This was tested using the global validation of linear model assumption test (gvlma) whereby the null hypothesis that variance is constant was accepted *(P-value = 4.312e–01 > 0.05 α).*



F1: Standardized Residual Histogram



F2: Linearity Scatter Plot

Figure 1: F1;F2

4.4 Panel regression hierarchical analysis

Panel regression was based on random effects model. Notably, a high positive financial distress Z-scoreindex indicates greater firm safety financially as described in section **3.3**. Table 8 presents panel regression results for models in hierarchy 1. Model H_1M_1tested corporate risk (CR) as a sole predictor of financial distress (FD). CRhas a significant negative influence on firm safety *(β = – 0.043; t-value = – 2.198;p-value = 0.029 < 0.05α).*Therefore, the more a firm is exposed to systematic and unsystematic risk, the higher the chances of becoming financially distressed hence CR has a significant positive relationship with FD. Some studies are in consensus with the results (Fang, 2016; Gathecha, 2016; Marin, 2013). The findings dispute the signaling theory concept that exposure from debt leverage directly and inversely relates to firm value and financial distress respectively. Equally, Almeida and Philippon (2007) established that the present value of distress cost is remarkably dependent on risk premium. On the contrary, Gupta et al. (2016) denoted risk parameters to be insignificant in prompting FD. Similarly, other studies have ascertained common risk factors including systematic correspondences to be insignificant in predicting FD (Idrees & Qayyum, 2018; Simlai, 2014; Waqas & Md-Rus, 2018). Other studies have reported an inverse relationship between overall risk and FD (Castanias, 1983; Litov et al., 2006).

Table 8: Hierarchy 1 Panel Regression Results

	Model H_1M_1			Model H_1M_2			Model H_1M_3		
Predictor	**Beta**	**t-value**	**Pr (>|t|)**	**Beta**	**t-value**	**Pr (>|t|)**	**Beta**	**t-value**	**Pr (>|t|)**
(Intercept)	4.305	7.690	0.000***	10.978	2.046	0.042*	9.608	1.753	0.081 .
CR	– 0.043	– 2.198	0.029*	– 0.044	– 2.259	0.025*	0.269	1.029	0.304
FS				– 0.318	– 1.251	0.212	– 0.254	– 0.978	0.329
CR*FS							– 0.014	– 1.202	0.230
R^2	0.8592			0.8599			0.8606		
Δ R^2	0.8592			0.0007			0.0007		
Adj. R^2	0.8342			0.8345			0.8347		
F-value	34.37			33.82			33.27		
df	52[a]& 293[b]			53[a]& 292[b]			54[a]& 291[b]		
p-value	2.2e–16			2.2e–16			2.2e–16		
Sig. F Change	P = 0.029			P = 0.212			P = 0.230		

a. Between columns
b. Within columns (errors)
Dependent variable: Financial distress

'', '**', '*', '.' represents 0.1%, 1%, 5% & 10% significance levels respectively***

Model H_1M_2 tested the main effects of CR and firm size on FD without any interaction effect. Hierarchically, a moderator's main effect on a response variable is initially determined prior to testing for interaction effects (Warner, 2013). CR retained a positive significance on FD*(p-value = 0.025 < 0.05 α)* while controlling for firm size. Firm size relates negatively and insignificantly with firm safety *(β = – 0.318; t-value = – 1.251; p-value = 0.212 > 0.05 α)*. The 0.0007 ΔR^2 in model H_1M_2 confirms a main effect from addition of firm size into the model. This shows inconsistency in the Modigliani and Miller's first proposition in that operating income and risk are not the only factors affecting a firm. Therefore, firm size has a positive effect on FD although not statistically significant. In agreement, Rianti and Yadiat (2018) established that firm size has a mild influence on FD. However, Idrees and Qayyum (2018) established probability of FD to be higher when firm size in terms of market value increases due to levered stock. Notably, increase in firm size in terms of asset base could be linked to expansion financed by reliance on debt beyond a trade-off between tax shield and bankruptcy related costs thus increasing the susceptibility to FD. In support of this, Carmassi and Patti (2015) uncovered that larger firms are associated with higher debt ratios unlike firms that are smaller in size. Chancharat (2008) also concludes that financially leveraged firms that are large in size have a high likelihood of being financially distressed. Conversely, Gebreslassie (2015) found firm size to have no effect on FD. Elsewhere, firm size has been shown to negatively affect FD (Rafique, 2018; Waqas & Md-Rus, 2018).

