THE IMPACTS OF FIRM SIZE AND THE RATIO OF BOOK VALUE TO MARKET VALUE ON LIFE DURATION OF FIRMS

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Abstract

As the entry to the competition is important for a firm, the life duration to achieve their goals on economic development is equally important. So the purpose of the present study is to investigate the influence of two factors of firm size and the ratio of book value to market value (BV/MV) on life duration of a firm. In this research, financial data and statements of the companies listed in Tehran Stock Exchange bankrupted during a 10-year period (2006-2016) were used. The firms were divided into two groups of large and small ones in order to use survival function by Kaplan-Meier method and finally, data obtained was analyzed using a semi-parametric test of Cox regression and Breslow test. The results show that survival function in Kaplan-Meier method supports the survival of larger companies with life duration of more than 20 years than small firms. There is also a significant relationship between firm size and BV/MV with life duration of a firm at 95% confidence.

Keywords: *firm size, ratio of book value to market value, life duration.*

Introduction

Many studies have been performed on the industry dynamics, and the process by which a company survive and grow, or go out of an industry. These studies seek to find answers to this question that what is going on following companies enter the competition (in terms of their likelihood of survival and growth pattern). Large organizations have advantages in that they may benefit from capital increase (statutory), may have better conditions to hire labor force or face with better tax conditions. Some believe that the lower the costs, the higher the likelihood of survival will be. The others believe that companies who aren't able to adapt themselves with the new competitive environment that is always associated with innovation and initiative will be forced to leave the competition. A number of studies have found that death (failure) of a company decreases

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as their age increases. What can't be ignored is that life duration and tenure is important as much as entering the industry because life duration has important effect on achieving long term goals in employment and economic growth. So those factors playing a role in the life duration and survival of the company should be identified for scholars and policymakers to be able to improve life duration of firms as a result of economic conditions, the level of employment by strengthening and promoting such attributes and opportunities, and find a solution for losses and stabilization of employment and prevent their exit (bankruptcy) and wanderings in the industry of the country. In fact, it is relatively easy to enter the market but to be survived is not easy that much. The problem that we face in this study is that factors affecting the company's life duration have been addressed very few in Iran so we sought to identify factors affecting duration life of a company. To this end, it is assumed that two variables of firm size and BV/MV ratio can be among the factors affecting life duration of a company.

Firm Size

Firm size may be a global variable (overall), which can represent many different aspects of a company in different studies. On one hand, firm size can reflect leverage of a company. Leverage is the presence of fixed costs in the list of company's costs. And on the other hand it can show the ability of management and the quality of the accounting schemes. There are different views on the firm size. These views are largely due to people attitudes. They consider different indicators as firm size the most major of which are: a) annual sales volume of the company, b) total assets, c) market value of corporate shares.

The Ratio of Book Value to Market Value

Most of researches have emphasized the importance and role of BV/MV ratio. The ratio is obtained by dividing of book value of shares by market value of shares. Book value of shares is obtained by total equity in the balance sheet and market value of shares is obtained by market value of a share (panel price) times by total number of shares. One perspective suggest that the difference between book value and market value is called confidence interval; the more it is, the less the investor will lose from irrational and unreasonable fluctuations of the market. Companies with larger shares BV/MV is likely to take more risk because with a shock in the market, the market value will be close or equal to book value. So it can be reasonably assumed that larger BV/MV is associated with more risk. From another perspective, however, as the ratio is smaller it indicates that this is a long time since the company have been founded and since the vast majority of companies don't incline to reevaluate their assets due to tax matters, this leads to dramatic differences between market value and book value.

Review of Literature

There have been much researches performed in different countries on corporate life duration and its effective factors. For example Adersh and Mahmud (1995) related after foundation performance of companies with their specific characteristics in addition to their technological environments and market structure and used hazard life duration model with the approach of identifying how initial size and technology affect the ability of new firms to survive over time in United States manufacturing companies and as expected they found that as the initial size of a firm is larger, the exit rate is reduced. Also Pearson (2002) believes that new companies face with a high risk of failure and the

probability of survival of newly established companies increases as their age and size increase. Later Steve Perez (2004) studied life duration of manufacturing firms and its effective factors and assumed that some variables such as advertising and R&D activities are effective in the survival of a company. His results indicated that the exit risk increases up to about twenty years and decrease afterwards. In addition, exporter companies in which extensive R&D activities and advertising are performed have greater chance to be survived. Research in this area has been also performed in Iran, for example Tari (2007) studied the role played by initial capital in the survival of manufacturing firms. In his research, the variable initial firm size has been considered as a factor influencing the survival of the firm. He found a positive relationship between initial size and the survival of a firm and also concluded that there was a significant difference between survival functions of manufacturing companies. In another research, Nasiri (2009) conducted a study between 1981 and 2007 to examine industry characteristics in the survival of a company so it supported a significant relationship between industry growth rate, average size and entry rate with the survival of the company. Also a comparison between survival functions of companies and according to average entry rate to the industry and between survival functions of companies present in different industries was performed in this study.

