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Using Altman Z”- Score to Predict Financial Distress: Evidence from Lebanese Alpha Banks

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ABSTRACT:
The main purpose of this research is to prove the validity of the Altman Z”-score model to expect the financial distress in the Lebanese Alpha banks over the period 2009 - 2018. The study begins with a literature review of secondary data from articles, books, financial reports, previous researches, and periodicals on the Lebanese Alpha Banks. The researchers calculated the Altman Z”-score for non-manufacturing companies and emerging markets. Moreover, to reach the specific goal of this study, the researchers used EViews Software and applied (1) a descriptive analysis of the variables (X_1, X_2, X_3, X_4, and Z”) and (2) the Pearson Correlation Matrix to study the impact of the independent variables on the dependent variable. The authors validated the Altman Z”-score Model using the four independent variables. In addition to that, the correlation of the variables indicated that there is a strong positive correlation between X_1 and Z” and a weak negative correlation between X_2 and Z” and a weak positive correlation between X_3 and X_4 and Z”. Above all, based on the calculated values for the Z” for non-manufacturing companies and emerging markets, the majority of the ten Alpha Banks had values below the cutoff of 1.1 which showed evidence that they were distressed over the period 2009 - 2018. It is worth it noting, based on the results, that the Z”-score model is recommended as an important, instrumental indicator for any external or internal use of banks’ financial statements like auditors, financial managers, investors, and lenders, to take the correct decisions in case of financial distress or failure of these institutions.

Keywords: *Altman Z”-score; Lebanese Alpha Banks; Financial distress; Working capital; Total assets; Total liabilities; Total equity*

INTRODUCTION

Many critical financial crises occurred in several countries around the world and had significant results and impact on the short and/or long-term aspects of the developed and emergent economies. These results have demonstrated that the weak use of financial instruments and investment decisions in the financial institutions can lead to an issue related to inconsistency in the balance of the liquidity level, profitability level, and margin of safety. Moreover, the substantial growth of the financial institutions which is more valued by all stakeholders is also affected (Aziz

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& Dar, 2006). It is highly recommended that expected financial distress should be detected immediately and the necessary measures and corrective actions should be taken to prevent bankruptcy. The stated recommendation is essential because stakeholders' interests will be significantly affected by the cost and sounding effects of bankruptcy (Altman, 1984; Altman & Hotchkiss, 2006; Andrade & Kaplan, 1998; Opler & Titman, 1994; Outcheva, 2007).

Academic studies suggest numerous approaches to predict possible bank failures. For example, the basic and simple method is financial statement analysis which gives an idea about banks' performance. Another tool is the calculation and interpretation of financial ratios. Also, the Altman Z-score model has been widely used. Despite the existence and application of the stated approaches, the issue or problem is embedded in determining which model can be adapted when seeking to make the right decision (Aziz & Dar, 2006).

The internal and external circumstances of any business have a major impact on its failure (Levratto, 2013). A financial failure will occur when a business fails to meet its debts and obligations or when the market value of its assets falls shorter than its debts (Ijaz *et al.*, 2013).

Altman Z-score, also known as the Multiple Discriminant Analysis (MDA) Model, was developed in 1968 by Edward I. Altman. It is a model used to predict potential financial distress and bankruptcy by using statistical measures. Besides, Altman explained the Z-score model in a form of a linear combination composed of four or five financial ratios that are weighted by appropriate coefficients. The MDA was used for the first time by Altman, who expanded an important prediction model with a remarkable degree of accuracy. The MDA techniques, mainly the Z-score model, has been used in many critical financial distress cases and bankruptcy studies and ended with suitable results (Aziz & Sar, 2006; Bellovary, Giacomino, & Akers, 2007; Platt & Platt, 2006; Zmijewski, 1984).

Later during the year 1983, Altman developed the initial model which permitted him to establish two models: the first is Model "A" Z-score, which is specific for manufacturing companies, and the second one Model "B" Z-score mainly for non-manufacturing companies (Altman, 2000).

According to Ismail (2014), financial distress or failure occurs when a business entity fails to meet its financial dues and obligations that it has already incurred. Consequently, this business entity is considered tending towards bankruptcy.

Likewise, John (1993) proved that the firm is facing financial difficulties when the current assets are not enough to meet the short-term requirements for current dues and obligations (also known as the current liabilities).