Model H_1M_3 shows the interaction effect of corporate risk and firm size (CR*FS) as the third predictor of FD. Interaction term CR*FS influences firm safety negatively though insignificantly *(β = – 0.014; t-value = – 1.202; p-value = 0.230 > 0.05 α)*. The 0.0007 ΔR^2 in model H_1M_3 confirms an interaction effect. Although insignificant, this implies that firms that are largein size are more prone to suffering FD when exposed to systematic and unsystematic risks. In agreement, Kannadhasan and Nandagopal (2011) established firm size to have an insignificant moderation effect on financial performance in terms of return on assets. On the contrary, Muigai and Muriithi (2017) found out that firm size significantly contributes to an interaction effect on FD. The 3 models in hierarchy 1 accounts for 85.92%, 85.99% and 86.06% respectively of the variations in FD as shown by R^2 in Table 8. The models fit the data significantly well compared to an intercept-only model as evidenced by the F-value of 34.37, 33.82 and 33.27 respectively each with a p-value of 2.2e–16 that is < 0.05 alpha level.

Table 9 shows results from hierarchy 2. Sub-variables of CR*(market risk [Mr]&Unsystematic risk [Ur])* were regressed against FD indices while testing for interaction effect of firm size (FS).

Table 9: Hierarchy 2 Panel Regression Results

	Model H_2M_1			**Model H_2M_2**			**Model H_2M_3**		
Predictor	**Beta**	**t-value**	**Pr (>|t|)**	**Beta**	**t-value**	**Pr (>|t|)**	**Beta**	**t-value**	**Pr (>|t|)**
(Intercept)	4.293	7.557	0.000***	10.998	2.046	0.042*	9.806	1.750	0.081 .
Mr	– 0.021	– 0.113	0.910	– 0.013	– 0.071	0.944	– 0.108	– 0.043	0.966
Ur	– 0.043	– 2.193	0.029*	– 0.045	– 2.259	0.025*	0.276	1.046	0.297
FS				– 0.319	– 1.255	0.211	– 0.263	– 0.996	0.320
Mr*FS							0.005	0.044	0.965
Ur*FS							– 0.014	– 1.219	0.224
R^2	0.8592			0.8599			0.8606		
Δ R^2	0.8592			0.0007			0.0007		
Adj. R^2	0.8336			0.8339			0.8336		
F-value	33.61			33.08			31.87		
df	53[a]& 292[b]			54[a]& 291[b]			56[a]& 289[b]		
p-value	2.2e–16			2.2e–16			2.2e–16		

a. Between columns

b. Within columns (errors)

Dependent variable: Financial distress

'', '**', '*', '.' represents 0.1%, 1%, 5% & 10% significance levels respectively***

Model H_2M_1 shows that both components of corporate risk negatively influence firm size. However, Unsystematic risk (Ur) comprising of business risk and financial risk is significant *(β = – 0.037; p-value = 0.038 < 0.05 α)* while market risk (Mr) is insignificant *(β = 0.306; p-value = 0.070 > 0.05 α).* This further indicates that Ur has a positive and significant effect on FD while Mr positively and insignificantly influences FD. The results are in consensus with Bokpin (2010) who established business risk and financial risk to be significant drivers of financial instability. Similarly, Rashid (2014) established idiosyncratic risk to be economically significant for financial decisions in contrast to market risk factors. Waqas and Md-Rus (2018) figured out that market based variables are insignificant in predicting financial distress. Notably, despite model H_2M_1 concurring with model H_1M_1 in terms of CR being a significant predictor of FD, unsystematic riskplays a greater role in contrast to market risk.

