Effect of Firm Life Cycle Theory on the relevance of Risk Measures

Abdollah Amiri[a], Parviz Saeidi[b] *

Department of Public Management, Bojnourd Branch, Islamic Azad University, Bojnourd, Iran
Department of Management and Accounting, Ali Abad Katoul Branch, Islamic Azad University, Iran

Abstract

Risk phenomenon is one of the key characteristics of decision making in the fields of investment, issues associated with financial markets, and various economic activities. The present study was an attempt to evaluate the impact of different periods of life cycle of companies on the relevance of risk measures of companies. In this study, the collected data have been analyzed in three stages. First, the statistical sample companies were selected using the elimination method. Then, the companies were divided into the stages of creation, growth, maturity, recovery, and decline using the Dickinson Cash Flow Pattern [1]. In the next step, the effect of risk measures was investigated in each stage and the stock return was utilized as a dependent variable. In order to test the research hypotheses, the Kolmogorov-Smirnov (K-S) test and the parametric multivariate regression method were used to check the normal distribution of data and to test the assumptions, respectively. The results of 406 year-company during the period of 2005-2015 indicated that the relevance of risk measures as well as the increasing explanatory power of risk measures in different stages of life cycle (birth, growth, maturity, recovery, and decline) have a significant difference with each other.

Keywords: Firm Life Cycle, Risk measures, Stock returns, Cash transactions

1. Introduction

The overall structural goals of most organizations include profitability, growth, and survival. However, based on the importance of these three goals for the company, their position may change over time (UNESCO and Nagrasa, 5, 2007).

The company's life cycle is one of these economic characteristics. According to the theory of the life cycle, companies have financially and economically distinct patterns and behaviors in different stages of their life cycle, meaning that the financial and economic characteristics of a company are affected by the stage of the life cycle in which the company is positioned [2]. With the recognition of the life cycle and the characteristics of the sample companies, one can help senior executives of companies in each period of their life cycles to recognize the extent of the growth the company must have. However, if companies identify different stages of their product's life cycle and devise specific financial strategies and measures at every stage, they will be prepared for the most difficult stage, i.e. the decline stage, and will prevent stopping.

According to Hanks (1990): "[Company life cycle knowledge] can provide a road map, in addition, identification of important organizational transitions as well as traps

---

and problems in the organization needing tracking, which prevent their growth in size and composition, contribute to recognition of management when we leave past strategies or manners that prevent future growth." In different stages of their life cycle, companies encounter different environments, adapt with different policies, and exhibit different performances (Yan and Zeo, 2009).

Risk phenomenon is one of the key characteristics of decision-making in the fields of investment, financial market affairs, and various economic activities. In most books in the field of economy, the three factors of labor, land, and capital are considered to be the main inputs of production. In some studies, risk is referred to as the fourth factor in the production process (Mesbahi Moghaddam, 2009).

The incidence of September 11, 2001 in New York, the wars between different countries worldwide, the global economic crisis in 2008, variations in macroeconomic variables (fluctuations of oil price, interest rates, and inflation rates) since 2006 so far on the entire stock market (capital market) of Iran, the national currency equality rate against foreign currencies, monetary and financial policies, and political situations are examples of sources of systematic risk that any change in the these factors affects the overall market conditions (Vakili Fard, 18, 2017) .

In Iran, in particular in companies admitted to the Tehran Stock Exchange, some companies that have suffered from a financial crisis and some of them may be unable to repay their debts and may not have the necessary profitability and yield to cover costs; in addition, the resources that could be used in these companies in profitable opportunities for creating value and increasing the wealth of shareholders and investors, may have been lost, and in general, have a negative effect on macroeconomic indices.

Based on the results of the study by Blake (1998), some accounting research indicated that investors, creditors, and financial analysts use the concept of life cycle in their assessments of the company. Knowledge on the company's specific growth stage and recognition of the stage in which the company is, allows the users of accounting information to provide a better evaluation of the company's financial information, current and future needs, and management capabilities (Roodaki et al., 2009). The results of previous studies have revealed that the response of capital markets to accounting information varies in different stages of the life cycle. Regarding the above issues, it is expected that the relevance of risk and performance criteria of a stage of life cycle to another stage of the life cycle differ. In the current investigation, the aim is to answer the question that: how do the different stages of the company's life cycle impact the relevance of the risk measures?

Taking into account the above issues, the main objective of this study is to examine the impact of different life cycle stages of the company on the relevance of risk measures. In this research, the risk measures, stock return, and the company's life cycle are considered as independent variables, dependent variable, and moderator variable, respectively. In the following, the concepts of risk and its measures and the life cycle of the company as well as the characteristics of its various stages will be briefly reviewed. In addition, the categorization of companies into each stage of the life cycle will be described, and finally the research hypotheses will be tested using multivariate regression tests and Wang statistical test.

2. Literature review

Risk is one of the return characteristics, in other words, risk is one side of the coin with the other side being the return. In modern financial management, one of the basic principles is that the return should be in a reasonable balance with risk [21].

The risk quantification was first introduced by Markowitz. To quantify and measure the risk, various criteria have been presented so far, including range of variation, interquartile domain, variance, standard deviation (SD), mean absolute deviation, and semi-variance. One of the most common of these criteria is variance and the beta calculated based on it [23].

Essentially, investments are risky due to the fluctuations emerging in their returns. Financial economists have presented different models for risk measurement.