This study is highly valued as it is one of the first studies in the Lebanese market applying the Z"-score Model on the Lebanese Alpha banks. Noting that, the banking sector is considered as one of the most important components in the Lebanese economy and it was described as the backbone of the economy. The banking sector contributes to high percentages in the gross domestic product (GDP) and employment in Lebanon (El Hajj, Abou Moussa, & Chidiac, 2017). The Lebanese Alpha banks have become an important subject for this study especially after witnessing severe instability recently (2018, 2019, and 2020) (Elia, 2020). The importance of this study lies in the fact that it pointed out the potential financial distress which turned to be the scenario the Lebanese Alpha banks and banks, in general, have been facing since 2019 until the present. Above all, this study seeks to prove the validity of the model which is then recommended for internal and external users of the annual reports to monitor the performance of Lebanese banks.

The problem statement that triggered the researchers to launch the current study is the fact that the banking authorities in Lebanon were trying to promote a healthy banking sector. Within the 100 annual reports that the authors went through while conducting this study, none of the reports mentioned any significant indicator for potential financial distress. Also, this study reviewed two articles published by Fadi Ghosn (2019a & 2019b) regarding the Altman Z-score for Lebanese banks. Ghosn reached a result that Lebanese banks were acting within the "safe" financial zone. However, since the end of 2019, these banks have been witnessing a severe crisis (Elia, 2020).

Therefore, this study aims to clarify the effectiveness of the Altman Z-score model to predict the Lebanese Alpha Banks' potential

financial distress throughout 2009 - 2018. Furthermore, a sub-objective of this study is to validate the accuracy of the revised Altman Z-score model (1983), known as the Altman Z"-score, and deciding whether it is considered as an optimal model for forecasting banks' financial failure by using data extracted from the annual reports of ten Lebanese Alpha Banks for the stated period.

This study is organized as follows:

Section 2 is the literature review part which covers the concept of financial failure or financial distress. Section 3 gives an introduction and a discussion related to the research design and the methodology used in this study, the primary and secondary data collection, and the sample of this research. Section 4 presents and discusses the results and findings. Furthermore, section 5 draws the final conclusion. Section 6 states the limitations the authors faced while preparing and writing this paper. Finally, section 7 suggests ideas for future, related work.

Literature Review

Several studies were done in the late 1960s by researchers to develop different models to forecast corporate failure. Researchers have tried to test the ability of some of these models in the prediction of corporate failure (e.g. Altman, 1968; Beaver, 1966; Deakin, 1972; Kida, 1980; Mohammed & Kim-Soon, 2012; Ohlson, 1980; Shirata, 1998; Taffler, 1983).

Many researchers like Al-Rawi, Kiani, and Vedd (2008) used the Altman Z-score model to anticipate corporate insolvency. They have realized that the majority of firms have increased their debts; consequently, this led them to face bankruptcy. Likewise, Pathan (2009) used the Z-score model for a specific sample consisting of U.S. bank holding firms for the period 1997-2004. He found that banks, that have a small board size and where the boards are not under the supervision of the CEO, were exposed to higher bank risk. Besides, Gerantonis *et al.* (2009) did many pieces of research to examine the ability of the Altman Z-score model in predicting potential corporate failure. They found that the Z-score can be considered as an accurate tool to predict the firm's failure. Based on their study, the Z-score model can foresee any probable financial failure.

Moreover, Hayes, Hodge, and Hughes (2010) did a study about the construction of the Z-score model in the retail industry on a sample size of 17 U.S. firms. This study proved that the model gives a correct prediction of bankruptcy at a level of 94%.

Furthermore, Mamo (2011) applied in his research the Altman model on 43 banks to predict probable financial distress. The result from his study proved that the model was an accurate predictor of 8 out of 10 firms that faced failure. Consequently, this led to an 80% validity rate for the model.

Besides, Al-Khatib and Al-Bzour (2011) did a study on the relationship between financial ratios and a firm's bankruptcy based on Altman and Kaida models covering the period 1960 - 2006 for a sample of many companies in the service and manufacturing sector. They concluded that the results are appropriate and the two models give an early bankruptcy warning to firms under the study. The average validity for Altman was 93.8% and for Keda 69%. This is why in the current study we apply the Altman Z"- score because of its higher accuracy.

Chieng (2013) conducted research seeking to validate Altman Z"-score model in foreseeing the financial failure of banks in the Eurozone. As a result, she verified the forecasting ability of the Z"-score model to the banks within the Euro area.

