AÜİİBFD
Anadolu Üniversitesi İktisadi ve İdari Bilimler Fakültesi
Anadolu University Journal of Economics and Administrative Sciences

Cilt: 25, Sayı: 2, Yıl: 2024
e-ISSN: 2687-184X
https://dergipark.org.tr/en/pub/anadoluibfd

Makale Türü / Submission Type: Araştırma Makalesi / Research Article
Başvuru Tarihi / Date Submitted: 28/09/2023
Kabul Tarihi / Date Accepted: 14/02/2024

DOI: 10.53443/anadoluibfd.1367665
2024, 25(2), 215-236

INVESTIGATING THE ROLE OF FIRM LIFE CYCLE ON FINANCIAL DISTRESS: EVIDENCE FROM BORSA ISTANBUL*

İbrahim GÜLTEKİN[2], Güven SAYILGAN[3]

Abstract

This paper aims to examine whether acting non-compatible with life cycle has impact on firm's financial distress. Considering every life stage requires unique priorities, firms should consider their life phases when determining their strategical decisions. We handle the causes of financial distress from a broad and strategical perspective on corporate finance ground. In this regard, we seek the relationships of investment, finance, and dividend policies with financial distress, considering firm life cycles. We applied panel data analysis examining 154 Borsa Istanbul (BIST) firms in manufacturing sector using their last seven-year data. We find that the ratio of investment to equity is positively correlated with financial distress for growth and decline firms at different levels. Additionally, we find that leverage increases financial vulnerability in all life cycles, however, the impact of leverage is larger for growth firms and decline firms. These findings are significant to navigate managers in the right direction.

Keywords: Firm Life Cycle, Financial Distress, Emerging Market Z-Score

JEL Codes: G32, G34

FİRMA YAŞAM EVRELERİNİN FİNANSAL SIKINTI ÜZERİNDEKİ ROLÜ: BORSA İSTANBUL ÖRNEĞİ

Abstract

Bu makalede, firmaların içinde bulundukları yaşam evresi şartlarına aykırı davranmalarının firmaların finansal sıkıntı yaşaması üzerinde etkisinin olup olmadığının tespit edilmesi amaçlanmaktadır. Her firma yaşam evresinin kendine özgü öncelikler gerektirdiği göz önüne alındığında, firmaların stratejik kararlarını belirlerken içinde bulundukları yaşam evrelerini dikkate almaları gerekmektedir. Çalışmada, firmaların finansal sıkıntı nedenleri kurumsal finans ilkeleri çerçevesinde ele alınmıştır. Bu bağlamda, firmaların yatırım, finansman ve kar dağıtım politikaları ile finansal sıkıntı arasındaki ilişki firma yaşam evreleri çerçevesinde incelenmiştir. Makalede, imalat sektöründe faaliyet gösteren 154 Borsa İstanbul (BIST) firmasının son yedi yıllık verileri kullanılarak panel veri analizi yapılmıştır. Bu kapsamda, yatırımların öz sermayeye oranı ile finansal sıkıntı arasında büyüme ve düşüş evresindeki firmalar için pozitif ilişki bulunmuştur. Ayrıca, finansal kaldıracın tüm yaşam evreleri için finansal kırılganlığı artırdığı, ancak bu etkinin büyüme evresindeki firmalarda ve düşüş evresindeki firmalarda daha büyük olduğu tespit edilmiştir. Söz konusu bulgular, firma yöneticilerince doğru stratejik kararların oluşturulması açısından önemlidir.

Anahtar Kelimeler: Firma Yaşam Evresi, Finansal Sıkıntı, Gelişen Piyasalar Z-Skoru

JEL Kodları: G32, G34

*Bu çalışma Ankara Üniversitesi Sosyal Bilimler Enstitüsü İşletme Anabilim Dalı'nda Prof. Dr. Güven SAYILGAN danışmanlığında İbrahim GÜLTEKİN tarafından "Şirket Yaşam Evrelerinde Uygulanan Kurumsal Finansman Politikalarının Finansal Başarısızlık Üzerindeki Etkileri" başlığı ile tamamlanarak 08/09/2022 tarihinde savunulan doktora tezinden türetilmiştir.

[2] Dr., Estoreboost, Samc LLC Sheridan, WY, igultekin06@gmail.com, ORCID: 0000-0002-4309-2019
[3] Prof. Dr., Ankara Üniversitesi Siyasal Bilgiler Fakültesi, sayilgan@ankara.edu.tr, ORCID: 0000-0002-4214-7321

INTRODUCTION

Describing social organizations with biological laws backs to the 1950s. In such studies, social organizations like firms were tried to be explained with biological realities. Within this concept, there is a dependency among size, shape, and function in living things. There will be some changes in shape and function when the living organization gets bigger. Unless necessary adjustment is made, the growth would be limited (Haire, 1959). Similarly, firms need to adjust themselves from many aspects as they get grow or shrink.

Firms are evolving entities. Like other living organizations, firms are born, grow, mature, decline, and die. However, this path is not a monotonous for firms, alike other living things. A firm provides many products and services, which all have different life cycles. In this regard, different factors such as bringing innovations to the products, entering new markets, making structural changes prevent the firm to follow a monotonous path toward to death (Dickinson, 2011). Thus, firm's life path cannot be predicted before. An introduction firm can exit from the market because of a wrong management, or a decline firm can pass into a growing phase due to a successful investment. However, decline phase is inevitable for the firms (Gardner, 1965). The important thing here is being aware of needs and taking necessary actions proactively.

Every firm life cycle requires a certain behavior pattern (Adizes, 1979). Acting compatible with the life cycle enables the firms to be successful. Otherwise, the firms may face with opposite results. This is the main question of our paper: Does not acting compatible with life cycle cause financial failure?