Hypotheses
- Firm size affects its life duration.
- BV/MV affects life duration of a company.

Research Methodology

The present research is deductive-inductive research. The relationship between variables is correlation and it is cross sectional. In view of data collection it is historical since financial statements of business units are extracted and it is applied research. Having extracted data from financial statements of companies and calculated variables and initial processing, data was analyzed using SPSS software. First survival functions for two groups of firms were plotted using product limit estimator (Kaplan-Meier) and then corporate behaviors in the desired time period were studied after the initial analysis of survival functions, so a comparison was conducted between survival functions of two groups. To test the hypotheses, first each hypothesis was tested at error level of 0.50 using Breslow test and then suing COX regression, simultaneous effect of two variables on the lifetime were investigated.

Statistical Population and Sample

Statistical population of the present research included all companies listed on the Stock Exchange from 2006 to 2010 which meet the following criteria-
- They are manufacturing companies.
- The fiscal year didn't alter during abovementioned years.
- The financial year ended in 29 Esfand.

The sample was selected among bankrupted companies in the respective interval using the following formula.

Independent Variable

- Firm size: it was calculated according to the logarithm of annual sales volume of the company.
- BV/MV: it is obtained from dividing book value of equity by its market value. Book value of equity is obtained by the sum of equity represented on the balance sheet.

Dependent Variable

Survival (duration) of a company is measured based on its years of activity (the distance between the entry to the industry and the first year failed in the period). In this research, bankruptcy date is considered as date of failure according to Article 141 of Commercial Code of Iran.

The Classification of Companies

In this research in order to compare their survival functions, companies were classified by the logarithm of sales volume into large corporations and other enterprises (SMEs). For simplification in this study the general term "small companies" was used instead of SMEs.

Table 1
Classification of Companies According to Sales Volume in a ten-year
Period 2006 till 2016

N	Valid	101
	Missing	0
Percentiles	25	4/5059
	50	4/9195
	75	5/3760

Data Analysis

The indicators mean, range and standard deviation were studied and kolmograph - Smirnov test was used to assess the normality of observations. Normality of observations was tested for all 3 variables (logarithm of sales volume BV/MV and lifetime).

Table 2
Descriptive Statistics of Variables

	Frequency	Range	Mean	Standard Deviation
lifetime	101	72.00	33.9514	12.92492
logarithm of sales volume	101	4.96	4.8970	.73398
BV/MV	101	39.19	-.8497	3.73645
Valid N (listwise)	101			

When analyzing survival functions, the researcher often has to compare survival functions with each other and check whether there are significant differences between them. There are two ways. The first way consists of plotting survival functions and then testing out whether they overlap in which lifetime table and product limit estimator (Kaplan-Meier) can be used. Second way is to calculate specific statistics in order to

compare survival functions. Since these methods don't consider any assumptions about process distribution, so they are especially suited for initial analysis of data. In this research, Kaplan - Meier method was used for plotting survival function and Breslow test for calculating the test statistic.

Product Limit Estimator

Product limit estimator (Kaplan–Meier) is considered as an important tool in analyzing censored survival data, i.e. data in the respective period involved in bankruptcy or exit and dissolution.

H1:   firm size affects its life duration.   To test H1 in this research, Kaplan – Meier method was used the results of which are shown in table 3.