Ghosn (2019a) calculated the Altman Z-score for non-manufacturing business entities and emerging markets. He aimed to forecast the financial distress of Lebanese non-listed banks. He chose a sample of 4 banks (Credit Libanais BankMed, IBL, and BBAC). The study covered the period 2013 - 2017. Ghosn found out that the four studied banks scored a Z-value below the cutoff when using the Z-score for non-manufacturing companies. This means that their financial failure and bankruptcy were predicted. However, the Z-scores calculated using the model for emerging markets were higher than the cutoff of 2.6. This shows that such banks are classified within the "safe" region.

In another study, Ghosn (2019b) also tested the financial health of four listed Lebanese banks (Byblos, BLOM, BOB, and BLC). His study covered the period 2013 – 2017. He applied the Z-score for emerging markets and non-manufacturing companies. He found out that the scores calculated using the model for emerging markets were all in the safe financial zone. On the other side, Ghosn found out that the adoption of

the Z-score (equation for non-manufacturing organization) is inappropriate to be implemented on banks within the Lebanese market. This was since the crisis in the Lebanese banking sector started after his study was published. At that time the Lebanese banking sector was still classified as healthy.

RESEARCH METHOD

This research is based on the analytical method. Inferential statistical analysis for the independent variables (X_1, X_2, X_3, and X_4) and the dependent variable (Z"-score) is conducted to complete the analytical part.

Data Collection

The data was extracted from the Lebanese Alpha banks' annual audited financial reports published on their websites. The sample consisted of the 10 Alpha banks over the period 2009-2018. The banks are Audi, Byblos, BLOM, SGBL, Crédit Libanais, Bank of Beirut (BOB), BankMed, IBL, BBAC, and Fransabank.

The Model

The Altman Z"-score (the revised Altman Z-score model) (1983) was considered as the base for the analytical model for this research. It is presented as a linear equation as follow:

$$\mathbf{Z" = 6.56\ X_1 + 3.26\ X_2 + 6.72\ X_3 + 1.05\ X_4}$$

Where;
Z" is the overall index (the value of the score)
X_1 = Working Capital (WC) /Total Assets (TA)
X_2 = Retained Earnings (RE) /Total Assets (TA)
X_3 = Earnings Before Interest and Taxes[1] (EBIT) /Total Assets (TA)
X_4 = Book Value of Equity (BVE) /Book Value of Total Liabilities (TL)
Source: Altman, Hartzell and Peck (1995:3)

To interpret the values of the calculated Altman Z"-scores, the following discrimination zones were used:

- Z" > 2.60, "**Safe**" zone, indicates that a company has an extremely low probability to go bankrupt in the foreseen future.
- 1.10 < Z" < 2.60, "**Grey**" zone, exemplifies that the organization might face financial instability or go bankrupt in the near future.
- Z" < 1.10, "**Distress**" zone, shows that the firm has an extremely high probability to go bankrupt shortly.

Dependent Variable

Z"-score is the discriminant variable whose value will allocate a firm as either financially distressed or healthy.

Independent Variables

This section defines the ratios that are used in the calculation of the Z"-score:

$$\mathbf{X_1 = WC / TA}$$

Working Capital (WC): is equal to current assets (CA) less current liabilities (CL). Moreover, it can have a positive or negative value.

$$\mathbf{X_2 = RE / TA}$$

Retained Earnings (RE): represents profits that are not allocated to stockholders. They are kept within the company so they will be reinvested in the future (this is known as internal financing). RE / TA gives a measure regarding the financing of the total assets through the earnings that are not allocated as dividends to shareholders. It is also an indicator of the degree of leverage (debt financing) of an organization. Moreover, it measures the accumulated profitability for an organization and determines the earning power of a firm as well as its age (Altman, 2000).

$$\mathbf{X_3 = EBIT / TA}$$

EBIT is called also the firms' operating income and it refers to the earnings received from the operating activities of the company under study. This ratio measures the assets' efficiency in generating profits from operating activities. In the case of a low EBIT / TA ratio, this means that the company is not using efficiently its assets in

1. In some annual reports it is mentioned Operating Income before taxes, or Profit from continuing operations before income tax, or Profit before income tax.

generating profits. It also estimates the cash supply available for allocation mainly to creditors, shareholders, and government. This ratio is highly important for investigating any firm bankruptcy because the ultimate continuity of a firm depends on its earning power (Altman, 1968).

$$X_4 = BVE / TL$$

Total liabilities measure both short-term and long-term debts. Equity represents the book value of all common and preferred shares. This ratio measures how much the company's assets might decrease in value before the assets become lower than the liabilities' value which directs the company to the possible bankruptcy case (Altman, 2000).