It is seen that firm life cycle is handled as a perceptible phenomenon in literature. In related studies, firm life cycles are investigated within a wide range from capital structure (Seifert and Gönenç, 2012), cost of equity (Hasan, Hossain, and Cheung, 2015), financial failure prediction (Dickinson, 2011; Cao, 2012; Vorst and Yohn, 2018), firm risk (Hasan and Habib, 2017; Shahzad, Fareed, Wang, and Shah, 2020), financial difficulty, rating scores (Blomkvist, Löflund, and Vyas, 2021), financial management (Faff, Kwok, Podolski, and Wong, 2016) to income quality, dividend payout (DeAngelo, DeAngelo, and Stulz, 2006; Bhattacharya, Chang ve Li, 2020, Çelik, 2013), organization (Hasan and Cheung, 2017; Hasan and Cheung, 2017), ownership distribution (Bansal and Thenmozhi, 2020), restructuring (Durand et al., 2015), risk desire (Shahzad, Lu, and Fareed, 2019), investors' information needs (Dickinson, Kassa, & Schaberl, 2018) and firm performance (Güleç and Karacaer, 2018; Arsoy, 2015) etc. All these studies support that firm life cycle has an important effect and should be included in such studies to reach more comprehensive results. However, the impacts of firm life cycles on the financial failures have not been investigated, especially from the corporate finance respect. This study aims to fill this gap.

Maximizing firm value is the main target of a firm according to the traditional finance theory (Koller, Goedhart, and Wessels, 2010). To reach this target, firms follow strategies and policies. In this regard, there are three fundamental strategy areas in the context of corporate finance, which shape a firm's entire structure. These are investing decisions, financing decisions, and dividend payout decisions (Damodaran, 2014). Firms form their general strategies according to these three fundamental decisions. Thus, they face with different results regarding profitability, liquidity, financial flexibility, and firm value. We believe that firms need to take into consideration their life stages to determine their fundamental policies.

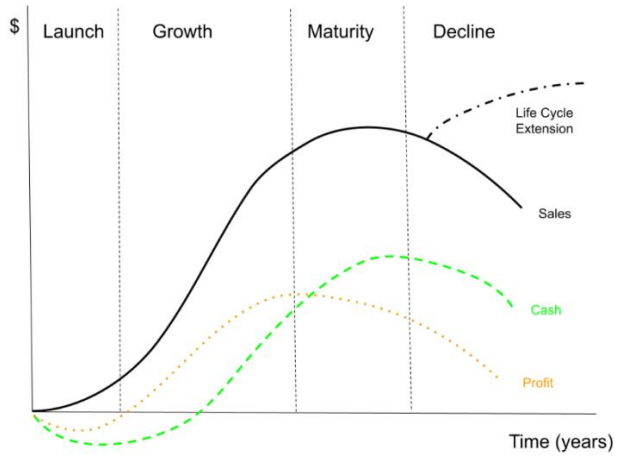
In this framework, we investigate the impacts of firm life cycle on financial distress in this paper.

Literature Review and Hypotheses Development

Firm life cycle

Firm life cycle can be mentioned as an extended version of product life cycle. Product life cycle theory is used to explain the path of a single product. According to this theory, a product gets through the stages of birth, growth, mature, decline, and death respectively. Though the direction of the path is same, the length of the path is different for each product. Many factors such as development of substitute products, change in fashions and trends, evolving end customers' choices affect the length of the life cycles of products (Güleç, 2019). Similarly, firms pass through certain life stages. The difference is that firm life cycle is cyclical due to not depending on only just one product (Dickinson, 2011).

Figure 1: Firm life cycle stages



Source: Streetfins, 2022

There are certain characteristics of life cycle stages:

Introduction Firms: This is the first stage of a firm that first starts to operate. There are few assets. The organizational structure is not established well yet. There is no customer base. There is knowledge deficiency on potential incomes and costs. The cash flows from operating are negative. Total sales and profitability are low, the income volatility is high. Uncertainty about new investment is high. Cash flows are not stable. In this regard, these firms expose to high operational risk.

Growth Firms: These firms have just completed their introduction phase and catch a certain level of sales. They show a high-growth rate. Sales and profitability increases. Operational risk is still high parallel to the uncertainties about investments. While the incomes increase, profits follow them lagged. Thus, cash flow generated meets the needs of investment delayed.

Mature Firms: The supply chain connections are established. The operating areas are clarified. Cash flows from operating are more stable. They can benefit scale-economies and have more solid capital structure. In this regard, the operating risk is lower compared to other life cycles.

Decline Firms: This is the last stage of a firm. The income and the profitability start to decrease since the rise of number of competitor firms. Though new investments tend to decline, the cash flow generation continues. Internal finance sources exceed investment needs.

Financial distress

Every firm begins its operations for a lasting period. However, this is not the case for most of them. Many firms are obliged to end their operations very early. Although both internal and external factors may have an impact on financial distress, the wrong strategies applied are the underlying reason in this process.

These strategies can be related with financial or operational characteristics. Leverage, operational performance, liquidity, sales, exchange rate fluctuation, profitability, volatility of equity, firm size (Whitaker, 1999; Sudarsanam and Lai, 2001; Turetsky and McEwen, 2001; Alfaro, Asis, Chari, and Panizza, 2019; Xu and Zhang, 2009; Lizal, 2002; Altman, Iwanicz-Drozdowska, Laitinen, and Suvas, 2016; Campbell, Hilscher, and Szilagyi, 2005) were mentioned as important factors to explain firms' defaults in literature. Rather than these factors, we handle the issue from a broader and strategical perspective on corporate finance ground. In this regard, we seek the relationships of investment, finance, and dividend policies with financial distress, considering firm life cycles.

Association between life cycle and financial distress

Firm risk basically stems from fixed costs and debt. In this regard, firms face two main risks, which are operational risk and financial risk. While the firms having huge investments bear relatively high operational risk, the firms with high level of debts bear more financial risk (Sayılgan, 2017).

Operational risk represents internal and external risks such as volatility in demand, input costs, exchange rates, working capital needs, other macro economical risks etc. These risks arise from other factors than financing activities and effect the firm directly. On the other hand, financial risk represents the risk stemming from capital structure. Firms expose different levels of financial risks depending on their financing choices about equity and debt.

Both risks change according to firm life cycle. Especially introduction and growth firms have higher operational risks due to the plenty of uncertainties. On the other hand, mature firms have relatively less operational risks. In this regard, firms should establish a right balance between operational risks and financial risks. If the operation risks are high, the financial risks should be low, or vice versa to stay in the safe zone. Since the operational risk is high at growth firms, they need to balance this situation having low financial risk, which corresponds to low level of debt. Contrary, having less operational risk enable mature firms to use higher level of debt to benefit from debt's benefits.