Markowitz securities portfolio theory

The original model of securities portfolio was developed by Harry Markowitz. For the first time, he deduced the expected return rates and risks for the portfolio of assets. He showed that the deviation of the return rate was a suitable criterion for the risk of the portfolio of securities under a set of reasonable assumptions and explained a method for calculating the risk of the portfolio of securities. This formula for the standard deviation of the portfolio of securities not only indicated the importance of diversification of investments to reduce the overall risk of portfolio of securities, but also specified the efficient diversification.

The Markowitz analysis using a set of inputs leads to identification of an efficient portfolio. These inputs are:

1. Expected return E (R) for each desired security

2. Standard deviation of returns SD (R) as the risk criterion of each of the securities

3. Covariance among expected returns (Heybati et al., 2011).

Capital asset pricing model (CAPM)

The theory of capital market extracts a model for pricing of the risky assets by expanding and generalizing the portfolio theory. The final output of this theory, called the CAPM, allows for the rate of return on any risky asset to be determined. The main factor leading to the expansion of capital market theory is the concept of risk-free assets. In general view, it can be stated that the CAPM model was formed based on the capital market theory.

The CAPM model is a regression-based pricing model with an equation as follows:

$Kj = Rf + \beta (Rm-Rf)$

Where:

R_f: Risk-free return rate

B: Sensitivity coefficient

R_m-R_f: Risk premium

The important and determining factor in this model is the beta coefficient, which is crucial for measuring the ability to explain and compare the real return rate. The beta coefficient specifies the sensitivity of excess expected returns on assets relative to the expected market returns obtained based on the Sharp model using the following equation:

$$\beta = \frac{Cov(ri.rm)}{Var(rm)}$$

CAPM contributes to the calculation of the investment risk and expected rate of return. The risk-free return rate is the starting point for this model. The reward rate is added to this rate and investors expect it due to taking more risk (Fathi et al., 28, 2012).

Sharp index (factor) model

William Sharp (1961) presented a single-factor model as a risk factor through explaining beta. The advantage of Sharp's single-factor model is the simplicity and reduction of data required to select a portfolio and provide a new measure of risk for investment. In addition, the single-factor model is a statistical model for expressing the process of calculation of the stock returns. The essential concept in the single-factor model is that all securities are affected by the general market volatility, as similar economic forces affect the future of most companies (Fazlzadeh, 44, 2012).

The single-factor model correlates the returns of each security to the return on the ordinary stock index. The single-factor model is:

$$R_{it} = \alpha_i + b_i R_{mt} + e_{it}$$

R_{it} = Random return TR of securities i in period t

α_i = fixed income security

b_i = Sensitivity of stock return to market index return

R_{mt} = Random return TR of market index in period t

e_{it} = Random error in period t

In order to estimate the single-index model, the total returns of the stock i can be adjusted and regressed according to the total return index. In the single-index model, it is assumed that the market index is not related to the error rate.

$$R_{it} = \alpha_i + b_i R_{mt}$$

It is also assumed that the securities are only affected by their reaction to market returns. This means that the errors i and j do not correlate and all the correlation between the returns on the securities is reflected in the expression of β. This is one of the key assumptions of the single-index model, meaning that the securities are influenced by their relationship with the market index, and other factors are not involved [23].

Risk measures

To quantify and measure the risk, various criteria have been proposed so far, including range of variations, interquartile domain, variance, SD, mean absolute deviation, and semi-variance. One of the most common of these criteria is the variance and beta calculated based on it. To calculate SD, after calculating the mean of data, the deviation of the data from the mean is calculated and the average sum of the squares of these deviations is presented as a risk measure. However, any deviation from the mean cannot be considered as a risk. In order to eliminate this shortcoming, the semi-variance and beta calculated based on it can be exploited as a downside risk criterion [23].

In this framework, the behavior of investors maximizes the desirability function, which depends on the mean and variance of the portfolio return. In this model, variance is

considered as a risk criterion [21]. Another reason for using downside risk measures is the possibility of the abnormal distribution of the returns on stock, in which case ordinary variance and beta cannot meet the expectations of risk analysts [23]. The CAPM is one of the most important models influencing financial knowledge. One of the fundamental challenges of this model is the suitability of the beta index for risk measurement. Beta as a risk measure is based on the assumption that there are equilibrium conditions in the market in which investors reflect the behavior of the mean variance. In this behavioral framework, the CAPM model reflects the equilibrium in which investors maximize a desirability function that depends on two parameters of returns and return variance. However, there are three approaches for risk measurement, including volatility measures, downside risk measures, and upside risk measures [21].

The volatility-based criteria are based on the mean variance behavior, which draws investors' decision-making framework based on the return volatility and underlies modern portfolio theory. Within this framework, the volatility of return around the average is defined as risk. The upside risk measures are based on the assumption that upward movement of returns and thus the upward volatility of expected returns or average are also considered as risks. Moreover, a upside risk indicates the probability or potential of increasing the return on an asset or investment based on the percentage or amount that can be a measure of the attractiveness or desirability of that asset, and the greater the upside risk, the higher the attractiveness of the investment. The third criterion is the criterion based on the downside risk. This approach is based on the assumption of the asymmetry of returns and the different reaction of investors to volatilities below

and above the average. In this framework, which is the basis for the post-modern portfolio theory, it is believed that investors consider downward movement of return as a risk and the upward movement as an opportunity. In these measures, it is assumed investors prefer security of the capital over the acquisition of returns, and they are more likely to protect their capital than seeking returns. The downside risk measures the likelihood of a decline in the price of an asset or investment or the losses that can result from the potential price drop. A downside risk is the estimation of the potential of an asset to reduce prices at a time when the market conditions do not go well, or the amount of loss that may result in an investment. In other words, it is that part of the risk which has a negative effect on the investment. A downside risk is a risk measure that measures the difference between risk position and risk-free position and only considers unfavorable deviations [21].