The calculation of the Altman Z"-score for non-manufacturing business entities was done using the following equation:

$$Z''_{(nm)} = 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4$$

Also, the researchers calculated the Z"-score for emerging markets using the following equation:

$$Z''_{(E)} = 3.25 + 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4$$

The calculated values for the Z" using the above two equations are represented in Appendix A.

Presentation and Discussion of the Study's Results

This section involves four subsections: (4.1) the Descriptive Analysis, (4.2) the Pearson Correlation Matrix, and (4.3) the Detection of Multicollinearity among Independent Variables.

Descriptive Analysis

The empirical part starts with a descriptive analysis. The calculated Altman Z"-scores were entered on EViews and the table below is extracted showing the measures of central tendency, the mean and the median, and measures of dispersion, the maximum, minimum, and standard deviation. Also, the table shows the Skewness and Kurtosis.

The mean for the Altman Z"-scores is 0.705793 which is below the cutoff. This shows evidence that there was a high probability that the ten studied Lebanese Alpha banks might face financial distress. It is remarkable also that the mean for the variable X_1 which divides the working capital by the total assets is negative. This demonstrates that the current liabilities (CL) were higher than the current assets (CA) for the studied banks over the period 2009 – 2018.

Pearson Correlation Matrix

Table 2 shows the correlation between the variables.

The correlation of the variables of the model was calculated and the results showed that there is a strong positive correlation between Z" and X_1 (0.996947), a weak negative correlation between Z" and X_2 (-0.282346), an extremely weak positive correlation between Z" and X_3 (0.084131), and a moderate positive correlation between Z" and X_4 (0.433626).

Table 1: Descriptive Statistical Analysis of the Studied Variables

	Z	X_1	X_2	X_3	X_4
Mean	**0.705793**	**-0.423478**	0.014472	0.012639	0.096854
Median	0.653762	-0.431202	0.014088	0.012637	0.093552
Maximum	2.693309	-0.126450	0.031760	0.028656	0.155100
Minimum	-0.640508	-0.628757	-0.000387	0.001726	0.052433
Std. Dev.	0.610054	0.092902	0.008681	0.003572	0.018554
Skewness	0.222970	0.216995	0.170068	0.937932	0.833117
Kurtosis	3.244620	3.182731	2.055440	6.443835	3.799766
Jarque-Bera	1.077922	0.923909	4.199531	64.07860	14.23316
Sum	70.57926	-42.34779	1.447188	1.263872	9.685413
Sum Sq. Dev.	36.84437	0.854448	0.007461	0.001263	0.034081
Observations	100	100	100	100	100

Table 2: Pearson Correlation Matrix

	Z"	X_1	X_2	X_3	X_4
Z"	1.000000	0.996947	-0.282346	0.084131	0.433626
X_1	0.996947	1.000000	-0.337676	0.029532	0.390173
X_2	-0.282346	-0.337676	1.000000	0.169766	0.060066
X_3	0.084131	0.029532	0.169766	1.000000	0.231937
X_4	0.433626	0.390173	0.060066	0.231937	1.000000

Table 3: Multicollinearity Test - Variance Inflation Factors

	Coefficient	Uncentered	Centered
Variable	**Variance**	**VIF**	**VIF**
C	9.59E-15	67.76074	NA
X_1	1.69E-14	22.73129	1.281306
X_2	2.00E-12	4.128250	1.169756
X_3	1.02E-11	12.56702	1.098523
X_4	4.70E-13	32.40197	1.240990

Detection of Multicollinearity among Independent Variables

The status of multicollinearity among the 4 independent variables, X_1, X_2, X_3, and X_4, is tested using the Variance Inflation Factors (VIF).

Based on the results shown in the table above, all 4 independent variables have a centered VIF of less than 5 (approximately 1); hence, the independent variables are not correlated among themselves. Therefore, multicollinearity does not exist in this model.

We conclude that the Altman Z"-score model for Lebanese Alpha banks is a reliable model and can be used for the forecast.