Hypotheses

Firms have different situations based on their life cycles. There are too many uncertainties for the introduction and growth firms due to instability of operations. Their capital structure is not yet optimal. They need new investments to grow. So, the profits should be canalized to fuel the investments rather paying back to the shareholders. If they get debt, the financial risk rises, and if they pay the dividend back to the shareholders, it hinders the growing. In this regard, the introduction and growth firms should primarily focus on investment decisions. On the contrary, mature firms have more stable cash inflows and profit. Thus, they have less operational risk. They can scale their businesses focusing on financing. Using tax shield, benefiting from cheaper financing source, and disciplining effects of lenders, contribute into the mature firms' reach to the optimal capital structure. Reaching optimal capital structure is more possible for mature firms compared to other life stages. Lastly, although having net cash inflows, decline firms experience a slow in their operations. In this regard, unless they find feasible investment opportunities, it will be better to pay dividend to shareholders for them.

In this framework, following hypotheses are developed on investment, financing and dividend payout.

Investment

Introduction-growth firms' primary target is growing by making new investments. Similarly, decline firms needs new feasible investments to repass into growth or mature phases. On the other hand, as the level of investments over equity gets bigger, the risks of firms increase. So, it is evaluated that when the balance between investment and equity is broken against equity side, the firm will expose to more financial risk.

Hypothesis 1: When the magnitude of investments over equity gets bigger, the risk of financial risk increases for introduction-growth firms.

Hypothesis 2: When the magnitude of investments over equity gets bigger, the risk of financial risk increases for decline firms.

Table 1: Hypotheses on investment

	Firm Life Cycle	**Expected Relationship Between Financial Distress and Investment**
Hypothesis 1	Introduction-Growth	-
Hypothesis 2	Shake-out-Decline	-

Financing

Debt financing provides many advantages such as tax shield and cost of debt. On the other hand, firms bear financial risk when they borrow. In this regard, mature firms are more likely to enjoy these advantages rather than other life stages. Since the operational risks of introduction-growth firms and shake-out-decline firms are high, they do not need to increase their financial risks by increasing debt level. In this regard, it is evaluated that the impact of debt financing on financial distress is much more at introduction-growth firms and shake-out-decline firms compared to mature firms.

Hypothesis 3: As the leverage level of firms get bigger, financial risks increase.

Table 2a: Hypothesis on financing

	Firm Life Cycle	**Expected Relationship Between Financial Distress and Investment**
Hypothesis 3	Introduction-Growth Mature Shake-out-Decline	-

Hypothesis 4: The impacts of leverage on financial distress is larger at introduction-growth firms and shake-out-decline firms than mature firms.

Table 2b: Hypothesis on financing

	Firm Life Cycle	Expected Relationship Between Financial Distress and Investment
Hypothesis 4	Introduction-Growth Mature Shake-out-Decline	Larger
	Mature	Smaller

Dividend payout

New investments are the core source of growth for introduction-growth firms. In this regard, keeping profits within the firm, rather than paying dividend, contributes firm growth. So, it is considered that financial risk will decrease as dividend payout ratio increases. On the other hand, if there is not feasible investment opportunity, shake-out-decline firms should pay dividend back to their shareholders. Thus, they do not take further risks and their risk will decrease.

Hypothesis 5: As the dividend payout ratio gets bigger, financial risk of introduction-growth firms increase.

Hypothesis 6: As the dividend payout ratio gets bigger, financial risk of shake-out-decline firms decrease.

Table 3: Hypotheses on dividend payout

	Firm Life Cycle	Expected Relationship Between Financial Distress and Investment
Hypothesis 5	Introduction-Growth	+
Hypothesis 6	Shake-out-Decline	-

Research Method

Sample and data

In this study, we use panel data analysis. This methodology can capture both time series and cross-sectional characteristics of data. We investigate manufacturing firms which are listed on the Borsa Istanbul

(BIST). We observe the period of 2015-2021. Although there are 195 manufacturing firms listed in 2022, we reach the entire data just for 154 firms. Thus, we gather 1078 firm-year observations. We get the data from Finnet Database.

Empirical model and variables

Within the framework drawn above, we test the relationship between EM Z-score and investment, financing, and dividend variables across the life cycles. We use the following model:

$$EMZ_{i,t} = \alpha_0 + \sum\beta_i LC_{i,t} + \beta_3 INV_{i,t} + \beta_4 LEV_{i,t} + \beta_5 DIV_{i,t} + \beta_6 SIZE_{i,t} + \beta_7 LIQ_{i,t} + \beta_8 CFO_{i,t}$$

$$+\beta_9 MB_{i,t} + \beta_{10} VOL_{i,t} \quad (1)$$

Table 4: Variables

Dependent Variable		
$EMZ_{i,t}$	Firm's Distress	Firm's Emerging Market Z-Score
Independent Variables		
LC1	Dummy variable for introduction firms and growth firms	If the firm is in this life cycle, the value is 1; if not, the value is 0.
LC2	Dummy variable for mature firms	If the firm is in this life cycle, the value is 1; if not, the value is 0.
LC3	Dummy variable for shake-out firms and decline firms	If the firm is in this life cycle, the value is 1; if not, the value is 0.
$INV_{i,t}$	The magnitude of investments of a firm for each year according to its equity	Net Cash Flows from Investment / Equity
$LEV_{i,t}$	The magnitude of debt of a firm for each year according to total assets	Total Debt / Total Asset
$DIV_{i,t}$	The magnitude of dividend payout of a firm for each year according to net profit	Total Dividend Payout / Net Profit
Control Variables		
$SIZE_{i,t}$	Firm size as total asset of a firm for each year	Ln(Total Asset)
$LIQ_{i,t}$	The magnitude of net liquid assets of a firm for each year according to total assets	(Short Term Assets – Short Term Liabilities) / Total Asset
$CFO_{i,t}$	The magnitude of cash flows from operations of a firm for each year according to total assets	Cash Flows From Operations / Total Assets

$MB_{i,t}$	The magnitude of market value of a firm for each year according to book value	Market Value / Book Value
$VOL_{i,t}$	Annualized value of daily volatility of equity of a firm for each year	(Daily Standard Deviation of Equity) x 250^0.5

Since the observed firms are the BIST firms (they are large companies), we believe that the difference between introduction firms and growth firms; and the difference between shake-out firms and decline firms will be minor. To get more certain results regarding life stages, we determine to evaluate these life stages together. Thus, introduction stage and growth stage are evaluated one group as LC1, and shake-out stage and decline stage are evaluated one group as LC3. As a result, we classified life cycles into three groups.