Markowitz claimed that individuals are interested in minimizing downside risk for two reasons:

1. The only risk-related criterion is downside risk because investors first seek to protect their investment and they prefer to minimize the downside risk.

2. Revenues of the securities may not be distributed normally, and in these circumstances, the use of a downside risk criterion is more appropriate.

In 1959, Markowitz supported the semi-variance measure versus variance, as this criterion considered the downside risk. He believed that investors care about negative volatilities more than the positive ones, and hence, in their desirability function, losses got greater weights compared to the profits

(Markowitz, 1991). The behavior of investors toward downside losses and desirable profits differ. Therefore, investors who are very concerned about downside risk demand a risk premium to hold assets that have lower returns in comparison to the upward returns. Hence, it can be concluded that assets with a negative skewness are more vulnerable to loss, in other words, their downward returns have more absolute value than their upward returns. These assets will have less attractiveness for investors and will require more returns and will be priced less. Conversely, assets with a positive skewness which have more potential to profit in comparison to the probable losses, are more attractive and require less risk premium [21].

The company's life cycle theory has been used in the business literature since 1960. Companies face different environments at each stage of their life cycle and adopt different strategies (Miller and Friesen, 1984; [6]; [4]; Yan and Zeo, 2009).

Based on biological life, the nature of the life of organizations is as follows: organizations are born, they try to grow in various forms and methods, and eventually die. These steps are like a hierarchical progression involving a wide range of organizational strategies, activities, and environmental structures [18] & [19]. The development pattern occurring at each stage in an organization does not include the activities and structure present in the other stage (Finali, 2015).

Generally, most companies do not have the opportunity to trade and finance through investors and banks in the start-up stage. They need more investment and financing opportunities in the growth stage. At the maturity stage, development opportunities are less than the growth stage, however companies have a high amount of liquidity. When companies develop and fall into the

recession (decline) stage, they have limited growth opportunities and less profitability. In this stage, a number of companies are restored by investing in new production lines and technologies. Overall, from the growth stage to the decline stage, companies face investment opportunities and their liquidity levels increase (Yan and Zeo, 2009). Most likely, investment opportunities are evaluated less than the company's true value, and information asymmetry is created among the company's executives and investors (Myers, 1977; Dietmar, 2000). Most companies have a surplus liquidity and the biggest conflict emerge among the companies and their stockholders (Esther Brooke, 1984; Jensen, 1986). Thus, companies may have a motivation to reduce information asymmetry, or spend surplus liquidity on stock redemption (Yan and Zeo, 2009).

According to the theory of life cycle, [2] declared that companies have financially and economically certain characteristics and behaviors at different stages of their life cycle, meaning that the financial and economic characteristics of a company are affected by a stage of the life cycle the company is placed in [22].

According to Cosendis (2005), sales units with high sales growth and capital spending growth and low life are commonly known as growing business units. In addition, business units with a low sales growth and capital spending growth and longer life are recognized as declining business units. Moreover, mature business units lay between these two groups (Rahimian et al., 2015).

Noravesh (2011) stated that one of the issues that should be taken into account in financial reporting is to consider the qualitative characteristics of financial information so that individuals can choose the best solution. Having predictive value is

one of the qualitative characteristics that enhances the decision maker's ability to predict future outcomes of the company events [17].

Haghighat and Bashiri (2012) found that birth-stage companies perform release of low-risk capital and debt and maintain balanced leverage ratios, while companies at the growth stage are more flexible and use debt financing in addition to having high leverage ratios, in addition, companies in the maturity stage have high flexibility and rely on intra-organizational financing and maintain low leverage ratios [22] The five-stage model of life cycle in various studies is presented as follows.

Birth stage: Sometimes integration or investment leads to the creation of a new organization. However, an organization is often born in one of the following ways: The individual skills of a person develop, or an entrepreneur collects individuals to help promote a new idea, product, or service. In both cases, the main incentive tends to making profit (UNESCO and Nagrasa, 2007).

Growth stage: At the growth stage, the size of the company is larger than its size at the birth stage, in addition, sales and revenues are higher than the birth stage. Moreover, the major part of the financial resources is invested in income-generating assets and the company has more flexibility in liquidity indicators. The dividend ratio in this range of companies fluctuates usually between 10% and 50%. Furthermore, the internal rate of return (IRR) is higher than the cost of financing in most cases, in other words, the relation (IRR $\geq$ K) is established [2].

Maturity or stability stage: At the maturity stage, companies experience stable and balanced sales; in addition, cash requirements are mostly provided through internal resources and the volume of the assets of these companies is accordingly larger than the size of the companies at the growth stage, with the dividend profit of these companies usually fluctuating between 50% and 100%. Due to the abundance of liquidity and the decrease of reliance on external financing policy, the IRR in these companies is usually equal to or more than the financing rate; in other words, IRR $\geq$ K [2].

Recovery stage: At this point, companies perform changes in the structure of the organization in order to recover the surplus growth values they have experienced at the initial stage. Besides, companies at this stage have a very long lifecycle and are highly competitive with similar companies with market share. They adopt diverse and broad activities to deal with the decline in sales growth (Miller and Friesen, 1984). Companies tend to some unrelated markets that have already experienced in the early stages of their life cycle to achieve a significant increase in sales growth. In the recovery stage, companies focus on the high levels of innovation and risk in order to recover themselves to growth rates experienced in the early stages of their life cycle. Successful companies in the recovery phase will experience faster growth (Finali, 2016).