CONCLUSION

This study is conducted aiming to predict the financial distress of 10 Lebanese Alpha banks over the period 2009 – 2018. The authors calculated the Altman Z"-scores using the equations for non-manufacturing companies as well as for emerging markets.

On one hand, the results of the Z"-scores for non-manufacturing companies came all (100%) below the cutoff which shows that the banks had a probability of financial distress soon. On the other hand, the scores using the equation for emerging markets showed that 73 % were in the distress zone, 26 % were in the grey zone, and only 1% were in the safe zone. Thus, this study verified that there was potential financial distress among Lebanese Alpha banks. Evidently, this turned to be the scenario for the Lebanese Alpha banks and banks, in general, from 2019 until the present.

Then, the authors ran two statistical approaches. First, the descriptive statistics showed that the mean for the Z" (using both equations) was below the cutoff. Second, the correlation matrix showed a strong positive correlation between Z" and X_1, a weak negative correlation between Z" and X_2, an extremely weak positive correlation between Z" and X_3, and a moderate positive correlation between Z" and X_4. Finally, multicollinearity did not exist in the studied model.

LIMITATIONS

This study is prepared with high interest. However, the researchers faced the following challenges while preparing it:

- To begin with, there was a challenge regarding the classification of the current assets and current liabilities. The researchers referred to

a managing partner at Ernst and Young, Lebanon, who clarified how classifications are reported within the annual reports published by banks.

- Second, there was remarkable inconsistency in the formats of the annual reports which rendered the work more complicated.
- Third, Banque Libano-française, which was classified among the Alpha banks over the studied period, published its annual reports online only starting 2014 till 2018. The researchers tried to contact the administration; however, they didn't cooperate and send the missing reports.

FUTURE RESEARCH

The authors recommend two future work to be performed concerning the addressed topic. First, a study examining the impact of the macroeconomic situation in Lebanon on the values of the Z"-score. Second, a study comparing the Z"-scores and the ratings of Lebanese banks.

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Appendix A

Audi

Variables	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009
X_1	(0.2727)	(0.4148)	(0.3992)	(0.4310)	(0.4512)	(0.4788)	(0.4048)	(0.4312)	(0.3787)	(0.3221)
X_2	0.0176	0.0189	0.0131	0.0106	0.0095	0.0081	0.0070	0.0076	0.0048	0.0031
X_3	0.0133	0.0135	0.0202	0.0114	0.0108	0.0105	0.0148	0.0156	0.0150	0.0131
X_4	0.0897	0.1059	0.0912	0.0843	0.0867	0.0805	0.0935	0.0893	0.0921	0.0903
$Z''_{(nm)}$	(1.5484)	(2.4574)	(2.3442)	(2.6275)	(2.7654)	(2.9592)	(2.4350)	(2.6052)	(2.2707)	(1.9200)
$Zone_{(nm)}$	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed
$Z''_{(E)}$	(0.2462)	0.4973	1.0846	0.0268	0.2079	(0.1338)	(0.6405)	1.1177	0.1429	(0.0735)
$Zone_{(E)}$	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Grey	Distressed	Distressed

Byblos

Variables	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009
X_1	(0.3354)	(0.3500)	(0.3231)	(0.3331)	(0.3571)	(0.3243)	(0.3478)	(0.2663)	(0.2805)	(0.3473)
X_2	0.0020	0.0015	0.0022	0.0021	0.0014	0.0019	0.0029	0.0026	0.0007	0.0012
X_3	0.0082	0.0087	0.0189	0.0099	0.0116	0.0100	0.0116	0.0135	0.0145	0.0130
X_4	0.0832	0.0904	0.0951	0.0944	0.0973	0.0979	0.1076	0.1102	0.1193	0.1055
$Z''_{(nm)}$	(2.0512)	(2.1373)	(1.8858)	(2.0127)	(2.1581)	(1.9509)	(2.0815)	(1.5320)	(1.6151)	(2.0765)
$Zone_{(nm)}$	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed
$Z''_{(E)}$	1.1988	1.1127	1.3642	1.2373	1.0919	1.2991	1.1685	1.7180	1.6349	1.1735
$Zone_{(E)}$	Grey	Grey	Grey	Grey	Distressed	Grey	Grey	Grey	Grey	Grey