Table 3
Estimation of Median and Mean for Small and Large Firms

Kaplan-Meier	Mean[a]				Median			
	Estimate	Std. Error	95% Confidence Interval		Estimate	Std. Error	95% Confidence Interval	
			Lower	Upper			Lower	Upper
SMEs	33.231	1.263	30.756	35.707	33.000	1.385	30.285	35.715
Large firms	36.111	2.038	32.117	40.105	39.000	1.193	36.663	41.337

The results of above table indicate that the estimation of mean for lifetime of small firms considering firm size is 33.23 which is less than that of large firms with 36.11. In other words, small firms have almost less survival than large firms. It should be noted that significant difference between survival times of firms was tested by Berslow test used for testing equality of two survival functions in two groups. Prior to Berslow test, diagrams of survival functions for small firms (denoted by 0) and large firms (denoted by 1) extracted from Kaplan-Meier method are presented:
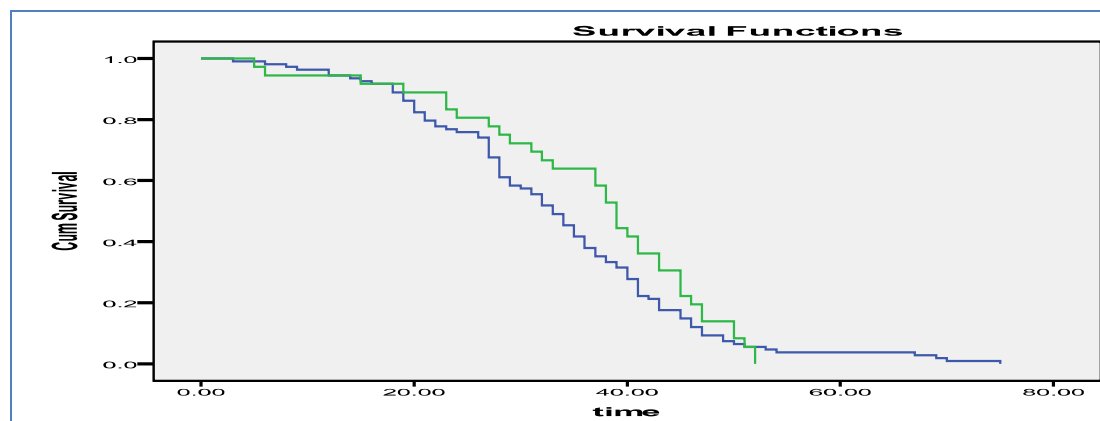

Diagram1: diagram of survival function by size for two groups of firms

Diagram 1 indicates that during a life time of less than 20 years, small firms have greater survival time than large firms. It should be noted that respective diagrams have been plotted considering firm size. Berslow test was used to study two survival functions the results of which are shown in table 4.

Table 4
Berslow Test for the Comparison of the Difference Between Survival Functions of Small and Large Firms in Proportion to Firm Size

	Chi-Square	Df	Sig.
Breslow (Generalized Wilcoxon)	4.094	1	.043

The above results indicate that Chi-squared statistic related to Berslow test is $\chi^2_{(1)} = 4.094$ which is more than that of Chi-squared table at 95% confidence so the hypothesis of equal survival function for two groups was rejected and the first hypothesis "firm size affects lifetime of company" was supported at 95% confidence (<0.05, $p-value = 0.043$).

H2: BV/MV affects life duration of a company. To test H2 in this research, Kaplan – Meier method was used the results of which are shown in table 5. The results of above table indicate that mean of lifetime for small firms considering BV/MV is estimated 34.971 which is more than that of large firms with 31.205. In other words, firms with lower BV/MV have almost more survival than firms with higher BV/MV. It is also true for median, the more BV/MV, the higher the estimation of median will be.

Table 5
Estimation of Median and Mean for Small and Large Firms by BV/MV

Kaplan-Meier	Mean[a]				Median			
	Estimate	Std. Error	95% Confidence Interval		Estimate	Std. Error	95% Confidence Interval	
			Lower	Upper			Lower	Upper
Small firms	34.971	1.257	32.509	37.434	35.000	1.463	32.132	37.868
Large firms	31.205	2.053	27.182	35.228	32.000	3.746	24.658	39.342