Decline stage: The decline stage is specified by decreasing the size (share) of the company's market. In the current competitive environment, it is likely that the company will approach the recession as demand declines. Usually, at this stage of the lifecycle, companies have a low level of innovation, which in turn, reduces the demand, and due to the lack of innovation, the company's products are outdated and are not desirable for the customer, and the company will be obliged to impose

discounts on prices to maintain the sales level (Finali, 2016).

[16] used the ratio proposed by Dianglow et al. (2006) and found that there is a significant difference between the life cycle stage and the probable integration activity.

In a study, Kalonki and Cellola (2008) concluded that due to changes in management information requirements, the use of activity-based costing systems varies in different stages of the life cycle. The rate of use of the activity-based costing systems is higher in companies at the maturity and recovery stages in comparison to the growth stage.

Dickinson (2007) described the life cycle theory of the company in its various stages of its life. Company life cycle stages are distinct and identifiable stages that are induced by changes in internal measures (such as selection of strategy, financial resources, and management ability) or external measures of the company (such as the competitive environment and macroeconomic factors) resulting in the adoption of strategic activities by the company.

Zoe (2007) examined the effect of the life cycle on the relevance of risk measures, and indicated that the relevancy of risk measures as well as the increasing explanatory power of risk measures vary in different stages of the life cycle. The increasing explanatory power of the risk measures have the highest and the lowest values in the decline and the maturity stages, respectively.

Aharoni et al. (2006) indicated that, the explanatory power of the criteria based on the cash flow is greater in the growth stage and the accrual-based criteria are higher in the maturity and decline stages.

In a study by Sojians (1996), it was concluded that the explanatory power of the research and development (R & D) expenditures have significant differences in various stages of the cycle. Companies in the growth stage and companies in the decline stage have the highest and lowest explanatory power, respectively.

Fama and French (1992) experimentally examined the variables including the company size, the ratio of book value to market price, the financial leverage, and the profit to cost ratio that play an effective role in explaining the difference in return on stock, with the expected return on stock in the US capital market. They reported that, the systematic risk index alone could not explain the relationship between risk and stock returns. Among the variables examined, two variables of the company size and book value to the market price ratio could better explain the difference in stock returns [5].

In a study, found a significant relationship between the company's performance measurement criteria and the stock market price at different stages of the life cycle, so that the relevance of the measures of sales growth and capital expenditures have a descending trend from the emergence to the decline stages. [6] On the other hand, according to [7], the financial requirements of a company will vary from its start-up to its maturity based on its ability to generate cash, its growth opportunities, and the risk of their realization. For instance, companies experience stable and balanced sales at the maturity stage compared with other stages, such as growth and decline and cash requirements are often supplied through internal resources. Due to the abundance of liquidity and reduced reliance on foreign financing policy, the return on investment or the adjusted return on investment (ROI)

is generally equivalent to or above the rate of supplying of capital.

Heidarpur Farzaneh et al. (2016) in a study investigated the relationship between company life cycle and risk of drop of stock prices. The study period was 2005-2014 and the sample included 71 companies. The common least squares regression method was used to test the research hypotheses. The findings revealed that after the financial leverage control, there was a negative and significant relationship between the company size, the ratio of market value to book value of equity, and return on equity between growth and decline stages and the risk of falling stock prices.

Karami and Omrani (2010) investigated the impact of company life cycle on relevance of risk and performance measures and showed that the relevance of risk and performance measures and the increasing explanatory power of risk factors in different stages of the life cycle had a significant difference with each other. The results of the Wang statistical test indicated that the increasing explanatory power of risk factors had the highest and the lowest level at the growth and maturity stages, respectively [2].

In a study, Ghaemi and Tousi (2008) examined the effect of variables of beta, company size, book value to market value ratio, ratio of earnings per share (EPS) and volume of stock exchanges on monthly stock returns in the stock market. The results of this study demonstrated that there was a significant and stable relationship between stock returns with the systematic risk index, company size, and price/income ratio [8].

Ahmadpour & Resa (2006) assessed the relationship between risk and bid price differences in purchasing and selling shares in Tehran Stock Exchange. The results of the study indicated that the model including all independent variables measured more than 68% of variations in the bid price differences between buying and selling of the shares. [5]

According to Jahankhani (2005), since the purpose of joint stock companies and their managers is to maximize the value of equity and, in other words, maximize the value of the company and its shares, and maximizing the company value requires the optimal use of financial resources and obtaining returns with minimal risk, in this framework, managers can maximize the company value in two ways: by increasing the company's returns and through minimizing the capital cost and the company risk [8].

In a study, Bagherzadeh (2005) addressed the relationship between company size, the ratio of the book value to stock price, and income/price ratio with stock returns of companies accepted in Tehran Stock Exchange (83, 1999), and concluded that the company size was negatively correlated with stock returns, however there was a positive relationship between the ratio of the book value to stock price and income/price ratio with stock returns [8].