In light of model H_2M_1, model H_2M_2 shows that Mr and Ur retains a positive insignificant and positive significant effect respectively while controlling for firm size. Firm size relates negatively and insignificantly with firm safety *(β = – 0.319; p-value = 0.211 > 0.05 α)*. A main effect from firm size as a predictor variable is present *(ΔR^2 = 0.0007)*. This implies that even though not statistically significant, increase in firm size increases chances of firms becoming financially distressed while controlling for corporate risk factors. Interaction effect from Mr*FS and Ur*FS was tested in model H_2M_3. The interaction effect was confirmed present *(ΔR^2 = 0.0007)*though not statistically significant. The interaction term Mr*FS has a positive effect on firm safety*(β = 0.005; p-value = 0.965 > 0.05 α)* while interaction term Ur*FS has a negative effect on firm safety *(β = – 0.014; p-value = 0.224 > 0.05 α)*. This translates to Mr*FS and Ur*FS negatively and positively influencing FD respectively.It is therefore implied that largefirms in terms of asset base, can accommodatemore market risk without becoming financially distressed. However, when a large firm is exposed to unsystematic risk, it increases the likelihood of experiencing FD. The 3 respective models in hierarchy 2 account for variations in financial distress to a similar extent as the 3 models in hierarchy 1. This is denoted by values of R^2 in Table 9. The respective F-values for the 3 models in hierarchy 2 are; 33.61, 33.08 and 31.87 each with a p-value of 2.2e-16 that is < 0.05 alpha level thus implying that the models significantly fit the data well compared to an intercept-only model.

V. Conclusions And Recommendations

The null hypothesis that corporate risk (CR) has no significant influence on financial distress (FD) was rejected and it was therefore concluded that CR has a significant positive influence on FD among the publicly trading non-financial firms in Kenya. Financial risk is associated with debt leverage and therefore the signaling theory concept becomes inconsistent in that issuance of more debt or borrowing more may fail to match the signal that a firm's management is optimistic of future earnings that will enhance firm value and financial health. The null hypothesis that corporate risk*firm size (CR*FS) does not significantly influence FD was accepted. However, even though not statistically significant, the interaction term CR*FS has a positive influence on FD implying that large firms are more prone to be financially distressed when exposed to systematic and unsystematic risks. Comparatively, firm size has a positive main effect on FD. This shows that other firm characteristics have the potential to influence the financial state of a firm hence bringing out inconsistency in the Modigliani and Miller's first proposition that holds that only operating income and risk affects the value of a firm. The significance of operational variables of corporate risk varies. Unsystematic risk (Ur) in terms of business risk (Br) and financial risk (Fr) have a positive significant effect on FD while systematic risk in terms of market risk (Mr) has a positive insignificant effect on FD. Therefore, unsystematic risk in contrast to market risk, plays a greater role in increasing the likelihood of a firm becoming financially distressed. Additionally, interaction Mr*FS and Ur*FS negatively and positively influences FD respectively. Therefore, large firms can accommodatemore market risk without experiencing FD but when exposed to unsystematic risk, the large firms become more susceptible to financial distress. This study recommends firms to embrace continuous proactive risk management practices that goes beyond merely assessing risk so as to make projections that integrate risk exposures and incidents. This should encompass analysis of opportunities that lead to realization of sustainable operating income as well as evaluating threats in form of exposures that warrant cash flow volatility and financial loss.

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Mark Waita Gichaiya. "Corporate Risk, Firm Size and Financial Distress: Evidence from Non-Financial Firms Listed In Kenya." IOSR Journal of Economics and Finance (IOSR-JEF) , vol. 10, no. 4, 2019, pp. 75-86.