BLOM

Variables	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009
X_1	(0.4971)	(0.4754)	(0.4572)	(0.4394)	(0.4513)	(0.4823)	(0.4498)	(0.4283)	(0.3949)	(0.4053)
X_2	0.0291	0.0310	0.0318	0.0287	0.0265	0.0233	0.0198	0.0160	0.0132	0.0109
X_3	0.0172	0.0186	0.0287	0.0169	0.0161	0.0166	0.0161	0.0177	0.0180	0.0169
X_4	0.0976	0.1017	0.1103	0.1032	0.0991	0.0987	0.0954	0.0936	0.0925	0.0899
$Z''_{(nm)}$	(2.9480)	(2.7859)	(2.5873)	(2.5667)	(2.6622)	(2.8727)	(2.6777)	(2.5404)	(2.3298)	(2.4151)
$Zone_{(nm)}$	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed
$Z''_{(E)}$	0.3020	0.4641	0.6627	0.6833	0.5878	0.3773	0.5723	0.7096	0.9202	0.8349
$Zone_{(E)}$	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed

SGBL

Variables	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009
X_1	(0.4312)	(0.5032)	(0.5121)	(0.5378)	(0.5379)	(0.5118)	(0.5115)	(0.5111)	(0.3692)	(0.3905)
X_2	0.0140	0.0177	0.0173	0.0144	0.0110	0.0088	0.0049	0.0064	-[2]	0.0024
X_3	0.0087	0.0122	0.0209	0.0129	0.0126	0.0128	0.0123	0.0078	0.0193	0.0176
X_4	0.0804	0.0936	0.0980	0.0838	0.0828	0.0856	0.0681	0.0524	0.1087	0.0890
$Z''_{(nm)}$	(2.6401)	(3.0631)	(3.0599)	(3.3063)	(3.3211)	(3.1531)	(3.1851)	(3.2245)	(2.1781)	(2.3422)
$Zone_{(nm)}$	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed
$Z''_{(E)}$	0.6099	0.1869	0.1901	(0.0563)	(0.0711)	0.0969	0.0649	0.0255	1.0719	0.9078
$Zone_{(E)}$	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed

2- The retained earnings for the year 2010 was null (zero).

Crédit Libanais

Variables	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009
X_1	(0.3032)	(0.4997)	(0.4844)	(0.5185)	(0.4822)	(0.4673)	(0.4743)	(0.3559)	(0.3433)	(0.4479)
X_2	0.0128	0.0075	0.0079	0.0084	0.0085	0.0077	0.0056	0.0032	(0.0004)	0.0029
X_3	0.0079	0.0086	0.0078	0.0078	0.0080	0.0095	0.0091	0.0105	0.0140	0.0112
X_4	0.0768	0.0788	0.0800	0.0824	0.0845	0.0888	0.0728	0.0731	0.0802	0.0848
$Z_{(nm)}$	(1.8140)	(3.1130)	(3.0156)	(3.2353)	(2.9927)	(2.8833)	(2.9560)	(2.1763)	(2.0753)	(2.7642)
$Zone_{(nm)}$	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed
$Z_{(E)}$	1.4360	0.1370	0.2344	0.0147	0.2573	0.3667	0.2940	1.0737	1.1747	0.4858
$Zone_{(E)}$	Grey	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Grey	Distressed

Bank of Beirut

Variables	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009
X_1	(0.3883)	(0.4420)	(0.4460)	(0.4608)	(0.1264)	(0.4202)	(0.3418)	(0.2029)	(0.2885)	(0.3615)
X_2	0.0149	0.0133	0.0114	0.0111	0.0101	0.0097	0.0113	0.0120	0.0102	0.0117
X_3	0.0130	0.0128	0.0133	0.0135	0.0141	0.0127	0.0138	0.0129	0.0153	0.0130
X_4	0.1422	0.1469	0.1551	0.1406	0.1385	0.1260	0.1395	0.1206	0.1283	0.1265
$Z_{(nm)}$	(2.2626)	(2.6157)	(2.6359)	(2.7483)	(0.5567)	(2.5073)	(1.9662)	(1.0783)	(1.6218)	(2.1127)
$Zone_{(nm)}$	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed
$Z_{(E)}$	0.9874	0.6343	0.6141	0.5017	2.6933	0.7427	1.2838	2.1717	1.6282	1.1373
$Zone_{(E)}$	Distressed	Distressed	Distressed	Distressed	Safe	Distressed	Grey	Grey	Grey	Grey