Research hypotheses

Anthony and Ramesh (1992) claimed that the rate of relevance of sales growth and capital expenditures has a declining trend from the emergence to the decline stages. Sajians (1996) reported a significant relationship between the explanatory power of R&D expenditures at different stages of the life cycle. Blake (1998) stated that the explanatory power of accrual-based pricing models and cash flows have a significant difference with each other in different stages of the life cycle. [10] declared that

the degree of relevance of profit components varies depending on the stage of the life cycle the company is at. Zoe (2007) reported a significant difference between the relevance and the increasing explanatory power of risk factors in different stages of the life cycle. The increasing explanatory power of the risk measures have the highest and the lowest levels in the stages of decline and maturity, respectively. According to Dehdar (2007), in the growth and maturity stages, profit and accrual-based valuation patterns have more increasing explanatory power compared to models based on operational cash flows, investment, and financing, and this is conversely true at the decline stage [2].

Karami and Omrani (2010) indicated that the relevance of risk and performance measures and the increasing explanatory power of risk measures in different stages of life cycle (growth, maturity, and decline) are significantly different [2]. Moreover, the increasing explanatory power of risk factors had the highest and the lowest levels in the growth stage and in the maturity stage, respectively. In the first and second hypotheses, the aim is to investigate the relevance of the company's risk measures and also to examine the difference in the increasing explanatory power of the risk factors in different stages of the life cycle of the companies accepted in Tehran Stock Exchange; these hypotheses are expressed as follows:

Hypothesis 1: The relevance levels of risk measures of the companies are significantly different in various stages of the life cycle.

Hypothesis 2: The increasing explanatory power of risk measures of the companies are significantly different in various stages of the life cycle.

3. Method

This study is applied and descriptive in terms of purpose and the method of implementation in the research field, respectively. The data used in this study are historical (post-event) and the data scale is of the relative type. The statistical population of the study included all of the companies listed in Tehran Stock Exchange. The sample companies were selected as follows taking into account the study objectives:

1. Companies that were listed in the Tehran Stock Exchange.

2. Companies that were profitable.

3. Companies that were not among the investment companies, banks, and their financial intermediaries.

4. Their information and financial statements were regularly available and achievable.

In this study, the Victoria Dickinson (2011) method, which was coinciding with the pattern of cash flows (operational, investment, and financing activities), was used to categorize companies. The cash flow patterns are obtained from the combination of the positive (input) and negative (output) signs of cash flows to determine the life cycle stages. Dickinson (2011) used the models obtained from the three classes of the cash flow (operational, investment, and financing) to divide the life cycle stages as follows (Table 1):

Table 1

Division of life cycle stages using cash flow modeling method

	1	2	3	4	5	6	7	8
	Creation	Growth	Maturity	Recession	Recession	Recession	Decline	Decline
Predicted sign								
Cash flows due to operational activities	-	+	+	-	+	+	-	-
Cash flows due to investing	-	-	-	-	+	+	+	+
Cash flows due to financing	+	+	-	-	+	-	+	-

Reference: Dickinson 2011

The characteristics of cash flows in the stages of creation, growth, maturity, and decline can be explained through economic theories. However, the prediction of the companies' cash flows is far more difficult at the recession stage. Hence, in the study by Dickinson (2011), companies lacking the other four classes are classified to be in the recession stage [22].

The statistical analysis of the data in the current research was carried out in the two descriptive and inferential levels. The cross-sectional, multivariate regression, F test, T-test, Wang statistical test, mean test, Taffler z-score, financial ratios, were used in the inferential level. In addition, in the descriptive section, the statistical techniques used included descriptive statistics indices such as tables and graphs. For data analysis and estimation of models, Excel, SPSS (version 24, IBM Corporation, Armonk, NY, USA), Pars Portfolio, and Tadbir Pardaz software packages have been used.

3.1. Operational definition of variables

Market risk measures: This risk, which is due to uncertainty about the receivables of the company's transactional portfolios, is resulted from volatilities in market conditions such as asset price changes, including financial assets, interest rates, market volatilities, and market liquidity. To calculate this risk, the leverage, company size, ratio of book value to market value, and beta of the CAPM model were exploited.

Stock returns: The dependent variable of the stock return has been composed of two parts: 1. Current returns or returns from receiving dividends and other benefits; and 2. Returns from stock price increases (capital gains). The following equation can be used to calculate the return on stock held for one year:

Relation (1)

$$R = \frac{Pt - Pt-1 + Di}{Pt-1}$$

R: Rate of return

Pt-1: Stock price at the beginning of the period

Pt: Stock price at the end of the period

Di: Profits and benefits of the shares during the period [2].

Company life cycle: As outlined in the previous sections, financial characteristics of companies are expected to vary at the stages of their lifecycle, in addition, the life cycle of companies affects their economic behavior and capital structure. Therefore, the company life cycle was considered as a moderator variable in this study.

Table 2

Research variables

Operational definition	Symbol	Variable
Logarithm of stock returns	R	Dependent
Logarithm of sum of company assets	SIZE	
Logarithm of the ratio of the book value to the market value of the company	BM	Independent
Logarithm of the beta coefficient of the CAPM model	BETA	
Logarithm of the ratio of the long-term debt to the total assets of the company	DEBT	
Company life cycle	LC	Moderator

4. Findings

In the current investigation, the Kolmogorov-Smirnov (K-S) test was utilized to examine the normal distribution of the data. In this regard, the zero statistical hypotheses and their opposite were developed as follows:

H0: Research data were not normally distributed.

H1: Research data were normally distributed.

Table 3

Kolmogorov-Smirnov (K-S) test for the normality of data

Normality of variables of the risk hypothesis		
Variable	Symbol	Sig
Stock return	LRI	0.057
Company size	LSIZE	0.53
book value to market value	B/M	0.347
Debt ratio	DEBT	0.131
Beta	LBETA	0.089

Reference: Research findings

As illustrated in the above table, the K-S test is significant for all variables (P > 0.05), meaning that the data have a normal distribution and the H0 hypothesis is rejected and its opposite hypothesis, H1, is accepted, hence the parametric test must be used.