Measurement of Variables

Firm life cycle

We use the Dickinson (2011) method to identify the life cycle of a firm. In this methodology, firms are classified into life phases based on their cash flow statements. Cash flow statement involves information on operating, investment, and financing activities of a firm. In this respect, it gives a comprehensive perspective about a firm. Dickinson (2011) methodology is based on the idea that the components of cash flow statement, which are operating, investment, and financing, is shaped according to the life cycle the firm is in. Since the cash flow statement reflects organic results, Dickinson (2011) methodology produces consistent results with economical theory (Dickinson, 2011).

According to Dickinson (2011) methodology, firms are classified into life stages based on their cash flows as follows:

Table 5: Dickinson (2011) classification

	Introduction	**Growth**	**Mature**	**Shake-Out**	**Shake-Out**	**Shake-Out**	**Decline**	**Decline**
Net Cash Flows from Operating Activities	-	+	+	-	+	+	-	-
Net Cash Flows from Investing Activities	-	-	-	-	+	+	+	+
Net Cash Flows from Financing Activities	+	+	-	-	+	-	+	-

Financial distress

We use the Emerging Market Z-Score (Altman, 2005) to measure the vulnerability of a firm. The original Altman Z-Score was developed for manufacturing firms in the USA. To address both non-manufacturing and private firms, it was modified several times. The Emerging Market Z-Score was proposed by Altman himself to capture emerging market firms' characteristics (Altman, 2005).

The Emerging Market Z-Score consists of four different ratios and one constant value as below:

$$\text{Emerging Market Z-Score} = 3.25 + 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4 \quad (2)$$

where;

X_1 = Working Capital / Total Assets

X_2 = Retained Earnings / Total Assets

X_3 = Operating Income / Total Assets

X_4 = Book Value of Equity / Total Assets

There are two threshold values to classify the firms as safe, vulnerable, and distressful.

The firm is evaluated as safe if the EM Z-Score is over 5.85

The firm is evaluated as vulnerable if the EM Z-Score is between 3.75 and 5.85

The firm is evaluated as distressful if the EM Z-Score is below 3.75

Although some additional adjustments for foreign currency devaluation, industry, competitiveness were stipulated in the original methodology of the Emerging Market Z-Score calculation, the formula mentioned above is seen enough to capture firms' financial vulnerability (Altman, 2005).

Empirical Results and Discussion

Descriptive statistics

The descriptive statistics regarding variables in the model is presented below:

Table 6: Descriptive statistics

	EM Z-Score	INV	LEV	DIV	SIZE	LIQ	CFO	MB	VOL
Mean	6.23	-0.12	0.56	0.13	8.69	0.14	0.06	3.67	0.48
Median	5.81	-0.07	0.58	0	8.66	0.14	0.05	1.72	0.45
St. Dev.	4.38	0.51	0.34	1.03	0.77	0.30	0.12	11.65	0.19
Min.	-38.65	-7.29	0.04	-18.40	6.56	-3.40	-0.64	0	0.14
Max.	28.73	6.36	4.40	7.44	11.10	0.85	0.94	317.97	2.26
Number	1078	1078	1078	1078	1078	1078	1078	1078	1078

Additionally, following Table shows how the average values of variables change according to the firm life stages.

Table 7: Average values of variables per firm life cycles

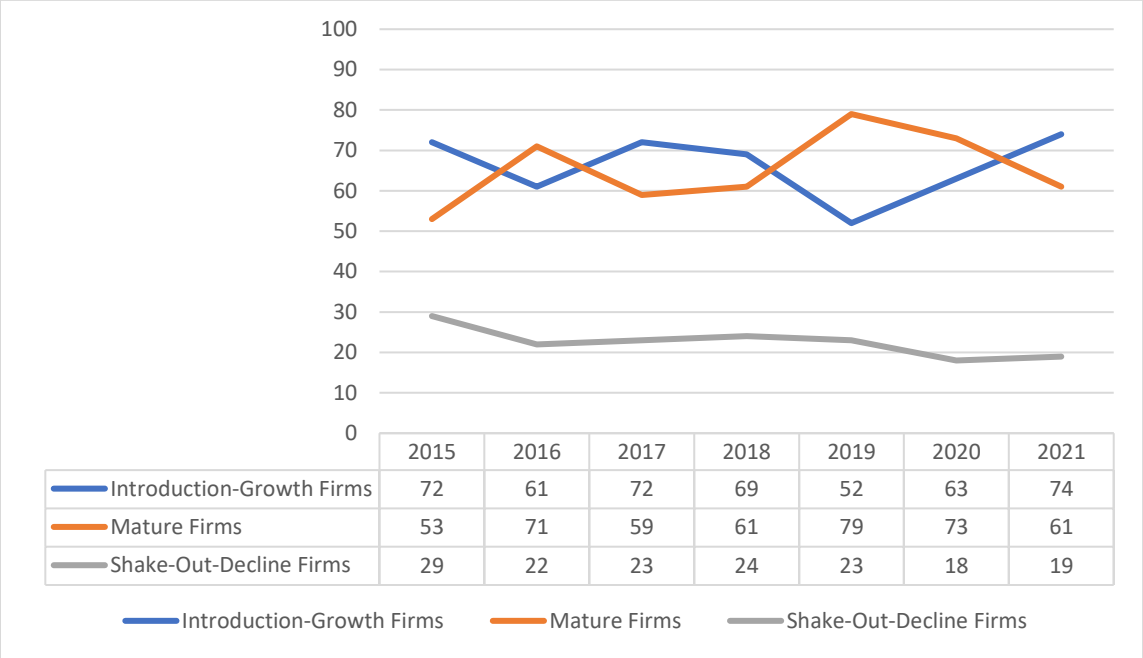
	Total	Introduction-Growth	Mature	Shake-Out-Decline
Firm-Year Observation Number	1078	463	457	158
Share in the total	%100	%42.9	%42.4	%14.7
EM Z-Score		5.89	6.91	5.23
INV		-0.201	-0.12	0.12
LEV		0.58	0.54	0.57
DIV		0.03	0.24	0.16
SIZE		8.65	8.82	8.44
LIQ		0.13	0.16	0.13
CFO		0.005	0.13	0.008
MB		3.65	3.86	3.20
VOL		0.50	0.46	0.50

It is observed that the average EM Z-Score values is relatively higher at mature firms and lower at introduce-growth firms and shake-out-decline firms. In terms of investment, the averages are increasing through the life stages. The negative sign shows that the firm is making new investments. In this regard, on average, new investments are much more at introduction-growth firms and mature firms. The average value of leverage is lower at mature firms compared to other stages. On the other hand, mature firms are the most paying dividends firms. Again, mature firms have the highest average values for firm size, liquidity, and MB, while the shake-out firms and decline firms have the lowest. The average value of the CFO is maximum at mature firms. It supports the idea that operations of mature firms are more stable than the others. In terms

of volatility, the average values of introduction-growth firms and shake-out-decline firms are higher. When considering these with the EM Z-Scores together, it is detected that these firms are riskier than the mature firms, which is consistent with the expectations.