As with pervious case, diagram obtained from this method is shown in diagram 2.
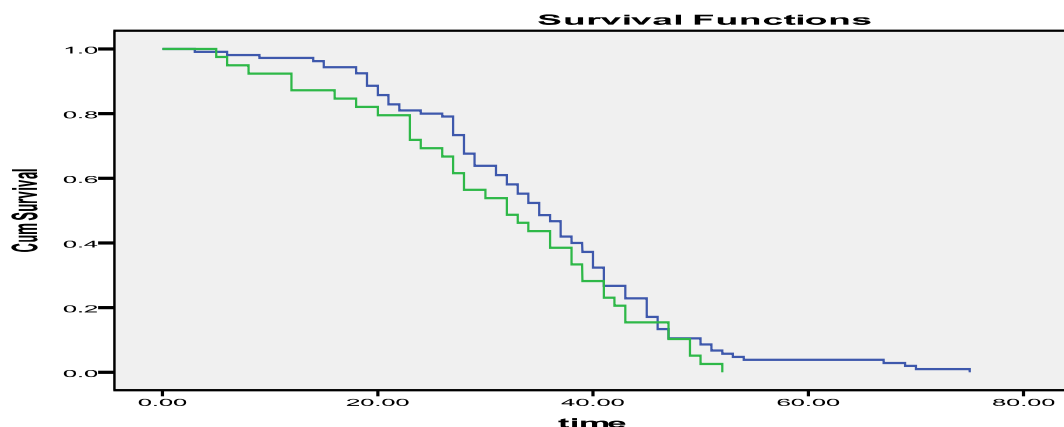

Diagram 2: diagram of survival functions by size for two groups of firms

The above diagram shows companies with lower BV/MV have greater survival time. In other words, firms with low BV/MV have low risk function (risk) and takes longer time to be bankrupted. Having reviewed survival functions graphically, survival functions in small and large companies were examined using Breslow test with respect to BV/MV the results of which are presented in the following table.

Table 6
Berslow Test for the Comparison of Difference Between Survival Functions in Small and Large Firms in Proportion to BV/MV

	Chi-Square	df	Sig.
Log Rank (Mantel-Cox)	2.593		.086
Breslow (Generalized Wilcoxon)	4.520	1	.033
Tarone-Ware	3.941	1	.047

The above results indicate that Chi-squared statistic related to Berslow test is $\chi^2_{(1)} = 4.52$ which is more than that of Chi-squared table at 95% confidence so the hypothesis of equal survival function for two groups was rejected and the hypothesis "firm size affects lifetime of company" is supported at 95% confidence (<0.05, $p - value = 0.033$).

Cox Regression Analysis

Cox Regression or proportional hazards models (relative risk models) is used to analyze the time to examine simultaneous effect of independent variables of the impact of firm size and BV/MV on dependent variable, life duration (survival time). In fact, in order to determine survival time-dependent predictor functions, hazard function modeling is used. Since $h(t)$ is a positive function, logarithm of hazard function is expressed as a linear function of explanatory variables:

$$LN[h(t)] = \beta_0 + \beta_1 x_1 + \beta_1 x_2 + \varepsilon_t$$

The results of examining two models are shown in tables 7 and 8.

Table 7
Statistics of Likelihood Approach

-2Log Likelihood	Overall (score)			Change From Previous Step			Change From Previous Block		
	Chi-square	df	Sig.	Chi-square	df	Sig.	Chi-square	df	Sig.
1118.462	7.946	3	.047	10.828	3	.012	10.828	3	.012

The results of the above table indicate that independent variables had significant effects on the dependent variable, life duration (survival time). In other words, log likelihood statistic (-Log Likelihood=1118.462) which has a chi-square distribution with 3 degrees of freedom is greater than the corresponding value in chi-squared table. Therefore, firm size and BV/MV as independent variables simultaneously influence on lifetime. Cox model regression coefficients are given in Table 4–12.

Fitted model: LN (survival time) = $\beta_1 \times$ (firm size)+ $\beta_2 \times$(BV/MV)

By substituting the Cox model regression coefficients, fitted model will be as follows:

LN (survival time) = $0.125 \times$ (firm size) + $0.230 \times$(BV/MV)

Considering significant level proportional to Cox model coefficients, independent variables have significant effects on lifetime; however, variables effects are different considering regression coefficients for each indicator. Table 8 indicates as the parent index value is lower the variable corresponding to the indicator has more effect and considering significant level, both variables have significant effects $(p-value < 0.05)$.