4.1. Descriptive statistics

Table 4 demonstrates the descriptive statistics of the explanatory variables by the stages of creation, growth, maturity, recovery, and decline. As it can be observed, a wide deviation exists among the descriptive statistics of these variables during the lifecycle stages.

Table 4

Descriptive statistics

Variables			Dependent	Risk measures			
			LRI	LSIZE	B/M	DEBT	LBETA
Total sample	n=406	Mean	-0.008	12.255	0.188	-0.966	-0.168
		SD	0.578	1.555	570.000	0.497	0.558
Birth stage	n=66	Mean	-0.390	11.989	0.256	-0.879	-0.112
		SD	0.691	1.577	0.571	0.416	0.495
Growth stage	n=79	Mean	0.011	12.527	0.069	-0.961	-0.275
		SD	0.580	1.471	0.545	0.506	0.634
Maturity stage	n=110	Mean	0.075	12.305	0.175	-1.026	-0.303
		SD	0.615	1.569	0.520	0.510	0.614
Recovery stage	n=87	Mean	0.097	12.061	0.191	-1.037	-0.101
		SD	0.395	1.546	0.624	0.493	0.491
Decline stage	n=64	Mean	0.074	12.231	0.284	-0.863	0.044
		SD	0.425	1.612	0.593	0.527	0.410

SD: Standard deviation　　　　　　Reference: Research findings

The largest size and the smallest size of the company belongs to the companies in the growth stage and the companies at the birth stage, respectively. In addition, the highest and lowest ratios of the book value to the market belongs to the companies at the decline stage and companies at the growth stage, respectively. The highest and lowest market risks (beta coefficient) of the companies belong to the growth and decline stages, respectively. Moreover, the highest and lowest debt ratios of the companies belong respectively to the birth and recovery stages.

Table 5

Matrix of Pearson correlation coefficients between variables

	LRI	LSIZE	BM	DEBT	LBETA
LRI	1	0.108	0.151	0.048	-0.12
LSIZE		1	-0.261	-0.184	-0.121
BM			1	0.173	-0.011
DEBT				1	0.056
LBETA					1

Reference: Research findings

The correlation coefficient between variables has also been presented in table 5. As it can be observed, the return has a negative and inverse relationship with the market risk (beta coefficient of the CAPM model) and a positive and direct

relationship with the size of the company, the book value to the market value, and the debt ratio.

4.2. Inferential statistics

The results of fitting of the regression model for the whole statistical samples as well as the statistical samples of each stage of birth, growth, maturity, recovery, and decline have been given in table 4. The F statistic expresses the general significance of the regression model. The lack of collinearity between independent variables, the independence of the residues, and the adequacy of the model have been confirmed.

4.2.1. Testing of hypothesis 1

According to hypothesis 1, the relevance of the risk measures of the company in different stages of the life cycle have a significant difference with each other.

As shown in table 4, all estimated coefficients of the risk measures are significant for the total sample (n = 406), however these coefficients are different in terms of value (which represents the degree of relevance) and significance in different stages of birth, growth, maturity, recovery, and decline. For instance, the company size

factor (LSIZE) at birth, growth, maturity, recovery, and decline is -0.107, 0.278, 0.308, 0.046, and 0.145, respectively, which is significant in the stages of growth and maturity, but is not significant at the stages of birth, recovery, and decline. Or, the book to market (B/M) ratio of each share in birth, growth, maturity, recovery, and decline stages respectively is 0.077, 0.243, 0.315, 0.121, and 0.192, which is significant at maturity and recovery stages, however, it is not significant at birth, growth, stages. Furthermore, the estimated beta coefficient of the CAPM model at the stages of birth, growth, maturity, recovery, and decline are -0.150, -0.102, 0.017, -0.366, and -0.117, respectively, which is significant in the recovery phase. However, this coefficient is not significant at the stages of birth, growth, maturity, and decline. Finally, the estimated coefficient of the ratio of the long-term debt to total assets (DEBT) of the company at the birth, growth, maturity, recovery, and decline stages are 0.022, 0.294, -0.043, 0.068, and 0.184, respectively, which is significant in the growth stage, but not significant at the stages of birth, maturity, recovery, and decline. Overall, the results of this hypothesis in table 6 indicate that the relevance of risk measures in the stages of birth, growth, maturity, recovery, and decline are significantly different from each other.

Table 6

Test results of hypothesis 1

Explanatory variables		Risk measures				Adjusted R²	F statistic	p-value	Durbin-Watson statistic
		LSIZE	B/M	DEBT	LBETA				
Total companies n=406	Coefficient	0.152	0.181	0.051	-0.102	0.049	6.234	0.000	1.980
	t statistic	2.983	3.575	1.022	-2.085				
	p-value	0.003	0.000	0.307	0.038				
Birth stage n=66	Coefficient	-0.107	0.077	0.022	-0.150	0.025	0.608	0.658	2.402
	t statistic	-0.839	0.590	0.172	-1.161				
	p-value	0.405	0.557	0.864	0.250				
Growth stage n=78	Coefficient	0.278	0.121	0.294	-0.102	0.082	2.748	0.034	2.748
	t statistic	2.356	1.041	2.551	-0.110				
	p-value	0.021	0.301	0.013	0.912				
Maturity stage n=110	Coefficient	0.308	0.315	-0.043	0.017	0.124	4.859	0.001	1.973
	t statistic	3.294	3.380	-0.470	0.186				
	p-value	0.001	0.001	0.639	0.853				
Recovery stage n=87	Coefficient	0.046	0.243	0.068	-0.366	0.174	5.520	0.001	1.734
	t statistic	0.436	2.373	0.683	-3.649				
	p-value	0.664	0.020	0.497	0.000				
Decline stage	Coefficient	0.145	0.192	0.184	-0.117	0.031	1.510	0.211	2.476