The figure below presents the change in the number of firms according to their life cycles over time:

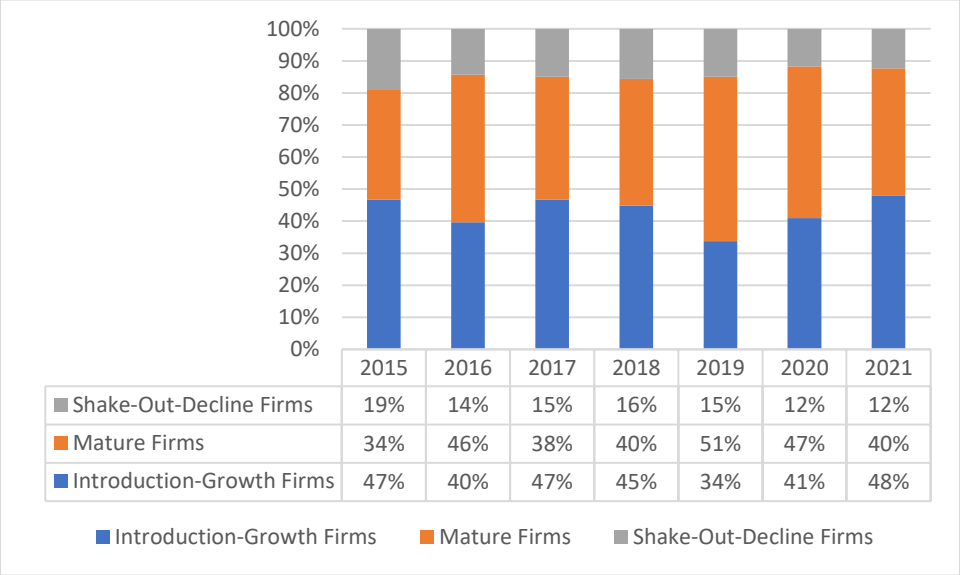
Figure 2: Numbers of firms according to life cycles over time



	2015	2016	2017	2018	2019	2020	2021
Introduction-Growth Firms	72	61	72	69	52	63	74
Mature Firms	53	71	59	61	79	73	61
Shake-Out-Decline Firms	29	22	23	24	23	18	19

The numbers of shake-out and decline firms are the fewest all years. While the numbers of introduction-growth firms are highest in 2015, 2017, 2018, and 2021; the numbers of mature firms are highest at remaining years.

Figure 3: Distributions of firms according to life cycles over time



When we observe percentage distribution of firms as life cycle, we see that introduction-growth firms are between %34-48; mature firms are between %34-51; shake-out-decline firms are between %12-19 over years.

The correlation matrix among independent variables is below:

Table 8: Correlation matrix

	INV	LEV	DIV	SIZE	LIQ	CFO	MB	VOL
INV	1							
LEV	-0.12471	1						
DIV	0.018088	-0.04836	1					
SIZE	-0.06321	0.034772	0.076497	1				
LIQ	0.134948	-0.77992	0.052128	-0.02661	1			
CFO	-0.00179	-0.0675	0.073282	0.155282	0.082558	1		
MB	-0.3583	0.064236	-0.01119	-0.02514	-0.02609	0.000159	1	
VOL	-0.02822	0.094007	-0.11628	-0.23333	-0.09211	-0.16308	0.161879	1

It is seen that there is no significant correlation among the variables.

Panel data analysis

We analyze the relationship between EM Z-Score and other variables using three models. In the Model 1, we investigate this relationship without including the effects of firm life cycles. In the Model 2, we include firm life cycles as dummy variables and seek the relationship between EM Z-Score and related variables considering firm life cycles. Lastly, we seek the interactions of variables in the Model 3.

$$\textbf{Model 1: } EMZ_{i,t} = \alpha_0 + \beta_1 INV_{i,t} + \beta_2 LEV_{i,t} + \beta_3 DIV_{i,t} + \beta_4 SIZE_{i,t} + \beta_5 LIQ_{i,t} + \beta_6 CFO_{i,t} + \beta_7 MB_{i,t} + \beta_8 VOL_{i,t} \quad (3)$$

$$\textbf{Model 2: } EMZ_{i,t} = \alpha_0 + \sum \beta_i LC_{i,t} + \beta_3 INV_{i,t} + \beta_4 LEV_{i,t} + \beta_5 DIV_{i,t} + \beta_6 SIZE_{i,t} + \beta_7 LIQ_{i,t} + \beta_8 CFO_{i,t} + \beta_9 MB_{i,t} + \beta_{10} VOL_{i,t} \quad (4)$$

$$\textbf{Model 3: } EMZ_{i,t} = \alpha_0 + \sum \beta_i LC_{i,t} + \beta_3 INV_{i,t} + \beta_4 LEV_{i,t} + \beta_5 DIV_{i,t} + \beta_6 SIZE_{i,t} + \beta_7 LIQ_{i,t} + \beta_8 CFO_{i,t} + \beta_9 MB_{i,t} + \beta_{10} VOL_{i,t} + \beta_{11} LC_{i,t} \times INV_{i,t} + \beta_{12} LC_{i,t} \times LEV_{i,t} + \beta_{13} LC_{i,t} \times DIV_{i,t} + \beta_{14} LC_{i,t} \times CFO_{i,t} \quad (5)$$

We apply pooled, firm fixed effects, random effects, and time fixed effects methods on all models respectively. According to the test results, it is observed that the firm fixed effects method gives the best result for each model. In order to compare, the results of the mentioned methods are submitted together. The coefficients regarding variables and test results are shown below:

Table 9: Model 1 results

Model 1	Pooled	Firm Fixed Effects	Random Effects	Time Fixed Effects
Intercept	7.063813***		6.5680137***	
INV	0.221617.	0.3083734**	0.2937770**	0.2877881**
LEV	-5.150983***	-5.8047689***	-5.5451019***	-5.4880201***
DIV	0.026520	0.0103619	0.0126598	0.0082737
SIZE	0.118129	0.3723934.	0.2255092.	1.1602356**
LIQ	7.661604***	6.5180120***	7.0018961***	6.6847713***
CFO	4.516315***	2.2907503***	2.7997047***	2.4331579***
MB	0.004252	0.0049584	0.0054916	0.0055828
VOL	-0.647882*	-0.7098346*	-0.6742405**	-0.3888925

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Pooled F-statistic: 604.6 on 8 and 1069 DF, p-value: < 2.2e-16
Firm Fixed Effects F-statistic: 316.28 on 8 and 916 DF, p-value < 2.22e-16
Pooled or Firm Fixed Effects: F Test for individual effects: F = 7.3252, df1=153, df2=916, p-value: < 2.2e-16
Random Effects: chisq: 3416.28 on 8 DF, p-value < 2.22e-16
Firm Fixed Effects or Random Effects: Hausman Test: chisq = 19.708, df = 8, p-value =0.0115
Time Fixed Effects F-statistic: 183.492 on 14, 910 DF, p-value < 2.22e-16

Table 10: Model 2 results

Model 2	Pooled	Firm Fixed Effects	Random Effects	Time Fixed Effects
Intercept	7.517110***		6.8535657***	
LC1	0.004581	-0.1305937	-0.1096974	-0.1566251
LC3	-0.747133***	-0.1783864	-0.3097487.	-0.1650232
INV	0.332119**	0.3179552**	0.3215440***	0.2926464**
LEV	-5.162098***	-5.7829006***	-5.5120867***	-5.4541988***
DIV	0.033764	0.0083183	0.0126702	0.0054631
SIZE	0.083735	0.3703901.	0.2042724.	1.1848448**
LIQ	7.613508***	6.5437426***	7.0513911***	6.7154213***
CFO	4.169953***	1.9985377***	2.5176372***	2.1183064***
MB	0.005587	0.0051713	0.0059942	0.0057527
VOL	-0.659618*	-0.7343937*	-0.7070597**	-0.4054649

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Pooled F-statistic: 493.9 on 10 and 1067 DF, p-value: < 2.2e-16
Firm Fixed Effects F-statistic: 253.113 on 10 and 914 DF, p-value < 2.22e-16
Pooled or Firm Fixed Effects: F Test for individual effects: F = 7.0875, df1=153, df2=914, p-value: < 2.2e-16
Random Effects: chisq: 3471.83 on 10 DF, p-value < 2.22e-16
Firm Fixed Effects or Random Effects: Hausman Test: chisq = 35.15, df = 10, p-value < 2.22e-16
Time Fixed Effects F-statistic: on 16, 908 DF, p-value < 2.22e-16
Time Fixed Effects Lagrange Multiplier Test - time effects (Breusch-Pagan): chisq = 0.41863, df = 1, p-value = 0.5176
Pooled or Random Effects: Lagrange Multiplier Test (Breusch-Pagan) for random effects: chisq = 614.78, df = 1, p-value < 2.2e-16

Both the Model 1 and the Model 2 put similar results regarding the signs and statistical importance of variables' coefficients. In this context, while the firm distress probability has negative relationship with the variables of investment, size, liquidity, cashflow from operations; it has positive relationship with leverage and volatility of equity. We cannot detect any statistically important relationship of dividend payout and market value to book value with distress probability.

According to the results of Model 3, there is a negative relationship between distress probability and investment for all life cycles. So, as the ratio of investment to the equity increases, the distress risk also increases. The magnitude of the relation is less for introduction-growth firms. Similarly, we observe same relationship between leverage and distress risk for all life cycles. In this respect, shake-out-decline firms are the most affected while the mature firms are the least. This suggests that financial risk of debt has biggest impact at shake-out-decline firms.

We get mixed results regarding the relationship between cash flow from operations and EMZ Score. While it is positive for both mature firms and shake-out-decline firms, it is indifferent for introduction-growth firms. It is seen that the more cash flow from operations, the better financial strength. The most powerful relation is seen at mature firms.

We also detect a positive relationship of firm size and liquidity; and negative relationship of equity volatility between EMZ Score. On the other hand, we cannot observe any statistically significant relationship between dividend payout and the ratio of market value to book value with firm distress risk.

Table 11: Model 3 results

Model 3	Pooled	Firm Fixed Effects	Random Effects	Time Fixed Effects
Intercept	5.990958***		5.4185104***	
LC1	1.435823***	1.1929710***	1.2391415***	1.1844066***
LC3	1.337600***	1.1028239***	1.1489977***	1.1359339***
INV	1.352876**	1.0351349*	1.1280137*	0.9914330*
LEV	-4.138859***	-4.0339578***	-4.0604749***	-3.8446095***
DIV	-0.036420	-0.0334234	-0.0270931	-0.0313890
SIZE	0.166971*	0.3671456.	0.2520302*	1.0174238**
LIQ	7.622047***	7.2992191***	7.5135552***	7.3989175***
CFO	7.663775***	3.7925196***	4.7516831***	4.0614413***
MB	-0.004455	-0.0055311	-0.0043841	-0.0037657
VOL	-0.760655*	-0.7266506**	-0.7391826**	-0.5411398.
LC1: INV	-1.612091**	-1.2737222**	-1.3581296**	-1.1742026*
LC3: INV	-0.909888.	-0.4557665	-0.5893024	-0.4996906
LC1: LEV	-2.113626***	-2.1654108***	-2.1361294***	-2.1151684***
LC3: LEV	-3.099633***	-2.0825611***	-2.2930540***	-2.0680571***

LC1: DIV	0.054872	0.0325010	0.0271107	0.0263929
LC3: DIV	0.108281	0.0547162	0.0670632	0.0695727
LC1: CFO	-8.345588***	-5.3586518***	-6.0827102***	-5.6137647***
LC3: CFO	-4.665665**	-2.6119536*	-3.1597376**	-2.7092157*

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Pooled F-statistic: 305.5 on 18 and 1059 DF, p-value: < 2.2e-16
Firm Fixed Effects F-statistic: 160.206 on 18 and 906 DF, p-value < 2.22e-16
Pooled or Firm Fixed Effects: F Test for individual effects: F = 7.1382, df1=153, df2=906, p-value: < 2.2e-16
Random Effects: chisq: 3904.33 on 18 DF, p-value < 2.22e-16
Firm Fixed Effects or Random Effects: Hausman Test: chisq = 60.938, df = 18, p-value =1.442e-06
Time Fixed Effects F-statistic: 121.334 on 24, 900 DF, p-value < 2.22e-16
Time Fixed Effects Lagrange Multiplier Test - time effects (Breusch-Pagan): chisq = 0.54851, df = 1, p-value = 0.4589
Pooled or Random Effects: Lagrange Multiplier Test (Breusch-Pagan) for random effects: chisq = 607.65, df = 1, p-value < 2.2e-16

Results on hypotheses and discussion

The results on the hypotheses regarding the relationship between financial distress and firm policies are presented below:

Hypothesis 1: When the magnitude of investments over equity gets bigger, the risk of financial risk increases for introduction-growth firms.