Table 8
Estimation of Cox Model Regression Coefficients

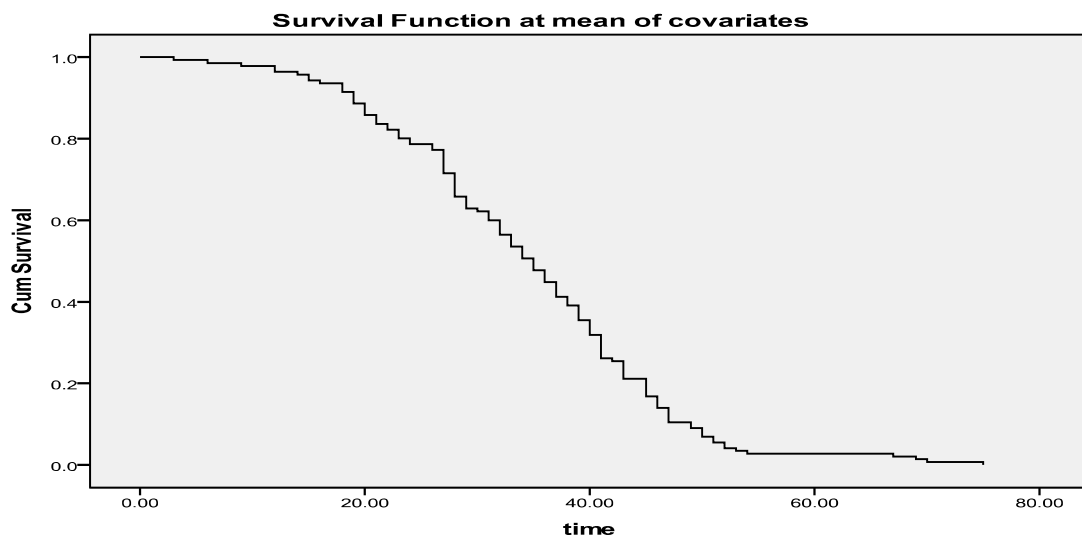|	B	SE	Chi-square	Df	Sig.
Firm size	.125	.012	3.923	1	.047
BV/MV	.230	.030	4.123	1	.042

Diagram 3: Survival Function Fitted for Observations with Cox Model

Discussion and Conclusion

The results of testing first hypothesis showed that as firm size is larger, lifetime (survival) of the firm will be longer because when a firm size is larger, it is more likely for a firm to employ financial resources in order to overcome financial distress and market shocks. In addition, large organizations have advantages to be able to increase statutory capitals which can help them in economic crisis [9]. In this regard, reviewing survival functions in two groups of small and large manufacturing companies indicated that survival function for small firms was higher than that of large firms up to 20 years; however, it decreases afterwards. In other words, small firms can survive up to 20 years; afterwards their life span decreases and exit from the industry due to bankruptcy. However, it is vice versa for large companies; failure rates are high up to 20 years and then it decreases evenly which is likely due to life cycle and characteristics of firms at

different stages of life cycle which is consistent with the findings of some studies including Steve Perez (2004). According to researches performed including Mata and Portugal (2000) survival probability of companies follows a U-shaped pattern which is attributed to two phenomena of youth and old-age responsibility the reasons of which include: companies in the early days are protected from failure due to resources they possess; however, at the end of the period hazard rate (failure) becomes maximum because their resources have been ran out. If companies can pass the period safely, afterwards exit rate decreases significantly. The reason why survival probability is higher for small manufacturing firms up to 20 years than large firms may be that according to Pen Roz such companies have high flexibility and low margin costs (R&D and advertising).

In the second hypothesis, survival functions for two groups plotted using Kaplan-Meier method indicated that survival function for small firms is higher than that of large firms. In other words, firms with lower BV/MV have higher survival time than firms in which BV/MV is higher because as BV/MV is lower firms have more financial power and less risk so it has longer life duration. However, some scholars believe that BV/MV reflects future potential growth of the firm so that when a company is expected to grow in the future, book value can't represent the company's growth potential due to the nature of accrual accounting so it is reflected in market value leading the ratio to be small in these firms. In fact, investors are optimistic about the companies that have performed well in the past and are skeptical about the companies that had bad performance. At the same time, it can be stated that as the ratio is smaller, it shows that it has passed a long time since the firm founded and because the most majority of firms don't incline to revaluate their assets due to tax matters, so this leads to significant difference between market value and book value. A company that gained reputation after some time since it has been founded, if this reputation is not recorded in financial books but is reflected in market value, there will be a difference between book value and stock market value.

Therefore, it is recommended that these two variables to be considered important when evaluating life duration of companies and small firms in early years of activity would be more supported by the government to be able to prevent crises occurred in the early years of entry to the competition leading them to exit and good conditions and grounds should be provided to survival of companies and employment be increased, businesses boomed and companies can achieve long term goals.

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