n=64	t statistic	1.074	1.374	1.442	-0.900
	p-value	0.287	0.175	0.154	0.372

Reference: Research findings

4.2.2. Testing of hypothesis 2

The second hypothesis states that the increasing explanatory power of the company's risk measures in different stages of the life cycle has a significant difference with each other.

Table 7

Summary of the results of hypothesis 2

Adjusted coefficient of determination	Total companies n=406	Total companies n=406	Total companies n=406	Total companies n=406	Total companies n=406	Total companies n=406
Explanatory power of risk measures R^2	0.049	0.025	0.082	0.124	0.174	0.031

Source: Research findings

In the above table, the explanatory power has been presented by the stages of birth, growth, maturity, recovery, and decline. As it is observed, these values are different at the stages of birth, growth, maturity, recovery, and decline and equal to 0.049, 0.025, 0.082, 0.124, 0.174, and 0.031, respectively.

The Z-statistic of Wang has been used in order to determine whether the increasing explanatory power of the risk measures of the stages is statistically significant. In the table, the increasing explanatory powers of the risk measures (R2) of the stages of birth, growth, maturity, recovery, and decline have been tested two to two by the Z-statistic of Wang and the unequal values have been assured. Therefore, the higher the adjusted coefficient of determination (R2) of each stage, the greater the increasing explanatory power of that stage.

Table 8

Summary of the results of hypothesis 2

Ratio of increasing explanatory power of risk measures at the lifecycle stages	Wang statistic	significance level	Z table	Test result
Birth to growth	0.31	3.35	1%	2.58	The hypothesis is confirmed.
Birth to maturity	0.20	4.06	1%	2.58	
Birth to recovery	0.14	5.41	1%	2.58	

Birth to decline	0.81	2.22	5%	1.96
Growth to maturity	0.66	0.65	10%	1.64
Growth stage to recovery	0.47	1.87	5%	1.96
Growth stage to decline	2.64	-1.01	10%	1.64
Maturity to recovery	0.71	1.28	5%	1.96
Maturity to decline	4	-1.92	5%	1.96
Recovery to decline	5.61	-2.94	1%	2.58

Source: Research findings

The increasing explanatory power has the highest and lowest values in the recovery and birth stages, respectively. Generally, these results indicate that the increasing explanatory power of the risk measures at different stages of the life cycle (birth, growth, maturity, recovery, and decline) have significant differences with each other.

5. Discussion and Conclusion

In this study, the followings were performed to answer the research question: how do company risk measures operate in different stages of the life cycle?

First, using annual data during the period of 2005-2015, using the cash flow patterns of the Dickinson (2011) method, the companies were classified into the stages of birth, growth, maturity, recovery, and decline according to the model used by Finali (2015). Then the regression and correlation analysis method [test used by Zoe (2007) and was used to test the hypotheses, and the effects of life cycle periods on the relevance of the risk measures were investigated. In addition, the stock returns of companies were exploited as a dependent variable [2].

Based on the study hypotheses, the relevance of risk measures and the increasing explanatory power of risk measures in different stages of the life cycle

have a significant difference. The results of regression analysis of the hypotheses in the current study indicated the important effect of life cycle stages (birth, growth, maturity, recovery, and decline) on the relevance of risk measures of the increasing explanatory power of risk measures. The results of the Z-statistic of Wang indicated that the increasing explanatory power of risk measures have the highest and lowest values in the recovery and birth stages, respectively. The results of this study are in line with the results of the studies by Zoe (2007) and [2].

In different stages of their life cycle, companies encounter different circumstances, adapt with different policies, and display a variety of functions. Overall, most companies do not have the opportunity to trade and finance through investors and banks in the initial and start-up stage. They require more investment and financing opportunities at the growth stage. At the maturity stage, development opportunities are less than the growth stage, but companies have a high amount of liquidity. As companies grow and fall into decline stage, they have limited growth opportunities and less profitability. At this stage, some companies are recovered through investing in new production lines and technologies. Generally, from the growth stage to the decline stage, companies face decreased investment opportunities and increased liquidity.

Markowitz claimed that individuals are interested in minimizing downside risk for two reasons:

1. The only risk-related criterion is downside risk because investors first seek to protect their investment and they prefer to minimize the downside risk.

2. Revenues of the securities may not be distributed normally, and in these circumstances, the use of a downside risk measure is more appropriate.

Investors behave differently against downside losses and upside gains. Therefore, investors who are very concerned about downside risk require a risk premium to maintain assets that have lower returns compared to upward returns. It can be concluded that assets with a negative skewness are more vulnerable to loss, in other words, their downward returns have more absolute value compared to their upward returns. These assets will have less attractiveness for investors and will require more returns and will be priced less. Conversely, assets with a positive skewness which have more potential of profit in comparison to the probable losses, are more attractive and require less risk premium [21].

References

[1] Dickinson, Victoria, Firm Life Cycle and Future Profitability and Growth, working paper, School of Business, University of Wisconsin - Madison, June 2005.