According to the Model 3, an increase at the magnitude of the investment over equity causes an increase in the distress risk for introduction-growth firms. New investments are the core engine for the introduction-growth firms. However, if new investments grow more than equity, financial vulnerability risk increases. This supports the hypothesis the idea that when these firms make new investments without maintaining new equity, their financial vulnerability risk rises.

Hypothesis 2: When the magnitude of investments over equity gets bigger, the risk of financial risk increases for decline firms.

According to the Model 3, an increase on the magnitude of the investment over equity causes an increase in the distress risk for shake-out-decline firms. New investments also play an important role for these firms in terms of passing a new stage. On the other hand, making new investments separately from equity increases the financial risk of these firms.

Hypothesis 3: As the leverage level of firms get bigger, financial risks increase.

According to the Model 3, as financial leverage rises, financial vulnerability also rises. This relationship is valid for all stages. Financial leverage brings additional risks to the firms besides its benefits. This result supports the Hypothesis 3.

Hypothesis 4: The impacts of leverage on financial risk is larger at introduction-growth firms and shake-out-decline firms than mature firms.

According to the results, the impact of leverage is larger on financial vulnerability of introduction-growth firms and decline firms than mature firms. This supports the Hypothesis 4. Since the mature firms have more stable cash inflows and less uncertainties, the impact on these firms is limited compared to other stage firms.

Hypothesis 5: As the dividend payout ratio gets bigger, financial risk of introduction-growth firms increases.

Hypothesis 6: As the dividend payout ratio gets bigger, financial risk of shake-out-decline firms decreases.

It is expected that there is a positive relationship between financial risk and dividend payout ratio for growth firms, and opposite relationship for decline firms. However, the results do not show any significantly important relationship as expected.

CONCLUSION

Whether operating not compatible with life cycles has an impact on firm vulnerability is an important issue for the managers. On the corporate finance ground, there are three fundamental policy areas which are investing, financing, and dividend payout. Firms' prioritizations should be changed according to their life cycles. Considering that the main target of growth firms is growing, they have a certain degree of operating risks. In this condition, it is evaluated that they shouldn't engage with activities that rises financial risk too. So, these firms should primarily focus on investment activities, and keep away from getting debt and paying dividend, which may hinder growth and increase financial risks. On the other hand, mature firms have a more stable profit and cash inflows. In this regard, they should focus on benefiting from advantages of getting debt and target to reach the optimal capital structure. So, their primary policy area should be financing. Lastly, there is a downward trend in profitability of decline firms. Also, new investment opportunities are limited for them. So, if they do not have feasible investment opportunities, they should focus on dividend policies and make dividend payments back to their shareholders.

Within this framework, it is predicted that the impacts of variables representing investment, financing, and dividend on financial vulnerability differ across the life cycles. The relationships between EMZ Score and other control variables are as expected and significantly important. We find supportive results for all the hypothesis except the dividend policy. According to that:

- An increase at the ratio of investments to equity affects both introduction-growth firms and shake-out-decline firms negatively,
- There is a positive relationship between financial fragility and leverage for all stage firms, and this relation is sounder for growth firms and decline firms compared to mature firms,
- It is not detected any statistically significant relation between financial fragility and dividend policy.

Table 12: Comparison of Established firms and shutting down firms (last 5 years)

	Established Firm	Shutting Down Firms	Shutting Down Firms / Established Firms
2022	142.214	24.303	%17
2021	111.125	17.184	%15
2020	102.794	15.949	%16
2019	85.263	14.050	%17
2018	86.349	13.593	%16
2017	73.783	14.701	%20

Source: TOBB

Table 13: The share of corporations and limited firms in shutting down firms

	Corporation		Limited Firm	
	Amount	Rate	Amount	Rate
2022	3.544	%15	19.573	%81
2021	2.899	%17	13.282	%77
2020	2.832	%18	12.473	%78
2019	2.556	%18	10.584	%75
2018	2.436	%18	10.067	%74
2017	2.322	%16	11.127	%76

Source: TOBB

It is seen that tens of thousands of firms had to shut down every year. Both micro and macro factors may play important roles here. However, the fundamental reason of firm defaults is bad management. The managers should see the competition environment well and take necessary actions proactively. Due to wrong strategical choices, inappropriate financing policies, false investments, not understanding the expectations of customers, inability to find right solutions for necessaries, bad organizational structures, firm managers cannot maintain efficiency and sustain competitive advantages at many firms. The needs of firms change according to their life cycles, and the policies should be designed based on well-directed policies. In this regard, it is significant to detect the life cycle of a firm correctly.

It is believed that these findings support the idea that firm life cycles should be taken into consideration when determining strategies. It is important to include life cycle phenomenon into prospective studies to get new perspectives. Additionally, such studies may also consider firm life cycles using different financial distress models apart from the Z-score.

AUTHOR STATEMENT / YAZAR BEYANI

Researcher(s) have jointly contributed to the article. Researcher(s) have not declared any conflict of interest.

Araştırmacı(lar) makaleye ortak olarak katkıda bulunduğunu bildirmiştir. Araştırmacılar herhangi bir çıkar çatışması bildirmemiştir.

REFERENCES

Adizes, I. (1979). Organizational passages – Diagnosing and treating lifecycle problems of organizations. *American Management Associations, 8*(1), 3-25. doi: 10.1016/0090-2616(79)90001-9.

Alfaro, L., Asis, G., Chari, A. & Panizza, U., (2019). Corporate debt, firm size and financial fragility in emerging markets. *Journal of International Economics, 118,* 1-19. doi: 10.1016/j.jinteco.2019.01.002.