BankMed

Variables	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009
X_1	(0.4667)	(0.4538)	(0.4370)	(0.4920)	(0.4339)	(0.3791)	(0.3638)	(0.3343)	(0.3254)	(0.3231)
X_2	0.0104	0.0159	0.0167	0.0154	0.0144	0.0147	0.0197	0.0162	0.0141	0.0124
X_3	0.0017	0.0089	0.0098	0.0113	0.0100	0.0104	0.0116	0.0118	0.0107	0.0096
X_4	0.0715	0.1041	0.1067	0.1083	0.1078	0.1084	0.1149	0.0915	0.1095	0.1210
$Z_{(nm)}$	(2.9407)	(2.7553)	(2.6344)	(2.9876)	(2.6195)	(2.2549)	(2.1243)	(1.9647)	(1.9016)	(1.8876)
$Zone_{(nm)}$	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed
$Z_{(E)}$	0.3093	0.4947	0.6156	0.2624	0.6305	0.9951	1.1257	1.2853	1.3484	1.3624
$Zone_{(E)}$	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Grey	Grey	Grey	Grey

IBL

Variables	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009
X_1	(0.5790)	(0.4651)	(0.3694)	(0.5305)	(0.5000)	(0.5507)	(0.6254)	(0.3568)	(0.5059)	(0.5384)
X_2	0.0284	0.0279	0.0234	0.0230	0.0204	0.0180	0.0153	0.0132	0.0142	0.0121
X_3	0.0173	0.0165	0.0143	0.0143	0.0134	0.0134	0.0127	0.0127	0.0132	0.0127
X_4	0.0884	0.0918	0.0810	0.0811	0.0774	0.0761	0.0736	0.0760	0.0728	0.0800
$Z_{(nm)}$	(3.4962)	(2.7527)	(2.1654)	(3.2232)	(3.0421)	(3.3838)	(3.8905)	(2.1323)	(3.1071)	(3.3235)
$Zone_{(nm)}$	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed
$Z_{(E)}$	(0.2462)	0.4973	1.0846	0.0268	0.2079	(0.1338)	(0.6405)	1.1177	0.1429	(0.0735)
$Zone_{(E)}$	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Grey	Distressed	Distressed

BBAC

Variables	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009
X_1	(0.3707)	(0.4391)	(0.5634)	(0.6194)	(0.6288)	(0.5828)	(0.5547)	(0.2355)	(0.5057)	(0.5193)
X_2	0.0252	0.0267	0.0310	0.0287	0.0283	0.0264	0.0233	0.0222	0.0202	0.0172
X_3	0.0096	0.0088	0.0126	0.0089	0.0099	0.0102	0.0107	0.0108	0.0112	0.0115
X_4	0.0858	0.0955	0.0960	0.0853	0.0891	0.0882	0.0848	0.0798	0.0812	0.0821
$Z_{(nm)}$	(2.1952)	(2.6340)	(3.4092)	(3.8206)	(3.8725)	(3.5759)	(3.4015)	(1.3161)	(3.0914)	(3.1875)
$Zone_{(nm)}$	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed
$Z_{(E)}$	1.0548	0.6160	(0.1592)	(0.5706)	(0.6225)	(0.3259)	(0.1515)	1.9339	0.1586	0.0625
$Zone_{(E)}$	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Grey	Distressed	Distressed

Fransabank

Variables	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009
X_1	(0.3242)	(0.3687)	(0.3659)	(0.4106)	(0.3651)	(0.3828)	(0.3276)	(0.3810)	(0.4571)	(0.5136)
X_2	0.0268	0.0260	0.0258	0.0248	0.0243	0.0245	0.0226	0.0207	0.0164	0.0149
X_3	0.0085	0.0102	0.0115	0.0112	0.0109	0.0117	0.0127	0.0135	0.0148	0.0118
X_4	0.1020	0.1081	0.1136	0.1085	0.1093	0.1081	0.1044	0.0985	0.1175	0.1103
$Z_{(nm)}$	(1.8750)	(2.1519)	(2.1196)	(2.4234)	(2.1283)	(2.2398)	(1.8803)	(2.2380)	(2.7224)	(3.1260)
$Zone_{(nm)}$	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed	Distressed
$Z_{(E)}$	1.3750	1.0981	1.1304	0.8266	1.1217	1.0102	1.3697	1.0120	0.5276	0.1240
$Zone_{(E)}$	Grey	Distressed	Grey	Distressed	Grey	Distressed	Grey	Distressed	Distressed	Distressed