[2] Gh. Karami, h. Omrani, (2010). Impact of Company Life Cycle on the Relevance of Risk and Performance Criteria. Financial Accounting Research, Second Year, No. 3, pp. 49-64.

[3] Gh. Karami, h. Omrani, (2010). Impact of Company Life Cycle and Conservatism on the Company Value. Accounting and Auditing Reviews, No. 59, pp. 79-96.

[4] E. L. Black, 1998. Life-cycle impacts on the incremental value-relevance of earnings and cash flow measures." Journal of Financial Statement Analysis 4, 40-56.

[5] A. Ahmadpour, A. Resaeian, (2006). The Relationship between Risk Measures and Difference of Bid Price of Stock Purchase and Sale in Tehran Stock Exchange. Accounting and Auditing Reviews, Volume 13, Issue 4, pp. 37-60.

[6] J. Anthony, and K. Ramesh. 1992. "Association between accounting performance measures and stock prices. Journal of Accounting and Economics 15, 203-227.

[7] I. Adizes, Organizational Passages: Diagnosing and Treating Lifecycle Problems of Organizations, Organizational Dynamics 8 (Summer 1979).

[8] B. Kardan, S. Khalilian Movahed, (2013). Investigating the Effect of Risk Factors on Ordinary Stock Risk Premium in Tehran Stock Exchange. Accounting Knowledge, Volume 4, Issue 13, pp. 53-74.

[9] J. Aharony, h, Falk & N, Yehuda, (2006). Corporate Life Cycle and the Value Relevance of Cash Flow Versus Accrual Financial Information. School of Economics and Management Bolzano, Italy, Working Paper No.34.

[10] D.S. Jenkins, G.D. Kane, and U. Velury, (2004)."The Impact of the Corporate Life Cycle on the Value Relevance of Disaggregated Earnings Components" Review of Accounting and Finance, Vol. 3, pp.5-20.

[11] A. D. Chandler, (1962), Strategy and Structure, MIT Press: Cambridge, Mass. Brockman, P. and Unlu, P. (2011), "Earned/contributed capital, dividend policy, and disclosure quality: An international study. Journal of Banking and Finance, Vol. 35, Vol. 7, pp.1610-1625.

[12] Finlay, William, (2015) An analysis of firm life cycle and financial distress: Evidence from UK divestitures Submitted for the award of Ph.D., Department of Accounting and Finance, University of Strathclyde

[13] F. Hiydarpour, H. Rajab Dorri, A Khalifeh Sharifi, (2016). Relationship between Company Life cycle and Risk of Falling Stock Price in Tehran Stock Exchange. Accounting Research, Volume 6, Issue 3, pp. 1-22.

[14] J. Kallunki, h. Silola, (2008). The Effect of Organizational Life Cycle Stage on the Use of Activity Based Costing, Management Accounting Research, Vol.19, pp.62-79.

of Economic Perspectives, vol. 4, pp.579, 587, (2010)

[15] B. Lev, & T. Sougiannis, 1996. The Capitalization, Amortization, and Value-Relevance of R&D. Journal of Accounting and Economics 21, 107-138.

[16] S. Owen, and A. Yawson, (2010), Corporate life cycle and M&A activity, Journal of Banking and Finance, Vol. 34, No. 2, pp.427-440.

[17] P. Piri, M. Imani Barandag, S. Allah Verdizadeh, (2011). The Effect of Different Life-cycle Periods on Profitability and Growth of Business Firms, Experimental Accounting Researches, Year 1, No. 2, pp. 49-66.

[18] E. Quinn, K. Robert and Cameron., Organizational life cycles and shifting criteria for effectiveness, Management Science, 29, 1983m 33-51.

[19] R. Quinn, And K. Cameron, (1983), "Organizational life cycle and shifting criteria of effectiveness: Some preliminary evidence," Journal of Management Science, No. 29, No. 1, pp.33-41

[20] N. Rahimian, R. Rajabi, (2015). Investigation of the Relationship between the Principles of Company Governance and the Life Cycle of Companies Accepted in Tehran Stock Exchange, Accounting Knowledge, Year 15, Volume 61, pp 51-67.

[21] M. Sadeghi, A. Soroush, M. Farahanian (2010). Examination of Volatility, Upside Risk, and Downside Risk Measures in Capital Asset Pricing Model: Evidence from Tehran Stock Exchange. Financial Research, Volume 12, Issue 29, Pages 59-78.

[22] N. Sarlak, A. Faraji, F. Bayat, (2015). The Relationship between Company's Financial Features and Capital Structure in the Stages of the Company's Life-cycle. Financial Accounting and Audit Research, Year 7, No. 27, pp. 1-21.

[23] R.Tehrani, A. Nourbakhsh, (2013). Financial Theory (Advanced Financial Management). Thomas A. Copeland, John Frederick Weston, Kuldeep Shastri; Translation and Compilation, Tehran: Negah-e Danesh Publishing Vakilifard, H (2017). Financial Decision Making. Hampton John, Hurt Block; Translation and Compilation, Tehran, Jungle Publishing, Elmi Foj.

[24] Vuong, H. Quang (1989). Likelihood ratio Tests for Mode Selection and None-nested Hypotheses.

B. Xu, (2007), Life cycle effect on the value relevance of common risk factors, Review of Accounting and Finance, Vol. 6, No. 2, pp.162-175

[25] Z. Yan and Y. Zhao, A new methodology of measuring firm life-cycle stages, International Journal of Economic Perspectives, vol. 4, pp.579, 587, (2010).