Altman, E.I. (2005). An emerging market credit scoring system for corporate bonds. *Emerging Market Review, 6,* 311-323. doi: 10.1016/j.ememar.2005.09.007.

Altman, E.I., Iwanicz-Drozdowska, M., Laitinen, E.K., & Suvas, A. (2016). Financial and nonfinancial variables as long-horizon predictors of bankruptcy. *Journal of Credit Risk, 12*(4), 49-78. doi.org/10.21314/JCR.2016.216.

Bansal, S., & Thenmozhi, M. (2020). Does concentrated founder ownership affect board independence? Role of corporate life cycle and ownership identity. *Pacific-Basin Finance Journal, 62*, 2-18. doi: 10.1016/j.pacfin.2020.101377.

Bhattacharya, D., Chang, C-W, & Li, W-H. (2020). Stages of firm life cycle, transition, and dividend policy. *Finance Research Letters, 33,* 1-12. doi: 10.1016/j.frl.2019.06.024.

Blomkvist, M., Löflund, A., & Vyas, H. (2021). Credit ratings and firm life-cycle. *Finance Research Letters, 39,* 1-5. doi: 10.1016/j.frl.2020.101598.

Campbell, J.Y., Hilscher, J., & Szilagyi, J. (2005). In search of distress risk (Harvard University Discussion Paper No. 2081). doi: 10.2139/ssrn.770805.

Cao, Y. (2012). MCELCCh-FDP: Financial distress prediction with classifier ensembles based on firm life cycle and choquet integral. *Expert Systems with Applications, 39,* 7041-7049. doi: 10.1016/j.eswa.2012.01.043.

Damodaran, A. (2014). Applied corporate finance (3rd Edition). New Jersey: John Wiley & Sons Inc.

DeAngelo, H., DeAngelo, L, & Stulz, R.M. (2006). Dividend policy and the earned/contributed capital mix: a test of the life-cycle theory. Journal of Financial Economics, 81, 227-254. doi: 10.1016/j.jfineco.2005.07.005.

Dickinson, V. (2011). Cash flow patterns as a proxy for firm life cycle. *The Accounting Review, 86*(6), 1969-1994. doi: 10.2308/accr-10130.

Dickinson, V., Kassa, H., & Schaberl., P.D. (2018). What information matters to investors at different stages of a firm's life cycle? *Advances in Accounting, 42,* 22-33. doi: 10.1016/j.adiac.2018.07.002.

Faff, R., Kwok, W.C., Podolski, E.J., & Wong, G. (2016). Do corporate policies follow a life-lycle? *Journal of Banking & Finance, 69,* 95-107. doi: 10.1016/j.jbankfin.2016.04.009.

Gardner, J.W. (1965). How to prevent organizational dry rot. *Harper's Magazine.* Retrieved from https://harpers.org/archive/1965/10/how-to-prevent-organizational-dry-rot/

Güleç, Ö.F., & Karacaer, S. (2018). Corporate life cycle theory and accounting performance: Borsa Istanbul case. Muhasebe ve Finansman Dergisi, (78), 265-279.

Güleç, Ö.F., & Arda, I. (2019). Investigating of cash flow profiles: Evidence from Turkey. *Muhasebe ve Finansman Dergisi,* Özel Sayı, 555-568. doi: 10.25095/mufad.607209.

Haire, M. (1959). *Modern organization theory*. Washignton DC: John Wiley.

Hasan, M.M., Hossain, M., & Cheung, A. (2015). Corporate life cycle and cost of equity capital. *Journal of Contemporary Accounting&Economics, 11,* 46-60. doi: 10.1016/j.jcae.2014.12.002.

Hasan, M. M., & Cheung, A. (2017). Organization capital and firm life cycle. *Journal of Corporate Finance, 48,* 556-578. doi: 10.1016/j.jcorpfin.2017.12.003.

Hasan, M. M., & Habib, A. (2017). Firm life cycle and idiosyncratic volatility. *International Review of Financial Analysis, 50,* 164-175. doi: 10.1016/j.irfa.2017.01.003.

Koller, T., Goedhart, M., & Wessels, D. (2010). Valuation measuring and managing the value of companies (5th Edition). New Jersey: John Wiley & Sons Inc.

Lizal, L. (2002). *Determinants of financial distress: What drives bankruptcy in a transition economy? The Czech Republic case* (William Davidson Working Paper No. 451). doi: 10.2139/ssrn.307224.

Sayılgan, G. (2017). *Soru ve yanıtlarıyla işletme finansmanı*. Ankara: Siyasal Kitapevi.

Seifert, B., & Gönenç, H. (2012). Issuing and repurchasing: The influence of mispricing, corporate life cycle and financing waves. *Journal of Multinational Financial Management, 22,* 66-81. doi: 10.1016/j.mulfin.2012.02.001.

Shahzad, F., Lu, J., & Fareed, Z. (2019). Does firm life cycle impact corporate risk taking and performance. *Journal of Multinational Financial Management, 51,* 23-44. doi: 10.1016/j.mulfin.2019.05.001.

Shahzad, F., Fareed, Z., Wang, Z., & Shah, S.G.M. (2020). Do idiosyncratic risk, market risk, and total risk matter during different firm life cycle stages?. *Physica A: Statistical Mechanics and Its Applications, 537,* 1-18. doi: 10.1016/j.physa.2019.122550.

StreetFins (2022, 8 Eylül). Corporate life cycles. Retrieved from https://streetfins.com/corporate-life-cycles/

Sudarsanam, S., & Lai, J. (2001). Corporate financial distress and turnaround strategies: an emprical analysis. British Journal of Management, 12, 183-199. doi: 10.1111/1467-8551.00193.

Türkiye Odalar Borsalar Birliği (8 Eylül 2022). Kurulan/kapanan şirket istatistikleri. Retrieved from https://www.tobb.org.tr/BilgiErisimMudurlugu/Sayfalar/KurulanKapananSirketistatistikleri.php

Turetsky, H.F., & McEwen, R.A. (2001). An emprical investigation of firm longevity: A model of the ex ante predictors of financial distress. *Review of Quantitative Finance and Accounting, 16,* 323-343.

Whitaker, R.B. (1999). The early stages of financial distress. *Journal of Economics and Finance, 23,* 123-132.

Xu, M., & Zhang, C. (2009). Bankruptcy prediction: the case of Japanese listed companies. *Review of Accounting Studies, 14,* 534-558. doi: 10.1007/s11142-008-9080-5.